



Rail Accident Investigation Branch

Rail Accident Report



Accident at Balnamore level crossing, Ballymoney, Northern Ireland 31 May 2013

Report 10/2014
May 2014

This investigation was carried out in accordance with:

- the Railway Safety Directive 2004/49/EC;
- the Railways and Transport Safety Act 2003; and
- the Railways (Accident Investigation and Reporting) Regulations 2005.

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

Accident at Balnamore level crossing, Ballymoney, Northern Ireland, 31 May 2013

Contents

Summary	5
Introduction	6
Preface	6
Key definitions	6
The accident	7
Summary of the accident	7
Context	8
Events preceding the accident	13
Events during the accident	16
Events following the accident	17
The investigation	18
Sources of evidence	18
Key facts and analysis	19
Background information	19
Identification of the immediate cause	20
Identification of causal factors	21
Other discounted factors	26
Observations	27
Summary of conclusions	30
Immediate cause	30
Causal factors	30
Additional observations	30
Actions reported as already taken or in progress relevant to this report	32
Learning points	33
Recommendations	34
Appendices	36
Appendix A - Glossary of abbreviations and acronyms	36
Appendix B - Glossary of terms	37
Appendix C - Key standards current at the time	40

Summary

At approximately 03:10 hrs on Friday, 31 May 2013, a car driver was forced to take action in order to avoid colliding with an engineering train that was traversing Balnamore automatic half barrier level crossing, which is located between Coleraine and Ballymoney stations on Northern Ireland Railways' Belfast to Londonderry/Derry line. The car subsequently struck metal fencing forming part of the crossing, causing minor injuries to its two occupants and damage to the car. The crew of the engineering train spoke with the car driver and then continued work without reporting the accident.

At the time of the accident, the engineering train was undertaking weed-spraying operations within a possession of the line, which meant that operation of passenger trains on the line had been suspended. Because the line was under possession, Balnamore level crossing, which is normally automatically operated by approaching trains, was being operated manually via its local controls. However, as the train passed over the crossing, its half barriers had not been lowered and its road traffic signals were not operating, even though this was required by the railway rules relating to this type of level crossing. This meant that the car driver did not have enough warning to stop his car before the level crossing became occupied by the train.

The RAIB has found that the team responsible for undertaking weed-spraying was routinely not complying with the rules relating to the operation of automatic half barrier level crossings within possessions. This was probably due to a combination of factors, including the team possibly having a low perception of the risks presented by this non-compliance and a desire by them to complete the weed-spraying more quickly. In addition, the team may have been influenced by the status of rules relating to the local control of other types of crossing in possessions and the method of work adopted at level crossings during a recent project.

The RAIB has also found that this non-compliance was not detected or corrected by safety checks conducted by Northern Ireland Railways. In addition, the investigation identified that the appointment of additional competent staff to operate crossings within the possession may have prevented the accident from occurring.

The RAIB has identified three key learning points. These are: that the person in charge of a possession should correctly complete the form intended to help them keep track of level crossings; that boarding moving trains, where it is prohibited, should be avoided; and that accidents should be reported.

The RAIB has also made three recommendations addressed to Northern Ireland Railways. These relate to: ensuring that activities undertaken at level crossings within possessions are subject to effective risk controls; ensuring that method statements relating to track engineering are supported by risk assessments; and increasing the opportunities for non-compliances to be detected and corrected.

Introduction

Preface

- 1 The purpose of a Rail Accident Investigation Branch (RAIB) investigation is to improve railway safety by preventing future railway accidents or by mitigating their consequences. It is not the purpose of such an investigation to establish blame or liability.
- 2 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.
- 3 The RAIB's investigation (including its scope, methods, conclusions and recommendations) is independent all other investigations, including those carried out by the safety authority, police or railway industry.

Key definitions

- 4 All dimensions in this report are given in metric units, except speed and locations which are given in imperial units, in accordance with normal railway practice. Where appropriate the equivalent metric value is also given. Any location mileages given are measured from a zero datum located at the site of the former Belfast York Road Station via Greenisland (reverse).
- 5 The report contains abbreviations and technical terms (shown in *italics* the first time they appear in the report). These are explained in appendices A and B.

The accident

Summary of the accident

- 6 At approximately 03:10 hrs on Friday, 31 May 2013, a car driver was forced to take action in order to avoid a collision with an engineering train which was traversing Balnamore *automatic half barrier level crossing* (AHBC), located on Northern Ireland Railways' (NIR) Londonderry/Derry to Belfast line (figure 1). As a result of this action, the car struck metal fencing which formed part of the crossing.
- 7 At the time of the accident, the engineering train was undertaking weed-spraying within a *T3 absolute possession*, which meant that operation of passenger trains on the line had been suspended and that Balnamore AHBC was being operated in *local control*. The crossing's half barriers had not been lowered and its road traffic signals were not operating as the train passed over it, as was required by the relevant NIR rules.

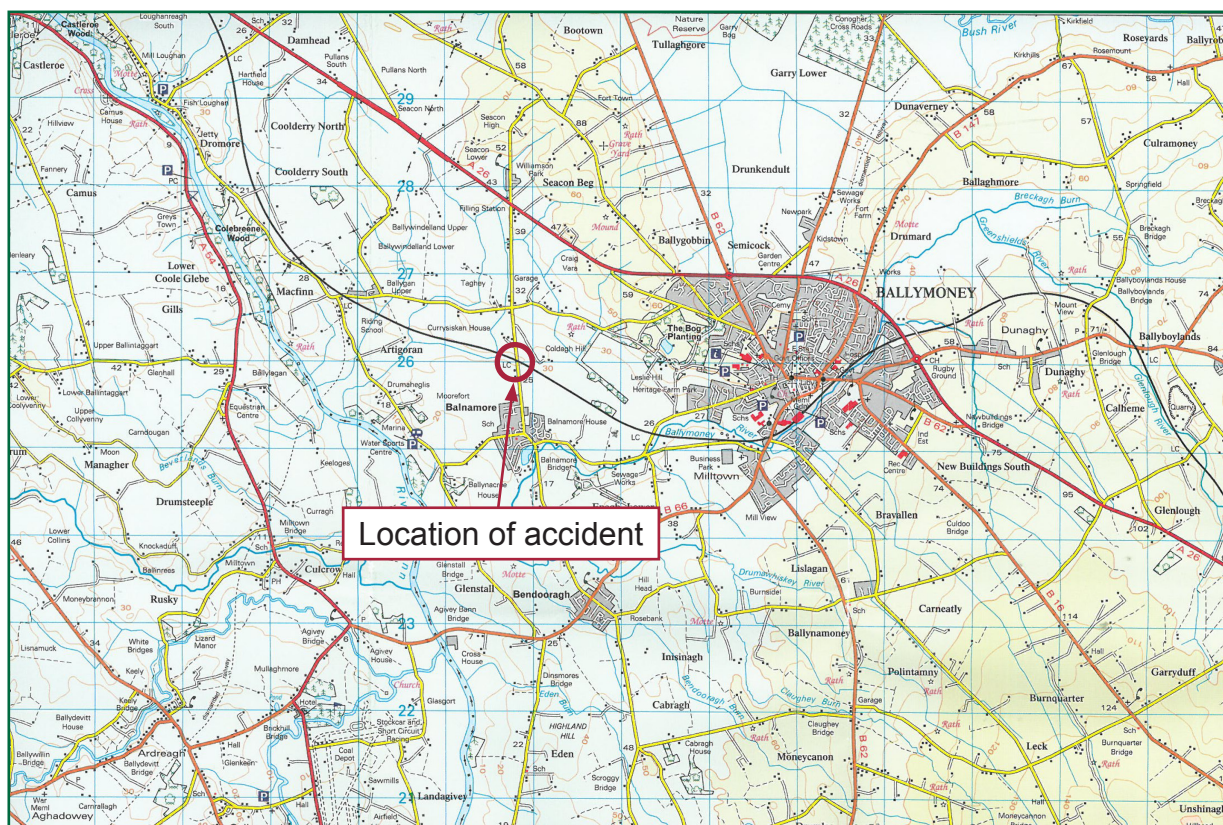


Figure 1: Extract from Ordnance Survey map showing location of accident

- 8 Both occupants of the car suffered minor injuries. The car received damage to its bodywork and was later reported as being beyond economic repair. No damage was caused to the engineering train and only minor damage was caused to the crossing fencing.
- 9 Following the accident, the crew of the engineering train spoke to the car driver and then continued work without reporting the accident to the *person in charge of the possession* (PICOP), NIR *operations control* or their line manager. The accident was reported directly to NIR by the car driver later the same day.

Context

Location

- 10 Balnamore level crossing (55 miles 45 chains) is located on the single-track Belfast to Londonderry/Derry line, between the stations at Coleraine (61 miles 62 chains) and Ballymoney (53 miles 31 chains) (figure 2). It is one of four AHBC level crossings within approximately 4.5 route miles (7.2 km) of track. During operating hours it is normally crossed by two passenger trains per hour (one in each direction), with extra trains crossing during peak hours. The last passenger train to traverse the crossing is the 23:54 hrs weekday service from Ballymoney, which arrives at Coleraine at 00:05 hrs.

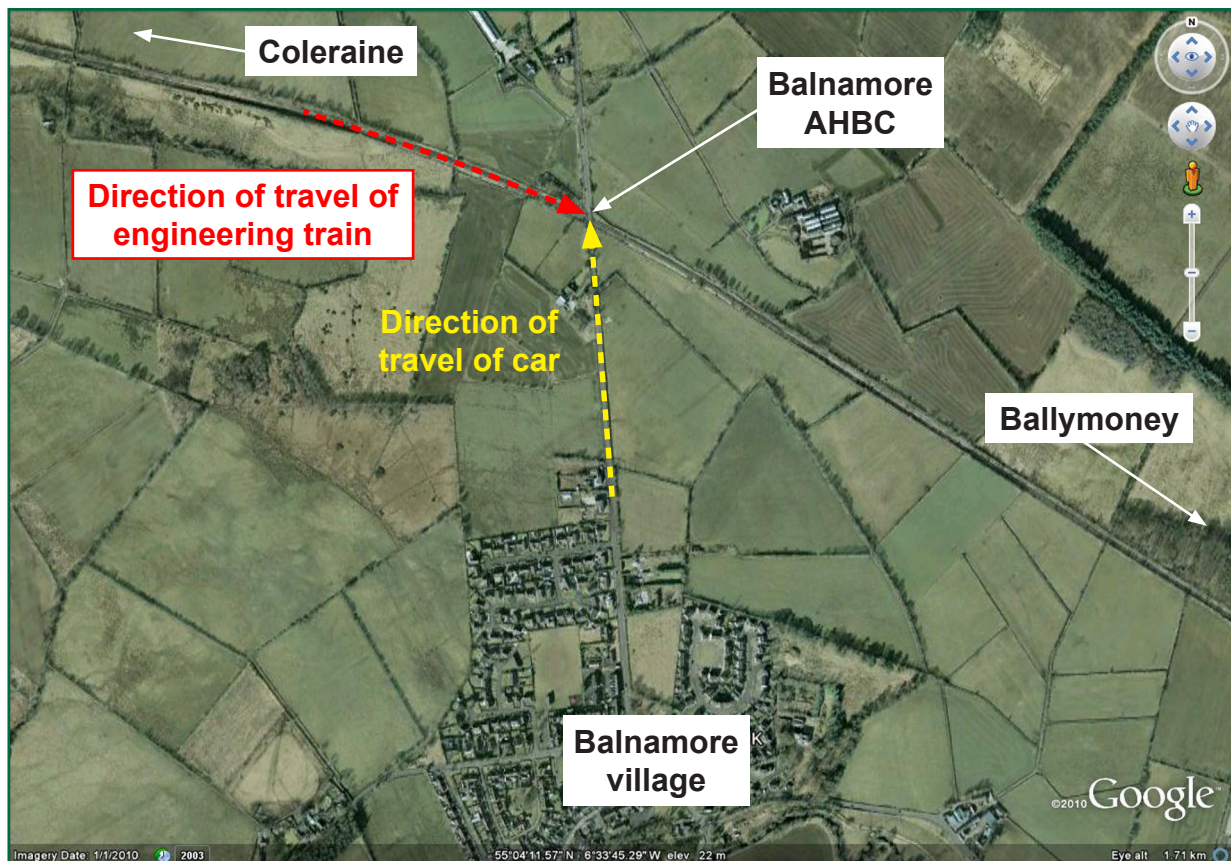


Figure 2: Google Earth image of Balnamore AHBC level crossing

- 11 Balnamore AHBC lies within the area controlled by Coleraine signal box, which is located close to Coleraine station. This signal box also directly controls Coleraine manually controlled barrier level crossing, which it overlooks, and Artillery Road *closed circuit television level crossing* (CCTV). Coleraine signal box is normally closed between 00:20 and 05:20 hrs.
- 12 Balnamore AHBC is located around 0.5 miles (0.8 km) to the north of Balnamore village on the single-carriageway Taughey Road, which runs from the village and through the crossing on a north-south axis. Immediately on leaving the village, the speed limit of Taughey Road rises from 30 mph (48 km/h) to the national speed limit of 60 mph (97 km/h). The surface of the crossing is skewed with respect to the railway and has a width of around 10.7 metres; of this approximately 8.5 metres is marked as the carriageway (figure 3).

The level crossing

- 13 Balnamore AHBC is equipped on both sides of the crossing with road traffic signals (known as 'wig-wags'), one of which is positioned to either side of the carriageway (figure 3). Each wig-wag signal consists of a single steady amber light and two flashing red lights. In addition to these signals, the crossing is protected on both sides by a half barrier which, in normal operation, will lower across the entrances to the crossing after the wig-wag signals have been operating for a set period. Two *boom lights* mounted on each half barrier illuminate in both directions along the road once the half barriers start to lower. An audible warning to pedestrians is also provided; this will sound as soon as the wig-wag signals start to operate. Telephones for public use are also provided on both sides of the crossing.

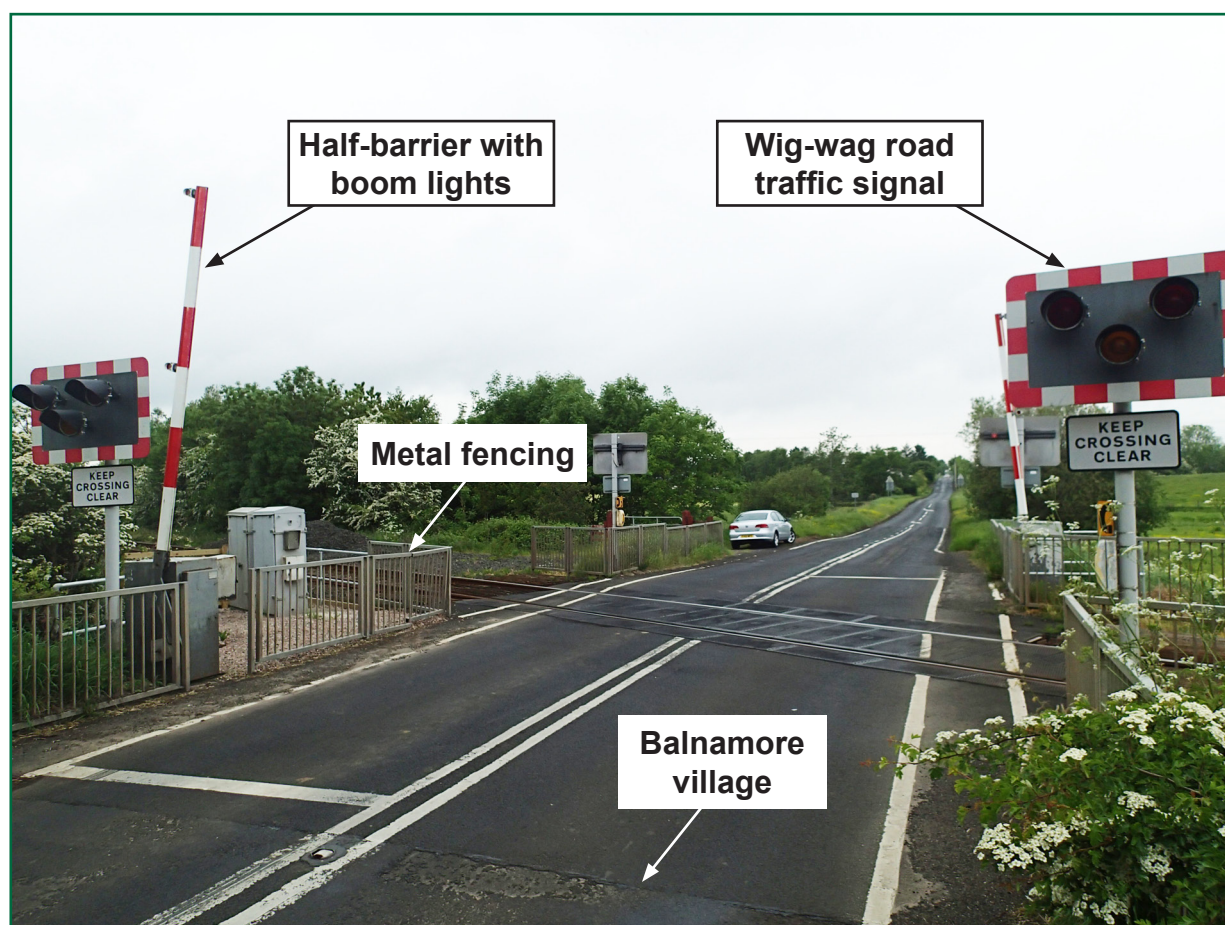


Figure 3: Balnamore AHBC level crossing

- 14 At the time of the accident, there was heavy vegetation to the *nearside* of road users approaching Balnamore AHBC from the south. This partly obscured the visibility of the nearside wig-wag signal, which would not have been visible to road users approaching from the south until they were around 50 metres away from the crossing. The half barriers and crossing surface would have become visible to road users once they had passed over a significant dip in the road, around 160 metres to the south of the crossing. The offside wig-wag signal was not obscured by vegetation or the road profile and would have been visible for over 400 metres to the south (figure 4 and figure 5).

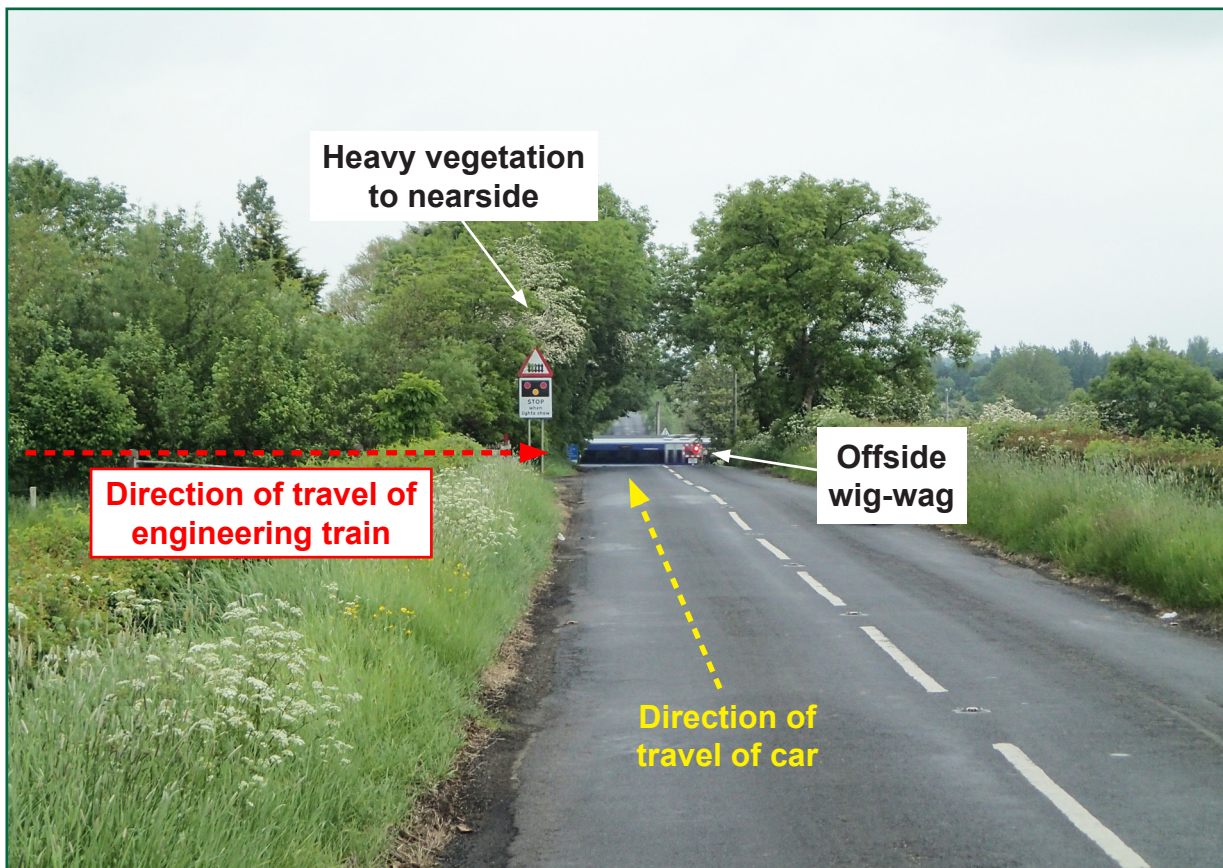


Figure 4: Approach to Balnamore AHBC from the south



Figure 5: Approach to Balnamore AHBC from the south, immediately prior to the dip in road profile

- 15 In normal operation, AHBCs are activated automatically by the approach of a train. Road users are required to stop behind the white vehicular stop line when the lights are illuminated as part of this activation¹; they are not, therefore, expected to look out for approaching trains when using AHBCs. However, it is of relevance that the heavy vegetation to the nearside of Balnamore AHBC meant that railway vehicles approaching the crossing from the nearside could not be seen by the drivers of road vehicles until the latter were relatively close to the stop line (and vice versa).
- 16 Although AHBCs are normally activated automatically, they are also equipped with a *local control unit* (LCU), which allows a person holding the appropriate competence (such as an *Emergency Operator* (EO), paragraph 48) to switch the crossing away from automatic operation and into local control. This allows the half barriers to be lowered or raised by the EO, independent of the presence of rail vehicles; lowering the half-barriers using local control will also automatically activate the wig-wag signals and audible signal. Opening the LCU cabinet door at Balnamore AHBC automatically illuminates a warning lamp in Coleraine signal box; the LCU cabinet door cannot be closed (and the warning lamp extinguished) unless the crossing has been switched back into automatic operation. LCUs are also fitted to CCTV level crossings (paragraph 52).
- 17 The crossing equipment at all four corners of Balnamore AHBC (eg barrier units, LCU cabinets and wig-wag signals) is protected by metal fencing and gates (figure 3).

Organisations involved

- 18 NIR is a subsidiary of the Northern Ireland Transport Holding Company, which is the public corporation providing rail and bus transportation in Northern Ireland and which operates under the group brand name of 'Translink'. NIR owns and maintains the railway infrastructure at Balnamore AHBC and operates passenger rail services on the Belfast to Londonderry/Derry line. The NIR district engineer with responsibility for the weed-spraying programme worked for the track department, which is part of NIR's infrastructure division.
- 19 Northern Excavators Ltd is a framework contractor to NIR; it owns the *road-rail vehicle* (RRV), rail trailer and other equipment which formed the weed-spraying engineering train on 31 May 2013. It had been undertaking weed-spraying operations on NIR's infrastructure since 2009 and employed the team which operated the weed-spraying engineering train.
- 20 NIR and Northern Excavators Ltd freely co-operated with the investigation.

Train involved

- 21 The weed-spraying engineering train was formed of a Mecalac type 14MBX RRV (approximately 3 metres long) towing a rail trailer (approximately 6 metres long with a 1.5 metre *drawbar*, making a total train length of around 10 metres, figure 6). The rail trailer was loaded with weed-spraying equipment; this consisted of a spraying unit (positioned to the rear of the trailer) and herbicide tanks (positioned to the front). The RRV was driven by a machine operator (referred to as the 'RRV operator' in this report) with a separate operator manning the trailer and spraying unit.

¹ If a road user has already passed the white line when the amber light illuminates, then they should continue to cross.



Figure 6: A Mecalac type 14MBX RRV and rail trailer – note that the trailer would not have been loaded with a hopper on 30/31 May 2013 (image courtesy of Northern Excavators Ltd)

- 22 Witness evidence is that the RRV was illuminated with head and working lights to the front (which would have been the leading end when weed-spraying) and tail lights to the rear. The trailer was illuminated with tail lamps to the rear, with a further three spotlights mounted on the spraying unit (two facing rearwards and one swivel-mounted to the front).

Staff involved

- 23 Weed-spraying was normally undertaken by a team of four staff, consisting of an RRV operator, a foreman (who also undertook the roles of trailer operator and *track safety co-ordinator*), a PICOP (who also acted in the role of *engineering supervisor* and EO) and a fourth team member, who undertook various duties connected to the weed-spraying programme. Although the staff and roles within the weed-spraying team had remained unchanged since the start of the programme in 2009, the fourth team member was absent on the night of the accident. The potential impact of his absence is discussed in paragraph 92.
- 24 The RRV operator had worked on the railway for 15 years and was an experienced machine operator, who had undergone training as an RRV operator in Great Britain. He had undertaken training as an EO with an NIR approved training provider and had been certified as competent in the role since March 2010. He was required to undergo periodic recertification as an EO and had last been recertified as competent in the role in March 2012, by an NIR approved training provider. His *personal track safety* (PTS) certification was current at the time of the accident.

- 25 The foreman had 14 years of railway experience, of which 3 had been in the position of foreman. He had undertaken training as both a track safety co-ordinator and EO with an NIR approved training provider and had been certified as competent in these roles since March 2008 and March 2010 respectively. He had last been recertified as a competent track safety co-ordinator and EO in March 2012, by an NIR approved training provider. His PTS certification was current at the time of the accident.
- 26 The PICOP had 13 years of railway experience. He had undertaken training as an EO with an NIR approved training provider and as an engineering supervisor and PICOP with NIR. He had been certified as competent as an EO, ES and PICOP since January 2008, October 2008 and March 2010 respectively. He had last been recertified as a competent EO in March 2012, by an NIR approved training provider and as a competent ES and PICOP in November 2012, by NIR. His PTS certification was current at the time of the accident.

External circumstances

- 27 The weather on the night of 30/31 May 2013 was mild and dry, with a slight breeze. Although visibility was good, the immediate area around Balnamore AHBC was dark, with no street or ambient lighting. At the time of the accident, no other rail or road traffic was present and the only noise in the vicinity of Balnamore AHBC was that generated by the RRV and spraying unit.
- 28 External circumstances did not affect the accident.

Events preceding the accident

- 29 The week commencing 27 May 2013 was the first week of a four to five week annual weed-spraying programme, which was to cover the whole NIR network. Weed-spraying took place at night, outside normal operating hours and within T3 absolute possessions. The nature of the work meant that it could only take place in dry conditions. Because of this, details of each night's possession were published via a *supplementary notice*, once the weather forecast for the night was known².
- 30 On the night of 27/28 May, the team sprayed the line from Londonderry/Derry to Bellarena. The following night's planned spraying from Bellarena to Coleraine was cancelled due to rain and was undertaken instead on the night of 29/30 May. On the night of 30/31 May the weed-spraying team planned to spray the Portrush branch line from Portrush to Coleraine and the Belfast to Londonderry/Derry line from Coleraine to Ballyboyland.
- 31 On 30 May a supplementary notice for a possession from Portrush to Killagan was published, to cover the planned spraying. At around 22:30 hrs, the foreman became aware that the fourth team member was going to be absent that night. Given the short amount of time available before the work was due to start, the foreman thought that he would be unable to find a replacement team member. He decided therefore that the work would continue with a team of only three.

² Staff working for the district engineer with responsibility for the weed-spraying programme would make a request to NIR's operations department to issue and distribute the relevant supplementary notice.

- 32 At around 23:00 hrs, the PICOP rang the signaller at Coleraine signal box and obtained permission to put down *protection* for the possession at Killagan. The PICOP then went to Coleraine to put down further protection and to obtain the *token* for the Portrush branch from the signaller, who subsequently granted him a T3 absolute possession at 00:15 hrs on 31 May. The signaller then closed the signal box, in line with normal practice. After the possession was granted, the PICOP gave himself (as engineering supervisor) authority to start work within a *work site* which covered the entire length of the possession. In his role as engineering supervisor, the PICOP gave authority to start work to the foreman, who was the track safety co-ordinator.
- 33 The weed-spraying team *on-tracked* the RRV and rail trailer at Coleraine manually controlled barrier level crossing and loaded the sprayer unit onto the trailer. While these activities were taking place, the crossing was not activated (ie the barriers remained raised and the wig-wag signals were not illuminated); this was because the lowered barriers would have obstructed the on-tracking operation. Road traffic was instead controlled by parking vehicles across the road and signalling to road users with hand lamps. This was broadly in accordance with the requirements of the joint NIR/*Iarnród Éireann* (IE) Rule Book (see paragraph 72).
- 34 The engineering train was then driven from Coleraine to Portrush (figure 7) in reverse formation (ie with the rail trailer leading) and with the spraying equipment switched off. The first crossing reached by the train during this movement was Artillery Road CCTV level crossing, to which the PICOP had driven by road in order to act as EO. At this crossing, the PICOP did not lower the barriers using the crossing's LCU (paragraph 16). He instead implemented a method of work where the train would stop short of the crossing (around the cattle/anti-trespass guards) whilst he controlled any approaching road traffic. The PICOP did this by parking his van (with its hazard lights switched on) to one side of the crossing, while he stood on the other side and signalled road traffic to stop using a hand lamp (figure 8). Once he judged that it was safe for the train to pass over the crossing, the PICOP signalled the RRV operator to proceed using a green hand lamp (paragraphs 48 to 52).

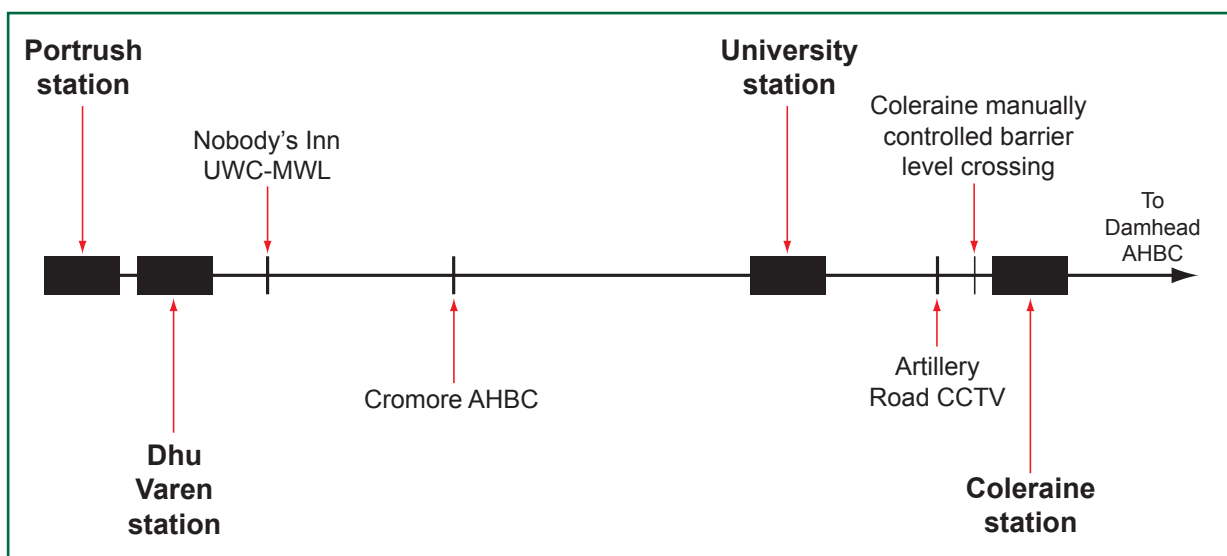


Figure 7: Diagram showing relevant level crossings between Coleraine and Portrush stations (not to scale)

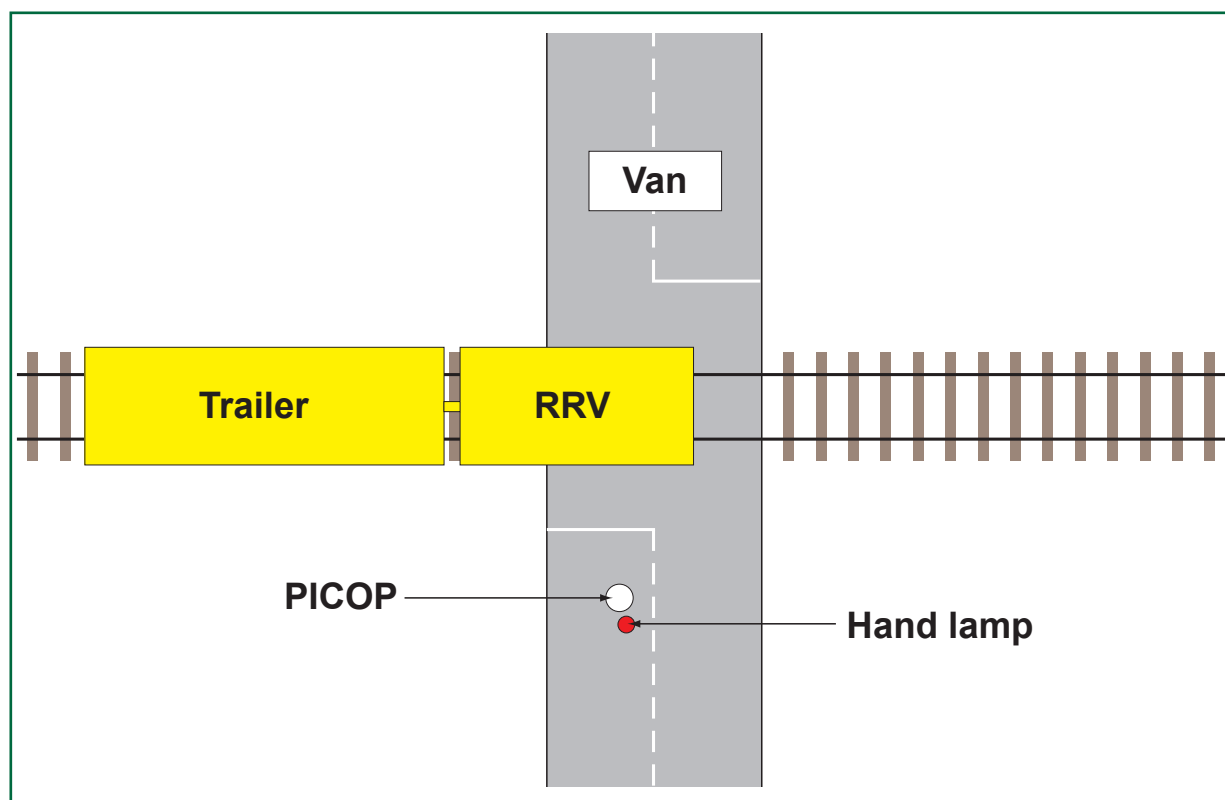


Figure 8: Diagram of how the PICOP protected level crossings during the initial movement from Coleraine to Portrush

- 35 The engineering train continued towards Portrush and passed over Cromore AHBC and Nobody's Inn, a *user worked crossing equipped with miniature red and green warning lights* (UWC-MWL). At these crossings the same arrangements were put in place by the PICOP to control road traffic as had been used at Artillery Road CCTV level crossing. All of these crossings were passed over by the train without incident.
- 36 On reaching Portrush, the team sprayed some sidings by hand, before departing on the return journey to Coleraine. During this part of the journey the train was travelling with the RRV leading and with the spraying equipment in use; witness evidence was that the train's speed would be limited to 5 or 6 mph (8 to 9 km/h) in order to deposit the correct density of herbicide. Identical arrangements were used at the crossings encountered during the return as were used on the outward journey.
- 37 At Coleraine manually controlled barrier level crossing, the PICOP controlled road traffic in a similar way to that used at Artillery Road CCTV level crossing. The train stopped briefly at this point to allow its herbicide tanks to be re-filled from a road vehicle and then continued spraying in the direction of Ballyboyland.
- 38 The PICOP travelled from Coleraine by road to the next level crossing, which was Damhead AHBC (figure 9). Once there, the PICOP used the LCU to switch the crossing into local control (paragraph 16). He then departed for the next crossing before the engineering train arrived at Damhead. He repeated this process for the remaining three level crossings (all AHBCs) which the train would need to pass over within the possession; this included Balnamore AHBC. The PICOP did not return to any of these crossings to act as EO.

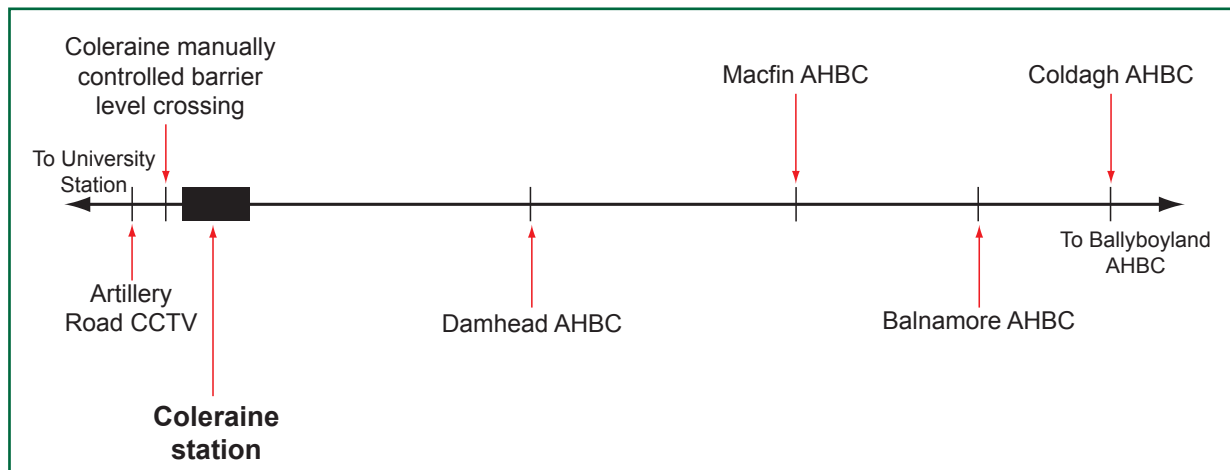


Figure 9: Diagram showing relevant level crossings between Coleraine station and Ballyboyland AHBC (Not to scale)

- 39 This practice of moving ahead of the train to switch crossings into local control was adopted where there was a high density of AHBCs; in these circumstances, if the PICOP stayed at an AHBC to act as EO, then the train would reach the *strike-in point* for the next crossing and cause it to activate automatically before the PICOP could arrive and switch it into local control (paragraph 50). The weed-spraying team had agreed in advance that, where the PICOP was not present to act as EO, the foreman (who also held the EO competence) would take responsibility for ensuring that the train passed safely over crossings.
- 40 The foreman and RRV operator had developed a separate method of work for AHBCs where the PICOP was not present. The train would stop short of the crossing and the foreman would alight from the trailer and go forwards to the crossing to check visually that the road was clear of traffic. Once satisfied that it was safe for the train to cross, the foreman would wave to the RRV operator to move the train onto the crossing; he would then remount the trailer as it moved past him. The foreman stated that he had no intention of signalling to road users and carried no equipment that would enable him do this.
- 41 On 31 May, this method of work was used without incident at Damhead AHBC and again at the crossing which directly followed it, Macfin AHBC; the engineering train then continued spraying towards Balnamore AHBC.

Events during the accident

- 42 At around 03:10 hrs, the engineering train arrived at Balnamore AHBC. In line with the method of work which they had developed (paragraph 39), the RRV operator stopped the train at the cattle/anti-trespass guard and the foreman alighted from the trailer. He went to the north side of the crossing to check that the road was clear of traffic in both directions. Satisfied that the road was clear and that it was safe for the train to cross, the foreman waved to the RRV operator who moved the train onto the crossing. The foreman then saw lights approaching the crossing from the south and gave a verbal warning of this to the RRV operator. It appeared to the foreman that the RRV operator had not heard the warning, as the train continued over the crossing. As it passed him, the foreman re-boarded the trailer.

- 43 The lights seen by the foreman were the headlights of a car being driven by a local resident, accompanied by a passenger. As the car approached Balamore AHBC, the car driver suddenly saw some sort of movement to his nearside through a gap in the vegetation; at this point he estimated that his speed was between 40 and 45 mph. He then saw the engineering train move onto the crossing surface and into his path. To avoid colliding with the train, he braked and attempted to steer away from it. However, the car skidded and subsequently struck the metal fencing at the nearside southern corner of the crossing, before coming to a stop. The car did not make contact with the engineering train during the accident.

Events following the accident

- 44 The RRV operator saw the car strike the metal fencing, which was now behind the train. He stopped the train and both he and the foreman returned to the crossing and spoke to the car driver. After a conversation, the car driver and passenger left to continue their journey. The RRV operator and foreman did not report the accident to the PICOP, NIR operations control or their line manager. The car driver reported the accident to NIR's contact centre at 07:00 hrs the same day.
- 45 The engineering train subsequently carried on weed-spraying until Ballymoney, where its supply of herbicide was exhausted. It then went to Ballyboyland AHBC without spraying, where it was met by the PICOP at around 04:00 hrs. Here, the spraying unit was unloaded and the RRV and rail trailer off-tracked. The PICOP stated that he was unaware that an accident had occurred.
- 46 The PICOP left Ballyboyland to lift the protection which he had earlier placed at Killagan. He then drove back through the length of the possession to restore the AHBCs to automatic operation. He returned to Coleraine to lift the remaining protection and to return the token for the Portrush branch to the signaller. The possession was given up by the PICOP at 05:30 hrs.

The investigation

Sources of evidence

47 The following sources of evidence were used:

- an examination of Balnamore level crossing and Coleraine signal box;
- witness statements;
- method statements issued for the weed-spraying programme and other relevant work packages;
- downloads from level crossing data recorders covering 29/30 May 2013;
- the NIR/IE Rule Book, NIR Rule Book Appendix and NIR Signalmen's General Instructions;
- NIR work planning and safety management system processes;
- legislation, regulations and guidance relating to the control of traffic at level crossings and temporary street works;
- an analysis of the relative positions and speeds of the train and car immediately prior to the accident;
- an analysis of the time required to complete weed-spraying activities on the night of 30/31 May 2013; and
- a review of previous accident and incidents that had relevance to this accident, including those previously investigated by the RAIB.

Key facts and analysis

Background information

Local control of AHBC level crossings by Emergency Operators

- 48 The arrangements for the local operation of AHBCs are detailed in the NIR Rule Book Appendix. This requires anyone taking local control of an AHBC to carry the correct equipment³ and to hold a current EO competency. During normal operating hours, an EO attending an AHBC should request the signaller's permission to take the crossing into local control and, once this is given, undertake a test of the barriers and wig-wag signals, to ensure that they are functioning correctly. The EO will then place a red flag or lamp facing towards approaching trains.
- 49 The signaller will arrange for any trains which are to pass over the AHBC to be *cautioned* and also alert the EO of their approach. On receiving this warning, the EO is required to lower the half barriers and, once satisfied that it is safe for the approaching train to pass over the crossing, remove the red flag or lamp and show a green hand signal to the train driver in its place. Once the train has passed over the crossing, the EO will raise the barriers and replace the red flag or lamp. In the event that the wig-wag signals are defective, the EO is required to place emergency red flashing lights in the carriageway before lowering the half barriers.
- 50 Local control of AHBCs is taken in possessions because engineering trains and *on-track plant* (such as RRVs) may approach a crossing more slowly than a train would during normal operating hours. This would mean crossing equipment being activated (and the road closed) for a longer period than normal; this may encourage crossing users to engage in risky behaviour. Another reason for taking local control is that some types of on-track plant may not reliably occupy the *track circuits* which automatically operate some types of crossing.
- 51 Signallers are required by NIR's Signalmen's General Instructions to ensure that an EO is appointed to take local control of any AHBC which will be affected by movements within an absolute possession⁴ before that possession can be granted and the signal box closed. Once the possession has been granted, the EO is required to remain alert for movements of engineer's trains (ie he will no longer receive a warning of their approach from the signaller). However, in all other respects, the arrangements detailed in the NIR Rule Book Appendix relating to the local control of AHBCs within absolute possessions remain the same as those during normal operating hours.

³ EO's are required to carry equipment including red and green flags/hand lamps, detonators and keys which allow them access to crossing LCUs.

⁴ Unless the movements within the possession are to pass over the crossing in the same manner as during normal operating hours.

52 Broadly similar arrangements apply to taking local control of CCTV level crossings in normal operating hours, although the EO at a CCTV crossing must inform the signaller once the barriers have been lowered and the crossing is safe so that the appropriate protecting signal can be cleared. In absolute possessions, an EO at a CCTV level crossing is permitted to authorise the driver of a train to pass over the crossing when they are satisfied it is safe to do so.

Control of train and on-track plant movements within absolute possessions

53 During absolute possessions, movements of trains and on-track plant are not controlled by the signaller, but are instead authorised by either the PICOP (for movements outside a work site but still within the possession's boundaries) or an engineering supervisor (for movements within a work site). The PICOP and engineering supervisor are required by the NIR/IE Rule Book to remind drivers of trains that movements within possessions and work sites must be made cautiously and must not pass over level crossings unless it is safe to do so (paragraphs 48 to 52).

Identification of the immediate cause⁵

54 The immediate cause of the accident was that the car driver did not have sufficient warning to stop his car before entering the crossing, after it had become occupied by the engineering train.

55 The car driver was undertaking a routine journey and, as a local resident, he was familiar with both the road and the level crossing. Although the car driver had not previously seen the crossing used by trains at the time of night that the accident occurred, he stated that he had seen it operate at other times.

56 Witness evidence was that the half barriers at Balnamore AHBC had not been lowered and the wig-wag signals were not operating as the car approached the crossing (paragraph 42). This meant that the car driver did not receive any warning from the crossing's equipment that the train was going to pass over the crossing. In addition, there was heavy vegetation at the nearside of the crossing (paragraph 14). These factors meant that the car driver probably only became fully aware of the presence of the engineering train as it entered the crossing.

57 The RAIB undertook an analysis of the relative positions and speeds of the train and car immediately preceding the accident, based upon the available witness evidence. This indicated that, given the unexpected nature of the hazard, the car driver would not have had sufficient time to brake safely to a stop before his car entered the crossing. It also indicates that the car driver would have had sufficient time to brake safely to a stop had the foreman activated the crossing's equipment at the point when he confirmed that the road was clear (paragraph 42).

⁵ The condition, event or behaviour that directly resulted in the occurrence.

Identification of causal factors⁶

- 58 **The crossing equipment at Balnamore AHBC was not operated prior to the engineering train entering the crossing, even though this was required by the relevant rules.**
- 59 At the time of the accident, both the foreman and RRV operator were certified as being competent EOs (paragraphs 24 and 25) and were also experienced at working within possessions. However, where the PICOP was not present at an AHBC to act as the EO, they had adopted a method of work (paragraphs 39 to 41) which did not require the activation of the crossing's equipment under local control before the train entered the crossing. This was despite the fact that the foreman would still have been able to activate the crossing via the LCU. This was contrary to the requirements of the NIR Rule Book Appendix (paragraph 48) and also increased the risks involved in passing the train over the crossing.
- 60 Although the PICOP was not present at Balnamore AHBC when the accident occurred, he stated that he was aware of the method of work being used in his absence. In addition, the method of work used earlier at Cromore AHBC (paragraph 35), demonstrated that, even when the PICOP was present and acting as the EO, crossing equipment was not always being activated at AHBCs by the weed-spraying team.
- 61 Information from data loggers fitted to AHBCs located within the weed-spraying possession of 29/30 May 2013 showed that, of the four crossings for which data was available, only one was operated in local control before the weed-spraying engineering train passed over it. Witness evidence indicates that this was probably typical of the practice adopted within the weed-spraying programme since it started in 2009. Where crossing equipment was not operated at an AHBC in accordance with the NIR Rule Book Appendix, witness evidence is that the alternative method of work used was normally dictated by the availability of the PICOP. This, in turn, was dependent on factors such as the density of crossings within a particular section of line.
- 62 The method of work used by the PICOP at AHBCs differed to that adopted by the foreman and RRV operator, in that the PICOP was trying to control road traffic whereas the foreman was only checking that the road was clear before signalling the train onto the crossing. However, the way in which the PICOP chose to control road traffic may not have been recognised by road users and so was also potentially unsafe. This is discussed further between paragraphs 103 and 105.
- 63 The RAIB found no evidence of any obstacle which would have prevented the weed-spraying team from operating AHBCs in possessions in accordance with the NIR Rule Book Appendix and has concluded that a combination of factors probably led them to routinely adopt non-compliant methods of work at these crossings. These are listed below (and discussed in further detail between paragraphs 64 and 91):
- the weed-spraying team may have had a low perception of the risks which using non-compliant methods of work presented;
 - adopting non-compliant methods of work at AHBCs would have saved time and allowed the weed-spraying to have been completed more quickly;

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

- the way in which the team complied with the rules relating to AHBCs may have been influenced by the status of rules relating to the local control of other crossing types in possessions and the method of work adopted at level crossings during a recent project;
- the use of non-compliant methods of work at AHBCs was not detected or corrected by NIR; and
- the team appointed a single EO to attend multiple level crossings within the possession.

The weed-spraying team's low perception of risk

64 The weed-spraying team encountered little road traffic and had used non-compliant methods of work at AHBCs for a number of years, apparently without incident. This may have created a perception within the team that the use of these methods presented a low risk and may also have affected their view of what constituted safe practice.

65 There was witness evidence that the weed-spraying team typically encountered little road traffic when working at level crossings within possessions. This was because weed-spraying was only undertaken at night, when the roads were quieter. The team had used non-compliant methods of work to pass trains over AHBCs for a number of years (paragraph 61). During this period, no other similar incidents or accidents were reported to NIR and witness evidence is that this was the first accident to involve the weed-spraying programme.

66 The above factors probably explain why the weed-spraying team did not perceive the increase in risk presented by their use of non-compliant methods of work at AHBCs. As these methods were used over a period of years, apparently without any safety incidents occurring, this probably reinforced the team's perception that any risks were being controlled to an acceptable level. The team's perception of what constituted safe practice at AHBCs was probably also affected by the methods of work permitted at level crossings in other situations; this is discussed further in paragraphs 73, 75 and 80.

Saving in time

67 Adopting non-compliant methods of work at AHBCs would have saved time and allowed the weed-spraying to have been completed more quickly.

68 It would have taken the weed-spraying team longer to complete the planned spraying on 30/31 May if they had operated AHBCs within the possession in accordance with the NIR Rule Book Appendix. Although one member of the team stated that this was not why non-compliant methods of work were used, the RAIB nevertheless considers that a desire by the team to finish work more quickly remains a credible explanation for their use.

69 There is witness evidence that the weed-spraying team was not concerned about over-running the planned duration of the possession on the night of 30/31 May and that this was, therefore, not a source of time pressure on them. This is supported by analysis undertaken by the RAIB, which indicates that there was sufficient time available within the possession for the team to have completed the spraying even had they operated the AHBCs in accordance with the NIR Rule Book Appendix. For this reason, the time available within the possession has been discounted as a causal factor.

The rules relating to other crossing types

70 The way in which the weed-spraying team complied with the rules relating to AHBCs may have been influenced by the status of rules relating to the local control of other crossing types in possessions and the method of work adopted at level crossings during a recent project.

The status of rules relating to manually controlled barrier and user worked crossings equipped with miniature red and green warning lights

- 71 There are no rules or requirements laid down within the NIR/IE Rule Book, NIR Rule Book Appendix or NIR's Signalmen's General Instructions for the taking of local control of manually controlled barrier or UWC-MWL crossings, either in normal operating hours or within possessions. There is witness evidence that the weed-spraying team was therefore required to develop their own method of passing trains over these crossings (paragraphs 34 to 41). This may have encouraged a culture within the team in which non-compliance to the rules relating to other level crossings types (such as AHBCs) became acceptable.
- 72 The NIR/IE Rule Book section concerning the on and off-tracking of RRVs at level crossings requires the person in charge to ensure that road users are not endangered and that they make '*...suitable arrangements to warn road users if the barriers or gates cannot be closed to road traffic*'. The weed-spraying team implemented this rule routinely as part of their work (paragraph 33) and the method which the team adopted to pass over manually controlled barrier crossings (paragraph 37) appears to have been based on its principles.
- 73 The RAIB considers that the rules relating to the on and off-tracking of RRVs probably influenced the weed-spraying team's perception of what constituted safe practice when passing trains over manually controlled barrier level crossings. Although the NIR network has a low number of these crossings relative to the number of AHBCs, these rules may also have influenced the team's perception of what constituted safe practice at other crossing types (such as AHBCs, paragraph 66 and CCTV level crossings, paragraph 74).

The status of rules relating to CCTV level crossings

- 74 The weed-spraying team also used a non-compliant method of work on 30/31 May at Artillery Road CCTV level crossing (paragraph 34). The method used was identical to that used both at manually controlled barrier crossings and at AHBCs when the PICOP was present. Witness evidence stated that this method of work was used by the team at CCTV level crossings because they believed (incorrectly) that the LCU at these crossings could not be operated when the signal box was closed.
- 75 This incorrect understanding arose at the start of weed-spraying in 2009 as a result of a briefing by the NIR district engineer with responsibility for the programme. This briefing is discussed further in paragraph 76. The NIR network has a low number of CCTV crossings relative to the number of AHBCs. However, it is possible that a belief that the requirements of the NIR Rule Book Appendix could not be complied with at CCTV crossings meant that non-compliance to the rules relating to AHBCs became accepted by the team.

Lack of action to address known issues at other crossings types

- 76 There is witness and documentary evidence that the NIR district engineer responsible for the weed-spraying programme had discussed level crossings with the PICOP in 2009, before the first spraying took place. Although the district engineer had briefed the PICOP that he would sometimes have to go ahead of the train and place batches of AHBC crossings into local control (paragraph 39) he stated that he was unaware that the PICOP was in practice not returning to these crossings in order to act as EO, or that the weed-spraying team was routinely using non-compliant methods of work at AHBCs.
- 77 There is witness evidence that the district engineer was aware of the issues which the team were encountering at manually controlled barrier and CCTV crossings (paragraphs 71 and 74); no action, however, was taken to address these issues prior to the accident. This lack of action to address issues at manually controlled barrier and CCTV crossings may have led the weed-spraying team to believe that the methods they had adopted at these crossings had been accepted as a safe practice and could therefore be used when passing over AHBCs.

The re-laying project

- 78 Between July 2012 and March 2013 the line between Londonderry/Derry and Coleraine was closed to normal operation as part of a project to re-lay the track. All level crossings within the section of line affected were disconnected and locked-out (eg with their barriers raised) for the duration of the project. From September 2012 on-track plant started running over portions of the line as part of the project.
- 79 The contractor responsible for the project issued a method statement detailing how on-track plant was to pass over these locked-out crossings. This method statement required barriers to be placed across the railway entrances to crossings. When on-track plant needed to pass over a crossing, these barriers would be removed by the engineering supervisor concerned, but only after he had ensured that he had sufficient personnel to control road traffic whilst he escorted the on-track plant across the road.
- 80 There is witness evidence that members of the weed-spraying team worked on the re-laying project and they may have been exposed to this method of work while doing so. This may also have influenced the team's perception of what constituted safe practice when passing trains over level crossings.

Detecting the use of non-compliant methods of work

81 The use of non-compliant methods of work at AHBCs was not detected or corrected.

- 82 Although there was evidence that non-compliant methods of work at AHBCs had been used by the weed-spraying team since the programme started in 2009 (paragraph 61) this was not detected by NIR. This meant that there was no opportunity to correct this practice.

83 Weed-spraying was conducted by a self-contained team which had worked together for a number of years (paragraph 23). The spraying took place over a period of four to five weeks, exclusively within possessions and at night (paragraph 29); additional work sites for other tasks were not set up within these possessions in order to avoid conflict with the weed-spraying. These factors reduced the number of opportunities for someone with the necessary competence to identify that non-compliant methods of work were being used by the team.

Site safety checks

84 NIR's infrastructure division's safety management system⁷ (SMS) requires that site safety checks of engineering work (including work by framework contractors) are undertaken in order to ensure that work is being carried out safely and in accordance with the relevant rules and procedures. Safety checks are required to be performed on a periodic and random basis and to include visits to sites of work.

85 NIR's infrastructure division has its own safety, quality and environment (SQE) team, responsible for organising safety checks of work being undertaken by (or on behalf) of the division. Safety checks were undertaken by the SQE team and also by the professional heads of each department within the division (or managers working for them).

86 Records of the ten safety checks undertaken within the infrastructure division during 2013 prior to the accident show that nine of these were undertaken between January and March, with a further inspection being undertaken in May. Safety checks were scheduled in this way due to the availability of suitable staff who could undertake them. The records show that these safety checks examined a variety of tasks and programmes, including work being undertaken within T3 absolute possessions.

87 There is no record of any safety checks being undertaken of the weed-spraying programme during 2013 and Northern Excavators Ltd has stated that the programme was not subject to safety checks in previous years. However, Northern Excavators Ltd reported that other work which the company had undertaken for NIR had been subject to safety checks. This is supported by witness evidence that members of the weed-spraying team had been subject to safety checks when undertaking work outside of the weed-spraying programme.

The appointment of a single EO

88 The weed-spraying team used a single EO to attend multiple crossings within the possession.

89 Before granting an absolute possession or closing a signal box, signallers are required to ensure that an EO is appointed to take local control of any AHBC or CCTV level crossing within the possession which will be affected by movements (eg of trains or on-track plant, paragraphs 51 and 52).

⁷ NIR Infrastructure Division, Divisional Safety Management System, I/SQ/SMS 016 'Planning and Undertaking of Engineering Work', Issue 0.E, September 2009.

- 90 On 30/31 May, there were a total of six AHBC or CCTV crossings situated within the limits of the possession. However, the RAIB found that the instruction regarding the appointment of an EO was interpreted generally within the weed-spraying team and signallers at Coleraine signal box as requiring only a single EO to be appointed, who would attend each AHBC and CCTV crossing within a possession as it became affected by a train movement. Although assigning five additional EOs to the team may have been seen as disproportionate, the availability of some additional EOs may have meant that the team operated AHBCs in accordance with the requirements of the NIR Rule Book Appendix. Operating AHBCs in this way would have meant that the accident was avoided.
- 91 NIR's own investigation concluded that the signaller on duty at Coleraine on the night of 30/31 May did not determine whether an EO was required to be appointed. NIR's investigation also concluded that the use of a single EO to attend multiple crossings within a possession was common and widely known about within the track department and had developed due to resource constraints. NIR's investigation also found that the practice was neither corrected nor used as a mechanism to change the relevant rules. The investigation subsequently recommended that the infrastructure division undertake a review of the rules and instructions relating to EOs to ensure that any ambiguity in them is addressed.

Other discounted factors

The absent team member

- 92 Witness evidence is inconsistent as to the role of the fourth team member, who was absent on the night of the accident (paragraph 23). Although there was some evidence that he may have helped to control road traffic at larger crossings (such as Coleraine manually controlled barrier level crossings), other witnesses stated that he played no role in passing the engineering train over level crossings during weed-spraying. However, downloads from crossing data loggers (paragraph 61) showed the same methods of work were being used at some AHBCs on the night of 29/30 May, when the team was at its full strength, as were used on 30/31 May, when the fourth team member was absent.

Rules for trains passing over failed AHBCs in normal operating hours

- 93 Where an AHBC has failed during normal operating hours and no EO is available, the NIR/IE Rule Book permits the guard of a train to alight at the crossing and indicate to the driver when it is safe for the train to pass over. There is no evidence that the team (who worked mainly within possessions) were aware of this rule or that it was an influence on the methods of work which they developed.

Observations⁸

Completion of the possession arrangements form

- 94 As part of taking a possession, PICOPs are required by the NIR/IE Rule Book to complete a possession arrangements form. This form includes a section for the PICOP to note how each level crossing within the possession is being controlled. This is intended to help the PICOP keep track of the arrangements made. The PICOP within the weed-spraying team, however, did not complete this section of the form on the night of 30/31 May. He stated that this was because there was insufficient space within this section to record the number of the crossings which lay within the boundaries of the possession.

Getting on or off moving vehicles

- 95 The NIR/IE Rule Book states the following;

'...do not get on any moving vehicle unless absolutely necessary and then only provided the vehicle is at a platform and it is safe to do so...'

However, at AHBCs where the PICOP was not present, the foreman had adopted the practice of re-boarding the rail trailer while it was still moving (paragraph 40).

The reporting of incidents and safety concerns

- 96 The NIR/IE Rule Book applies the following requirement to all employees;

'... in addition to any emergency action ...all accidents must immediately be reported to: - Operations Control [and] - the Local Manager'

This requirement is also included within NIR's training material for PTS certification.

- 97 Both the RRV operator and the foreman held a current PTS certification at the time of the accident (paragraphs 24 and 25) and so would have been aware of this requirement. However, on the night of 30/31 they decided not to report the accident at Balnamore AHBC May to the PICOP, NIR operations control or their line manager (paragraph 44).

Method statements and risk assessments

- 98 The NIR infrastructure division SMS requires that a method statement, supported by a risk assessment, is provided for all work. However, neither NIR nor Northern Excavators Ltd could provide any documentary evidence to the RAIB which showed what type of risk assessment, if any, had been undertaken to support the method statement prepared in 2009 for the weed-spraying programme. NIR's own investigation concluded that no risk assessment had been undertaken.
- 99 The method statement for the programme did not address how level crossings were to be passed over during weed-spraying. However, method statements would not normally be expected to address this area except where the NIR/IE Rule Book, NIR Rule Book Appendix and Signalmen's General Instructions cannot be applied eg where crossings are locked out of use for a prolonged period (paragraph 74). For this reason, this lack of a risk assessment was not causal to the accident.

⁸ 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.

- 100 Following the accident Northern Excavators Ltd issued an updated method statement for the weed-spraying programme. This was produced in close co-operation with the NIR district engineer responsible for the weed-spraying programme, who also created reference documentation to support it. Because the accident on 31 May had highlighted the use of non-compliant methods of work, incorrect briefings and gaps in the rules relating to level crossings (paragraphs 71 and 74) this method statement and its supporting reference documents specifically addressed the measures to be taken when passing over crossings during weed-spraying; this included a re-iteration of the requirements of the NIR/IE Rule Book and NIR Rule Book Appendix.
- 101 There was witness evidence that the NIR district engineer responsible for the weed-spraying programme had previously produced risk assessments for a number of routine maintenance tasks. In addition, the up-dated method statement refers to a number of generic risk assessments which relate to specific tasks within the weed-spraying programme. However, the RAIB found that those parts of the method statement and its supporting reference documents which dealt with the measures to be taken at level crossings where there were not any existing rules (eg at manually controlled barrier crossings, paragraph 71) were not risk assessed in line with the requirements of the NIR infrastructure division SMS.

Auditing of compliance to SMS

- 102 The NIR infrastructure division SMS includes a safety management procedure which relates to method statements and the production of risk assessments⁹. This requires compliance to the procedure to be audited by the Translink group auditing team. NIR stated that, since 2011, the Translink group auditing team has undertaken 15 audits within the infrastructure division. Whilst some of these audits were on safety related matters, and the SMS was audited at high level, none of the audits considered method statements or risk assessments.

Traffic control by railway staff at level crossings

- 103 There is currently a requirement within the NIR/IE Rule Book for railway staff to control road traffic at level crossings when on and off-tracking RRVs. Witness evidence is that, in practice, a mix of signalling with hand lamps and parked vehicles was used to control road traffic during such operations (as was the case on 30/31 May, paragraph 33).
- 104 In addition, the NIR Rule Book Appendix requires EOs to signal road traffic using emergency red flashing lights placed in the carriageway when wig-wag signals are defective (paragraph 49). Since these lights were not used on 30/31 May, this was not a causal factor in the accident.
- 105 A review undertaken by the RAIB has shown that neither of these methods of controlling road traffic appears to comply with the requirements of the law, regulations and guidance relevant to level crossings. Consequently, since there is a risk that a road user might not recognise or comply with them, their use is considered by the RAIB to be potentially unsafe.

⁹ NIR Infrastructure Division, Safety Management Procedure, I/SQ/OHS/013 'Method Statement Procedure', Issue 1.0, January 2012.

Safety monitoring of framework contractors

- 106 NIR staff can report safety concerns through a variety of mechanisms including staff safety representatives, a monthly safety meeting and a monthly standards review meeting. The NIR infrastructure division SMS also requires that larger contractors on major projects are set safety performance indicators. Progress against these indicators is monitored by NIR via regular performance meetings.
- 107 At the time of the accident there was no requirement for monitoring arrangements (such as performance meetings) to be put in place for framework contractors such as Northern Excavators Ltd, although NIR stated that contractor personnel working alongside its own staff would be able to report any concerns they had via the relevant NIR staff safety representative.
- 108 The certification of the weed-spraying team was correct and current for the roles being undertaken on 30/31 May (paragraphs 23 to 26). In addition, there had been no previous reported incidents involving the weed-spraying programme (paragraph 65), or adverse reports from safety checks (paragraph 86), which might have highlighted any potential safety issues with the weed-spraying programme within a mechanism such as a regular performance meeting. The lack of a requirement to establish monitoring arrangements with framework contractors was therefore not a causal factor in the accident.

Summary of conclusions

Immediate cause

109 The car driver did not have sufficient warning to stop his car before entering the crossing, after it had become occupied by the engineering train (**paragraph 54**).

Causal factors

110 The crossing equipment at Balnamore AHBC was not operated under local control prior to the engineering train entering the crossing, even though this was required by the rules relating to the operation of AHBCs within possessions (**paragraph 58, Recommendation 3**).

111 The weed-spraying team were routinely adopting non-compliant methods of work at AHBCs. This was probably due to a combination of the following causal factors;

- a. the team probably had a low perception of the risks which using non-compliant methods of work presented (**paragraph 64, Recommendation 3**);
- b. adopting non-compliant methods of work at AHBCs probably saved time and allowed the weed-spraying to be completed more quickly (**paragraph 67, Recommendation 3**);
- c. the way in which the team complied with the rules relating to AHBCs may have been influenced by the status of rules relating to other crossing types and the method of work adopted at level crossings during another project (**paragraph 70, Recommendation 1**);
- d. the use of non-compliant methods of work at AHBCs was not detected or corrected by NIR (**paragraphs 81 and 119, Recommendation 3**); and
- e. the team appointed a single emergency operator to attend multiple level crossings within the possession (**paragraph 88, Recommendation 1**).

Additional observations

112 The PICOP did not record what method of work had been arranged for each level crossing on his possession arrangements form, as was required by the NIR/IE Rule Book (**paragraph 94, Learning point 1, Recommendation 3**).

113 At AHBCs where the PICOP was not present, the foreman re-boarded the rail trailer whilst it was still moving. This was prohibited by the NIR/IE Rule Book (**paragraph 95, Learning point 2, Recommendation 3**).

114 The RRV operator and foreman did not report the accident (paragraph 45) as was required by both the NIR/IE Rule Book and PTS training materials (**paragraph 97, Learning point 3, Recommendation 3**).

- 115 NIR's own investigation concluded that no risk assessment had been undertaken in support of the method statement prepared for the weed-spraying programme in 2009, as required by the NIR infrastructure division SMS. An updated method statement was issued following the accident which detailed the measures to be taken at level crossings where there were no applicable existing rules. However, these measures were also not risk assessed in line with the requirements of the NIR infrastructure division SMS (**paragraphs 98 and 100, Recommendation 2**).
- 116 The methods of controlling road traffic used during the on and off-tracking of RRVs and when wig-wag signals are defective do not appear to comply with the requirements of the law, regulations and guidance relevant to level crossings. Their use is considered by the RAIB to be potentially unsafe (**paragraph 105, Recommendation 1**).
- 117 NIR's infrastructure division SMS did not require monitoring arrangements (such as performance meetings) to be put in place for framework contractors (**paragraphs 107 and 120**).

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

- 118 An extra staff member has been added to the weed-spraying team in order to assist the PICOP in implementing the updated method statement for the weed-spraying programme at level crossings (paragraph 100).
- 119 NIR's infrastructure division has proposed a restructuring of its SQE team. The proposed new structure includes dedicated resources for auditing compliance to its SMS (ie additional to those currently provided by the Translink group auditing team), sufficient inspectors to undertake additional site safety checks and a person with responsibility for the development of the NIR/IE Rule Book, NIR Rule Book Appendix and Signalmen's General Instructions (paragraph 111d, Recommendation 3).
- 120 Following the accident, NIR's infrastructure division has now implemented a monthly performance meeting with framework contractors (paragraph 117, Recommendation 3).

Learning points¹⁰

121 The RAIB has identified the following key learning points.

- 1 The level crossing section of the possession arrangements form is intended to allow PICOPs to keep track of crossings within their possessions. It should always be correctly completed, using additional sheets as necessary, should there be insufficient space due to the number of crossings. The risks of not completing possession arrangements forms correctly have been previously highlighted in the RAIB report into a dangerous occurrence involving an engineering possession near Dunblane, Scotland on 28 October 2012 (RAIB report 05/2013)¹¹ (paragraph 112).
- 2 Boarding moving trains in circumstances where it is prohibited by the rule book can result in very serious injuries and should be avoided. These risks were previously highlighted in the RAIB bulletin into the serious injury of a guard on the Foxfield Light Railway on 24 October 2010 (RAIB bulletin 01/2011) (paragraph 113).
- 3 It is important that accidents are correctly reported. The non-reporting of accidents can lead to opportunities for safety learning being missed (paragraph 114).

¹⁰ '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.

¹¹ RAIB reports are available at www.raib.gov.uk.

Recommendations

122 The following recommendations are made¹²:

- 1 *The intent of this recommendation is for Northern Ireland Railways to ensure that any activities undertaken at level crossings within possessions are subjected to effective risk controls.*

Northern Ireland Railways should review (in conjunction, as necessary, with Iarnród Éireann) the requirements of the NIR/IE Rule Book, NIR Rule Book Appendix and NIR Signalmen's General Instructions which relate to activities at level crossings within pre-planned possessions. This review should consider whether:

- all of the level crossing types present on the infrastructure managed by Northern Ireland Railways are covered by the existing rules and instructions;
- the risks of such activities are being adequately mitigated; and
- existing risk controls are adequately resourced and comply with any relevant industry best practice, legislation, regulations, codes of practice and guidance.

Northern Ireland Railways (in conjunction with Iarnród Éireann as necessary) should implement any changes identified as a result of this review. Northern Ireland Railways should ensure that suitable briefing and training accompanies any changes which are implemented (paragraphs 111c, 111e and 116).

- 2 *The intent of this recommendation is for Northern Ireland Railways to ensure that any method statements relating to track engineering are supported by risk assessments.*

Northern Ireland Railways should review any method statements currently being used by its track department in order to ensure that they are supported by risk assessments, in accordance with relevant requirements of the infrastructure division's safety management system (paragraph 115).

continued

¹² 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 Department for Regional Development Northern Ireland to enable it to carry out its duties under regulation 12(2) to:

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

Copies of both the regulations and the accompanying guidance notes (paragraphs 200 to 203) can be found on RAIB's website www.raib.gov.uk.

- 3 *The intent of this recommendation is to increase the opportunity for the types of non-compliance identified by this investigation to be detected and corrected.*

Northern Ireland Railways should implement the planned restructuring of the infrastructure division safety, quality and environment team. The team should have the resources and tools necessary to facilitate the identification of non-compliances to the NIR/IE Rule Book, NIR Rule Book Appendix and NIR Signalmen's General Instructions, similar to those identified by this investigation. This should be supported by ongoing monitoring arrangements by Northern Ireland Railways of the performance of its framework contractors (paragraphs 110, 111a, 111b, 111d, 112, 113, 114, 119 and 120).

Appendices

Appendix A - Glossary of abbreviations and acronyms

AHBC	Automatic half barrier level crossing
CCTV	Closed circuit television level crossing
EO	Emergency operator
IE	Iarnród Éireann
LCU	Local control unit
NIR	Northern Ireland Railways
PICOP	Person in charge of the possession
PTS	Personal track safety
RRV	Road-rail vehicle
UWC-MWL	User worked crossing equipped with miniature red and green warning lights

Appendix B - Glossary of terms

All definitions marked with an asterisk, thus (*), have been taken from Ellis's British Railway Engineering Encyclopaedia © Iain Ellis. www.iainellis.com.

Automatic half barrier level crossing (AHBC)	An automatic level crossing fitted with half barriers, road traffic signals on the highway and a telephone to the relevant signal box. Abbreviated to AHB on Northern Ireland Railways.*
Boom lights	Small red marker lights fitted along a level crossing barrier to warn road users of the barrier's presence when lowered.*
Cattle/anti-trespass guards	An arrangement of angled timber sections placed alongside level crossings to deter cattle and pedestrians from entering the track.*
Caution	An indication or instruction requiring the driver to be ready to stop.*
Closed circuit television level crossing (CCTV)	A level crossing which is checked by the signaller by means of CCTV to ensure that it is clear before the barriers are lowered.*
Drawbar	A solid bar connecting two railway vehicles together.*
Emergency operator (EO)	A person certified as competent to operate a level crossing in local control on Northern Ireland Railways' infrastructure.
Engineering supervisor	A person certified as competent to manage a work site on Northern Ireland Railways' infrastructure. The responsibilities of this role include authorising movements entering or within the work site and giving track safety co-ordinators within the work site authority to start work.
Iarnród Éireann (IE)	The national railway company of the Republic of Ireland.
Local control	The operation of a level crossing's equipment independent of the presence of rail vehicles via the local control unit.
Local control unit (LCU)	A cabinet located adjacent to a level crossing that allows it to be operated in local control by a person holding the appropriate competence.*
Manually controlled barrier level crossing	A manned level crossing with full barriers operated locally from a signal box or level crossing box. Known as a manual barrier level crossing on Northern Ireland Railways.*
Nearside	The side of a road vehicle normally nearest the kerb.
On-tracking	Driving a road rail vehicle onto the track and placing it in rail mode. The opposite action is known as off-tracking.*

On-track plant	A rail-mounted engineering vehicle which can only be used in possessions. Includes road-rail vehicles, rail-mounted maintenance machines, trailers and attachments with rail guidance wheels.
Operations control	The control centre responsible for the operation of train's on Northern Ireland Railways' infrastructure.
Person in charge of the possession (PICOP)	<p>A person certified as competent to manage a possession on Northern Ireland Railways' infrastructure. Responsibilities of this role include;</p> <ul style="list-style-type: none"> ● ensuring that the necessary protection is provided for the possession; ● authorising movements of trains entering or within the possession (but which are outside of work sites); ● ensuring the possession is given up properly so that normal working is safely resumed; and ● giving engineering supervisors within the possession the authority to establish work sites.
Personal track safety (PTS)	The minimum training required before being allowed to work on or near the line.*
Protection	The measures taken to mark the limits of a possession.*
Road-rail vehicle (RRV)	A vehicle designed or adapted to operate on both road and rail.*
Strike-in point	The location on the approach to an automatic level crossing at which an approaching train triggers the operating sequence of the crossing.*
Supplementary notice	A published alteration or addition to Northern Ireland Railways' weekly operating notice.
T3 absolute possession	A period during which the operation of normal service trains is suspended on a designated section of line for the purposes of maintenance and/or engineering works. The Northern Ireland Railways' engineering department requiring a possession must agree beforehand with the operations department the extent and duration of the possession, which will be arranged in accordance with Section T Part 3 of the NIR/IE Rule Book*.
Token	A device carried by a driver as authority to enter a section of line. The system is arranged so that once a token is issued, no other token can be issued for that section of line.*

Track circuit	An electrical train detection system, based on the principle of proving the absence of a train. In its basic form, a source of electrical current is connected between the running rails at one end of the section to be detected. At the other end a relay coil (or equivalent) is connected between the rails. When there is no rail vehicle present, the current source energises the relay coil and the section is proved clear. When a rail vehicle enters the section, the action of wheels and axles is to short the relay out, creating an open circuit.*
Track safety co-ordinator	A person certified as competent to make arrangements intended to prevent people in their group from being endangered by trains on Northern Ireland Railways' infrastructure.
User worked crossing equipped with miniature red and green warning lights (UWC-MWL)	A level crossing where the barriers or gates are operated by the user, which is equipped with miniature red and green warning lights and an audible alarm which are automatically operated by approaching trains.
Wig-wag	The road traffic signals fitted at level crossings in order to warn road users of the crossing's operation. Each signal consists of a single steady amber light and two flashing red lights. Drivers of road vehicles are required to stop behind the white line when the lights illuminate. If a user has already passed the white line when the amber light illuminates, then they should continue to cross.
Work site	The area within a possession which is managed by an engineering supervisor.

Appendix C - Key standards current at the time

Northern Ireland Railways/Iarnród Éireann Rule Book Issue 11/07, November 2007	Rule Book
Northern Ireland Railways Rule Book Appendix 11/07, November 2007	Rule Book Appendix
Northern Ireland Railways Signalmen's General Instructions 11/07, November 2007	Signalmen's General Instructions
Northern Ireland Railways Infrastructure Division I/SQ/SMS 016 Issue 0.E, September 2009	'Planning and Undertaking of Engineering Work'
Northern Ireland Railways Infrastructure Division I/SQ/OHS/013 Issue 1.0, January 2012	'Method Statement Procedure'

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

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