Railway Accident Investigation Unit Ireland

INVESTIGATION REPORT

Collision between a Bord na Móna Flat Wagon and Kilcolgan Level Crossing Gates, Offaly, 8th June 2020

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Report Description

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Where the report has been altered following its original publication, details on the changes will be given.

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Report structure

The report structure is taken from guidelines set out in “Commission Implementation Regulation (EU) 2020/572 of 24 April 2020 on the reporting structure to be followed for railway accident and incident investigation reports” having regard to “Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety”.

Reader guide

All dimensions and speeds in this report are given using the International System of Units (SI Units). Where the normal railway practice, in some railway organisations, is to use imperial dimensions; imperial dimensions are used, and the SI Unit is also given.

All abbreviations and technical terms (which appear in italics the first time they appear in the report) are explained in the glossary.

Descriptions and figures may be simplified in order to illustrate concepts to non-technical readers.

Preface

The RAIU is an independent investigation unit within the Department of Transport which conducts investigations into accidents and incidents on the national railway network, the Dublin Area Rapid Transit (DART) network, the LUAS light rail system, heritage and industrial railways in Ireland. Investigations are carried out in accordance with the Railway Safety Directive 2004/49/EC enshrined in the European Union (Railway Safety) (Reporting and Investigation of Serious Accidents, Accidents and Incidents) Regulations 2020.

The RAIU investigate all serious accidents. A serious accident means any train collision or derailment of trains, resulting in the death of at least one person or serious injuries to five or more persons or extensive damage to rolling stock, the infrastructure or the environment, and any other similar accident with an obvious impact on railway or tramline safety regulation or the management of safety. During an investigation, if the RAIU make some early findings on safety issues that require immediate action, the RAIU will issue an Urgent Safety Advice Notice outlining the associated safety recommendation(s); other issues may require a Safety Advice Notice.

The RAIU may investigate and report on accidents and incidents which under slightly different conditions might have led to a serious accident.

The RAIU may also carry out trend investigations where the occurrence is part of a group of related occurrences that may or may not have warranted an investigation as individual occurrences, but the apparent trend warrants investigation.

The purpose of RAIU investigations is to make safety recommendations, based on the findings of investigations, in order to prevent accidents and incidents in the future and improve railway safety. It is not the purpose of an RAIU investigation to attribute blame or liability.

Summary

At approximately 13:15 hours (hrs) on the 8th June 2020 a Bord na Móna (BnM) *double rake system* travelled through Kilcolgan Level Crossing, closing and opening the *derailing points* to allow passage through the crossing. At some stage after the passage of the double rake through Kilcolgan Level Crossing, the derailing points were placed in the closed position (possibly by trespassers).

Approximately two kilometres away, works were being undertaken at BnM Worksite 610A, Lemonaghan, in preparation for track renewal work. The works included the transport and unloading of ballast at Worksite 610A by means of a Locomotive, a Flat Wagon and an Excavator. During the ballast unloading, ballast fell from the Flat Wagon onto the track; which in turn resulted in the Flat Wagon derailing during a shunting manoeuvre. The Locomotive was *uncoupled* from the Flat Wagon to facilitate the rerailing and a lifting chain was placed around the excavator bucket and the Flat Wagon coupling. The Flat Wagon was then lifted, aligned with the track and lowered onto the rail. The chain was removed from the Flat Wagon coupling and the Flat Wagon rolled away towards Kilcolgan Level Crossing.

On approach to Kilcolgan Level Crossing, the Flat Wagon passed over the derailing points (in the closed position) allowing the Flat Wagon to continue towards the gates. The Flat Wagon collided with the first gate at Kilcolgan Level Crossing forcing the gate across local road, L70075, before colliding with the second gate forcing it open away from the road. The Flat Wagon came to a stop approximately 50 metre (m) past Kilcolgan Level Crossing.

Causal factors were identified as:

- The derailing points were in the closed position, resulting in the Flat Wagon not derailing, instead it continued towards and struck Kilcolgan Level Crossing gates;
- Checks were not undertaken to ensure that the Flat Wagon could not roll freely prior to rerailing; and, the Flat Wagon was not secured after rerailing.

No *contributing factors* were identified. *Systemic factors* were identified as:

- The training for rerailing wagons / rail stock does not include any assessment to confirm competence of the task; and, there is no continuous assessments to ensure continued compliance with the procedures;
- The risk register was not updated to include the risks associated with the interference with derailing points by members of the public resulting in an absence of mitigation measures.

As a result, the RAIU made the following four safety recommendations:

- 202102-01 – BnM should identify locations where derailing points are vulnerable to unauthorised movements and provide a means of securing the derailing points at these locations;
- 202102-02 – BnM should review and update its Procedure for Rerailing Wagons / Rail Stock to ensure that there are clear instructions in relation to how to: visually check the lifting chains; rerail; and, safety secure rerailed stock;
- 202102-03 – BnM should develop a training, assessment and continuous assessment programme related to the Procedures for Rerailing Wagons / Rail Stock;
- 202102-04 – BnM should review its level crossing Risk Register updating where necessary to sufficiently capture all reasonably foreseeable risks. In addition, BNM should consider adding a requirement within its Rail Safety Case Document that requires regularised Risk Management Workshops at which risks, mitigation measures, etc, are reviewed and updated when necessary.

The RAIU made a number of additional observations in relation to the efficacy of the derailing points and the level crossing signage. As a result, the RAIU make the following safety recommendations:

- 202102-05 – The Engineering Department of BnM should carry out the technical evaluation into the efficacy of the derailing points, etc. identified in BnM internal investigation report into the collision between a BnM locomotive and the gates of Endrim Gates on the 21st September 2017;
- 202102-06 – BnM should update their Specification for Crossings to include the requirements of the Department of Transport's Traffic Signs Manual; based on this BnM should update the signage on the approaches to all BnM level crossings.

Contents

RAIU Investigation

RAIU decision to investigate

1 In accordance with the Railway Safety Act 2005 and European Union (Railway Safety) (Reporting and investigation of Serious Accidents, Accidents and Incidents) Regulations 2020, the RAIU investigate *serious accidents*, the RAIU may also investigate and report on *accidents* and *incidents* which under slightly different conditions might have led to a serious accident.

2 The RAIU received an email notification of the collision of a BnM Flat Wagon with Kilcolgan Level Crossing gates (X15:06) on 15th June 2020 from the BnM Health and Safety Manager. Under the RAIU's "Guidance: Notification of occurrences to the RAIU for RUs, IMs & other ROs", Version 3, live from the 1st January 2020, "occurrences that under slightly different conditions may have led to a fatality, serious injury or extensive damage" should be reported immediately; this was such an event.

3 After the RAIU conducted a preliminary examination, the RAIU's Chief Investigator made the decision to conduct a full investigation into the accident, given its impact on railway safety (*Article 20* (2) (c)), as under slightly different circumstances this accident may have led to serious accident with the potential for fatality or serious injuries due to the collision and subsequent crossing of a Flat Wagon onto a public road.

4 In terms of categorisation, the RAIU have categorised this occurrence as a: Level Crossing (Collision) – Accident.

5 The RAIU's Chief Investigator allocated RAIU Senior Investigators, trained in accident investigation, to conduct this investigation, as appropriate. In this instance, no external parties were required to assist with the investigation.

Scope & limits of investigation

6 The RAIU have established the scope and limits of the investigation as follows:

- Establish the sequence of events leading up to the accident;
- Identify any other precursors which led to the accident;
- Establish, where applicable, causal, contributing and systemic factors;
- Identify any additional observations;
- Examine the relevant elements of the BnM Rail *Safety Case* for BnM Industrial Railways at Level Crossings & Underpasses (to be referred to as the BnM Rail Safety Case for the remainder of this report) and associated standards;

- Examine the relevant risk assessments and risk registers;
- Review the BnM training and competency for staff directly involved in the accident;
- Comparison between BnM standards and the statutory requirements.

Communications & evidence collection

7 During this investigation, the RAIU collate evidence through the submission of Requests for Information (RFIs). Related to this investigation, the RAIU collated and logged the following evidence:

- Witness statements from parties involved in the accident;
- Competency records for the staff involved;
- All BnM standards, instructions or mandatory procedures in relation to the rerailing of vehicles on the BnM rail network;
- All risk assessments for the rerailing of BnM vehicles;
- Training documentation for the staff involved;
- Statutory requirements for level crossing signage;
- Statutory requirements for carrying out lifts.

8 All relevant parties co-operated fully with the RAIU investigation.

Other stakeholder inputs

9 No judicial authorities or emergency service were involved in this accident although the presence of youths at the crossing and possible interference with the derailing points prior to the accident was reported to An Garda Síochána.

Summary of the accident & background information

Synopsis of the accident

10 At approximately 13:15 hrs on the 8th June 2020 a double rake system travelled through Kilcolgan Level Crossing. The leading locomotive driver moved the derailing points to the closed position to allow the double rake system to pass through Kilcolgan Level Crossing; with the trailing locomotive driver returning the derailing points to the open position prior to continuing on their journey.

11 Approximately two kilometres away, work was being undertaken at BnM Worksite 610A, Lemonaghan, in preparation for track renewal work (see inset of Figure 1 for location of accident).

Figure 1 – Location of the accident

12 The works included the transport and unloading of ballast at Worksite 610A by means of Locomotive and a Flat Wagon (see Figure 2) and an Excavator. During the ballast unloading, ballast fell from the Flat Wagon onto the track; which in turn resulted in the Flat Wagon derailing during a shunting manoeuvre.

Figure 2 – Locomotive coupled to Flat Wagon (coupling arrangement inset)

13 The Locomotive was uncoupled from the Flat Wagon to facilitate the rerailing (see inset of Figure 2 for the coupling arrangement). A lifting chain was placed around the excavator bucket and the Flat Wagon coupling. The Flat Wagon was then lifted, aligned with the track and lowered onto the rail. The chain was removed from the Flat Wagon coupling and the Flat Wagon rolled away towards Kilcolgan Level Crossing (located two kilometres away).

14 The Flat Wagon passed over the derailing points (in the closed position[1]) on the approach to Kilcolgan Level Crossing allowing the Flat Wagon to continue towards the gates.

15 The Flat Wagon collided with the first gate at Kilcolgan Level Crossing forcing the gate across local road, L70075, before colliding with the second gate forcing it open away from the road. The Flat Wagon came to a stop approximately 50 m past Kilcolgan Level Crossing.

External circumstances at the accident location

Weather

16 Weather data taken from the Met Éireann Weather Station at Mullingar, recorded that there was no rainfall for the day, with maximum temperature of 17ºC and the minimum temperature was 5.4ºC. The mean wind speed was recorded at 4.2 knots.

17 Weather conditions were not contributory to the accident.

[1] Derailing points should be kept in the *open position* to protect level crossings from an unintended movement through the crossing.

Fatalities, injuries & material damage

Fatalities & injuries

18 There were no fatalities or injuries to staff or members of the public.

Material damage

19 The Kilcolgan Level Crossing gates suffered minor damage to the locks and lights.

20 There was no damage to the rail infrastructure as a result of the accident.

Parties & roles associated with the accident

Parties involved in the accident

21 BnM operates industrial rail network throughout the midland counties of Ireland, for the purposes of supplying peat to their Energy, Horticulture and Fuels businesses.

22 BnM Energy – Asset Management are the owners and maintainers of the BnM railway infrastructure and rolling stock.

23 BnM – Supply Chain & Logistics are responsible for the operation of rolling stock on the BnM rail network.

24 BnM do not require Safety Authorisation or Safety Certification as per Regulation 4 (3) of the Railway Safety Act 2005 which states that the act “does not apply to the operation of railway infrastructure solely for industrial use, except insofar as it has an interface with a public road or with a railway organisation”. With regard to their “interface with a public road or with a railway organisation”, in 2017, the CRR shared “Guideline for an Interface Management Document for Industrial Railways with Public Interfaces” (document number CRR-G-049-A, Issue 1, issued on the 10th October 2017), which is with BNM to progress.

Roles involved in the accident

25 The roles involved in the accident from BnM – Supply Chain & Logistics are:

- Locomotive Driver – Employed by BnM for forty-two years and has been employed as a Locomotive Driver for the past thirteen years, was involved in the rerailing of the Flat Wagon;
- Excavator Operator – Employed by BnM for forty-two years and has been employed as a machine operator for the past fourteen years; was involved in the rerailing of the Flat Wagon;
- Leading Rake Driver – Employed by BnM and competent to drive locomotives; responsible for closing the derailing points at Kilcolgan Level Crossing before travelling through the level crossing;
- Trailing Rake Driver – Employed by BnM and competent to drive locomotives; responsible for opening the derailing points at Kilcolgan Level Crossing after travelling through the level crossing.

Parties not directly involved in the accident

Department of Transport

26 The Mission Statement of the Department of Transport is: “As a central government department, serving the government and the people of Ireland, our mission is to shape the safe and sustainable development of transport, to support economic growth and social progress”.

27 The Department of Transport produce the Traffic Signs Manual, discussed paragraphs 69 to 70.

Infrastructure

Track

28 The rail network consists of 850 kilometres (km) of permanent British Standard Rail narrow gauge (914 millimetres (mm)) incorporating ninety-seven level crossings and forty-six underpasses[2].

29 The section of single line track on which the Flat Wagon rolled away is the Boora – Lemonaghan Rail Line; with the altitude changing from 50.5 metres (m) at the point of the runaway (0 km) to an altitude of 39.3 m at Kilcolgan Level Crossing Gates (two kilometres away), see Figure 3.

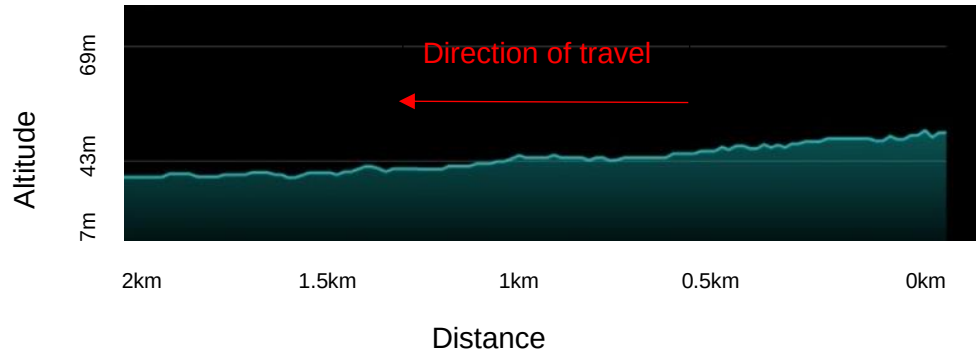

Figure 3 – Altitude over distance

[2] Bridge over the railway.

Kilcolgan Level Crossing

30 Kilcolgan Level Crossing has rail recessed into the existing road surface (see Figure 4).

Figure 4 – Kilcolgan Level Crossing

31 The gates are manually opened and closed by the BnM locomotive drivers. Gates have warning beacons and reflective signs attached (see Figure 5). Swing posts and latching posts are set in concrete.

Figure 5 – Kilcolgan Level Crossing gates

32 Kilcolgan Level Crossing is graded as a Grade B level crossing, meaning it is a gated crossing on a local primary/ secondary road, see Figure 4.

33 The classification of the level crossing in terms of operation, is a BnM *Type 2 Level Crossing as* the derailing points have to be manually operated to open or close the derailing points by means of a lever as the derailing points are not connected to the level crossing gates[3]; see Figure 6 for the derailing points associated with Kilcolgan Level Crossing.

Figure 6 – Derailing points (in the open position – locomotive would derail)

34 Warning signs are sited on the roads on the approach to the level crossing, which is discussed in paragraphs 68 to 77 of this report.

[3] BnM Type 1 Level Crossing are rail level crossings where the derailing points are attached to operation of gate by means of wire rope.

Rolling Stock

Locomotive

35 The Locomotive involved in the accident was Hunslet Wagon Master, Number LM336, see Figure 7.

36 The Locomotive was manufactured in 1981, weighs 9.3 tons, and is powered by a six-cylinder 2713E Ford engine and a five-speed fluid coupling.

Figure 7 – BnM Locomotive LM336

37 The Locomotive brakes are spring operated and pneumatic release with external shoe and linkage giving a maximum brake force of 22,613 lbs (100.6 kN) measured at the wheel rim.

38 The Locomotive has a top speed of 25 kilometres per hour (km/h) but is fitted with a speed limiter restricting maximum operational speed to 18 km/h.

Flat Wagon

39 BnM were unable to provide a unique number for the Flat Wagon involved in the accident, the manufacturer, or the year of entry into service. The year of manufacture is estimated to be in the early to mid-seventies.

40 The Flat Wagon is 29.5 feet (ft) long and 8 ft wide and has two heavy duty Diamond *Bogies*; each bogie contains two wheelsets (see Figure 8).

Figure 8 – Locomotive coupled to Flat Wagon (coupling arrangement inset)

41 The Flat Wagon has a chain coupling and a 55 mm Buffer Bar (see inset Figure 8).

42 The Flat Wagon has no braking system.

Signalling and communications

43 There are no signals on the BnM rail network and movements take place by *line-of-sight principle.*

44 The means of communication between the train drivers and BnM staff is by radio.

Operations

45 Milled peat is transported in open wagons from South Belair to Derrinlough Briquette Factory on the Boora to Lemonaghan Rail Line.

46 Milled peat transportation is usually but not always worked in pairs of trains known as the double rake system with each rake consisting of a Locomotive and sixteen open wagons. A single rake transports on average ninety-five tonnes of milled peat.

47 The maximum permitted line speed for the BnM railway is 18 km/h. As mentioned previously, locomotives are fitted with a speed limiter for this speed (paragraph 38).

Evidence

Training and Competence

48 Section 2.6, Training and Competence, within the BnM Rail Safety Case states that "The Resource Manager is responsible for ensuring that the employees under his immediate control and others, including contractors are made aware of and comply with BnM's Safety Statement and Rail Safety Case and the organisation and arrangements for carrying it out", by[4]:

- Ensuring that employees under their control receive adequate safety training and instruction appropriate to the task performed;
- Taking appropriate action to ensure employees or others are informed of safety procedures for level crossings and underpasses;
- Ensuring that appropriate arrangements are in place where specific *hazard*s exist;
- Ensure that all employees under their immediate control are aware of actions to be taken in case of emergency.

49 In terms of training received by the Locomotive Driver and the Excavator Operator, both attended a Toolbox Talk on 30th January 2020 on the following tasks:

- Procedure for Rerailing Wagons / Rail Stock (which is discussed in paragraphs 50 to 52);
- Rerailing Wagons / Rail Stock Risk Assessment, FS-RA-10600-32, (occupational safety document not relevant to this investigation);
- Coupling and Uncoupling rail stock Risk Assessment, FS-RA-10600-31 (occupational safety document not relevant to this investigation).

[4] Only the relevant statements are included in this list.

BnM Procedures

BnM Procedure for Rerailing Wagons / Rail Stock

50 BnM "Procedure for Rerailing Wagons / Rail Stock" (document number POHS B 0024, Revision 1, published on the 28th March 2017) is a seven-page document. Its purpose "is to set out a standard method for rerailing rail stock (locomotives, peat wagons and rail section loads/bogies) which allows such tasks to be undertaken in a safe manner". Its scope "covers rerailment of derailed rail stock (locomotives, peat wagons and rail section loads/bogies) where it is possible to rerail rail stock using an excavator or rerailer without additional help)". The pre-requisites for carrying out the task are:

- Training on the "Procedure for Rerailing Wagons / Rail Stock";
- Personnel carrying out the task are deemed to be competent;
- Suitable PPE to be worn;
- Training on Rail Haulage;
- Training on Excavator / Rerailer.

51 The procedure does not state how competency is achieved as there is no assessment of staff in relation to the procedure.

52 In terms of derailments, the procedures set out three scenarios in relation to rerailing. The scenario relevant to this investigation (Scenario 2) is where there is no line damage and uncoupling is required to allow rerailment. The procedures include: the positioning of the locomotive, wagons, excavator and personnel; ensuring the coupler is not under tension; how to attach the lifting chain; alignment, etc. The following procedures are of note to this accident:

- Before lifting ensure all peat wagons / rail section loads/bogies cannot roll freely (item 12).
- Secure rerailed stock (item 18).

53 The procedure does not state that w*heel chocks* can/should be used to secure rolling stock. On the day of the accident, wheel chocks were available in the rail hut of the rail refurbishment team, which was nearby, however, they were not used to secure the Flat Wagon and prevent it rolling away.

54 In addition, the procedure for rerailing wagons / rail stock does not require the lifting chain to be examined prior to carrying out the lift. However, it should be noted that BnM do

inspect all lifting chains and lifting equipment every six months and operators are required to carry out visual inspections, however, this is not formally documented in the procedure.

BnM Procedure for operating of Level Crossing Gates

55 BnM "Procedure for the Operation of Level Crossing Gates" (document number POHS B 0002, Revision 3, issued on the 7th September 2011), set out the procedure for the operation of different gates on the BnM network. In relation to Type 2 Level Crossings (as in the case of Kilcolgan Level Crossing) paragraph 33, the derailing points have to be manually operated to open or close by using the rail lever.

56 In summary, locomotive drivers are required to (the task can be split between leading and trailing rake drivers when operating in a double rake system):

- Stop a safe distance from the first derailing points;
- Check for road traffic and open the rail gates to the rail line;
- Close the derailing points on the opposite side of the road of the locomotive and then close the derailing points next to the locomotive;
- Drive through the level crossing;
- Stop locomotive when the last wagon is clear of the derailing points;
- Open derailing points behind the last wagon and open derailing points on opposite side of the road;
- Close level crossing gates against the rail line.

57 The procedure highlights that derailing points "should be in the "OPEN POSITION", meaning that the line is broken, and derailment will occur if any locomotive etc. is driven through; this is to prevent uncontrolled locomotives or rail rolling stock from hitting level crossing gates and placing members of the public at risk of serious injury or death".

58 It should be noted, that at the time of the accident, there was no means of securing the derailing points in the open position; and, BnM management have stated that a number of incidents of interference of derailing points by members of the public have taken place; and An Garda Síochána have been notified.

Hazard identification and risk assessment

Introduction

59 Section 3.0, Hazard Identification & Risk Assessment, of the BnM Rail Safety Case identifies the "basic philosophy of BnM is that no employee, contractor or member of the public should be subject to any preventable accident, no matter how slight the consequences may be. Therefore it is important that all hazards associated with peat haulage operations though level crossings and underpasses and hazards associated with the physical condition of level crossings and underpasses whether or not they are in use are identified, the level of risk assessed, and control measures are put in place to reduce the risks as far as is reasonably practicable".

Risk Scores

60 The methods and processes for hazard identification was through a Risk Management Workshop held in December 2006 "to systematically identify all reasonably foreseeable hazards which the operation of level crossing and underpasses might present to the public, employees and contractors". A second workshop was held in January 2010 in order to review the risk assessments compiled in 2006 and define the associated residual risk after implementation of mitigation measures. Risks were then scored based on the probability of occurrence (on a scale of 1 to 6) and its impact should it occur (on a scale of 1 to 4) i.e. the highest risk score being 24. A score of 5 and below is considered negligible; a score between 6 and 12 is considered tolerable; and a risk score of 15 to 24 is considered intolerable[5].

[5] The risk scoring matrix cannot calculate a risk score of 13 or14, hence they are not included in the range.

Risk Register

61 Through the risk scores the BnM Risk Register was developed and revised; with risk scores ranked from 1 to 33, where 1 is the risk with the highest score. The risks identified and relevant to this accident are:

- Manual catch points[6] not left open (Risk Score 12 & Risk Rank 3);
- Procedure for opening / closing gates (Risk Score 6 & Risk Rank 14);
- Uncoupled / Runaway wagon (Risk Score 6 & Risk Rank 15);
- Derailments (Risk Score 6 & Risk Rank 20);
- Training Locomotive – Drivers not fully trained (Risk Score 4 & Risk Rank 26);
- Vandalism of Level Crossing Gates (Risk Score 4 & Risk Rank 27);
- Locomotive speeding approaching catch point (Risk Score 4 & Risk Rank 28).

Mitigation Measures

62 For item 3 on the Risk Register (Risk Score 12), Manual catch points not left open, the risk mitigations are:

- It is mandatory for locomotive drivers to leave points in the open position before leaving the level crossing. This is stated in Level Crossing Procedures and is part of the training provided to all locomotive drivers;
- Periodic audits of conformance with Level Crossing Procedures will be carried out on by safety personnel.

63 For item 14 on the Risk Register (Risk Score 6), Procedure for opening and closing gates, the risk mitigations are:

- A Procedure for Operating Level Crossing Gates is in place in BnM. This procedure has been circulated to all works and transport centres;
- The procedure forms part of training provided to all locomotive drivers;
- Periodic audits of conformance with Level Crossing Procedures will be carried out on by safety personnel.

[6] Such as the derailing points at Kilcolgan Level Crossing

64 For item 15 on the Risk Register (Risk Score 6), Uncoupled / runaway wagons, is the risk mitigations are:

- All gated level crossings have derailing points on either side of the crossing. These derailing points are left in the open position and have to be manually closed to complete the rail line and allow locomotives and wagons proceed to the level crossing gates. Hence any runaway or uncoupled wagons will be derailed prior to the level crossing;
- Wagons and couplings are regularly maintained.

65 For item 20 on the Risk Register (Risk Score 6), Derailments, the risk mitigations are:

- Conditions of the rails at level crossings will be checked as part of annual inspections and audits. Any maintenance required will be completed as soon as possible.
- Should a derailment occur at a level crossing, the Procedure for Rerailing will be followed.

66 For item 26 on the Risk Register (Risk Score 4), Training – Locomotive Drivers not fully trained, the risk mitigations are:

- BnM provides recognised training for all their peat haulage locomotive drivers, which is assessed by BnM Trainers. Refresher training is carried out periodically;
- A Procedure for Operating Level Crossings Gates is in place and has been circulated to all works offices and transport centres. This procedure is part of the training provided to locomotive drivers.

67 For items 26 and 27 on the Risk Register, Vandalism of Level Crossing Gates (Risk Score 4) and Locomotive speeding approaching catch point (Risk Score 4), respectively, no risk mitigations are included in the document; this is also the case for the remaining items on the Risk Register (i.e. no risk mitigations are provided for items 27 to 33).

Signage requirements and signage present at Kilcolgan Level Crossing

Introduction

68 This section of the report will outline the required warning signage as set out in the:

- Department of Transport's Traffic Signs Manual, last updated in August 2019;
- BnM's Specification for Level Crossings, published in February 2007;
- BnM Rail Safety Case, Revision 5, published on the 5th September 2011.

Department of Transport, Traffic Signs Manual

69 Chapter 6, Warning Signs, of the Department of Transport's Traffic Signs Manual provides "details of the warning signs which may be used on the roads in Ireland, including their layouts and symbols, the circumstances in which each sign may be used and guidance on positioning them". The terminology "shall" or "must" indicates that a particular requirement is mandatory.

70 Chapter 6 states that "three appropriate yellow diamond 'Level Crossing Ahead' signs shall be erected on each roach road", indicating that Sign W 121 (see Figure 9) is mandatory and supplementary plates P 001 (see Figure 9) showing the distance to the junction at three location on the approach to the crossing should also be provided; in addition, two RUS 027 Stop signs (see Figure 9) should be erected on the level crossing gates.

W121 – Level Crossing (Ahead) with no flashing red signals | P 001 – Supplementary Plate: Distance | RUS 027 – Stop Sign

Figure 9 – Mandatory road signage on approach to and on level crossing gates

BnM's Specification for Level Crossings

71 Section 6.0, "Grade B Level Crossing & Signage" of BnM's Specification for Level Crossings includes details of the signage required at Grade B Level Crossings (such as Kilcolgan Level Crossing). The section includes drawing number CW-M-319, entitled "Position of Road Signage For Grade B Road", which positions Type B1 (Figure 10) and Type B2 (Figure 11) at distances of 160 m and 250 m from the level crossing gates, respectively.

Figure 10 – Type B1

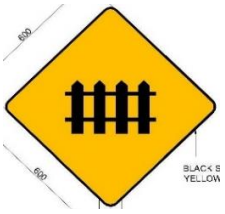

Figure 11 – Type B2

Figure 12 – Sign Type D2

72 In addition, each gate should have an “ID Sign”, Type D2 Sign (Figure 12), with a unique identifying number and emergency contact number; these signs are also referenced in Section 2.4.5, “To and from the Public” in the BnM Rail Safety Case.

73 Section 3.0 sets out the requirements for signage on the gate. In terms of signage on the gate, with Figure 3.2 of the section, outlining a “typical BnM Level Crossing Gate”, see Figure 13. Each gate should have two warning beacons, one “Main Gate Sign” and two “Warning Triangles” and the “ID Sign”.

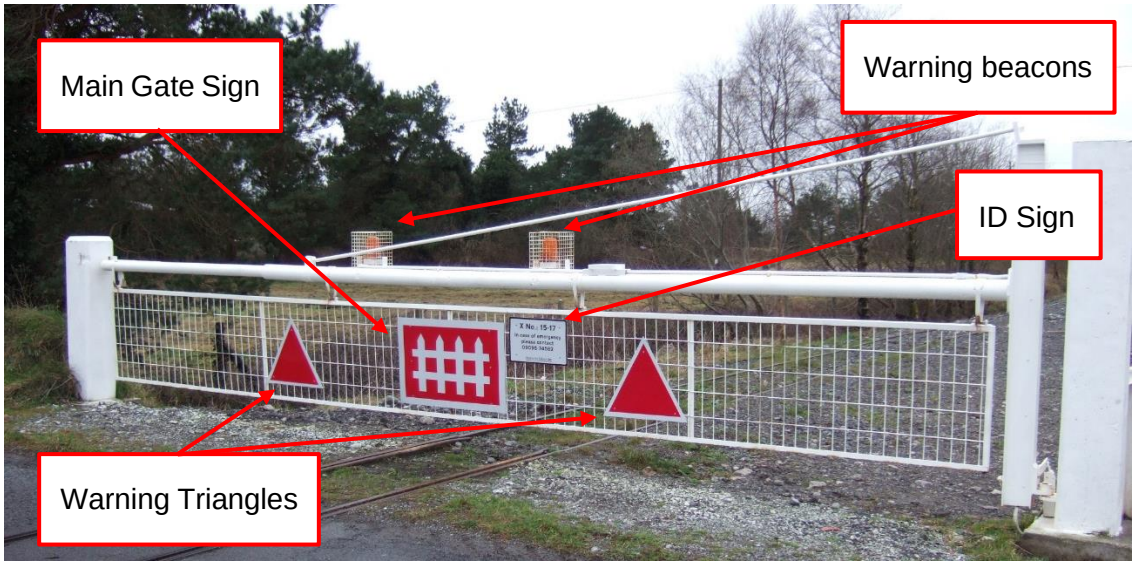

Figure 13 – Figure set out in BnM’s Specification of Level Crossings

Signage at Kilcolgan Level Crossing

Approach Road Signage

74 In terms of the approach road signage at Kilcolgan Level Crossing and the requirements of the Department of Transport's Traffic Signs Manual, the three "Level Crossing Ahead" (W121) signs and associated supplementary distance plates (P 001) were not erected (paragraph 70).

75 In their place were the BnM's Specification for Level Crossings signage, Type B1 and Type B2 signs (paragraph 71). The Type B1 signs were positioned at distances of 349 m (approaching from the west) and 351 m (approaching from the east), against a specification of 250 m. The Type B2 signs were both positioned 259 m from the level crossing (approaching from the west and east), against a specification of 160 m.

Signage on Kilcolgan Level Crossing Gates

76 The "Stop" signs (RUS 027), as required by the Department of Transport's Traffic Sign Manual, were not positioned on the gates (paragraph 70).

77 In their place, were the signs as set out in the BnM's Specification for Level Crossings, such as the "Main gate Sign" and the "Warning Triangles", which are signs designed by BnM. The ID Sign was not positioned on the gate at the time of the accident.

Events before, during & after the accident

Events before the accident

78 The Locomotive Driver and the Excavator Operator both worked the same shifts leading up to the accident; with both having a rest day on Sunday 7th June the day before the accident. Fatigue is not considered to be a contributing factor in relation to the accident.

79 At approximately 13:15 hrs on the 8th June 2020 a double rake system (with a Leading Rake Driver and a Trailing Rake Driver) travelled through Kilcolgan Level Crossing. As set out in the BnM Procedure for operating of Level Crossing Gates, the Leading Rake Driver moved the derailing points to the closed position to allow the double rake system to pass through Kilcolgan Level Crossing; with the Trailing Rake Driver returning the derailing points to the open position prior to continuing their journey (paragraphs 55 - 58).

80 The Trailing Rake Driver saw a number of youths present in the area at this time.

81 At around the same time, approximately two kilometres away, a Flat Wagon was at Worksite 610A was being unloaded by an excavator.

82 During the unloading ballast fell onto the track and when the Locomotive Driver moved the Flat Wagon forward the wheelsets of the bogie of the Flat Wagon closest to the Locomotive drove up on the fallen ballast and derailed.

83 The Locomotive was uncoupled from the Flat Wagon, by the Locomotive Driver, to give access to the coupler for the rerailing process.

84 The Locomotive Driver then placed a chain around the Flat Wagon coupler and the Excavator bucket; the Locomotive Driver did not ensure that the Flat Wagon was secure, despite being on a gradient (paragraph 29). Using the excavator, the Flat Wagon was lifted; the bogie was aligned with the rails; and the Flat Wagon was lowered back on to the track.

85 The Locomotive Driver then removed the chain that was around the coupler of the unsecured Flat Wagon; and the Flat Wagon began to roll away in the direction of Kilcolgan Level Crossing.

86 The Locomotive Driver entered the Locomotive and followed the Flat Wagon as it rolled towards Kilcolgan Level Crossing but had no means of stopping it.

87 The Locomotive Driver observed the derailing points were in the closed position as he approached Kilcolgan Level Crossing.

Events during the accident

88 On the approach to Kilcolgan Level Crossing the Flat Wagon passed through the derailing points in the closed position; resulting in the Flat Wagon colliding with the first gate at Kilcolgan Level Crossing; with the collision forcing the level crossing gate open, across the road.

89 The Flat Wagon continued through the second gate, forcing it open away from the road.

90 The Flat Wagon came to a stop approximately 50 m past Kilcolgan Level Crossing.

Events after the accident

91 The Locomotive Driver reported the accident immediately to Area Team Leader – Supply Chain & Logistics.

92 The Railway Safety Act 2005, revised May 2019, does not require BnM to carry out drugs and alcohol testing of staff as the infrastructure is used or intended to be used solely for industrial use; and as such the staff involved in the accident were not required to be tested post-accident.

93 BnM management reported the accident, by email, to the RAIU on 15th June 2020, a week later.

Similar Occurrences

94 At the time of the accident, the RAIU had not been previously notified of any collisions at BnM level crossings.

95 Since the commencement of the RAIU investigation into this accident, the RAIU were provided with a copy of a "BnM Accident Investigation Form" into the accident of a collision between BnM Locomotive (ID LM411) and Endrim Level Crossing gates (ID 21-05) on the 21st September 2017 (report published on the 22nd October 2017), see Figure 14 for a photograph of the accident.

Figure 14 – Collision of BnM Locomotive with Endrim Level Crossing gates

96 The BnM investigation found that on the approach to the Endrim LC gates the locomotive driver slowed down prior to the derailing points (which were in the open position) but felt a "thump" from behind (from the attached flat wagons) pushing the locomotive through the derailing points. The derailing points derailed the locomotive and the first wagons directly behind the locomotive; but the locomotive continued forward striking and opening the crossing gate, against the road. The second and third wagons behind the locomotive passed the derailing points without derailing (possibly due to the level crossing being a BnM *Type 1 level crossing*, where the derail points are attached to the operation of the gate by means of wire rope, and the derailing points moved to the open position. The derailing points did not prevent the Locomotive colliding with Endrim LC gates and did not protect the roadway as the gate opened across the road.

97 The report concluded “that there were no significant anomalies” on the day of the accident, a number of issues were highlighted:

- At a speed of 6.8 km/h, 51 m from the derailment points the locomotive failed to stop at the derailment points and subsequently derailed and struck the gates of Endrim LC;
- The approach to Endrim LC, from the Boora side, is through a cutting which has resulted in high embankments either side of the track. These high embankments restrict the view of the locomotive drivers and the gates of Endrim LC are not visible until the driver is within 300 m of the level crossing. There is currently no warning signage in place on the approach to Endrim LC to indicate to the locomotive drivers the distance they are from the level crossing gates.

98 The report identified that the following remedial actions needed to be carried out to significantly reduce the risk of this accident occurring in the future:

- A technical evaluation of the accident needs to be carried out by the Engineering Department to investigate, locomotive stopping distances, derailment points, wagon coupling systems and the possible wider implication of this event to the other BnM rail crossings;
- Distance warning signage is 100 m increments up to 300 m needs to be erected on the approach to the Endrim gates to ensure the drivers are aware of the distance to the gates. Prior to the erection of the signs a toolbox talk needs to be held with all locomotive drivers to make them aware of the new signage to be put in place and to ensure the speeds travelled towards the level crossing gates are reduced.

99 The RAIU requested progress on these recommendations and it was found that the distance warning signs had been erected, but no actions had been taken in relation to technical evaluation (first bullet, paragraph 98).

Analysis

Training and Competence

100 The BnM Rail Safety Case states that there are provisions for safety training, safety procedures, management of hazards (paragraph 48).

101 In terms of training for the Locomotive Driver and Excavator Operator, both attended a Toolbox Talk on the 30th January 2020 in relation to BnM Procedures for Rerailing Wagons / Rail Stock (POHS B0024); as well as briefings in terms of risk assessments associated with rerailing wagon / rail stock (FS-RA-10600-32) and coupling and uncoupling rail stock (FS-RA-10600-32), (paragraph 49).

102 In terms of the training related to the BnM Procedures for Rerailing Wagons / Rail Stock, the RAIU consider that the briefing of the document is insufficient in terms of training as there is no physical demonstration. In addition, there is no competency assessment associated with the briefing (paragraph 51).

BnM Procedures

BnM Procedure for Rerailing Wagons / Rail Stock

103 The BnM Procedures for Rerailing Wagons / Rail Stock (POHS B 0024) sets out a stepped guide on how to perform the rerailing for different scenarios (paragraph 52); however, despite stating that checks should be untaken to ensure that the rail stock cannot roll freely and rerailed stock should be secured (paragraph 52), it does not identify that wheel chocks, which are freely available, should be used (paragraph 53). In addition, it does not require that the chain (used to lift the derailed stock) should be visually examined in line with the Safety, Health and Welfare at Work (General Application) Regulations 2007 (paragraph 54).

104 On the day of the accident, the Locomotive Driver did not ensure that the Flat Wagon could not roll away once uncoupled (paragraph 84) and did not secure the Flat Wagon once rerailed (paragraph 85).

BnM Procedure for operating the Level Crossing Gates

105 The derailing points should be maintained in the open position, to prevent uncontrolled locomotives or rail rolling stock from hitting level crossing gates and placing members of the public at risk of serious injury or death (paragraph 57).

106 The procedures set out the instructions for locomotive drivers on the operation of the gates (paragraph 56); and, according to the Milled Peat Train Locomotive Drivers, the procedures were carried out in full (paragraph 79).

107 It is noted that there is no means of securing the derailing points in the open position (paragraph 58) and youths had been seen in the area before the accident (paragraph 80). Incidents of interference with the derailing points has been previously reported to An Garda Síochána (paragraph 58). It cannot be fully determined by the RAIU how the points were in the closed position prior to the accident.

Hazard identification and Risk Assessment

108 The BnM Rail Safety Case does include a section on hazard identification and risk assessment (paragraph 59); and Risk Management Workshops were held in 2006 and 2010 to produce risk score and develop a risk register (paragraph 60 and 61). It is noted that periodic audits should have taken place (paragraph 65), however, this does not appear to have occurred. It is noted that it is ten years since the last Risk Management Workshop.

109 In terms of the mitigation measures, the following highlight some omissions:

- Manual derailing points not left open, two mitigation measures have been identified; however, securing of the derailing points has not been identified as a mitigation measure (paragraph 62);
- Uncoupled / runaway wagons, two mitigation measures have been identified including the provision of derailing points ahead of level crossings; however, the securing of wagons after rerailing has not been identified as a mitigation measure (paragraph 64);
- Vandalism of Level Crossing Gates, despite being aware of vandalism through the uncontrolled operation of the derailing points, no mitigation measures have been identified (paragraph 67).

110 It is noted, from the previous BnM investigation, that the locomotive failed to stop at the derailment points and subsequently derailed and struck the gates of Endrim LC (paragraph 97); however this was not added to the risk register or additional mitigation measures made; although it is noted that it is ten years since the last Risk Management Workshop.

Signage requirements and signage present at Kilcolgan Level Crossing

111 Chapter 6, Warning Signages, of the Department of Transport's Traffic Signs Manual clearly sets out the signage requirements which must be present on the approach to and at level crossings located on the roads of Ireland (paragraphs 69 and 70). In relation to Kilcolgan Level Crossing, the mandatory requirements are that three diamond "Level Crossing Ahead" (Sign W121) signs are located on the approaches to the level crossing, with their associated distance plates (P 001), see paragraph 70 and Figure 9. At the level crossing, Stop signs should be erected on the gates of the level crossing (paragraph 70 and Figure 9). These signs are not in place at Kilcolgan Level Crossing.

112 In their place are signs as set out in BnM's Specification for Level Crossings document, requiring that Grade B level crossings have one diamond "Level Crossing Ahead" sign, Type B2 Sign (Figure 11) (with no distance plate) and one "Slow Level Crossing Ahead" sign, Type B1 Sign (Figure 10) erected (paragraph 71). However these were not erected at the required distances of distances of 250 m and 160 m ahead of the level crossing, respectively (paragraph 71); but positioned at distances of approximately 350 m and 260 m, respectively (paragraph 75). On the level crossing gates, BnM have, in place of the required Stop sign, BnM designed signs such as "Main Gate Sign" and "Warning Triangles" (paragraphs 76 and 77); in addition, the ID Sign was absent (paragraphs 73, 77 & Figure 12).

Similar Occurrences

113 There was one similar occurrence to this accident, namely, the collision between a BnM Locomotive and the gates of Endrim LC on the 21st September 2017 (paragraph 95); this accident had not been reported to the RAIU at the time (paragraph 94). The report found that the derailing points did not prevent the locomotive colliding with Endrim LC gates and did not protect the roadway as the gate opened across the road.

114 The report made two recommendations (paragraph 98); however, at the time of publication of this report BnM could not find any evidence that any actions had been taken against the technical evaluation in relation to locomotive stopping distances, derailment points, wagon coupling systems and the possible wider implication of this event to the other BnM rail crossings (paragraph 99).

Conclusion

Training and Competence

115 The Locomotive Driver and the Excavator Operator last received training in relation to rerailing wagon / rail stock, however, there was no physical demonstration or competency assessment at this time (paragraphs 101 and 102); and, there is also no continuous assessment to ensure that the task is undertaken correctly.

BnM Procedures

BnM Procedures for Rerailing Wagons / Rail Stock

116 The BnM Procedures for Rerailing Wagons / Rail Stock does provide a stepped guide on how to perform the rerailing for different scenarios; however, absent are means to prevent rerailed wagons / rail stock from rolling away and visual checks of the lifting chain (paragraph 103).

BnM Procedures for operating the Level Crossing Gates

117 The BnM Procedures for operating the Level Crossing Gates are clear, and if carried out correctly will ensure that the derailing points are maintained in the open position (paragraph 105). However, at the time of the accident there was no means of securing the derailing points in the open position despite it being known by BnM that members of the public had interfered with level crossing derailing points on the BnM network in the past (paragraph 107).

Hazard identification and risk assessment

118 The BnM Rail Safety Case does include a section of hazard identification and risk assessment and Risk Management Workshops were held in 2006 and 2010 to develop risk scores and a risk register; however, there has been no review in ten years; despite an internal investigation into another collision at level crossing gates in 2017 identifying potential issues with the derailing points (paragraph 110). The required periodic audits do not appear to have been conducted (paragraph 108). As a result, this risk was not included on the risk register. In addition, no mitigation measures related to vandalism of level crossing gates have been identified or the risk added to the risk register, despite, the known interference with derailing points by members of the public (paragraph 109). Also, there are some omissions of mitigation measures related to catch points not being left open and uncoupled runaway wagons (paragraph 109).

Causal, Contributing & Systemic Factors

119 On the 8th June 2020, a BnM Flat Wagon collided with the gates of Kilcolgan Level Crossing, causal factors were identified as:

- CaF-01 – The derailing points were in the closed position, resulting in the Flat Wagon not derailing, instead it continued towards and struck Kilcolgan Level Crossing gates;
- CaF-02 – Checks were not undertaken to ensure that the Flat Wagon could not roll freely prior to rerailing; and the Flat Wagon was not secured after rerailing.

120 The RAIU did not identify any contributing factors associated with the accident.

121 Systemic factors were identified as:

- SF-01 – The training for rerailing wagons / rail stock does not include any assessment to confirm competence of the task; and, there is no continuous assessments to ensure continued compliance with the procedures.
- SF-02 – The risk register was not updated to include the risks associated with the interference with derailing points by members of the public resulting in an absence of mitigation measures.

Additional Observations

122 The RAIU made a number of additional observations as a result of the accident, namely:

- AO-01 – There is some doubt as to the efficacy of the derailing points, as highlighted by the 2017 accident at Endrim LC, where the locomotive collided with the level crossing gates, despite derailing. A remedial action from "Investigation Report Collision between BnM Locomotive LM411 and Endrim Gates (21-05) 21st September 2017" requiring a technical evaluation into the "locomotive stopping distances, derailment points, wagon coupling systems and the possible wider implication of this event to the other BnM rail crossings" has, to date, not been commenced. The findings were also not added to the risk register.
- AO-02 – The Procedures for Rerailing Wagons / Rail Stock does not require any visual examination of the lifting chain prior to use;
- AO-03 – The road signage on the approach to Kilcolgan Level Crossing and on the level crossing gates is not as set out in the Department of Transport's Traffic Signs Manual;

- AO-04 – The RAIU were not immediately informed of the accident and were also not informed of the 2017 accident in line with the RAIU's "Guidance: Notification of occurrences to the RAIU for RUs, IMs & other ROs".

Measures taken since the accident

123 During the drafting of this report, on the 14th January 2021, as part of BnM's Brown to Green strategy, a decision was announced to permanently end all peat harvesting on BnM land. The decision illustrates the steep fall in BnM's use and dependence on peat during the past two years. Up to now 80% of the peat harvested went to electricity generation. The Electricity Supply Board's (ESB) two midlands power stations have now closed and the BnM Edenderry Station cofires with Biomass. As a result, the volume of peat being moved in 2021 and subsequent years will fall by circa 82% verses that moved in 2019, and the rail haulage activities will reduce by a similar volume. There will remain some rail haulage servicing our Derrinlough briquette factory which will operate until 2024 and Edenderry station until 2023.

124 At the time of publication of this report, BnM have taken the following actions:

- Reported anti-social behaviour at Kilcolgan Level Crossing to Garda Síochána;
- The derailing points at Kilcolgan Level Crossing were firstly fitted with a combination lock to prevent unauthorised use by members of the public and have now been fitted with automatic derailing points mechanisms i.e. when the gate is closed to the rail line the derailing points are in the open position;
- BnM staff have been re-trained on the Procedures for Rerailing Wagons / Rail Stock, BnM have stated that this now includes theory, practical and assessments for each member of staff;
- A performance review has taken place with Locomotive Driver and the Excavator Operator;
- BnM completed a BnM Incident Report Form on the 8th June 2020 outlining the accident; but did not make any findings in terms of factors related to the accident and did not make any safety recommendations;
- BnM have developed their "Notification & Reporting Requirements for Accidents & Incidents at BnM Interfaces" operations document, Document No. POHS B 0105, Revision 1, published on the 8th February 2021. This document now references the RAIU's "Guidance: Notification of occurrences to the RAIU for RUs, IMs & other ROs", highlighting what occurrences require immediate notification, etc.

Safety Recommendations

Introduction to safety recommendations

125 In accordance with the Railway Safety Act 2005 (Government of Ireland, 2005a) and the European railway safety directive (European Union, 2004), recommendations are addressed to the national safety authority, the CRR. The recommendation is directed to the party identified in each recommendation.

Absence of safety recommendations due to measures already taken

126 As BnM have developed their "Notification & Reporting Requirements for Accidents & Incidents at BnM Interfaces" operations document (paragraph 124) to include the requirements of RAIU's "Guidance: Notification of occurrences to the RAIU for RUs, IMs & other ROs" no further safety recommendation is required (AO-04).

Safety recommendation as a result of the accident

127 Although it is noted that the derailing points at Kilcolgan LC have now been fitted with automatic derailing points mechanisms; given the risk to road users at other BnM level crossings, this should be expanded to locations vulnerable to misuse; as a result, the RAIU make the following safety recommendation (CaF-01):

Safety Recommendation 202102-01

BnM should identify locations where derailing points are vulnerable to unauthorised movements and provide a means of securing the derailing points at these locations.

128 In relation to the Procedures for Rerailing Wagons / Rail Stock, there are a number of omissions in relation to the: use of wheel chocks to secure rerailed stock; procedures for rerailing on a gradient; and visual checks of lifting chains before use. As a result, the RAIU make the following safety recommendation (CaF-02, AO-02):

Safety Recommendation 202102-02

BnM should review and update its Procedure for Rerailing Wagons / Rail Stock to ensure that there are clear instructions in relation to how to: visually check the lifting chains; rerail; and, safety secure rerailed stock.

129 The BnM training in relation to the Procedure for Rerailing Wagons / Rail Stock does not include any assessment or continuous assessments; as a result, the RAIU make the following safety recommendation (SF-01):

Safety Recommendation 202102-03

BnM should develop a training, assessment and continuous assessment programme related to the Procedures for Rerailing Wagons / Rail Stock.

130 The risk register, which has not been updated for ten years, was not updated to include the risks associated with unauthorised movements of the derailing points. In addition, the potential risks associated with the findings of an internal investigation report completed in 2017 were also not included on the risk register; as a result, the RAIU make the following safety recommendation (SF-02):

Safety Recommendation 202102-04

BnM should review its level crossing Risk Register updating where necessary to sufficiently capture all reasonably foreseeable risks. In addition, BNM should consider adding a requirement within its Rail Safety Case Document that requires regularised Risk Management Workshops at which risks, mitigation measures, etc, are reviewed and updated when necessary.

Safety recommendations from additional observations

131 A remedial action from "Investigation Report Collision between BnM Locomotive LM411 and Endrim Gates (21-05) 21st September 2017" requiring a technical evaluation into the locomotive stopping distances, derailing points, wagon coupling systems and the possible wider implication of this event to the other BnM rail crossings has not been commenced; as such potential risks remain open. While the derailing points were closed at the time of the accident; the risks to road users as a result of potentially inadequate derailing points should be reviewed by BnM; as a result, the RAIU make the following safety recommendation (AO-01):

Safety Recommendation 202102-05

The Engineering Department of BnM should carry out the technical evaluation into the efficacy of the derailing points, etc. identified in BnM internal investigation report into the collision between a BnM locomotive and the gates of Endrim Gates on the 21st September 2017.

132 The road signage on the approach to, and at, Kilcolgan Level Crossing was not compliant with the Department of Transport's Traffic Signs Manual; given that signage should be erected as per the Department of Transport's Traffic Signs Manual, the RAIU make the following safety recommendation (AO-03):

Safety Recommendation 202102-06

BnM should update their Specification for Crossings to include the requirements of the Department of Transport's Traffic Signs Manual; based on this BnM should update the signage on the approaches to all BnM level crossings.

Additional Information

List of abbreviations

BnM	Bord na Móna
CI	Chief Investigator
CRR	Commission for Railway Regulation
DART	Dublin Area Rapid Transit
EU	European Union
ESB	Electricity Supply Board
hr	hour
IM	Infrastructure Manager
km	kilometre
km/h	Kilometres per hour
LC	Level Crossing
m	metre
mm	Millimetre
PPE	Personal Protective Equipment
RAIU	Railway Accident Investigation Unit
RFI	Request For Information
RO	Railway Organisation
RU	Railway Undertaking

Glossary of terms

Accident	An unwanted or unintended sudden event or a specific chain of such events which have harmful consequences. For heavy rail, the EU Agency for Railways divides accidents into the following categories: collisions, derailments, level-crossing accidents, accidents to persons caused by rolling stock in motion, fires and others.
Article 20 of Directive (EU) 2016/798, Obligation to investigation	Article 20 (1) Member States shall ensure that an investigation is carried out by the investigating body referred to in Article 22 after any serious accident on the Union rail system. The objective of the investigation shall be to improve, where possible, railway safety and the prevention of accidents. Article 20 (2) The investigating body referred to in Article 22 may also investigate those accidents and incidents which under slightly different conditions might have led to serious accidents, including technical failures of the structural subsystems or of interoperability constituents of the Union rail system. The investigating body may decide whether or not an investigation of such an accident or incident is to be undertaken. In making its decision it shall take into account: (a) the seriousness of the accident or incident; (b) whether it forms part of a series of accidents or incidents relevant to the system as a whole; (c) its impact on railway safety; and (d) requests from infrastructure managers, railway undertakings, the national safety authority or the Member States.
Ballast	Ballast stone used to from the track bed upon which railroad sleepers are laid.
Bogie	The undercarriage assembly of rolling stock incorporating the train wheels and suspension.
Causal Factor	Any action, omission, event or condition, or a combination thereof that if corrected, eliminated, or avoided would have prevented the occurrence, in all likelihood.
Closed position (derailing points)	Points set to allow rail movement through the points safely.

Contributing Factor	Any action, omission, event or condition that affects an occurrence by increasing its likelihood, accelerating the effect in time or increasing the severity of the consequences, but the elimination of which would not have prevented the occurrence.
Derailing points	A set of points used to derail a rail vehicle; sometimes referred to as derailing switches, trap points or catch points.
Double Rake System	Pairs of milled peat trains (with each train consisting of one locomotive and sixteen open wagons (rake)).
Flat Wagon	A wagon on two bogies with no walls used to transport maintenance equipment.
Hazard	A condition, event or practice with the potential to cause an injury, damage or loss.
Incident	Any occurrence, other than an accident or serious accident, associated with the operation of trains and affecting the safety of operation. For heavy rail, the EU Agency for Railways divides incidents into the following categories: infrastructure; energy; control-command & signalling; rolling stock; traffic operations & management and others.
Investigation	A process conducted for the purpose of accident and incident prevention which includes the gathering and analysis of information, the drawing of conclusions, including the determination of causes and, when appropriate, the making of safety recommendations
Line-of-sight	Movement of a rail vehicle at a speed that will allow the driver to stop the vehicle if an obstruction is viewed.
Open position (derailing points)	Points set to obstruct rail movement through the points, used as safety device.
Rake	Locomotive and sixteen flat wagons.
Risk	The chance that harm will result from a Hazard; the combination of the severity of the Hazard with the likelihood of its happening, the probable consequence of potential harm or damage resulting from an unmanaged Hazard.

Risk Assessment	A structured assessment to identify the likelihood of a Risk event, the severity of the adverse consequences should the event come about, and the mitigating Risk control actions.
Safety Case	A document detailing the railway's safety arrangements and provisions for managing interfaces internally and externally.
Serious Accident	Any train collision or derailment of trains, resulting in the death of at least one person or serious injuries to five or more persons or extensive damage to rolling stock, the infrastructure or the environment, and any other similar accident with an obvious impact on railway safety regulation or the management of safety. For heavy rail, the EU Agency for Railways divides serious accidents into the following categories: collisions, derailments, level-crossing accidents, accidents to persons caused by rolling stock in motion, fires and others.
Speed limiter	Device fitted to a Locomotive restricting the speed the Locomotive can travel at.
Systemic Factor	Any causal or contributing factor of an organisational, managerial, societal or regulatory nature that is likely to affect similar and related occurrences in the future, including, in particular the regulatory framework conditions, the design and application of the safety management system, skills of the staff, procedures and maintenance.
Type 1 Level Crossing	BnM define a Type 1 Level Crossing as a rail level crossing, where the derail points are attached to operation of gate by means of wire rope.
Type 2 Level Crossing	BnM define a Type 2 Level Crossing as rail level crossing with the derailing points having to be manually operated to open or close the derail points by means of a lever, as the derail points are not connected to the level crossing gates.
Uncoupled	Rail vehicle detached from adjacent vehicle.
Wheel Chocks	Wedge placed at a wheelset to prevent movement.

References

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BnM (2011), Procedure for operating of Level Crossing Gates, POHS B 0002, Revision 3, 07/09/2011.

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BnM (2007), Signage requirements for BnM Level Crossing, CW/M/319, February 2007.

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Railway Safety Act 2005 (2005), revised May 2019.