

**Oliver Stewart**  
**RAIB Recommendation Handling Manager**



9 March 2023

Mr Andy Lewis  
Deputy Chief Inspector of Rail Accidents

Dear Andy,

**RAIB Report: Derailment of a passenger train at Carmont, Aberdeenshire on 12 August 20**

I write to provide an update<sup>1</sup> on the action taken in respect of recommendations addressed to ORR in the above report, published on 10 March 2022.

The annex to this letter provides details of actions taken in response to the recommendations and the status decided by ORR. The status of recommendations 1–3 & 6–20 is '**Open**'. The status of recommendations 4 & 5 is '**Closed**'.

ORR will advise RAIB when further information is available regarding actions being taken to address these recommendations.

We will publish this response on the ORR website on 10 March 2023

Yours sincerely,

Oliver Stewart

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<sup>1</sup> In accordance with Regulation 12(2)(b) of the Railways (Accident Investigation and Reporting) Regulations 2005

## Initial consideration by ORR

1. All 20 recommendations were addressed to ORR when the report was published on 10 March 2022
2. After considering the recommendations ORR passed recommendations 1 – 13 to Network Rail and recommendations 15, 17 & 20 to RSSB asking them to consider and where appropriate act upon them and advise ORR of its conclusions. RSSB has also coordinated the response to recs 14, 16, 18 and 19. The consideration given to each recommendation is included below.
3. This annex identifies the correspondence with end implementers on which ORR's decision has been based.

### Recommendation 1

*This recommendation recognises the evolution of Network Rail's processes since the Carmont 2011/12 drainage scheme was constructed and is intended to ensure that current processes ensure works are appropriately constructed and transferred into maintenance regimes with the records needed for safe future management of the asset.*

Network Rail should review its contractual and project management arrangements to identify effective measures to:

- a) substantially reduce the risk of contractors modifying an approved design during construction without the appropriate approvals from the designer, the client and any other body affected by the change
- b) ensure the timely provision of the accurate records needed for future management of the asset. The review should include consideration of:
  - contractual conditions and penalties for non-compliance with mandated process
  - assurance and quality control requirements
  - change management procedures
  - appropriate client checks during construction
  - the timely preparation and hand-over of 'as-built' drawings and health and safety files
  - the requirements of the Construction (Design and Management) Regulations 2015
  - ways of guaranteeing access to asset records should a contractor go out of business
  - current levels of compliance and reasons for any significant levels of non-compliance.

The measures identified by the review should be incorporated into Network Rail's contractual and project management systems, and those tasked with implementing the improved arrangements should be provided with clear guidance and suitable briefing

### ORR decision

4. Network Rail is reviewing contractual and project management arrangements across three workstreams – culture, workshops with suppliers (through the Rail Industry Association) and internal workshops. Network Rail have indicated the review is almost complete and have committed to providing ORR with its outputs in the near future.

5. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- is taking action to implement it by December 2023

**Status: Open**

### Information in support of ORR decision

6. On 19 May 2022 Network Rail provided the following action plan:

#### Action Plan

##### Please provide milestones with dates

The Action Plan will undertake a review of contractual and project management arrangements, determine, and deliver relevant improvement to governance controls and competency development offering. This action plan will be led by the Rail Investment Centre of Excellence with involvement from across our Regions, Technical Authority and Route Services directorates.

1. Identify current Standards relating to recommendation – **complete**
  2. Identify those accountable, responsible, or need to be consulted - **complete**
  3. Integrate planning with Heads of Engineering (Regions) in relation to overlap with action plans relating to recommendations A9.11, A9.13, and A9.20 – 8<sup>th</sup> April '22
  4. Hold recommendation action plan launch with national technical leads for programme management (RiCoE), contract commercial (Route Services), and construction management (Technical Authority) – by end April '22
  5. confirm current governance and assurance arrangements – by middle May '22
  6. risk workshop and gap analysis/mitigation plan with Regions – by end May '22
  7. Supply chain engagement to identify good practice – by end June '22
  8. Review risk-based gap analysis against current controls - by end June '22
  9. Identify behavioural and competency gaps – by end July '22
  10. Publish and promote learning material to Sponsor, Project Management, and Project Engineering teams – by end August '22
- Pending conclusion of risk-based gap analysis as required:
11. Standards change remits for approval published (if required by milestone 6 and / or 8) – by end June '22
  12. Roll out formal training and development interventions (if required from milestone 9) - be end September '22

13. Updated standards and controls published (if required by milestone 6 and / or 8) – by end December '22
14. Embedment of new Standards complete that integrates any formal training and development (action 12), technical and awareness briefings held, recorded and subsequently made available on the standards and controls website, and any further development sessions required to embed the change (if required by milestone 6 and / or 8) – by end June '23

### Evidence required to support closure of recommendation

- a) Minutes from Heads of Engineering (milestone 3 plan agreed)
- b) Minutes from national technical leads briefing (milestone 4 plan endorsed)
- c) Baselined scope document (milestone 5)
- d) Risk record created (milestone 6)
- e) Minutes from supply chain engagement meeting (milestone 7)
- f) Risk record updated with mitigation (milestone 8 and 9)
- g) Standards change remits published (milestone 11)
- h) Briefing document (milestone 10)
- i) Training plan and needs analysis (milestone 12)
- j) Published Standards (milestone 13)
- k) Standards change remits approved for closure (milestone 14)
- l) Risk record updated to reflect reduction in risk to tolerable levels (risk closed)

7. On 24 May Network Rail provided the following update:



2022 05 24 Carmont  
derailment (Rec 1) - N

8. On 22 September 2022 Network Rail provided the following update:



Carmont  
Recommendation 1

9. On 24 January 2023 Network Rail provided the following action plan showing completed milestones and next steps:

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Action Plan and milestone dates				
MS	Description	Date	Status	Comment
1	Identify current Standards relating to recommendation		Complete	
2	Identify those accountable, responsible, or need to be consulted		Complete	
3	Integrate planning with Heads of Engineering (Regions) in relation to overlap with action plans relating to recommendations A 9.11, A9.13, and A9.20 – 8 <sup>th</sup> April '22		Complete	
4	Hold recommendation action plan launch with national technical leads for programme management ( RICOe ), contract commercial (Route Services), and construction management (Technical Authority) – by end April '22		Complete	
5	Confirm current governance and assurance arrangements – by middle May '22		Complete	
6	Risk workshop and gap analysis/mitigation plan with Regions – by end May '22 (07 June '22)		Complete	
7	Supply chain engagement to identify good practice – by end Sept '22		Substantially complete	Report complete, further cascade & briefing required
8	Review risk-based gap analysis against current controls - by end October '22		Substantially complete	Engagement with action owners ongoing
9	Identify behavioural and competency gaps – by end October '22		Substantially complete	Engagement with action owners ongoing
10	Publish and promote learning material to Sponsor, Project Management, and Project Engineering teams – by end November '22	November '22	Ongoing	Some training started. Opportunity for industry-wide learning identified.

24/01/2023

OFFICIAL



Action Plan and milestone dates				
MS	Description	Date	Status	Comment
	<b>Pending conclusion of risk -based gap analysis as required:</b>			
11	Standards change remits for approval published (if required by milestone 6 and / or 8) – by end January '23		Complete	See next slide
12	Roll out formal training and development interventions (if required from milestone 9) – by end March '23	March '23		
13	Updated standards and controls published (if required by milestone 6 and / or 8) – by end September '23	September '23	Ongoing	See slide 11
14	Embedment of new Standards complete that integrates any formal training and development (action 12), technical and awareness briefings held, recorded and subsequently made available on the standards and controls website, and any further development sessions required to embed the change (if required by milestone 6 and / or 8) – by end December '23	December '23		
NEW 15	Review into the cultural entrenched reasons for the process failure of 2011/12 governance and assurance arrangements – by end October '22		Complete	See slide 6

24/01/2023

## Recommendation 2

*The intent of this recommendation is to identify and correct instances where new works have not been incorporated into appropriate maintenance processes (at present these include Ellipse and Maintenance Scheduled Tasks).*

Network Rail should:

- a) take steps necessary to ensure that all elements of infrastructure constructed in Scotland since 2012 that require routine inspections and maintenance are included in the appropriate asset management processes

b) dependent on findings from the above activity, extend the timeframe, to an extent determined on the basis of safety risk, to include work constructed before 2012

c) determine, based on safety risk, the extent to which similar steps are required on Network Rail infrastructure outside Scotland and, if necessary, implement these steps

d) conduct an audit review covering the implementation of existing arrangements to identify, report and correct asset database management and data quality issues

### **ORR decision**

10. The recommendation was initially progressed as a regional recommendation, but after consideration a national approach was adopted by Network Rail. We consider the approach being taken by Network Rail to be appropriate and are encouraged by the time being taken to understand and scope the problem.

11. The information received from Network Rail Scotland in relation to the recommendation has reflected and confirmed that obtained through/from the TA in relation to regional planning. For example, in the January 2023 update, Recommendation 2 is captured under the ‘Fewer Infrastructure Failures’ workstream, and the following regional update was provided:

- Supporting working groups for Management of H&S file standard and AMP standard rewrite
- 31/12/2022 – deliver initial action within Regional action plan
- 05/01/2023 – NRRP to confirm acceptance of Regional action plan
- 31/07/2023 – Continue to support AMP and H&S file standard working groups

12. The update provided by Network Rail on 24 January 2023 appears to confirm that accountability has moved to the regions/routes, though the regional panel has yet to accept the plans. ORR inspection contact in Scotland Region has found that the first submission regional action plans largely contain information necessary to address the recommendation, but Network Rail’s internal review found formatting and presentation was not consistent across the country. Regions have been directed to resubmit plans, having reviewed feedback from the panel and discussed between themselves, with the aim of achieving greater consistency. Resubmission was expected to be completed by the end of February 2023, but Network Rail have not confirmed this.

13. Once the regional plans have been agreed, setting out actions and timescales, ORR will consider how to consistently monitor delivery across the regions. Network Rail will also monitor delivery and conduct post implementation reviews. The work done so far shows the majority of the central Initial Action Plan activity relating to parts a), b) and c) of the recommendation is complete, albeit slightly behind the intended timescale.

14. For part d) of the recommendation, Network Rail is reviewing existing relevant standards and processes (INF02202 and MTC/089) covering identification of asset information and transfer, however it is not clear if and how that the workstream has

included audit of the implementation of existing arrangements. Some items suggest that it is included, for example the work has identified that the Ellipse Asset Information tool referenced in the process does not exist. Network Rail aims to introduce revised versions of IN02202 and MTC/089 in June and September 2023, so the degree of audit of existing arrangements may be a moot point, but further scrutiny by ORR is intended to clarify the position and potentially the arrangements for assuring the implementation of new arrangements.

15. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

### Information in support of ORR decision

16. On 17 May 2022 Network Rail provided the following action plan:

#### Action Plan

##### Please provide milestones with dates

##### Progress to date

- Two working group meetings have been held (31 Mar and 6 Apr 2022) with representatives from TA and each of the Regions to discuss the approach to addressing this recommendation. The representatives were: Brian Tomlinson (TA), Nicholas Connelly (TA), Rupert Randhawa (Southern), Steve Pearson (W&W), Andy Free (NW&C), Adrian Murray (Scotland), Scott Waldrop (Scotland) and Hector Kidds (Eastern).
- It was agreed that the work required to be undertaken to address this recommendation is potentially very significant, therefore a risk-based approach needs to be taken with later, more detailed, stages being informed by earlier work to scope and prioritise.
- In taking a risk-based approach the following factors need to be considered:
  - likelihood – the factors that could impact on whether an asset is recorded in our asset maintenance databases; and
  - consequence – the severity of outcome if an asset is not being maintained i.e. passenger, workforce and public safety.
- Whilst the scope of the RAIB Recommendation focuses on Scotland (part a) and then depending on the outcome to consider extending the timeframe (part b) and widening to other Regions (part c), the working group have agreed that all Regions would be involved from the outset.
- Further working group meetings have been planned for 27 April, 12 May and 26 May.

##### Initial Action Plan

The initial suite of actions agreed by the working group to date are as follows:

- Produce a more detailed definition and agree what is included within the scope of the term 'all elements of infrastructure constructed'. The scope should include both enhancements and renewals, and consideration shall be given to where one asset type may impact another. This may necessitate a more detailed definition for each asset type and the nature/extent of work undertaken. Parts of the system which could reasonably have been replaced by the maintenance organisation during repair activities, such as Line Replaceable Units e.g. relays, are not considered to be in scope.

- Identify the relevant asset management system/database for each of the key asset types.
- For each asset, map out the processes for registering assets and their maintenance requirements in the relevant database. Use the mapping exercise to identify potential weaknesses in the process and any areas for improvement, also to prioritise areas for focus in the scope of the review e.g. new assets that have not been previously subject to an inspection and maintenance regime as opposed to existing assets that are being renewed that will have featured in the asset register previously.
- Obtain list of projects recorded in Oracle as constructed/installed since 2012 and reconcile with the list of projects notified to National Records Group (NRG). Use the outputs of this exercise to identify the potential (initial) scope of projects/works to be considered. It is noted that work in this area is being undertaken in relation to provision of Health & Safety Files.
- Produce a list of questions for asset managers to lead a conversation with responsible teams to identify where omissions/errors could exist in our asset management data. This should include consideration of:
  - where new/novel types of asset have been installed;
  - experience gained where there has been a change in maintenance responsibilities e.g. change in geographic owner, change in discipline owner, change in company ownership;
  - any known or potential issues e.g. identified from historical events;
  - where one asset discipline acts as the client, and makes changes to the assets of other disciplines;
  - the effectiveness of different delivery mechanisms for registering asset information at project handback e.g. asset protection, enhancements, works delivery, minor works; and
  - assets that are installed (e.g. as part of a trial) where asset management responsibility requires clarification or agreement e.g. earthwork failure detection equipment.
- Conduct an initial discussion around the questions at the Asset Technical Review (ATR) meetings.
- Conduct follow up discussions within Regions and Routes, with responses being fed back into each ATR.
- Based on the outputs of the discussion determine whether further interviews/reviews/audits are required. Substantiate the points raised through asset management system queries.
- Detail the process required to address the recommendation to confirm the assets have been entered into the relevant database, that the data is of the required quality and that a sufficient maintenance regime has been established i.e. identify project, obtain H&S file, retrieve records, examine/check records, correct records, report complete. Identify relevant KPIs required to established and monitored to track progress.
- Consider to what extent we have achieved a cultural change around the importance of transfer of assets into maintenance, or whether there is further work to do.
- Regions to select a sample of assets identified through the early interview/discussion sessions, and follow the process required to address the recommendation (see above). A key candidate for this initial exercise would be drainage assets constructed since 2012. Use feedback from this exercise to refine the approach taken within the detailed action plan.
- Following completion of this initial suite of actions, a more detailed plan will be produced by each Region to address the recommendation. At this point further actions to address part (d) of the recommendation will be identified. This will include key milestone stage gates and regular progress reporting.

#### **Evidence required to support closure of recommendation**

Items identified from the initial suite of actions:

- Definition and agreement on scope of the term 'all elements of infrastructure constructed'.
- List of the asset management system/database for each of the key asset types.
- Process maps for registering assets and their maintenance requirements in the relevant database.
- Details of potential weaknesses in the process(es) and any areas for improvement.
- Reconciled list of projects constructed (installed) since 2012 reconciled with the list of projects notified to NRG.
- List of questions to identify where omissions/errors could exist in our asset management data.



- Results of discussions with Regional/Route asset managers in response to the questions including any feedback on whether cultural change has been achieved.
- Details of the process required to address the recommendation to confirm the assets have been entered into the relevant database, that the data is of the required quality and that a sufficient maintenance regime has been established.
- Results of application of the process required to address the recommendation to the sample of assets identified from the early interview/discussion sessions.
- Details of KPIs to be established and monitored to track progress.
- More detailed action plan outlining the next steps to address the recommendation.

17. On 24 May Network Rail provided the following update:



2022 05 24 Carmont  
derailment - NR upda

18. On 22 September 2022 Network Rail provided the following update:



RAIB Carmont  
Action Plans Rec 2, 1

19. On 24 January 2023 Network Rail provided a further update on recommendations 2, 12 and 13:



RAIB Carmont  
Action Plans Rec 2, 1

### Recommendation 3

*The intent of this recommendation is for Network Rail to use learning from events at Carmont and the subsequent investigation of this to improve the design of drainage systems.*

Network Rail should review and update its drainage-related procedures so that the output from the design process takes full account of likely impacts on railway safety due to flooding and/or debris washed from drains and/or surrounding ground. The review should take account of:

- water flow return periods and climate change allowances appropriate for both normal operation of the drain and for assessment of drain performance during more extreme events
- the extent to which site-specific information about topography and ground conditions should be obtained, taking into account the extent to which modern technology (such as LiDAR) can assist this
- the full range of drain types available, including those recently developed

- the circumstances in which each type of drain should be used and the detailed specification necessary to suit particular locations
- potential failure modes such as blocked pipes and catchpits
- preventing flooding and/or material displaced from a drain endangering the safety of train movements, allowing for potential exacerbating factors such as the use of gravel-filled drains on steep slopes.

**This recommendation may also apply to other infrastructure managers in the UK.**

### ORR decision

20. Network Rail has carried out a review of drainage procedures to take account of the impact of flooding potentially caused by climate change or extreme weather. The review has identified a number of improvements, as set out in the update provided by Network Rail on 24 January 2023, although the expected completion date is now March 2024.

21. Network Rail have provided evidence of progress and a summary document covering the changes made, which was discussed at the February 2023 drainage quarterly liaison with ORR. Network Rail have established a working group to implement the actions described in the document. The working group will review drainage design standard (NR/L2/CIV/005/Mod09) to ensure it reflects that the risk from debris washout must be taken into account during the design process.

22. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

### Information in support of ORR decision

12. On 19 May 2022 Network Rail provided the following action plan:

#### Action Plan

#### Please provide milestones with dates

1. **Agree methodology and approach** – 1 May 2022 (at DOT ATR)

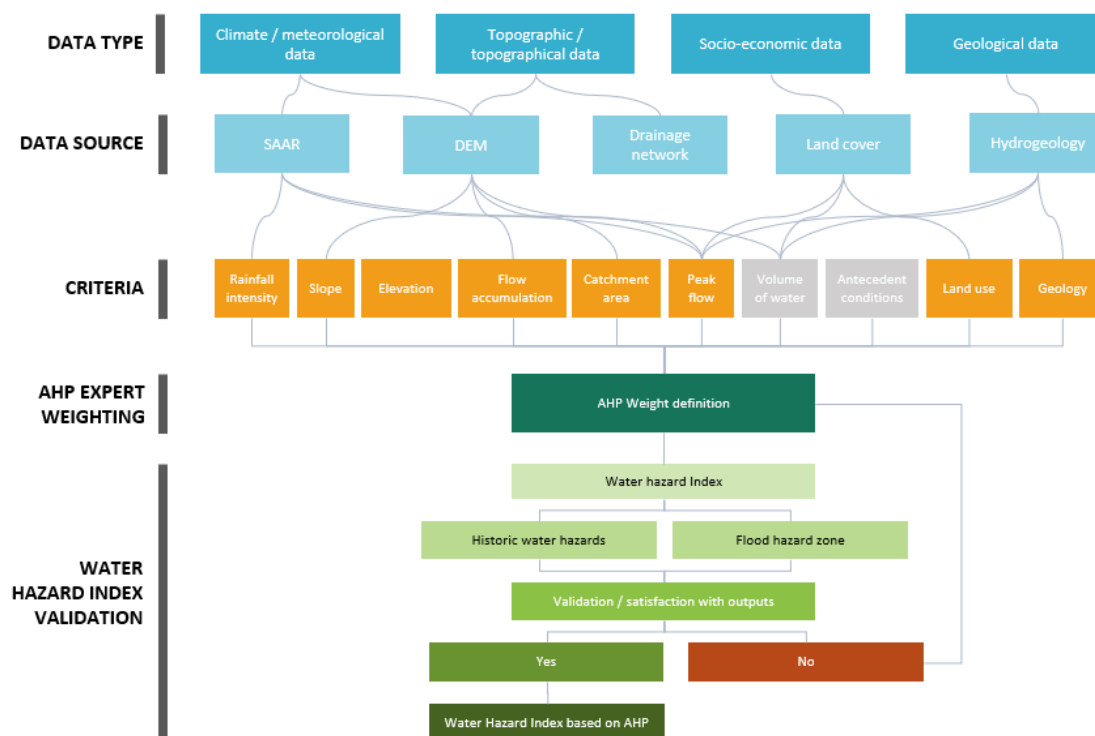
The methodology and approach shall include definitions ('steep slope', 'vulnerable', 'catastrophic', 'rainfall exceedance', etc.) and process of identification of the vulnerable drainage systems, their typical failure modes, and types of mitigation. Scope to be limited to drainage components including infill material and geotextiles.

2. **Issue preliminary guidance for A9.16** – 18 May 2022

Upon agreement with the Route/Regional Drainage asset managers, finalise and issue a preliminary guidance for A9.16. The formal closure of A9.15 will be upon publications of updated Drainage Design Standard and drainage standard detail drawings. The associated standards' governance and process will require several months to complete.

### 3. National roll-out of Catchment Analysis and Water Hazard Map – 26 May 2023

Via II, deliver national roll-out of catchment delineation, peak flows under various return periods (to consider impact of climate change projections) and then map water hazard levels (very low to very high) against each catchment. The analysis shall use topography, climate, soil categories, geology, LiDAR, etc.



Results will be available on Geo-RINM Viewer and the specific data sets from Drainage data mart platform. Data sets can be used by individual asset groups to determine specific risk to their asset, operational threats, as parameters in designs and by ASPRO for engagement with outside parties. The analysis will be delivered agilely beginning in late summer 2022, with ongoing validation and/or verification across various Routes. Completion of entire network by end May 2023.

### 4. Drainage Standard Detail Drawings – 30 June 2023

Amend existing fifteen and create new as required drainage standard detail drawings to include full range of drainage types available, specifications and notes for each configuration/type, restrictions and limitations. Special attention to drainage components on steep slopes. Include industry best practice components which may be new or novel for NR. Consider carbon footprint impact and no/low maintenance solutions. Amend and issue update of NR/CIV/SD/SG/320 (*Selection Guide for Drainage Systems*). Publish under update to NR/L3/CIV/151/F010: *Index of Standard Designs and Details for Building and Civil Engineering Works*. Require engineering assurance with associated Forms 1, 2 and 3.

### 5. NR/L2/CIV/005/09, Drainage Design Standard – 29 September 2023

Incorporate guidance, definitions of vulnerable drainage systems, potential failure modes (including catastrophic failures) and mitigations. Strengthen section 7.2 with effects and impacts to railway infrastructure from over exceeding drainage design capacity. Include updates and findings from work completed above into the updated version of the *Drainage Design Standard*.

#### 6. Narrative of our Journey – 30 June 2023

Publish document identifying the lessons learned, developments and improvements made since 2012 to present day. A document that can be shared with other infrastructure operations or transport industry to support sharing and benchmarking. Include the people, process and systems/tools elements of the journey

### Evidence required to support closure of recommendation

Guidance document issued to DEAMs to enable progression of A9.16.

Catchment analysis including water hazard index mapped in GRV.

Published amended version of NR/L2/CIV/005/09 (*Drainage Design Standard*) with further clarity on effect of exceedance events and drainage system/component vulnerability identification.

Published amended version of NR/L3/CIV/151/F010 (*Index of Standard Designs and Details for Buildings and Civil Engineering Works*) including track drainage. Drainage Standard Detail Drawings with clear notes on restrictions, limitations, vulnerability (including failure mode mitigations) and engineering assurance (Forms 1, 2 and 3).

23. On 22 September 2022 Network Rail provided the following update:



Carmont Rec 3  
Action Plan - ORR u|

24. On 23 January 2023 Network Rail provided the following Review of Drainage Design Procedure and Process:



Carmont Rec 3 -  
Review for Actions.pd

## Recommendation 4

*The intent of this recommendation is to evaluate the way that examinations of mixed cuttings are being conducted to ensure that the approaches adopted across the network meet with the intent of the relevant standard.*

Amey and Network Rail should jointly review the way that they are implementing the requirements of standard NR/L3/CIV/065 (and the associated module 02) that relate to mixed cuttings and the reporting of incomplete examinations in order to establish any improvements that are required to working practices during examinations. The review should consider the extent to which working practices are compatible with the intent of the standard, consistent with best practice elsewhere and appropriate for effective management of risk.

The areas for improvement identified by the review shall be implemented by means of a timebound plan (with reference to any improvements to the standard arising from implementation of Recommendation 5)

### ORR decision

25. Network Rail have carried out a review into how requirements of standard NR/L3/CIV/065 are delivered and have made a number of improvements. We consider the review to be suitable and sufficient and accept the Network Rail justification for not involving Amey (as envisioned by the recommendation), as they are not the only examination supplier. The Network Rail Technical Authority oversaw a consultation by the regions with all of their examination suppliers.

26. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- have taken action to implement it

**Status: Closed**

### Information in support of ORR decision

27. On 20 April 2022 Network Rail provided the following action plan:

#### Action Plan

Please provide milestones with dates

#### **Recommendation 4 – Review of working practices for Mixed soil and rock cuttings:**

Network Rail will review the way in which mixed cutting examinations are being conducted and managed nationally and how the requirements of NR/L3/CIV/065 are being implemented. The review and response to this recommendation will include:

- 1) desktop review and analysis of a sample of mixed cutting examinations.
- 2) collated feedback from regions on their ongoing assurance activities into the quality of examinations (which includes mixed cuttings).
- 3) development of improvement plans, as necessary, based on findings of the review steps in 1&2, these will be addressed in the response to recommendation 5.

#### **1) Analysis of mixed cutting examinations (TA)**

The review will target 1% of complete mixed soil and rock cutting examinations (~125 Nationally) in order to establish whether or not there is evidence to suggest that the examiner has not visited the crest of the cutting during the examination. This will consist of a review of photos, examiner comments and specific parameters within the examination report.

#### **2) Regional management of mixed cutting examinations (Regions) and incomplete exams**

Network Rail will carry out a review of how examination activities and associated assurance processes are managed across the five Regions. The review will focus on input from regions and specifically look at:

- a) compliance with clause: 5.12 (cyclical examination of mixed cuttings) of NR/L3/CIV/065
- b) feedback from the quality and consistency checks, noting that the earthwork examining engineer (EEE) is required on an annual basis to re-examine at least one percent of all earthworks reported to have an Earthworks Hazard Category (EHC) of either A, B or C and undertakes a review and approval process for signing off exams
- c) feedback from earthwork evaluations of mixed cutting (inc. reasoning for rejected exams)
- d) findings from route and regional assurance plans undertaken in accordance with requirements A.4 of NR/L3/CIV/065, specifically 1% end product review to check if all known movement indicators and drainage have been adequately inspected
- e) the process for reporting incomplete examinations

### 3) **Development of improvement plans (TA & Regions)**

Based on the findings in the review stages of 1&2 Network Rail will develop National and/or Regional improvement plans, where required. Improvement plans may include activities such as:

- a) Updates to NR/L3/CIV/065 Standard to provide clarity on requirements for mixed cuttings\*;
- b) Briefing of requirements on mixed cutting to geotechnical asset managers, EE's and EEE's;
- c) Route and Regional Assurance plans continuing to focus on mixed cuttings.

\*Link to Carmont Recommendation 5

Action	Milestones	Target Dates
<b>Recommendation 4 (input requirements for Recommendation 5)</b>		
1	review and analysis of a sample of mixed cutting examinations (Technical Authority)	31.05.2022
2	regional management of mixed cutting examinations (Regions)	31.05.2022
3	Development of improvement plans (Technical Authority & Regions)	30.06.2022
4	Closure statement & submission of evidence (noting RAIB rec 5 has longer timescales relating to improving the standard)	29.07.2022

#### Evidence required to support closure of recommendation

- Quantitative analysis of 1% mixed cutting examinations
- Documented Regional review of current working practices and interpretation of requirements for mixed cuttings
- Development of improvements plans

28. On 6 September 2022 Network Rail sent the following closure statement and supporting evidence:



[N204-05] Carmont  
Rec 4 Closure Stater



[N204-05] Carmont  
Rec 4 Doc 1.pdf

### Recommendation 5

*The intent of this recommendation is to reduce the risk that incomplete examinations are not reported to Network Rail.*

In parallel with the implementation of Recommendation 4, Network Rail's Technical Authority should evaluate the adequacy, and ways of improving the clarity, of standard NR/L3/CIV/065 (and the associated module 02) requirements that relate to the examination of mixed cuttings. Steps should then be taken to improve the clarity of the standard and to incorporate any necessary changes into the examination process.

### ORR decision

29. The Network Rail Technical Authority has evaluated standard NR/L3/CIV/065 (and module 02) and made revisions to make the requirements for the examination of cuttings much clearer. The revised standard has now been published.

30. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- have taken action to implement it

**Status: Closed**

### Information in support of ORR decision

31. On 20 April 2022 Network Rail provided the following action plan:

#### Action Plan

Please provide milestones with dates

#### Recommendation 5 – NR/L3/CIV/065 Standard Update

Network Rail will carry out a review the following:

- NR/L3/CIV/065
- NR/L3/CIV/065/Mod.02
- Findings from Recommendation 4 – Review of working practices for Mixed soil and rock cuttings

The review will identify where improvements can be made to the clarity of the standard for mixed cutting examinations and the interpretation of the existing requirements, through feedback from recommendation 4

Network Rail will update NR/L3/CIV/065 to provide improved clarity on the requirements on what is required for mixed cutting examinations. The output of this will be briefed accordingly to all stakeholders in Network Rail and its external contractors involved in the delivery of earthworks examinations.

The examination period for earthworks is primarily November to April when vegetation is at its lowest. The review and amendments to the standard are planned to be completed and briefed ahead of the 2022 examination period.

Action	Milestones	Target Dates
<b>Recommendation 5</b>		
2	Complete review of standards	02.05.2022
3	Approved remit to Standards Steering Group	19.05.2022
4	Working group and stakeholder group consensus on changes	30.06.2022

5	Publication deadline (submission of completed documents to standards team)	15.07.2022
6	Publication of updated standard	03.09.2022
7	Complete briefing of standard changes	31.10.2022

#### Evidence required to support closure of recommendation

- Updated NR/L3/CIV/065 standard to provide clarity on the requirements of mixed cuttings.
- Briefing on changes appropriate to internal and external stakeholders.

32. On 6 September 2022 Network Rail sent the following closure statement and supporting evidence:



[N204-05] Carmont  
Rec 5 Closure Stater



[N204-05] Carmont  
Rec 5 Doc 1.pdf



[N204-05] Carmont  
Rec 5 Doc 2.pdf

### Recommendation 6

*The intent of this recommendation is that the railway industry should review extreme weather processes and ensure that these adequately address rainfall-related risk at earthworks and drainage assets. The recommendation effectively requires a review of the changes introduced shortly after the accident and an assessment of their effectiveness.*

Network Rail should review and, where necessary, improve its processes for mitigating rainfall-related threats to the integrity of its earthworks and drainage infrastructure which could potentially affect the safe operation of trains. This review should include:

- identification of any additional mitigation measures to manage the risk to assets, including those that are not considered to be at particular risk of failure in extreme rain-fall, and the circumstances in which these measures should be applied
- identification of enhanced methods for the monitoring and measurement of extreme rain-fall and thresholds for applying and disapplying mitigation measures
- consideration of resource availability during extreme events (allowing for any mobilisation time)
- a plan for ongoing review of the mitigation measures taking account of technological improvements and changing circumstances
- possible extension of learning to other weather conditions and/or other types of asset.

Any improvements to existing processes that are identified by this review should be implemented throughout the network.



## ORR decision

33. Work to address the recommendation is closely linked to other workstreams being led by the Weather Risk Task Force (WRTF). RSSB has published T1269 (whole system risk model for extreme rainfall events) and Network Rail are taking steps to understand the range of error in inputs and how that impacts outputs.

34. We have asked Network Rail to provide a clear plan addressing each point in the recommendation, the workstreams for progressing those points and a clear explanation of how they fit together and the interaction with other workstreams considering rainfall related risk. We will expect the Network Rail response to fully take into account T1269 and its management of system risk.

35. We have met with RSSB and Network Rail to discuss the work being done to improve implementation of blanket emergency speed restrictions in relation to Laurencekirk rec 2<sup>2</sup>.

36. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

## Information in support of ORR decision

37. On 19 May 2022 Network Rail provided the following action plan:

### Action Plan

#### 1. Please provide milestones with dates

General - a review of the changes introduced shortly after the accident and an assessment of their effectiveness

1. Undertake a round of national embedment assurance, covering all regions, to prove the use of the convective alerting tool (CAT). To be concluded after software improvements identified by previous assurance activity have been completed (April 2022) – Date: 31 August 2022
2. Check every region has an Integrated Weather Management Plan (IWMP) and for any region that does not, identify the alternative (May 2022). Assure the effectiveness of the IWMPs (or equivalent). Date: 31 December 2022
3. A gap analysis and training to close those gaps for our current weather tools was undertaken with circa 330 Network Rail Operations and Engineering colleagues (concluded January 2022). Evaluate the effectiveness of training material for Network Rail Weather Service (NRWS) and complimentary training provided. Date: 31 December 2022

Rainfall related threats:

- Additional mitigations (inc. assets not at particular risk)
  1. In collaboration with RSSB, deliver whole system risk model to better inform our mitigations (in the light of system risk) – Date: November 2022

<sup>2</sup> ORR initial response to Laurencekirk and Portlethen RAIB report: [RAIB Report: Overspeeding trains between Laurencekirk and Portlethen on 4 December 2020 - ORR letter to RAIB dated 21 October 2022](#)

2. [Resolution of RAIB recommendation 10 – Review the effectiveness of bow-ties controls will address]
- Identification of enhanced methods for the monitoring and measurement of extreme rainfall and thresholds for applying and disapplying mitigation measures
    1. Deliver the science plan to better understand the link between rainfall and earthworks failure: Date: 31 December 2022. *N.B. there is a risk that the science plan will not identify an enhanced method for setting rainfall thresholds.*
    2. Review of CAT thresholds balancing the human factors risk associated with more granular information (control overload) with the benefit of imposing speeds during convective storms. **Completed and new thresholds implemented April 2022**
    3. Deliver replacement service for NRWS leveraging better weather data where available. *N.B. The five-year plan to deliver the Meteorological Insights Tool (MIT) as recommended by Dame Julia Slingo will incrementally improve our monitoring and measurement of extreme rainfall in the long term.* Date: 31 August 2023
    4. Develop Operational Route Section (ORS) parameters for the Seasonally Agnostic Railway Model (SARM). Date: 31 August 2022.
  - Consideration of resource availability during extreme events
    1. [Resolution of NR internal investigation recommendation A9.1 – Regional Operations Directors to review resource to deal with significant disruption events will address]
  - A plan for ongoing review of the mitigation measures taking account of technical improvements and changing circumstances
    1. Develop and agree a transition approach detailing how new weather tools will be implemented, embedded, and assured in each region (including clear roles and responsibilities). Date: 30 September 2022
    2. Assess effectiveness of above through business as usual (BAU) activities, including National De-Briefs of Extreme Weather Events. Date: From 01 October 2022
  - Possible extension of learning to other weather conditions and/or types of assets.
    1. Conduct a joint review with the Chief Engineers Leadership Team on the potential impacts to other asset groups (e.g. structures/telecoms). Date 31 December 2022

#### Evidence required to support closure of recommendation

- Whole System Risk model published
- Output of the science plan (rainfall)
- New CAT thresholds justification, implemented and reviewed
- Programme plan for MIT
- WRTF Roadmap and ORR monitoring regime, Eunice outputs + future protocol (written)
- Review report

## Recommendation 7

*This recommendation is intended to enhance the ability of route control staff to contribute to the safe operation of a modern railway by making good safety decisions in difficult circumstances based on a holistic assessment of the most relevant information. It is intended to build on the work already undertaken as part of Network Rail's 21st Century Operations programme.*

Network Rail, in conjunction with train operating companies, should review the capability of route control rooms to effectively manage complex, widespread and unusual situations such as abnormal weather conditions and multiple infrastructure failures. This review should consider the steps needed to ensure that route controls

have sufficient staff with appropriate skills (technical and non-technical), experience and knowledge, all with clearly defined responsibilities and accountabilities. The review should therefore examine how Network Rail ensures that route control staff are provided with appropriate training, learning and professional development for their roles, supported by means of a comprehensive competence management system, that enables them to feel confident and empowered to make difficult decisions.

As part of this review, Network Rail should also compare its railway control safety-related decision-making frameworks with those in other organisations (such as off-shore exploration and air traffic management) to determine if good practices can be imported into the railway environment.

The review should be used to inform the development of a timebound programme for the implementation of the measures that are needed to develop the incident management capability of route controls

### **ORR decision**

38. Network Rail has provided a plan setting out the four workstreams that make up the plan to address the recommendation: (1) RCM/NDM competence framework and learning journey; (2) decision making training for control room staff; (3) training to improve understanding of the impact of abnormal weather conditions (Weather Academy); and (4) a review and update of the controller competence framework focusing on Incident Controller and Train Running Controller roles.

39. Network Rail has completed a draft NOP for RCM/NDM competence and learning journey with publication expected in June 2023. 'Taking the chair' training and Tactical and Strategic Incident Commander Training has been provided for 50% of RCM/NDMs and is expected to be complete by the end of the year.

40. The Railway Operations Weather System will be the decision-making support tool. However, the decision-making work is delayed due to findings from workshop with Nottingham University in October 2022. These findings were around the complexity of such decision-making, not only requiring greater understanding of weather forecast information but the operational context, likely impact on assets and resultant risks. Further research is proposed. Work also delayed until Training and Competence Manager appointed, which is expected later in 2023.

41. A weather learning hub has been created and the trial went live at end of Jan 2023. This is an interim step to the final Weather Academy.

42. The controller competence framework has been re-drafted and is under review. The decision on when to go live was expected in February 2023, but has not yet been confirmed. It is understood that weather will be strengthened as a theme in the competence framework for Incident Controllers and Train Running Controllers in summer 2023.

43. To close the recommendation, we would expect Network Rail to provide evidence that new or refreshed competence frameworks are in place for

RCMs/NDMs and controllers to provide the skills (technical and non-technical), knowledge and experience needed to respond effectively in the event of adverse weather conditions. In addition, we expect demonstrable evidence that NR has the means to assure themselves that their competence management system, including the training provided in decision-making and understanding the impact of abnormal weather conditions, enables those with responsibility and accountability to feel confident and empowered to make difficult decisions in adverse weather conditions. It is anticipated that any bespoke training provided, e.g. via the Weather Academy, will become routine, rather a one-off training exercise.

44. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

### Information in support of ORR decision

45. On 19 May 2022 Network Rail provided the following action plan:

#### Action Plan

#### Please provide milestones with dates

- 1) Implement and embed the RCM/NDM competence framework and learning journey that has been initiated as part of the 21<sup>st</sup> Century Operations Project.

Date: Framework and Learning Journey to be published by Sept 22

- 2) Develop a training programme on operational decision making which is embedded into training for all operations roles.

Note: This action will continue whilst the work to further investigate decision making processes and benchmark ourselves against other industries (see action 4 below) continues. The results of this work will feed into the training as part of a continuous improvement process.

Date: Training to be piloted in May with national roll out to start in September 22. Roll out strategy may depend on outcomes of the Weather Academy work which is also considering an approach to enhancing decision making skills.

- 3) Work in conjunction with the National Weather taskforce to create the weather academy (Recommendation 5) and embed that as part of the RCM/NDM learning journey.

Date: The first part of the weather academy is due to complete in Sept 22. It is anticipated that roll out will take a further 12 months and there may be further developments/stages of the Academy. A more detailed action plan will be available in August 22 once some of the discovery and development work for the Academy has taken place.

- 4) Undertake research to explore decision-making frameworks in other industries particularly as they apply to decisions around managing weather related events and other unpredictable events. The aim of this

research is to understand what good practice might be adopted into our approaches to decision making and the training we provide

Date: Research to start in May 22 and conclude by Oct 22 with a view to feeding into phase 2 of the weather academy work.

- 5) Review and update the controller competence framework (focussing on incident controller and train running controller roles) and create a supporting training programme by Dec 2022 for the start of their next 3-year cycle.

Date: Framework to be published by Sept 22 in line with the start of the next competence cycle. Learning Journey to be completed by June 23.

#### Evidence required to support closure of recommendation

RCM/NDM Learning Journey and competence standard  
Operational decision-making training material  
Learning Needs Analysis to support delivery of Weather Academy  
Outline of the Weather Academy  
Training delivery plan to demonstrate training within Control

46. On 13 September 2022 Network Rail provided the following update:



Rec 7 Carmont Aug  
22 update.pptx

### Recommendation 8

*The intent of this recommendation is to improve the effectiveness of Network Rail's management assurance processes related to safety critical functions of route control rooms, so that it provides a more realistic assessment of the extent to which mandated safety systems are being correctly applied, and the overall level of safety performance.*

Network Rail, in consultation with staff representatives, should undertake a project to improve the way its management assurance system operates in areas directly affecting the safety critical functions of route control rooms. This project should include an in-depth management review to identify gaps or weaknesses in route control management arrangements and the underlying reasons for any areas of non-compliance that are identified.

The output of this project should include a structured and validated programme, endorsed by the Network Rail board, for implementing the necessary improved management assurance arrangements, and briefing the changes to those on the front line.

### ORR decision

47. Network Rail has established a working group to review the critical activities in Route Control and National Operations Control, with the aim of producing a better process for managing assurance. The working group is trying to identify critical points that need assurance and determine how to do it, within the overall aim of moving to quality assurance rather than compliance assurance. The new process will take account of the ORR guidance document, RSP01 – Developing and Maintaining Staff Competence. The work is closely linked to the development of a competence framework to identify key decision-making activities for recommendation 7.

48. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

### Information in support of ORR decision

49. On 13 July 2022 Network Rail provided the following action plan:

#### Action Plan

##### Please provide milestones with dates

The action plan will be delivered using the principles behind process management and the guidance contained within RSP01, this will allow the move towards quality assurance for key processes and risks.

Convene a working group to review the critical activities in Route Control and the National Operations Control. This will include Control reps, staff reps and process owners for elements of the operations core process. August 2022

Through the working group, identify the leading and lagging indicators that will prove assurance that the controls are being implemented and that they are delivering the correct outcome. November 2022

From the working group output put in place a plan to deliver more targeted assurance activity for Route Controls. December 2022

Provide an overview of the approach to Route Control assurance activity to the Network Rail Board. June 2023

Systemise the assurance activity on a system similar to IRIS which will provide a live position on the assurance activity. June 2023

Implement the assurance activity within the Route Control environment. November 2023

Develop a report to the Head of Control and process owners which will provide the feedback loop to allow improvement. December 2023

##### Evidence required to support closure of recommendation

Clear strategy for assurance in Route Control & the National Operations Control.

Process Definition Documents updated to reflect the required assurance.

Evidence of the systemized assurance activity.

Paper to Network Rail Board.

## Recommendation 9

*This recommendation is intended to ensure that Network Rail makes effective use of safety learning from previous events.*

Network Rail, in consultation with the Office of Rail and Road, should review the effectiveness of recent changes to its processes for ensuring that appropriate action is taken in response to safety recommendations. The review should aim to identify current obstacles to the thorough implementation of lessons learned from the investigation of previous events, and any additional measures that are needed to address them. As a minimum, the review should consider:

- a) the business process and cultural change needed to ensure that agreed responses to recommendations are implemented in an appropriate and timely manner
- b) ways of encouraging the open and accurate reporting of progress with implementation of agreed action plans
- c) the monitoring and senior management review of the extent to which closed recommendations have been effectively implemented and embedded at a working level.

### **ORR decision**

50. Network Rail is conducting a review of the effectiveness of changes to processes for ensuring that appropriate action is taken in response to safety recommendations. The review covers all changes to the process made in the last 2 years. The review is expected to be completed in July 2023.

51. Network Rail has also analysed all RAIB recommendations made in the last last 5 years using the ORR Railway Management Maturity Model (RM3) criteria. The analysis found a third of recommendations were the responsibility of Network Rail operations, imposing a significant workload. A significant proportion of RAIB recommendations were also on track and levels crossings.

52. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

### **Information in support of ORR decision**

53. On 20 April 2022 Network Rail provided the following action plan:

#### **Action Plan**

**Please provide milestones with dates**

For the avoidance of confusion this recommendation refers to the lessons learned from recommendations previously made in investigation reports.

Significant changes have been made to the recommendation management process over the last 12 months, these include:

- Enhanced scrutiny at NRRP for RAIB and significant formal recommendations. This includes all action plans needing panel approval before being sent to the ORR, as well as all closure statements. Around 50% of all actions/closures require some amendments following panel.
- Quarterly meetings with the ORR Recs Handling Team are held with the NR recs team, they review all open recommendations (based on ORR data) and address any recommendations of concern or those requiring updates. There are currently 42 recommendations that NR have closed but the ORR are yet to agree to the closure, this number has reduced by over 50% in the last year.
- We now hold more recommendation progress meetings with the ORR to track progress against action plans, and provide update papers to ELT on the more high profile recommendations.
- An annual audit takes place by Internal Audit of the recommendation process, last year the audit was rated 'fair' based on the improvement works that had been put in place but could not yet be tested. The audit raised concern in a small number of cases that the closure information was based on future programmes of work or standard publications that the business did not deliver. Due to this concern the recommendations team reviewed over 600 closed recommendation, and have identified 21 that are currently being reviewed in more detail.
- The first L2 Special Topic Audit to test the embedment of a sample of closed recommendation is just being completed. This will provide the business and ELT with assurance of the embedment of recommendations at a working level (or where improvement is required).
- Significant Incidents paper provided to Tactical Safety Group every 6 weeks, this provides a round up of the reports reviewed by NRRP, significant issues (that may be related directly to a report or not) and a look ahead at what reports will be published over the coming few months. This paper is well received by TSG members and used by Senior Leaders for onward briefings.
- An update paper on recommendations is produced each quarter for SHEC Committee, this paper is currently used to update the committee on new recommendation but will be adapted to also provide an update on ongoing recommendations where necessary.

Improvements to the recommendation management process can take time to be truly tested for their impact, as such it is proposed that a full review of the changes and their effect is started in June 2022 (once the L2 audit for 21/22 is complete and published).

It is proposed that the annual audit completed by Internal Audit is used to test the effectiveness of all the implemented changes and to review how long term monitoring and delivery might be better tracked and reported.

#### Evidence required to support closure of recommendation

Review Report  
Improvement plan with completion dates  
Reduction in open recommendations with the ORR

54. On 2 January 2023 Network Rail provided the following timescale extension:



230103

Recommendation Ext



## Recommendation 10

*The intent of this recommendation is to identify and address any further areas of weakness in the mitigating controls that relate to weather-related failures of earthworks, drainage and structures (that is, the right-hand side of Network Rail's 'bow-tie' analyses).*

Network Rail, in conjunction with RSSB, should undertake a detailed and systematic risk assessment of the mitigating controls, including operational responses, that relate to weather-related failures of earthworks, drainage and structures. The purpose of the review shall be to rigorously assess the robustness of each control and to identify any further areas of weakness that warrant further examination.

The output of this risk assessment should then be used to devise a timebound programme to address the areas of weakness identified, so far as is reasonably practicable

### ORR decision

55. Network Rail are working with RSSB to risk assess mitigating controls relating to weather-related failures of earthworks, drainage and structures. Once the risk assessment has been completed, Network Rail will put together a timebound plan for any changes. Once available, ORR will assess the plan, and if it is suitable and sufficient will consider closing the recommendation.

56. In addition to the synergy with Laurecekirk recommendation 1 and 2, we note that the Network Rail response to Carmont recommendations 3, 6 and 10 will become increasingly interlinked.

57. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

### Information in support of ORR decision

58. On 19 May 2022 Network Rail provided the following action plan:

#### Action Plan

##### 2. Please provide milestones with dates

###### Progress to date

- Structures, Earthworks & Drainage bow-ties issued to RSSB on 15<sup>th</sup> March 2022
- Initial meeting between Network Operations & TA (B&C) leads held on 7<sup>th</sup> April 2022
- Initial alignment mapping of high consequence mitigation controls started for structures, earthworks & drainage bow-ties

###### Initial Action Plan

1. Review and align, where appropriate, mitigating controls on structures, earthworks and drainage bow-ties that relate to weather related failures.

2. Procure support from RSSB and Specialist Consultants to support objective and independent risk assessment of mitigating controls utilising industry best practice methodologies
3. Peer Review with Regions, Routes, TA & Operations to establish current breadth of application of each mitigating control and identify other potential controls.
4. In determining the nature of the interventions required to address the recommendation following the initial activities outlined above consideration shall be given to:
  - To inform the detailed and systematic risk assessment undertake information gathering such as but not limited to; assurance & audit activity to gather input on current control application in Regions and Routes, KPI's or PI's currently in use, qualitative information from Ops Directors, Control Managers, Asset Management & Engineering Directors and Asset Engineers on opportunities, concerns and gaps.
  - In conjunction with NR bow-tie specialists, RSSB and additional specialist consultants where necessary risk assess the current performance of the mitigating controls to assess their robustness.
  - Identify existing overlapping in-flight work in WRTF that will improve robustness of mitigating controls.
5. Identify scope and programme of improvement works and confirm action plan with leaders, time scales and budget.

#### Evidence required to support closure of recommendation

Typical Evidence, Items to be confirmed from Initial Action Plan:

- Formal report detailing the review, actions, intervention plan, timescales and deliverables.
- Independent assessment of robustness of controls.
- Bow-Ties, Processes, Standards and Controls updated to deliver the implementation plan and intent of recommendation.
- Technical briefing and table top exercises completed to support changes to standards and controls.

### Recommendation 11

*The intent of this recommendation is to provide a consistent risk-based approach for establishing when trains are to be run to prove a line is safe for normal use by subsequent services, and the procedures, including the operating speeds, applicable to these trains. Implementation should consider all types of route proving, including if required after engineering works and after a prolonged period when train services are not operated.*

Network Rail, assisted by RSSB and the Rail Delivery Group (RDG) should:

- a) determine the objectives of the operation of route proving trains, including consideration of the risks which the operation of such trains is expected to mitigate, and the risk posed to the operation of route proving trains themselves
- b) identify the hazards which staff operating such trains are expected to identify, and the responsibilities for reporting any identified hazards
- c) identify the circumstances (including those not related to weather conditions) in which route proving trains should be operated

d) identify how route proving trains should be operated (considering factors such as train speed and the effect of reduced visibility)

e) introduce documented processes for implementing these findings.

### **ORR decision**

59. A National Operating Procedure (NOP) for route proving and the competence framework that will underpin it are being drafted. A working group is being established to consider how to embed the NOP.

60. Network Rail have asked RSSB to develop guidance (and possible changes to the Rule Book) covering route proving and cooperation between drivers and signallers.

61. The Network Rail Technical Authority has drafted guidance for route controls on route proving, covering how it is implemented, when it is needed and timescales. The draft guidance is being stakeholder reviewed internally by Network Rail.

62. The NOP is expected to be published in May/June 2023, so the December completion date in the Network Rail plan remains valid. The RIS and Rule book changes may be after December 2023.

63. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

### **Information in support of ORR decision**

64. On 20 April 2022 Network Rail provided the following action plan:

#### **Action Plan**

##### **Please provide milestones with dates**

Develop interim guidance to be cascaded to the Regions so there is a consistent approach to Route Proving until the longer term work is complete. March 2022 – Item complete.

Submit a request for help to the RSSB with the proposal for risk work to be completed and the required changes to the Rule Book. The changes will incorporate the Signaller, Driver and other operational roles on the railway. March 2022 – Item complete.

Submit a remit to the Standards and Controls Group to build the Guidance into the National Operating Procedures for Route Control. 30 April 2022

Complete a cross industry piece of risk work to assess the objectives of the operation of route proving trains. 31 August 2022

From the risk work, determine how to publish the requirements and decide whether there is a need to develop a Railway Industry Standard to outline the process for Route Proving. 30 November 2022

From the risk work, determine whether there is a need to publish the requires for Signallers, Drivers and other rail staff within the Rule Book for Route Proving. 30 November 2022

Publish the guidance for Route Controls within a National Operating Procedure. April 2023

Develop industry briefing materials and implementation plan. 31 August 2023

Publish the RIS for Route Proving if required. 15 December 2023

Publish the Rule Book updates for Route Proving if required. 15 December 2023

#### Evidence required to support closure of recommendation

Route proving guidance document.  
Request for help document.  
Standard Remit document  
Industry risk assessment.  
Possible Rail Industry Standard.  
Possible National Operations Procedure.  
Updated Rule Book modules.  
Industry briefing material.

## Recommendation 12

*The intent of this recommendation is to take account of learning from the Carmont accident in the development of a coherent long-term strategy for derailment mitigation. It is anticipated that implementation of this recommendation will be informed by work, including RSSB project T1143, already undertaken by the rail industry as a result of Recommendation 3 of RAIB's investigation of the Watford derailment.*

RDG and Network Rail, in conjunction with RSSB, should consider and incorporate all relevant learning from the Carmont accident into the assessment of rolling stock and infrastructure design features that can provide guidance to trains when derailed. Particular features to be taken into account include:

- a) the risk of derailment from relatively small landslips and washouts
- b) position of track relative to adjacent ground on which derailed wheels may run (that is, features that can affect the deviation of a derailed train)
- c) proximity to features with the potential to increase the consequence of an accident (bridge parapets, tunnel portals etc)
- d) topography likely to increase the extent of vehicle scatter.

The above-mentioned assessment should then be used to develop a systemic, risk-based strategy for the provision of additional measures for the guidance of derailed trains that takes into account the appropriate balance between infrastructure-based mitigation and vehicle-based mitigation. The strategy should also include a plan for implementation of changes to the appropriate industry standards.

## ORR decision

65. RDG and Network Rail have jointly sponsored a study to take forward the findings from T1143 as research project T1316, with the first steering group meeting held in December 2022. Network Rail has completed the scoping work to address the recommendation.

66. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, RDG and Network Rail have:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

## Information in support of ORR decision

67. On 20 April 2022 Network Rail provided the following action plan:

### Action Plan

#### Please provide milestones with dates

##### Progress to date

- Reports from RSSB Research & Development study T1143 titled 'Devices to Guide Derailed Trains' produced in response to the Watford derailment have been reviewed.
- Meeting held between Brian Tomlinson (NR) and Mark Oakley (RSSB) on 31 March 2022 to discuss potential for further work in this area.
- Contacted Marcus Dacre (RSSB) who has advised that the lead for the risk model would be Chris Harrison (RSSB).
- Meeting held between Brian Tomlinson, Gareth Evans (NTH Track), Simon Abbott (NTH Geotechnical), Mark Burstow (Principal Vehicle Track Dynamics Engineer), Mark Bradbury (Principal Engineer, Track), David Shipp (Head of Risk Management) and Michael Edwards (Principal Engineer, Geotechnical) on 1 April 2022 to discuss previous involvement with T1143 and proposed approach to addressing Carmont Recommendations 12 and 13.
- Meeting held between Brian Tomlinson and Phil Barrett (RDG) on 6 April 2022 to discuss joint sponsorship of further work in this area. Agreement reached to progress a joint proposal.
- Further desktop information obtained regarding the derailment devices in use on Japan Railways East and Japan Railway West.
- A second meeting between the Network Rail technical and risk specialists was held on 13 April 2022 to review the Initial Action Plan.

##### Initial Action Plan

To address this recommendation, it is proposed that RDG and Network Rail jointly sponsor a further study that will request RSSB to develop the work undertaken as part of T1143, building in the learning from the Carmont accident and other relevant information sources.

- An initial scoping meeting for the further study proposed involving representatives from RDG, Network Rail and RSSB is arranged for 4 May 2022. When fully developed the output will be a completed 'Request for Help' form that will be submitted to RSSB. Considerations for the remit will include:
  - a) addressing the recommendations from T1143 which include: (i) producing a mature costed 'stopper' design; (ii) evaluating the risk at S&C; (iii) design considerations for new vehicles; (iv) further development and trial of the risk tool; and (v) simulation of effectiveness;
  - b) evaluation of any further information available regarding vehicle and/or infrastructure fitment in other countries, including effectiveness in actual derailment events;
  - c) understanding details of any related patents that have been granted or are pending;

- d) the potential for modelling and simulation to better understand: (i) vehicle performance in the event of impacting debris on the track (such as from small landslips and washouts) and the potential effectiveness of lifeguards and obstacle deflectors; and (ii) subsequent vehicle interaction and trajectory/scatter following derailment. This would include a variety of typical infrastructure configurations/features with a range of derailment guidance options fitted, and not fitted, to evaluate their relative effectiveness. This could include simulation of historical accidents involving train derailment. Consideration shall also be given to existing vehicle design features (or subsequent modification/design thereof) that could provide vehicle guidance in the event of a derailment such as axle-mounted disc brakes and/or gearboxes;
- e) impact of vehicle and/or infrastructure fitment including technical performance, potential failure modes, maintenance costs, lower sector vehicle gauge, etc.;
- f) potential impact on other railway system risks such as a person falling from a platform (survival space), equipment located in the 'four foot', conductor rail, trackside monitoring equipment, etc.;
- g) factors that may exacerbate the consequences of derailment through vehicle and/or infrastructure derailment device fitment;
- h) understanding of development and testing requirements and timescales;
- i) use of the established Common Consequence Tool (CCT) outputs in conjunction with the Safety Risk Model (SRM) derived model in determining potential routes or locations for vehicle and/or infrastructure fitment;
- j) cost benefit analysis for fitment of potential derailment guidance options (new vehicles/infrastructure, overhaul/renewal or for retrospective fitment) including sensitivity analysis;
- k) comparative case for investment in preventative measures that reduce the likelihood of derailment as an alternative to consequence mitigation.

#### Subsequent Action Plan

- RSSB's processes for evaluating the study proposal (i.e. Request for Help) will then follow.
- The outputs of the study will be considered to determine the industry approach to be taken to address the recommendation. This may involve the production of an industry strategy, and subsequent capture of requirements in standards and train/infrastructure requirements. A timebound action plan would be produced at this stage relating to items to be taken forward.

#### **Evidence required to support closure of recommendation**

- Remit for the further study proposed i.e. a completed 'Request for Help' form.

68. On 24 May 2022 Network Rail provided the following update:



2022\_05\_24 Carmont  
derailment - NR upda

69. On 22 September 2022 Network Rail provided the following update:



RAIB Carmont  
Action Plans Rec 2, 1

70. On 14 December 2022 RSSB provided the following update:

*Good progress continues, knowledge search building on T1143 workstreams. Risk modelling approach in development, Huddersfield University engaged to support. External sponsor established and stakeholder steering group meets 16/12/22*

71. On 15 February 2023 RSSB provided the following update:

*RSSB has now started a new project, T1316. A kick-off meeting with the project steering group was held on 16 December 2022 and the project is expected to be completed in mid-2024.*

*The results of T1316 will be reported to the industry in the usual manner when the project is complete.*

### **Recommendation 13**

*The intent of this recommendation is to enhance the processes for implementing infrastructure-mounted derailment containment devices (such as guard rails and kerbs) at high-risk locations, including bridges and tunnels (currently covered by standard NR/L2/TRK/2102).*

Network Rail should review and improve its processes linked to the installation of guard rails and containment kerbs so that such derailment containment is available at high-risk locations until such time, if any, when rail vehicles carry onboard devices to perform a similar function. This review should include:

- a) risk-based criteria for selecting sites for the fitting, or enhancement, of guard rails and containment kerbs, taking into consideration relevant learning from the accident at Carmont
- b) the criteria used to determine the distance guard rails or kerbs should extend on the approach to a risk feature (for example, bridges and tunnels)
- c) the criteria used to determine whether derailment containment should be retrofitted as soon as possible or installed during planned asset renewal.

### **ORR decision**

72. The plan provided by Network Rail aims to outline the measures being considered to address the risk of derailment at high-risk locations in the short to medium term, with the longer-term consideration covered by recommendation 12. Network Rail have undertaken a significant amount of work in response to the recommendation, but clarity is needed in a number of areas to clearly explain how each part of the recommendation is being addressed.

73. We have challenged Network Rail to clearly demonstrate the risk assessment and associated process that determines the reasonable practicability of fitting guard rails or curbs at different locations across the network, and where they are to be fitted how they will be prioritised.

74. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and

- is taking action to implement it

**Status: Open**

### Information in support of ORR decision

75. On 20 April 2022 Network Rail provided the following action plan:

#### Action Plan

##### Please provide milestones with dates

##### Progress to date

- Reports from RSSB Research & Development study T1143 titled 'Devices to Guide Derailed Trains' produced in response to the Watford derailment have been reviewed.
- Meetings held with RSSB and RDG in connection with RAIB Carmont Recommendation 12, acknowledging there is a degree of overlap with Recommendation 13. The former being a longer-term study, and the latter being an 'interim' measure.
- Details of the requirements detailed in standards relating to guard rails provided by Gareth Evans.
- Analysis provided by Mark Bradbury of the number and length locations currently fitted with guard rails including a summary by infrastructure feature and age.
- Meeting held between Brian Tomlinson, Gareth Evans (NTH Track), Simon Abbott (NTH Geotechnical), Mark Burstow (Principal Vehicle Track Dynamics Engineer), Mark Bradbury (Principal Engineer, Track), David Shipp (Head of Risk Management) and Michael Edwards (Principal Engineer, Geotechnical) on 1 April 2022 to discuss previous involvement with T1143 and proposed approach to addressing Carmont Recommendations 12 and 13.
- Review of an Australian RISSB code of practice on derailment protection and mitigation for rail underbridges, and other studies undertaken in Europe in relation to freight train derailments.
- A second meeting between the Network Rail technical and risk specialists was held on 13 April 2022 to review the Initial Action Plan.

##### Initial Action Plan

To address this recommendation, the following actions are initially proposed:

- A remit will be produced for a study to address the key points in Carmont Recommendation 13. Considerations for the remit will include:
  - l) identification of the potential infrastructure mitigation options currently available and evaluation of their potential effectiveness using evidence obtained. These will include guard rails and containment kerbs;
  - m) reviewing the current suitability of the risk model developed under T1143 for trial use, or application to a wider geography. This will take into account the recommendations made within the T1143 research report;
  - n) the degree to which the outputs of the established Common Consequence Tool (CCT) could be used within the risk model to determine potential locations for, and extent of, infrastructure fitment;
  - o) the factors described in parts (a) and (b) of the recommendation;
  - p) the degree to which infrastructure fitment may require removal or modification when the outcomes from Recommendation 12 are available;
  - q) impact of infrastructure fitment including technical performance, potential failure modes, maintenance costs, gauging, use in 3<sup>rd</sup>/4<sup>th</sup> rail areas, trackside monitoring equipment, equipment located in the 'four foot', track renewal, rail awaiting installation/removal, re-railing activities, and impact on inspection and maintenance activities such as visual/automated inspection, tamping, ballast cleaning and stone blowing;
  - r) factors that may exacerbate the consequences of a derailment following infrastructure fitment;
  - s) cost benefit analysis for fitment of potential derailment guidance options (new infrastructure, renewal or for retrospective fitment) including sensitivity analysis – addressing part (c) of the recommendation;
  - t) comparative case for investment in preventative measures that reduce the likelihood of derailment as an alternative to consequence mitigation.

Following review at Network Rail's National Recommendations Review Panel (NRRP) on 19 April 2022, it was noted that the scope of the response to this recommendation will exclude risk assessment of new and



existing trap points, as this is covered by the response to Recommendation 4 from RAIB's investigation into the runaway and derailment of wagons at Toton on 17 January 2021.

#### Subsequent Action Plan

- Depending on the content of the remit this may require specialist technical/risk input to assist in undertaking the study. A view on next steps will be taken at this point before proceeding.
- The outputs of the study will be considered to determine whether any new, or changes to existing standards, are required. In addition, whether the safety analysis would conclude if installation of infrastructure mitigation would be reasonably practicable: (a) at new project sites; (b) for renewal schemes; or (c) retrospectively at locations determined as higher risk. A timebound action plan would be produced at this stage relating to items to be taken forward.

#### Evidence required to support closure of recommendation

- Remit for the study proposed.

76. On 24 May 2022 Network Rail provided the following update:



2022 05 24 Carmont  
derailment - NR upda

77. On 22 September 2022 Network Rail provided the following update:



RAIB Carmont  
Action Plans Rec 2, 1

### **Recommendation 14**

*The intent of the recommendation is to reduce the derailment risk of HST power cars caused by running into obstacles on the track.*

Owners of HST power cars should:

- investigate the feasibility of enhancing the strength of the bogie mounted lifeguards to a level as close to modern standards as reasonably practicable
- if appropriate, develop a timebound programme for carrying out modifications identified in a).

### **ORR decision**

78. Work to address this recommendation is being coordinated by the RSSB Carmont Recommendations Steering Group. A revised design of lifeguard to be fitted to HST bogies has been finalised following a successful trial of a prototype fitted to a Scot Rail HST. Material supply issues have caused a delay, but the programme to fit the new lifeguards to the ScotRail HST fleet is expected to be completed by June 2023. We have asked RSSB to provide time-bound plans for

lifeguard fitment to HST fleets other than those operated by ScotRail, including charter operators.

79. RSSB is assessing the case for changes to standards and guidance on lifeguards in light of the recommendation.

80. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, RSSB has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

### **Information in support of ORR decision**

81. On 14 December 2022 RSSB provided the following update:

*First article installations now completed, and design successfully revised as a result, quotation for material now received, orders to be placed Dec 22/Jan 23*

82. On 15 February 2023 RSSB provided the following update:

*A new lifeguard, meeting the proof load requirements of GMRT2100, has been designed and trial fits have been undertaken. Material is now on order and fitting is expected to be completed on the Scotrail HST fleet by August 2023.*

### **Recommendation 15**

*The intent of this recommendation is to minimise the risk of serious cuts and lacerations to passengers caused by broken glazing in any future accidents.*

RSSB should:

a) investigate the performance of the bodyside windows on the leading coach of train 1T08 to understand the detachment of large shards of glass into the vehicle interior (including the effects of bodyside deformation) and how this relates to the requirements of relevant standards regarding spalling and passenger containment, and disseminate the findings to owners and operators of both mark 3 coaches and any other relevant rolling stock

b) in the light of findings from (a), review the current acceptance tests and criteria in railway glazing standards to determine if there are practicable improvements (including retrofit options) that should be made to minimise the quantity and size of broken glass that could enter vehicle interiors in future accidents, without adversely affecting the passenger containment performance of the glazing

c) where appropriate, integrate practicable improvements into revised standards for railway glazing.

## ORR decision

83. Work to address this recommendation is being coordinated by the RSSB Carmont Recommendations Steering Group.

84. RSSB has conducted a knowledge search of available relevant information on glazing and produced a table of potential options for retrofit, based on cost benefit analysis. For the ScotRail HST fleet the cost of any of the retrofit glazing options would be grossly disproportionate. We have asked RSSB to clarify if the cost benefit analysis only refers to HSTs or all relevant rolling stock operating in the UK.

85. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, RSSB has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

## Information in support of ORR decision

86. On 23 June 2022 RSSB provided the following initial response to recommendations 15, 17 & 20:

*Thank you for your letter of 30 May 2022, requesting a response regarding Recommendations 15, 17 and 20 in RAIB's report on the Carmont accident. As you will be aware from ORR colleagues, RSSB is playing a wider role in delivering progress against the requirements of RAIB's recommendations.*

*Following a meeting on 6 April 2022, it was agreed that the eight recommendations relating to rolling stock (i.e. 12, 14, 15, 16, 17, 18, 19 and 20) would be rolled into the existing, Angel Trains-led, "Carmont Seniors Group", which was considering the four recommendations applicable to owners/operators. The group is to be renamed the Carmont Recommendations Steering Group (CRSG), and this revised approach to delivering the industry response will be chaired by RSSB, supported by industry.*

*CRSG will include one representative (and one alternate) from each relevant organisation, and ORR as an observer. It will provide the overarching leadership of the response, and ultimately provide the industry responses to the recommendations.*

*Each of the recommendations will be managed by a working group, where required, noting that some items (such as RSSB project work) will not require a direct working group, but may request representatives to be part of the project stakeholder group. Each working group will have a lead individual and consist of relevant stakeholders. The working group will be tasked with collating, analysing, and delivering a response. This may require external support, and this will be managed by the working group as required.*

*Each working group will develop a plan or route map, agreed by CRSG. Reporting will be via a scorecard supplied to each CRSG meeting. It is proposed that RSSB will*

lead the working groups for Recommendations 15, 17 and 20 and – jointly with RDG and Network Rail – Recommendation 12.

Although the structure of the various recommendations varies, the approach to each recommendation, except for RSSB projects, is expected to consist of three main stages:

- Stage 1. A knowledge search or collation of available information
- Stage 2. A cost benefit or ALARP analysis/development of a solution
- Stage 3. A response to the recommendation

Ultimately it will be for the CRSG to decide the required approach, but the quantified safety risk underpinning much of this work was supported by a database of injuries based on the accidents at Southall, Ladbroke Grove, Hatfield, Great Heck, Potters Bar, Ufton Nervet and Watford. RSSB will investigate whether this database can be updated with data from Carmont and Grayrigg, so that working groups have the most current and complete information to develop their ALARP analysis, supported by resources such as the Safety Risk Model.

The working groups are detailed in the attached document, along with relevant RSSB work already completed or soon to be under way.

87. On 11 January 2023 RSSB provided the following update covering period 5-10 of 2022/23:

**Period 5 (2022):**

25/08/22: As noted in our email of 23 June 2022, Recommendations 12, and 14-20 are being managed by RSSB via the Carmont Recommendations Steering Group. Regarding Recommendation 15, draft Knowledge Search S372 (Window Coatings) is now with the Steering Group for review..

In addition, Recommendation 12 (on RDG and Network Rail in conjunction with RSSB) will be delivered by RSSB project T1316, for which a project plan is being formed.

**Period 6 (2022):**

26/09/22: As noted in our email of 23 June 2022, a number of recommendations are being managed by RSSB via the Carmont Recommendations Steering Group. Regarding Recommendation 15, draft Knowledge Search S372 (Window Coatings) is still with the Steering Group for review.

In addition, Recommendation 12 (on RDG and Network Rail in conjunction with RSSB) will be delivered by RSSB project T1316, for which a project plan is being formed.

**Period 7 (2022):**

20/10/22: Drafting of Knowledge Search S372 (Window Coatings) has been completed and is being reviewed by the Steering Group.

**Period 8 (2022):**

17/11/22: The draft Knowledge Search S372 (Window Coatings) was reviewed by the Steering Group. Comments received are now being actioned.

**Period 9 (2022):**

*14/12/22: An options analysis is in preparation, including a cost-benefit assessment. This will be presented to the Steering Group during December 2022.*

**Period 10 (2023):**

*11/01/23: The options analysis is nearly complete. The knowledge search (S372, window coatings) report and executive summary are being prepared and will be presented to the Steering Group on 9 January 2023.*

88. On 15 February 2023 RSSB provided the following update:

*RSSB has completed Knowledge Search S372 which assesses the potential for using Safety Window Films or alternative interlayers for the laminated interior panels of bodyside glazing. Both options could be considered for retrofit or for inclusion in new vehicle designs. However, the effects of both options on compliance with the containment requirements (developed after the Ufton Nerve incident) are unknown and would therefore require a comprehensive set of testing.*

*It has been determined that the cost of suitable testing would be around £100,000 per option and would take approximately six months to complete; economies of scale and parallel workstreams could improve upon this. It is likely that 9-12 months would be needed before any new windows could be in series production and/or reflected in standards.*

*The options are set out in Appendix A (see below) with indicative costs and quantifiable benefits in terms of reduced injuries. The conclusions of the options analysis are:*

- 1. For retrofit, the costs are grossly disproportionate to the potential benefits. Nevertheless, since the behaviour of laminated glass with additional safety film is unknown, further testing is required to establish whether this would achieve the desired result.*
- 2. The behaviour of the alternative interlayers under the loading conditions experienced at Carmont are unknown; testing would assist in determining this.*

*Therefore, without testing, there is currently no justification for either retrofit or change to standards.*



Appendix A.docx

**Recommendation 16**

*The intent of this recommendation is to minimise the risk of serious injury arising from secondary impact with the vehicle bodyside mounted folding tables fitted at some positions on the ScotRail HST mark 3 coaches.*

Angel Trains, in conjunction with ScotRail, should:

a) review the design of the bodyside mounted folding tables fitted to train 1T08 with respect to minimising the risk of secondary impact injury in the folded position, and its compliance with the requirements of applicable standards.

b) develop a timebound plan for the modification or replacement of similar tables in trains leased by Angel Trains to a design which does not feature potentially injurious edges.

**This recommendation may apply to owners of other types of rail vehicles on the UK main line network featuring similar table designs.**

### **ORR decision**

89. Work to address this recommendation is being carried out by a subgroup of the RSSB Carmont Recommendations Steering Group.

90. Design and supply proposals for a new bodyside-mounted folding tables were submitted by 3 suppliers. Following review by the subgroup, technical queries were raised and proposal resubmitted. A design has been finalised and new tables will be shipped for fitting to the ScotRail HST fleet by September 2023.

91. Fitment of a redesigned bodyside mounted folding tables to other Angel Trains fleets is being considered on a case-by-case basis. We have asked RSSB to clarify the timescales for this work.

92. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, RSSB has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

### **Information in support of ORR decision**

93. On 15 February 2023 RSSB provided the following response:

*Angel Trains, working together with other ROSCOs and TOCs, has commissioned a new design of tabletop which is suitable for retrofit to Mark 3s; the design principles are also transferrable to other affected stock. It is anticipated that fleet fit of Angel Trains' ScotRail Mark 3s will be complete by the end of September 2023; other affected fleets are being assessed on a case-by-case basis and, where appropriate, will be scheduled for fitting thereafter.*

### **Recommendation 17**

*The intent of this recommendation is to reduce the risk of injury to drivers due to secondary impact during accidents.*

RSSB should:

a) review its previous research on fitting secondary impact protection devices for train drivers (including seatbelts) in light of the circumstances of Carmont, future train accident risk (including derailment) and the capabilities of current technology

b) in consultation with relevant stakeholders, evaluate the case for fitting specific secondary impact protection devices into new and existing trains

c) where justified by a) and b), incorporate requirements for improved protection measures into standards for train driving cabs

### **ORR decision**

94. Work to address this recommendation is being coordinated by the RSSB Carmont Recommendations Steering Group.

95. RSSB has conducted a knowledge search of available relevant information on secondary impact within a cab in accidents. RSSB research shows knee bolsters and air vests were potentially reasonably practicable options, but we have asked for clarity on this point. If any options are demonstrated to be reasonably practicable, RSSB will update standards accordingly.

96. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, RSSB has:

- taken the recommendation into consideration; and
- is taking action to implement it

### **Status: Open**

### **Information in support of ORR decision**

97. On 23 June 2022 RSSB provided the following initial response to recommendations 15, 17 & 20:

*Thank you for your letter of 30 May 2022, requesting a response regarding Recommendations 15, 17 and 20 in RAIB's report on the Carmont accident. As you will be aware from ORR colleagues, RSSB is playing a wider role in delivering progress against the requirements of RAIB's recommendations.*

*Following a meeting on 6 April 2022, it was agreed that the eight recommendations relating to rolling stock (i.e. 12, 14, 15, 16, 17, 18, 19 and 20) would be rolled into the existing, Angel Trains-led, "Carmont Seniors Group", which was considering the four recommendations applicable to owners/operators. The group is to be renamed the Carmont Recommendations Steering Group (CRSG), and this revised approach to delivering the industry response will be chaired by RSSB, supported by industry.*

*CRSG will include one representative (and one alternate) from each relevant organisation, and ORR as an observer. It will provide the overarching leadership of the response, and ultimately provide the industry responses to the recommendations.*

*Each of the recommendations will be managed by a working group, where required, noting that some items (such as RSSB project work) will not require a direct working group, but may request representatives to be part of the project stakeholder group. Each working group will have a lead individual and consist of relevant stakeholders. The working group will be tasked with collating, analysing, and delivering a response. This may require external support, and this will be managed by the working group as required.*

*Each working group will develop a plan or route map, agreed by CRSG. Reporting will be via a scorecard supplied to each CRSG meeting. It is proposed that RSSB will lead the working groups for Recommendations 15, 17 and 20 and – jointly with RDG and Network Rail – Recommendation 12.*

*Although the structure of the various recommendations varies, the approach to each recommendation, except for RSSB projects, is expected to consist of three main stages:*

- Stage 1. A knowledge search or collation of available information*
- Stage 2. A cost benefit or ALARP analysis/development of a solution*
- Stage 3. A response to the recommendation*

*Ultimately it will be for the CRSG to decide the required approach, but the quantified safety risk underpinning much of this work was supported by a database of injuries based on the accidents at Southall, Ladbrooke Grove, Hatfield, Great Heck, Potters Bar, Ufton Nervet and Watford. RSSB will investigate whether this database can be updated with data from Carmont and Grayrigg, so that working groups have the most current and complete information to develop their ALARP analysis, supported by resources such as the Safety Risk Model.*

*The working groups are detailed in the attached document, along with relevant RSSB work already completed or soon to be under way.*

98. On 11 January 2023 RSSB provided the following update covering period 5-10 of 2022/23:

**Period 5 (2022):**

*25/08/22: As noted in our email of 23 June 2022, Recommendations 12, and 14-20 are being managed by RSSB via the Carmont Recommendations Steering Group. Regarding Recommendation 17, Knowledge Search S367 (Protection for Train Drivers Against Secondary Impact) has been published on the [RSSB website](#). A further knowledge search has been requested, and will review deformable cab desk material.*

*In addition, Recommendation 12 (on RDG and Network Rail in conjunction with RSSB) will be delivered by RSSB project T1316, for which a project plan is being formed.*

**Period 6 (2022):**

*26/09/22: As noted in our email of 23 June 2022, a number of recommendations are being managed by RSSB via the Carmont Recommendations Steering Group. Regarding Recommendation 17,*



*Knowledge Search S367 (Protection for Train Drivers Against Secondary Impact) has been published on the [RSSB website](#). A further knowledge search has been requested, and will review deformable cab desk material.*

**Period 7 (2022):**

*20/10/22: Drafting of the knowledge search on deformable cab desk material has been completed and is being reviewed by the Steering Group.*

**Period 8 (2022):**

*17/11/22: The knowledge search on deformable cab desk material has been reviewed by the Steering Group. Comments received are now being actioned.*

**Period 9 (2022):**

*14/12/22: An options analysis is in preparation, including a cost-benefit assessment. This will be presented to the Steering Group during December 2022.*

**Period 10 (2023):**

*11/01/23: The options analysis is nearly complete. The knowledge search (S367, protection against secondary impact) report and executive summary are being prepared and will be presented to the Steering Group on 9 January 2023.*

99. On 15 February 2023 RSSB provided the following update:

*In anticipation of RAIB's report, RSSB completed Knowledge Search S367, which has subsequently been revised and updated, with a further Knowledge Search S373 looking at options from other industries.*

*The two Knowledge Searches are now complemented by an analysis of potential options for both retrofit and changes to standards for new vehicles.*

*Similarly to Recommendation 15, these options need to be thoroughly assessed to determine their effectiveness in reducing potential injuries. It is anticipated that such investigations would need to include testing as well as simulation, bringing the cost to around £250,000 per option and taking between 12 and 15 months to complete. Therefore series production of any changes to vehicles is unlikely to start within two years.*

*An exception to this could be for the 'wearable' airbag; as this uses a modification to an existing off-the-shelf product it is considered that simulation alone would probably suffice, and timescales would likely be of the order of 6-9 months. However, it is understood that this option is likely to be challenging in terms of industrial relations.*

*The options are set out in Appendix B (see below) with indicative costs and quantifiable benefits in terms of reduced injuries. The conclusions of the options analysis are that:*

- 1. For retrofit, the above suggests that the costs are grossly disproportionate to the potential benefits.*

2. *Without testing, there is currently no justification for change to standards.*



Appendix B.docx

## **Recommendation 18**

*The intent of this recommendation is for corrosion limits in maintenance and overhaul plans to be based on an adequate engineering analysis so that ageing rail vehicles retain their structural integrity to original design standards.*

Owners of mark 3 coaches and other rail vehicle fleets susceptible to significant levels of corrosion and operating on the mainline network, should develop and implement a timebound plan to:

- a) Review vehicle maintenance and overhaul plans to check there are clear criteria in place for the allowable extent of corrosion in safety critical areas. These criteria should be supported by an adequate engineering assessment that takes into account the intervals between corrosion inspections, so that vehicles maintain compliance with their original structural design load cases throughout their service life.
- b) Amend vehicle maintenance and overhaul procedures as necessary to take account of findings from the review in a) and any practical issues with inspection of areas which are not normally readily accessible.

## **ORR decision**

100. RSSB has issued Technical Note TN102 to provide additional guidance to RIS-2780-RST Issue 1.1 Rail Vehicle Structures and RIS-2004-RST issue one Rail Vehicle Maintenance about the management of corrosion.

101. Vehicle owners have started a thorough review and will amend maintenance procedures when complete. This is a significant undertaking, and we are satisfied with the progress being made. Work is also in progress to identify maintenance tasks for targeted areas of vehicles. This task has been completed for the HST.

102. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, RSSB has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

## **Information in support of ORR decision**

103. On 20 April 2022 Network Rail provided the following action plan:

## Action Plan

### Please provide milestones with dates

The Route Services Supply Chain Operations (SCO) fleet team are a member of the Carmont Seniors Group – this group is formed of HST owners and operators and has the remit of developing coordinated and collaborative plans for the rolling stock recommendations in the Carmont RAIB report.

Recommendation 18 will be addressed by Route Services SCO using outputs from the Carmont Seniors Group. These are as follows:

- a) Work with the group to identify safety critical areas of the coaching stock using previous industry reports and structural analysis. **August 2022**
- b) Publish a corrosion repair policy which sets out the approach to be taken when corrosion is discovered in safety critical areas. **August 2022**
- c) Update Network Rail Infrastructure Monitoring fleet maintenance and overhaul documents to reference the repair policy **December 2022**

### Evidence required to support closure of recommendation

- Report detailing the safety critical areas of IM fleet rolling stock
- Corrosion repair policy document
- Updated IM fleet maintenance and overhaul documentation

104. On 2 January 2023 Network Rail provided the following timescale extension:



Recommendation  
Extension Form - A Pc

105. On 15 February 2023 RSSB provided the following response:

*RSSB has published a Technical Note TN102 which provides guidance to the industry regarding the effects of corrosion on vehicle structural integrity, and therefore the need to consider corrosion both during design and maintenance.*

*The vehicle owners have started a thorough review of maintenance and overhaul documentation, which has prioritised the Scotrail fleets. It should be noted that many of the activities associated with ensuring vehicle structural integrity through corrosion repairs was already underway as part of vehicle owners' asset management strategies.*

## Recommendation 19

*The intent of this recommendation is to evaluate the additional risk to train occupants associated with the continued operation of HSTs, which entered service before modern crashworthiness standards were introduced in July 1994. This will enable the future planning of HST deployment to be informed by a fuller understanding of any additional risk and the costs and safety benefits of any potential mitigation measures. This learning should also inform thinking about the mitigation of similar risks associated with the operation of other types of main line rolling stock.*

Operators of HSTs, in consultation with train owners, ORR, DfT, devolved nations' transport agencies and RSSB should do the following:

a) Assess the additional risk to train occupants associated with the lack of certain modern crashworthiness features compared to trains compliant with Railway Group Standard GM/RT2100 issue 1 (July 1994), also taking account of age-related factors affecting condition (such as corrosion). This assessment should include a review of previous crashworthiness research (including driver safety), a review of previous accidents, consideration of future train accident risk, the findings presented in this report and any relevant engineering assessments.

b) Based on the outcome of a) and cost benefit analysis, identify reasonably practicable measures to control any identified areas of additional risk for HSTs, and develop a risk-based methodology for determining whether, and if so when, HSTs should be modified, redeployed or withdrawn from service.

c) In consultation with operators of other pre-1994 passenger rolling stock, develop and issue formalised industry guidance for assessing and mitigating the risk associated with the continued operation of HSTs and other types of main line passenger rolling stock designed before the introduction of modern crashworthiness standards in 1994.

### **ORR decision**

106. ORR hosted a meeting on 6 April 2022 (see para 108) with owners and operators of HSTs, together with government bodies and RSSB, to consider how recommendation 19 should be addressed. The initial consideration of the recommendation by relevant parties was done by the Carmont Seniors Group, coordinated by Angel Trains. SNC Lavalin have been commissioned to undertake an HST design review, which is expected to be completed by April 2023. The design review includes FE modelling in conjunction with recommendation 18. The coordination function of the Carmont Seniors group has now been subsumed into the RSSB Carmont Recommendations Steering Group.

107. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, RSSB has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

### **Information in support of ORR decision**

108. Notes of ORR Carmont rec 19 industry meeting:



2022 04 06 Carmont  
rec 19 meeting - not

109. On 20 April 2022 Network Rail provided the following action plan:

## Action Plan

### Please provide milestones with dates

The Route Services Supply Chain Operations (SCO) fleet team are a member of the Carmont Seniors Group – this group is formed of HST owners and operators and has the remit of developing coordinated and collaborative plans for the rolling stock recommendations in the Carmont RAIB report.

Recommendation 19 will be addressed by Route Services SCO using outputs from the Carmont Seniors Group. These are as follows:

- a) Review of research and evidence related to crashworthiness of IM fleet rolling stock and a comparison with modern rolling stock crashworthiness features **September 2022**
- b) Risk assessment of the future train accident risk profile considering the current plans for renewal of the Infrastructure Monitoring fleet (in CP7) **December 2022**
- c) Undertake a Cost Benefit Analysis of whether the IM fleet should be modified, or operations amended considering the output of the risk assessment in stage b. **February 2023**

### Evidence required to support closure of recommendation

- Report detailing the crashworthiness review and comparison with modern rolling stock features
- Risk assessment of future train accident risk
- Cost benefit analysis with control measures

110. On 15 February 2023 RSSB provided the following response:

*Vehicle owners have commissioned SNC-Lavalin to undertake a literature search of previous relevant accidents. This has been used to inform a Finite Element Analysis of the HST trailer vehicles. This work will inform the need, or otherwise, for structural enhancements on HST trailer vehicles. Similar work is planned for other pre-1994 stock in due course.*

## Recommendation 20

*The intent of this recommendation is to reduce the risk from train fires originating in or around batteries fitted to passenger vehicles, recognising the trend towards increased use of battery systems to store energy for motive power. To address this recommendation, it is envisaged that RSSB will investigate the fire-related properties of products used in other transport sectors.*

RSSB should investigate alternative designs of batteries, and their casings, which may offer improved fire-related properties compared to those currently fitted to rolling stock. The output from this investigation should be shared with the UK train and tram industry

## ORR decision

111. RSSB has completed research into the design of batteries and casings and a technical note has been drafted. The content of the technical note will be reflected in amendments to relevant standards.

112. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, RSSB has:

- taken the recommendation into consideration; and
- is taking action to implement it

**Status: Open**

### **Information in support of ORR decision**

113. On 23 June 2022 RSSB provided the following initial response to recommendations 15, 17 & 20:

*Thank you for your letter of 30 May 2022, requesting a response regarding Recommendations 15, 17 and 20 in RAIB's report on the Carmont accident. As you will be aware from ORR colleagues, RSSB is playing a wider role in delivering progress against the requirements of RAIB's recommendations.*

*Following a meeting on 6 April 2022, it was agreed that the eight recommendations relating to rolling stock (i.e. 12, 14, 15, 16, 17, 18, 19 and 20) would be rolled into the existing, Angel Trains-led, "Carmont Seniors Group", which was considering the four recommendations applicable to owners/operators. The group is to be renamed the Carmont Recommendations Steering Group (CRSG), and this revised approach to delivering the industry response will be chaired by RSSB, supported by industry.*

*CRSG will include one representative (and one alternate) from each relevant organisation, and ORR as an observer. It will provide the overarching leadership of the response, and ultimately provide the industry responses to the recommendations.*

*Each of the recommendations will be managed by a working group, where required, noting that some items (such as RSSB project work) will not require a direct working group, but may request representatives to be part of the project stakeholder group. Each working group will have a lead individual and consist of relevant stakeholders. The working group will be tasked with collating, analysing, and delivering a response. This may require external support, and this will be managed by the working group as required.*

*Each working group will develop a plan or route map, agreed by CRSG. Reporting will be via a scorecard supplied to each CRSG meeting. It is proposed that RSSB will lead the working groups for Recommendations 15, 17 and 20 and – jointly with RDG and Network Rail – Recommendation 12.*

*Although the structure of the various recommendations varies, the approach to each recommendation, except for RSSB projects, is expected to consist of three main stages:*

- *Stage 1. A knowledge search or collation of available information*
- *Stage 2. A cost benefit or ALARP analysis/development of a solution*
- *Stage 3. A response to the recommendation*

*Ultimately it will be for the CRSG to decide the required approach, but the quantified safety risk underpinning much of this work was supported by a database of injuries based on the accidents at Southall, Ladbroke Grove, Hatfield, Great Heck, Potters Bar, Ufton Nervet and Watford. RSSB will investigate whether this database can be updated with data from Carmont and Grayrigg, so that working groups have the most current and complete information to develop their ALARP analysis, supported by resources such as the Safety Risk Model.*

*The working groups are detailed in the attached document, along with relevant RSSB work already completed or soon to be under way.*

41. On 11 January 2023 RSSB provided the following update covering period 5-10 of 2022/23:

**Period 5 (2022):**

25/08/22: As noted in our email of 23 June 2022, Recommendations 12, and 14-20 are being managed by RSSB via the Carmont Recommendations Steering Group. Regarding Recommendation 20, this will be rolled into an existing project. A knowledge search report will also be compiled.

In addition, Recommendation 12 (on RDG and Network Rail in conjunction with RSSB) will be delivered by RSSB project T1316, for which a project plan is being formed.

**Period 6 (2022):**

26/09/22: As noted in our email of 23 June 2022, a number of recommendations are being managed by RSSB via the Carmont Recommendations Steering Group. Regarding Recommendation 20, this has been rolled into an existing project. A knowledge search is now in progress.

**Period 7 (2022):**

20/10/22: Drafting of the knowledge search has begun.

**Period 8 (2022):**

17/11/22: The draft knowledge search has been shared with the Steering Group for comment. Responses received so far have been positive.

**Period 9 (2022):**

14/12/22: The comments received from the Steering Group on the draft knowledge search are being processed to produce the final report.

**Period 10 (2022):**

11/01/23: The knowledge search report and executive summary are being prepared and will be presented to the Steering Group on 9 January 2023.

114. On 15 February 2023 RSSB provided the following update:

*RSSB has investigated alternative designs of batteries, and their casings, which have the potential to offer improved fire-related properties compared to those*

*currently fitted to rolling stock. As part of a wider scope of work addressing alternative traction power sources for rail, RSSB has looked at the risks and benefits of using batteries on trains, current and emerging battery technology, and the factors that must be addressed when considering the management of fires on rolling stock employing batteries.*

*To share the results of these investigations with the UK train and tram industry they will be published in an RSSB Technical Note, the content of which will be absorbed into the relevant standards as and when they are updated*