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10 December 2019



Mr Andrew Hall
Deputy Chief Inspector of Rail Accidents
Cullen House
Berkshire Copse Rd
Aldershot
Hampshire GU11 2HP

Dear Andrew,

RAIB Report: Fatal collision between a tram and a pedestrian, near Saughton tram stop, Edinburgh on 11 September 2018

I write to report¹ on the consideration given and action taken in respect of the recommendations addressed to ORR in the above report, published on 25 July 2019.

The annex to this letter provides details of actions taken in response to the recommendations and the status decided by ORR. The status of all 4 recommendations is 'Implemented'.

We do not propose to take any further action in respect of the recommendations, unless we become aware that any of the information provided has become inaccurate, in which case I will write to you again.

We will publish this response on the ORR website on 11 December 2019.

Yours sincerely,

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

A handwritten signature in black ink, appearing to read 'Oliver Stewart', with a stylized, cursive script.

Oliver Stewart

Initial consideration by ORR

1. All 4 recommendations were addressed to ORR when the report was published on 25 July 2019.
2. After considering the recommendations ORR passed recommendation 1 to Edinburgh Trams, recommendation 2 to all tram operators, owners and infrastructure managers and recommendations 3 & 4 to the Light Rail Safety Standards Board (LRSSB) asking them to consider and where appropriate act upon them and advise ORR of its conclusions. The consideration given to each recommendation is included below.
3. ORR also brought recommendation 1 to the attention of all tram operators (apart from Edinburgh Trams), owners and infrastructure managers as it was concluded that there are equally important lessons for them. ORR did not ask these organisations to provide a reply.
4. This annex identifies the correspondence with end implementers on which ORR's decision has been based.

Recommendation 1

The intent of this recommendation is to improve the audible warnings provided to pedestrians by trams in Edinburgh (paragraph 55).

Edinburgh Trams Limited should:

- a) increase the audibility of its tram warning horns so that they provide effective warning of approaching trams to pedestrians, in particular at foot crossings on off-street sections of its network. The warning horns should be clearly discernible above the background noise at relevant locations and take into consideration sighting distances and line speeds; and
- b) develop, document, brief and train instructions in which situations it expects its drivers to use the horn as an audible warning.

This recommendation may apply to other UK tram operators.

ORR decision

5. Edinburgh Trams Ltd have undertaken a programme of work to improve the audible warning of their tram fleet by fitting new horns that deliver a louder tone, which is due to be completed by the end of December 2019. The horns meet the requirements set out in LRSSB guidance LRG 5.0.
6. Edinburgh Trams Ltd state that driver training has been reviewed and rules established and fully briefed to new and existing drivers. Drivers are trained to use the horn as an audible warning in off-street areas. Driver training documents have been modified accordingly.

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

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

Status: Implemented

Information in support of ORR decision

8. On 11 November 2019 Edinburgh Trams Ltd provided the following updated initial response:

City of Edinburgh Council verified prior to Passenger Service that our horns met the essential requirements of Railway Safety Principles & Guidance [clause 277 b)]. Adequacy was established through testing of equivalence to Class M motor vehicles as defined in EC Directive 70/388/EEC. At the time of the accident, our horns were compliant with the basic requirements of UN-ECE-R28 Amendment 5 which required sound pressure levels at 7 metres, in front of the vehicle, of between 87 and 112 dB(A) at a height between 0.5 to 1.5 metres. The RAIB report records our horns at 89 dB(A) which is at the lower end of this acceptable limit. RAIB states that the discernibility of Horn vs Background Noise is not sufficient and so we accept this recommendation to increase the sound pressure of our horn.

a) All trams in the operational fleet have now been fitted with a pair of 24V 380Hz Hella horns. These are configured for single continuous sound however they will be further modified to provide pulsed two tone sound, in line with the recommendation from the fatal accident at Bayles and Wylies footpath crossing [Ref. RAIB report 19/2013]. The aim is to increase the likelihood of a pedestrian to acknowledge the presence of the tram. The modification will be implemented by end December 2019.

Following installation of the new horn arrangement, compliance of the sound pressure, to emerging British Standard BS EN 15153-4 and LRSSB LRG 5.0 - Tramway Audible Warning Acoustic Test Guidance, was carried out, at a location between Gogar and Ingliston tramstops on the mainline, by OptiConsulting with the following recorded sound pressure readings.

- 99 dB(A) @ 7 metres
- 80 dB(A) @ 100 metres (approx. service braking distance @ 70 kph on wet track).

Background sound pressure level readings were recorded at 58 dB(A).

This demonstrates that at the 70kph emergency braking distance of a tram (approx. 90 metres), the horn is likely to be discernible at least 3 times higher (15dB) than the background sound pressure level.

b) Tram Driver training has been reviewed and the following rules established and fully briefed to new and existing Tram Drivers:

i) On-street areas – Due to close proximity of pedestrians and lower speeds (Limit 32 kph), Tram Drivers will sound a warning with the Bell (Horn sounded automatically if emergency brake is applied).

ii) Off-street areas – Whenever the Tram Drivers identifies that there is a person on or approaching the tram infrastructure, they will sound the Horn in the first instance and prepare to stop by entering brake mode. If there is no acknowledgement from the crossing user by the time the tram reaches the Crossing Warning signage, then the driver will apply Emergency Brake (Horn is sounded continuously automatically if the emergency brake is applied).

iii) The off-street signs warning Tram Drivers that there is a crossing will be positioned at the distance from the crossing that provides a suitable visual indication to the driver that if a 'Locked Out' pedestrian has not acknowledged the presence of a tram or stopped entering the hazard zone, then the driver should apply full emergency brake mode and the 'Locked Out' pedestrian will still have enough time to get from one place of safety to another before a tram, in emergency brake reaches the crossing.

9. On 16 October 2019 LRSSB advised of the following although the recommendation had not been addressed to them:

LRSSB have provided operators/duty holders with guidance as per Recommendation 3 and advised that any further guidance is adopted and applied to the new vehicles.

LRSSB have advised within the published document LRG 2.0 Non-Motorised Crossing Guidance that operators/duty holders undertake audibility tests at identified noisy locations, particularly at crossings on new off street segregated sections of tramway to ensure, so far as is reasonable practicable. Further advising that the tram audible warning can be heard above appropriate levels of background noise from the design sighting distance.

Recommendation 2

The intent of this recommendation is to improve the safety of pedestrian crossings on off-street sections where trams run at relatively high speeds (paragraph 75).

Edinburgh Trams Limited should:

a) undertake risk assessments of all of its pedestrian crossings on off-street sections and identify any necessary control measures. The assessment should include consideration of the crossing layout, sighting distances, line speed, tram braking

distances and the audibility of the tram warning horns. Control measures for consideration should include the following safety features:

- improved demarcation of the crossing; and
- barriers, chicanes, or similar, to turn pedestrians' direction of travel, just before crossing, to face oncoming trams on the nearest track.

b) develop and implement a procedure for monitoring that the control measures identified remain valid.

ORR decision

10. Edinburgh Trams Ltd have carried out risk assessments of all of its pedestrian crossings on off-street sections using LRSSB document LRG 2.0 Non-Motorised Crossing Guidance.

11. Based on the output of the risk assessment, changes have improved control measures at a number of crossings and risk assessment documentation updated.

12. We addressed the recommendation to all other tram owners, operators and infrastructure managers and will deal with measures they have taken to address it through our usual inspection work.

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

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

Status: Implemented.

Information in support of ORR decision

14. On 15 October 2019 Edinburgh City Council provided the following initial response:

I agree that this recommendation is applicable to us and I confirm that following the publication of this report, my team have been working in partnership with Edinburgh Trams to comply with the recommendations of this report to identify risks, appropriate mitigation measures and to support and finance the implementation programme of these measures.

Edinburgh Trams are maintaining the records from this joint working and they will respond directly to recommendation 2 and provide evidence of the current position of the investigation to identify and mitigate risks.

15. On 11 November 2019 Edinburgh Trams provided the following updated initial response

A full review, in accordance with LRSSB emerging guidance for Non-Motorised User Crossings (NMUC) was carried out for all off street crossing. Associated risk assessments were updated to reflect new approach therein.


a) The NMUC risk assessments identified:

- *Number of lines crossed*
- *Track Geometry*
- *Line speeds*
- *Average Usage/Hour*
- *Photographs of Crossing Approaches and Environment including 'Desire Lines'*
- *Sighting distances and identification of any sighting restrictions and associated recommended action*
- *Risk assessment of the crossing including any proposed/actioned mitigation*
- *Sight specific background sound pressure readings and average horn discernibility level.*
- *Distance from the crossing of the Crossing Warning Signage dependant on line speed to provide a visual indication to the Tram Driver when to apply the emergency break if a 'Locked Out' pedestrian has not acknowledged the approaching vehicle despite audible warnings.*
- *Incident history section.*

Following the review, the following documents were updated:

- UN/0020/2019 - Urgent Operating Notice for Off Street Audible Warnings.
- ET/TDM/1.12 - Edinburgh Tram Professional Driving Standards
- ET/EM/015 - Off Street Tramway Crossing and Tramstop Inspections

The following pages of this letter contain Saughton Mains NMUC risk assessment as an example.

	Non-Motorised User Crossing Risk Assessment: Saughton Mains	ET/NMUC/10 ~ v1.0	
		Issue Date: 31-Jul-19	Review Date: 31-Jul-20


Non-Motorised User Crossing Risk Assessment				
Details of Assessment				
Persons Involved:	AC, NB, SS, MJP			
Date(s):	04-Jun-2019			
Time(s) Arrived:	09:25	Time(s) Departed:	09:55	
Part (A) Crossing Details:				
Crossing Reference	NMUC/10			
Location	Saughton Mains Pedestrian Crossing (at EMG Autos)			
Number of Lines Crossed	2			
Track Geometry	Horizontal Curvature	Straight Track	Vertical Curvature APT Bound Approach Track Slope %	0.5
			Vertical Curvature CTY Bound Approach Track Slope %	-0.5
Speed Limit km/h	CTY-bound Line	70	AIR-bound Line	70
Crossing Usage:				
Pedestrians = 18 per hour				

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Page 1 of 10

Derived From LRSSB Form NMUC1

	Non-Motorised User Crossing Risk Assessment: Saughton Mains	ET/NMUC/10 ~ v1.0	
		Issue Date: 31-Jul-19	Review Date: 31-Jul-20


Part (B) Crossing Approaches and Environment (insert photographs as titled. Landscape photos need to be height 6cm or 6.5cm to fit in):			
	LOOKING AIR-BOUND [towards Airport] (AB)	CENTRE OF CROSSING	LOOKING CTY-BOUND [towards City] (CB)
CTY-BOUND SIDE (CS)			
AIR-BOUND SIDE (AS)			

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Derived From LRSSB Form NMUC1

	Non-Motorised User Crossing Risk Assessment: Saughton Mains	ET/NMUC/10 ~ v1.0	
		Issue Date: 31-Jul-19	Review Date: 31-Jul-20



		
Desire line on AIR-bound side, between NMUC/10 and SGT tram stop (1)	Desire line on AIR-bound side, between NMUC/10 and SGT tram stop (2)	Desire line on AIR-bound side, between NMUC/10 and SGT tram stop (3)

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Derived From LRSSB Form NMUC1


	Non-Motorised User Crossing Risk Assessment: Saughton Mains	ET/NMUC/10 ~ v1.0	
		Issue Date: 31-Jul-19	Review Date: 31-Jul-20

		
Desire line on CTY-bound side, between NMUC/10 and SGT tram stop	Desire line on AIR-bound side, west of SGT tram stop (1)	Desire line on AIR-bound side, west of SGT tram stop (2)

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Derived From LRSSB Form NMUC1

	Non-Motorised User Crossing Risk Assessment: <i>Saughton Mains</i>	ET/NMUC/10 ~ v1.0	
		Issue Date: 31-Jul-19	Review Date: 31-Jul-20


Part (C) Sighting Distance [from 3.25m from nearest rail]:						
All distances in Metres	Minimum Sighting Distance Required	Measured Sighting Distance	Point sighting distance is measured to	Is Sighting Distance compliant?	If sighting distance is not compliant is it mitigated?	Sighting time mitigations (mandatory horn on approach etc.)
CTY-bound side looking CTY-bound (CS-CB)	155	155+	AIR 07 14	Yes	N/A	N/A
CTY-bound side looking AIR-bound (CS-AB)	155	198	AIR 07 08	Yes	N/A	N/A
AIR-bound side looking CTY-bound (AS-CB)	155	155+	AIR 07 14	Yes	N/A	N/A
AIR-bound side looking AIR-bound (AS-AB)	155	198	AIR 07 08	Yes	N/A	N/A

Part (D) Sighting Restrictions	CTY-bound Direction y/n	AIR-bound Direction y/n	Part (E) Census Data	Census data taken on day	Average traverse Time (in Sec)
Vanishing Point within Sighting Distance	None	None	Pedestrians	18 per hour	8.45 seconds (10m)
Permanent Structure (building, bridge, wall etc.	None	None	Cyclists	Zero sighted	Zero sighted
Signage or crossing equipment	Kick rails and correct signage (upper and lower) on both sides	Kick rails and correct signage (upper and lower) on both sides	Mobility scooter	Zero sighted	Zero sighted
Vegetation	None	Consider cutting back foliage on left of photo CS-CB A015	Other	None	
Bad Weather on day of assessment	Clear & Sunny	Clear & Sunny	Average Traverse Speed (Pedestrian)	Average traverse speed 1.18m/s. (Lowest traverse speed 0.77m/s - 13 seconds)	
Other	None	None	Average Traverse Speed (Cyclist)	Zero sighted	
Notes:			Average Traverse Speed (Mobility Scooter)	Zero sighted	

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Derived From LR55B Form NMUC1


	Non-Motorised User Crossing Risk Assessment: <i>Saughton Mains</i>	ET/NMUC/10 ~ v1.0	
		Issue Date: 31-Jul-19	Review Date: 31-Jul-20

Part (F) Risk Assessment										
No	Hazards	Observations	Existing Controls	Prop + Lik	Prop + Sev	Ex Risk	Mitigation	Prop + Lik	Prop + Sev	Risk
1	Sighting Hazards - Pedestrians (Infrastructure/Trees/Track Alignment) seasonal effects (fog)	Foliage present on CSCB side	Compliant visibility. ASCB foliage has been cut down	4 (2+2)	7 (1+4)	28	Paint hazard zones yellow A001	3 (1+2)	7 (1+4)	21
2	Sighting Hazards - Tram Drivers (Infrastructure/Trees/Track Alignment) seasonal effects (fog)	Foliage present on CBCS side	Compliant visibility. ASCB foliage has been cut down	4 (2+2)	7 (1+4)	28	Paint hazard zones yellow A001	3 (1+2)	7 (1+4)	21
3	Underrun Considerations (i.e. Ballasted Track/Paved Alignment) NOTE: sub-30kph impacts only	No underrun protection, direct fix track	None	5 (2+3)	7 (1+4)	35	Install underrun protection A003 Note:- The benefit of this mitigation will only be present when the vehicle speed has slowed to ≤ 30 kph	5 (2+3)	4 (1+4)	25
4	Pedestrians Clearances 5m is desirable, 3m is acceptable. Clear justification required if any less.	Clearance is acceptable	(19m on AIR side, 3.5m on CTY side; width is 3.0m)	2 (1+1)	7 (1+4)	14	N/A	2 (1+1)	7 (1+4)	14
5	Local Amenities Impacting/Potential to Impact on Crossing Usage	Bus stop, drivers' cars seemingly parked on CTY-bound side. Frequent crossing use by dog walkers with increased crossing time.	Blue 'Tramway: Look Both Ways' signage present (both head-height and ground). Also kick rails and tactiles	2 (1+2)	7 (1+4)	21	N/A	2 (1+2)	7 (1+4)	21
6	Signage, Defined Walkways, Disability Issues	Signage present	Blue 'Tramway: Look Both Ways' signage present (both head-height and ground). Also kick rails and tactiles	4 (2+2)	7 (1+4)	28	Paint hazard zones yellow A001	2 (1+1)	7 (1+4)	14
7	Fenced Barrier 'Chicane'	Not present	None	5 (2+3)	7 (1+4)	35	Consider further measures that control the speed of crossing users and encourage persons to look for the presence of approaching trams A002	3 (1+2)	7 (1+4)	21
8	Pedestrian 'Transition to High Risk Area' Markings or Indication	Tactile paving present	Blue 'Tramway: Look Both Ways' signage present (both head-height and ground). Also kick rails and tactile paving	5 (2+3)	7 (1+4)	35	Paint hazard zones yellow A001	3 (1+2)	7 (1+4)	21
9	Impact on pedestrian position (anything that may affect pedestrian approach)	Desire lines (Same as row 13)	None	6 (2+4)	7 (1+4)	42	Implement measures to mitigate multiple desire lines A020	3 (1+2)	7 (1+4)	21

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	Non-Motorised-User-Crossing-Risk-Assessment: Saughton-Mains	ET/NMUC/10 ~ v1.0
	Issue Date: 31-Jul-19	Review Date: 31-Jul-20

Part (F) Risk Assessment

Notes:

Table 1 (All dB)	Daytime hours			Night time hours		
	Background Noise Levels		Comments	Background Noise Levels		Comments
CTY-bound	69 dB			58 dB		20:05
AIR-bound	72 dB			59.2 dB		63.2 = Bus

Average Horn-Discernibility = 19 dB


The Crossing Warning sign is installed as a visual aid to the driver, at the distance from the crossing where the 'Locked Out' pedestrian has not acknowledged the presence of the tram despite sounding of audible warnings, they can apply the emergency brake and have slowed sufficiently for other safety measures to be effective (e.g. underrun protection). Additionally the 'Locked Out' user will still have sufficient time to reach a place of safety.

A place of safety is at a point 1 m from the nearest running rail (Swept Envelope 0.75 m + 0.25 additional clearance).

Location	Speed (km/h)	Alignment Slope (%)	Overall Stopping Time (s)	Emergency Stopping Distance (m)	Crossing Sign Distance (m)	Residual Speed @ Crossing (km/h)
Saughton-Mains Pedestrian Crossing	70	-0.5	7.88	81.3	50	10.09

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	Non-Motorised User Crossing Risk Assessment: Saughton Mains	ET/NMUC/10 ~ v1.0
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Part (G) Incident History

Pedestrian fatality crossing from AIR-bound side to CTY-bound side, Sep 2018
 7x EBs in 'Saughton' (not location-specific)


- 5 prior to 2017,
- 1 in 2018,
- 1 in 2019

PART (H) Risk Matrix

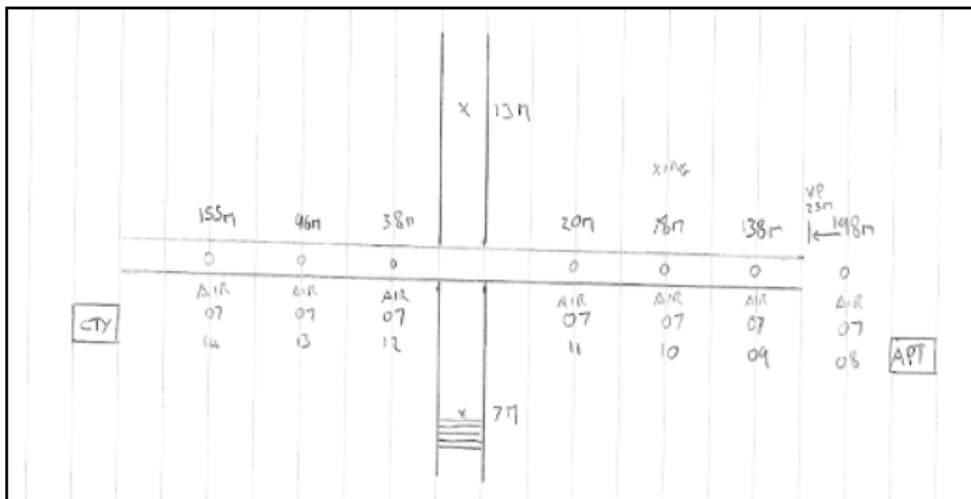
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	Non-Motorised User Crossing Risk Assessment: Saughton Mains	ET/NMUC/10 ~ v1.0	
		Issue Date: 31-Jul-19	Review Date: 31-Jul-20

RISK RATING = The Sum of Frequency + Likelihood x The Sum of People + Severity												
Frequency 4: Frequent Several events per year expected 3: Infrequent Expected to happen once in two years 2: Occasional to happen once between two and ten years 1: Rare Once every ten years Likelihood 6: Certain / Imminent 5: Very Likely near miss (accident narrowly avoided) 4: Likely Risk of accident dependent on 1 other main factor 3: Possible Risk of accident dependent on several other factors 2: Unlikely Risk of accident dependent on exceptional factors 1: Very Unlikely Risk	Frequency + Likelihood	10	10	20	30	40	50	60	70	80	90	100
		9	9	18	27	36	45	54	63	72	81	90
		8	8	16	24	32	40	48	56	64	72	80
		7	7	14	21	28	35	42	49	56	63	70
		6	6	12	18	24	30	36	42	48	54	60
		5	5	10	15	20	25	30	35	40	45	50
		4	4	8	12	16	20	24	28	32	36	40
		3	3	6	9	12	15	18	21	24	27	30
		2	2	4	6	8	10	12	14	16	18	20
		1	1	2	3	4	5	6	7	8	9	10
		People + Severity										
		People at risk 4: 30 > 3: 16 > 30 Possibility of double figures 2: 5 > 15 A small number of people (single figures) 1: 1 > 4 Individuals at risk Severity 6: Fatality likely 5: Severe possible fatality / debilitating injuries 4: Lost Time >3 days broken bones / hospitalisation 3: Lost Time <3 days no broken bones no / hospitalisation 2: Minor injury 1: Negligible										

	Non-Motorised User Crossing Risk Assessment: Saughton Mains	ET/NMUC/10 ~ v1.0	
		Issue Date: 31-Jul-19	Review Date: 31-Jul-20

Appendix: Sketch of Crossing



The proposed measures being implemented to mitigate the RAIB report recommendations include:

Action Ref	Action Required	Status
A001	Paint hazard zones yellow	Completed
A002	Consider further measures that control the speed of crossing users and encourage persons to look for the presence of approaching trams (chicane, bollards etc) Recommendation to use Bollards instead of chicanes due to spatial constraints is documented in Edinburgh Trams - Chicane Design Issues (September 2019)	Completed
A003	Implement underrun protection in accordance with emerging LRSSB Underrun Protection Guidance	Completed
A015	Consider cutting back foliage on left of photo CS-CB	Completed
A020	Consider measures to mitigate multiple desire lines Documented in Edinburgh Trams - Chicane Design Issues (September 2019) Appendix 3 Additionally implement anti-pedestrian deterrent measures at all crossings.	Completion Due - date end Dec 19
A023	Review crossing warning signage relevant to crossings See Notes in ET/NMUC/010 Part F Risk Assessment and response to Recommendation 1 b) in this letter.	Completed
A024	Audibility measurements Documented in OC-0894-01 Test Plan for Acoustic Tests	Completed
A033	Ensure drivers are using their horns in relation to crossings Documented in: <ul style="list-style-type: none"> • Urgent Operating Notice: UN/0001/2019 dated 18th Feb 2019 • ET/TDM/1.2 – Tram Driving Procedure 	Completed

Table 1 - Risk Assessment Review Actions

The actions in Table 1 are scheduled in a programme of works.

16. On 16 October 2019 LRSSB advised of the following although the recommendation had not been addressed to them:

The LRSSB document LRG 2.0 Non-Motorised Crossing Guidance has provided guidance to develop existing pedestrian crossing risk assessment and audit programme completing a thorough assessment of all segregated at grade crossings, applying new guidance where necessary.

The LRSSB guidance and risk assessment methodology will, so far as is reasonably practicable be applied to all crossings of the segregated tramway on the networks.

Recommendations 3

The intent of this recommendation is to establish improved industry guidance for the audibility of warning horns and bells fitted to current and future UK trams (paragraph 85).

The Light Rail Safety and Standards Board (LRSSB) should develop the guidance for audible warnings devices on both current and future UK trams, so that they provide effective warning of approaching trams. The guidance should define a process so that each tram operator can establish appropriate sound pressure levels and frequencies for warnings that are clearly discernible above background noise and which take into consideration sighting distances, tram braking characteristics and line speeds.

Recommendation 4

The intent of this recommendation is to improve current industry guidance for pedestrian level crossings on UK tram systems, by including lessons from this accident and previous similar accidents (paragraph 75).

The Light Rail Safety Standards Board (LRSSB) should update and improve the current industry guidance for the design, layout and management of off-street pedestrian level crossings on UK tram systems contained in 'Tramway Principles and Guidance', January 2018. The new guidance should consider lessons from this and previous similar tramway accidents. It should as a minimum include guidance on routine risk assessments of crossings, taking into account sighting distances, line speed, tram braking characteristics and the audibility of warning horns.

ORR decision

17. LRSSB have updated their main Tramway Principles and Guidance (ref LRG 1.0) by including a cross reference to their Non-Motorised Tramway Crossing

Guidance (ref LRG 2.0) which in turn refers to the Tramway Audible Warnings Acoustic Test Guidance (ref LRG 5.0).

18. LRSSB have taken the approach of ensuring that trams meet recognised European standards for braking and audible devices and then ensuring that the design of the other elements of the system (such as speed, crossing design, inter-visibility, operating instructions) take this into account.

19. LRSSB have addressed both recommendations, albeit using a different approach to that identified in the recommendations.

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

- has taken both recommendations into consideration; and
- has taken action to implement them

Status: Implemented.

Information in support of ORR decision

21. On 16 October 2019 LRSSB provided the following initial response to recommendation 3:

LRSSB has revised and updated guidance for the design, layout and management of off-street pedestrian level crossings on UK tram systems contained within the document LRG 1.0 - Tramway Principles and Guidance (TPG) in addition to LRG 2.0 - Non-Motorised Crossing Guidance (see response to Recommendation 2).

LRSSB will continue to work with both operators/duty holders to support any further reviews of guidance for non-motorised user crossings and to implement any new recommendations where it is reasonably practicable to do so.

22. On 16 October 2019 LRSSB provided the following initial response to recommendation 4:

LRSSB has worked closely with operators/duty holders to ensure that any changes are considered and assessed in-light of the existing standard being applied and will adopt any emerging guidance on both the existing and extended network, where it is reasonably practicable to do so.

LRSSB have developed and published documentation LRG 5.0 - Tramway Audible Warning Acoustic Test Guidance for both current and future UK trams. The guidance outlines the process, so that each operator/duty holder can establish appropriate sound pressure levels, frequencies for warnings that are clearly discernible above background noise and takes into consideration sighting distances, tram braking characteristics and line speeds.

