The Hampshire (Test Valley Borough No. 63)

(Parish of East Dean)

Definitive Map Modification Order 2017

PROOF OF EVIDENCE OF AMANDA INGRAM, LEVEL CROSSING MANAGER

ON BEHALF OF NETWORK RAIL INFRASTRUCTURE LIMITED

PINS REFERENCE: ROW/3

1. Personal Details

1.1 My name is Amanda Ingram and I am a Level Crossing Manager (LCM) within Network Rail Infrastructure Limited's Wessex Route.

1.2 I am responsible, so far as is relevant to this public inquiry, for the day to day safety and management of various types of level crossings comprised within the Wessex Route, which includes a responsibility for the risk assessments carried out for, and asset inspections of, the level crossings within my area of control. In total, I am responsible for 67 level crossings within my portfolio.

1.3 Since joining the rail industry in 2007 I have had a variety of managerial positions, mainly in the Operations function, joining the safety team as a Level Crossing Manager in 2013, and in 2016, taking on the role as Route Level Crossing Manager for 1 year in order to cover a secondment.

1.4 I am a member of the Institution of Railway Operators and am also a Rail Accident Investigation Board (RAIB) Accredited Agent.

2. Scope of Evidence

2.1 My evidence covers the following matters:

2.1.1 The assessment by Wessex Route of safety risk at a footpath level crossing:

- Network Rail's level crossing policy
- The risk assessment process of footpath level crossings
- The quantitative risk model used in the safety assessment of level crossings, namely 'All Level Crossing Risk Model' (ALCRM)
- The options under ALCRM for another footpath level crossing on the same railway line, cost-benefit analysis, the effect of variances in use (census data), train speeds on the risk score, and the 'Fatalities and Weighted Injuries' (FWI) figure
- Consideration of incidents at footpath level crossings within a narrative risk assessment
- Whistle boards and 'Train Sighting Distances' (TSD) and their effect upon passing trains
- Site specific factors considered, including the nature of the proposed footpath, the type and frequency of usage and the nature of railway traffic

- The description of the proposed crossing and topography, including a description of 'Up' and 'Down' side
- Impact of deck; Stop, Look, and Listen signage, and trains passing.
- Vulnerable users and human behaviour
- Fatalities

2.2 This proof does not cover the following matters:

2.2.1 Network Rail's statutory obligations under key health and safety laws. Further to the evidence produced elsewhere on behalf of Network Rail, these matters will be covered in submissions to the Inquiry to the extent necessary.

2.2.2 The process of assessing infrastructure and providing safe and value-for-money engineering options, the feasibility of mitigating level crossing risk, and other 'full replacement' engineering options.

3. Network Rail's Level Crossing Policy

3.1 Network Rail has a settled policy for managing level crossing risk, published on the company's website and contained within the document entitled "*Our Approach to Managing Level Crossing Safety*". The policy contains sixteen principles and commitments. The principles are centred around:

i. Risk management; limiting/reducing the number of active open level crossings, continual risk reduction activities, risk based prioritisation of efforts, undertaking of inspection and maintenance activities, on-going risk assessment regime (using tools such as ALCRM), support for public education and awareness of level crossing safety;

ii. Research and development; commitment to request, and participate in, research to reduce level crossing risk; to investigate and introduce new technology;

iii. Co-operation with stakeholders; support for the British Transport Police (BTP) and for the ORR in order to enforce adherence to level crossing and road traffic legislation, forming partnerships with other organisations such as local highway authorities;

iv. Learning and taking action; that Network Rail will learn from others, from accidents/incidents/recommendations and take action, where considered necessary.

3.2 A key element of Network Rail's policy on level crossings is reflected in ORR's publication RSP7 (see section 3.4.3).

4. Network Rail's Standards

4.1 Network Rail has its own company standards governing the asset management and risk management of level crossings. These standards enable Network Rail to meet its obligations and underpin the health and safety management of its level crossing estate.

4.2 There are two key documents governing the risk assessment process for level crossings:

- . *First*, a high-level document that sets out Network Rail's requirements to ensure a suitably robust and consistent process for assessing risk and determining the safety requirements for both existing and new level crossings.

- *Second*, a comparatively more detailed, process-specific document. This standard sets out the frequency of routine risk assessments, defines non-routine risk assessment triggers and details the complete assessment process. LCMs follow this compliance standard in order to satisfy the risk management of level crossings.

4.3 In addition to the above referred documents, there are also engineering and design specifications, further to asset maintenance and condition standards that are integral to ensuring level crossing safety and Network Rail's approach to asset management.

5. The Assessment of Level Crossing Safety Risk at a Footpath Level Crossing

5.1 The process for risk assessment adopted by Network Rail incorporates a quantitative (calculated risk model) and qualitative (structured expert judgement) approach. Both elements are employed in order to achieve a rounded and balanced analysis of risk. Both are complementary of one another.

5.2 Between the introduction of ALCRM in 2006/07 and also the introduction of the Level Crossing Managers organisational structure in the Wessex Route in April 2013, Network Rail's standards has specified a fixed, three-yearly frequency for the routine risk assessment of footpath level crossings.

5.3 Since LCMs were introduced, the frequency of routine risk assessment at each level crossing is based upon its current level of risk. In general, the risk level of a footpath requires it to be assessed every 2.25 years.

5.4 Further, if three misuse incidents, a 'near miss', or any more serious incident is reported at any level crossing (within the time period of 2.25 years), then a risk assessment is required unless the existing risk assessment is less than 6 months in age at the date of the incident.

6. All Level Crossing Risk Model (ALCRM)

6.1 ALCRM was first introduced in 2007 and has been developed with regard to extensive research and risk assessment approaches since the early 1990s. The risk assessment of level crossings in Great Britain dates from 1993 when the British Railways Board began its programme of research. The risk model was developed as the result of a collaborative partnership between Rail Safety & Standards Board (RSSB), Network Rail and Arthur D. Little (ADL).

6.2 ALCRM's main purpose is to support Network Rail's broader level crossing risk management process by providing a consistent methodology for assessing the safety risks to crossing users, train passengers and train staff at level crossings on Network Rail controlled infrastructure.

6.3 ALCRM is a quantitative risk model that also incorporates qualitative commentary to document decision-making and the recording of observations of relevance to the safety risk management of level crossing assets. ALCRM not only enables risk to be appropriately calculated and measured, it also helps to calculate the effect of risk control solutions by modelling the benefits as revised scenarios.

6.4 ALCRM's calculated levels of risk are used as *but one part* of Network Rail's overall risk management process, informing Network Rail of the relative risks of different level crossings and supporting, in conjunction with structured and expert judgements, decisions made on crossing upgrades and closures. ALCRM's calculated levels of risk are further discussed below.

6.5 ALCRM has been calibrated (i.e. set-up to be representative of real-world levels of risk) using data from the rail industry's Safety Management Information System (SMIS) and from the RSSB's Safety Risk Model (SRM). SMIS is a repository database used by Railway Group members to record details of all safety related events which occur on infrastructure managed by Network Rail. In relation to level crossings, SMIS is searchable to identify safety events such as accidents and incidents (including 'near miss' events). It records detailed information related to these events including: date, time, location, level crossing type and a narrative of the incident itself. The SRM uses the incident data (or precursors) from the safety events within SMIS to calculate the actual levels of risk for each type of level crossing. These baseline risk levels, found against each core crossing type in ALCRM, underpin the calculations of the risk model. SRM calculated risk is used by the rail industry as a measure of system risk on the network; of which level crossings form but one element.

6.6 ALCRM can be updated in order to incorporate findings from latest research, account for the changing risk profile (recalibration) or accommodate other business needs.

6.7 ALCRM uses the same principles for modelling risk at each type of crossing. In particular, the consequences associated with level crossing accidents are largely independent of crossing type. However, there are key differences in the way in which each type of crossing is modelled regarding the frequency of accidents, from both a railway and user perspective, which give rise to different levels of risk. ALCRM has been designed to account for these differences, looking specifically at the causes of accidents that could occur at different types of crossing. For example, at 'user-worked' crossings, users are immediately responsible for complying with all instructions for use and for making their own decisions on when it is safe to cross. Accidents may therefore be caused by an inadvertent failure of the user to correctly stop, look and listen for trains. In contrast, at manually controlled crossings the user is prevented from entering the crossing by barriers which are lowered across the road and so it is unlikely that a user will enter onto the crossing when a train is approaching unless they disregard the protection and climb the barriers. These differences are reflected in the calculations for each crossing type, which logically summarise all of the different causes of accidents.

6.8 To calculate the level of risk for a particular level crossing, ALCRM requires specific information about the asset. Information is gathered from existing records held by Network Rail on that asset, using intelligence sources, stakeholder engagement and not least, upon a full site visit being undertaken during which time the presence of a defined set of observable crossing features is recorded. The features recorded during the site visit are listed in site visit pro forma, and include aspects such as crossing orientation, census and users and the visibility of the crossing on approach roads.

6.9 Once the mandatory inputs are entered into ALCRM, Network Rail uses the model in order to process the data that has been entered and return results, or calculated risk, for the particular crossing. ALCRM determines level crossing risk using the same basic principles as for any risk assessment; namely hazard identification, frequency and consequence assessment leading to a calculation of risk. These calculations are fundamental to the way in which crossing risk is robustly calculated, as the precise scale of risk will inevitably vary in accordance with the particular characteristics of the crossing, the people using the crossing and the railway features such as number of trains and train speed.

6.10 ALCRM reports two measures of risk; collective risk and individual risk of fatality.

- Collective risk is a measure of the total harm, or safety loss and is expressed in terms of FWI per year. For example the value 1 represents: 1 fatality or 10 major injuries or 200 minor RIDDOR[1] injuries or 1000 minor non-RIDDOR injuries per year. Collective risk is reported by ALCRM in a simplified form referred to as a 'Collective risk number' ranked from '1 to 13' ('1'

[1] Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (2013)

representing the highest risk and '13' representing nil risk). This is independent of crossing type, so crossings that are relatively busy with lower degrees of protection will receive the highest rankings and conversely lightly used crossings that have high levels of protection will receive rankings towards the lower end.

- The risk to a regular crossing user is presented as individual risk of fatality per year. This calculation shows the level of risk a single typical user is exposed to per year of use at a level crossing based on 500 traverses. ALCRM calculates this risk as the 'probability of fatality' and unlike the collective risk, is not expressed as an FWI. Individual risk is expressed in the simplified form of an 'Individual risk letter' ranked from 'A to M' ('A' representing the highest risk and 'M' representing nil risk). This is independent of crossing type, meaning that crossings with higher degrees of protection (such as Manually Controlled Barriers (MCB)) will be grouped around the lower end (towards 'L'), with less well protected crossings (such as User Worked Crossings (UWC)) grouped around the higher end (towards 'A').

6.11 ALCRM also highlights the pre-defined key risks which contribute toward the overall calculated level of risk (where applicable). Known as key risk drivers, these include hazards such as sun glare, low sighting time or frequent trains.

6.12 The calculated outputs of ALCRM enable Network Rail, in conjunction with structured judgement of assessors, to better identify the hazards and risks present at each of its level crossings. ALCRM also enables proposed risk control solutions to be modelled as scenarios. This option enables a comparison to be made with the current risk assessment and facilitates an understanding of how changes or improvements translate 'quantitatively' as a benefit or risk reduction. In this way, LCMs use ALCRM in order to support risk control selection and use identified key risk drivers to determine solutions which target risks and hazards. ALCRM also helps Network Rail compares the risks between level crossings. This can support informed decision-making about investment or safety expenditure, so that Network Rail delivers the greatest degree of public safety for every pound spent. Inevitably, with a finite resource, money spent on safety improvements in one location will lead to some reduction in the money spent elsewhere. Our aim is always to secure the greatest public safety return for any investment made. That is why we take such care in each case to proceed with an entirely logical, evidence-based and network-consistent approach.

7. Risk Assessment at a Footpath Level Crossing

7.1 When carrying out a level crossing risk assessment, in line with Network Rail and ORR policy – *Level Crossings: A guide for managers, designers and operators, Railway Safety Publication 7, Office or Rail Regulation* (December 2011) one must look to eliminate hazard through the hierarchy of risk controls. Risk controls,

where practicable, can be achieved through the elimination of level crossings in favour of bridges, underpasses or diversions.

7.2 The introduction of the LCM organisation introduced a dedicated team of Level Crossing Managers in Wessex Route each based locally around the Route and with 50 – 80 under their control. This has led to a considerable development of our knowledge and understanding of our level crossings using expert judgment.

7.3 Each LCM also undertakes all asset inspections – an appraisal of the asset's physical condition – which for level crossings such as a footpath take place 6-monthly, as well as leading local stakeholder liaison meetings. This helps to develop a sense of 'ownership' in the local community and encourages a more proactive approach to risk management.

7.4 With this new organisation came the introduction of a full Narrative Risk Assessment (NRA) which enables the LCM with their holistic view of the crossing to think about the foreseeable risk at a level crossing and make the right assessment using expert judgement through option selection.

7.5 This NRA document is also used on occasion to aid Network Rail in understanding the full risk that a crossing has, meeting the requirements of the Management of Health and Safety at Work Regulations 1999, and thus providing the necessary supporting safety information to a decision-making process for the crossing. This will lead to recommendations as to the most suitable option to reduce the risk to as low as reasonably practicable (ALARP).

7.6 The risks identified from a site visit walking the railway track were that the proposed footpath level crossing had deficient sighting on the upside due to the track curvature. This is without vulnerable usage considered. Vulnerable user types are considered as dog walkers with dogs off the lead, users wearing headphones and elderly users with walking aides, by way of example. If vulnerable usage were considered at this site the sighting on the down side would be deficient.

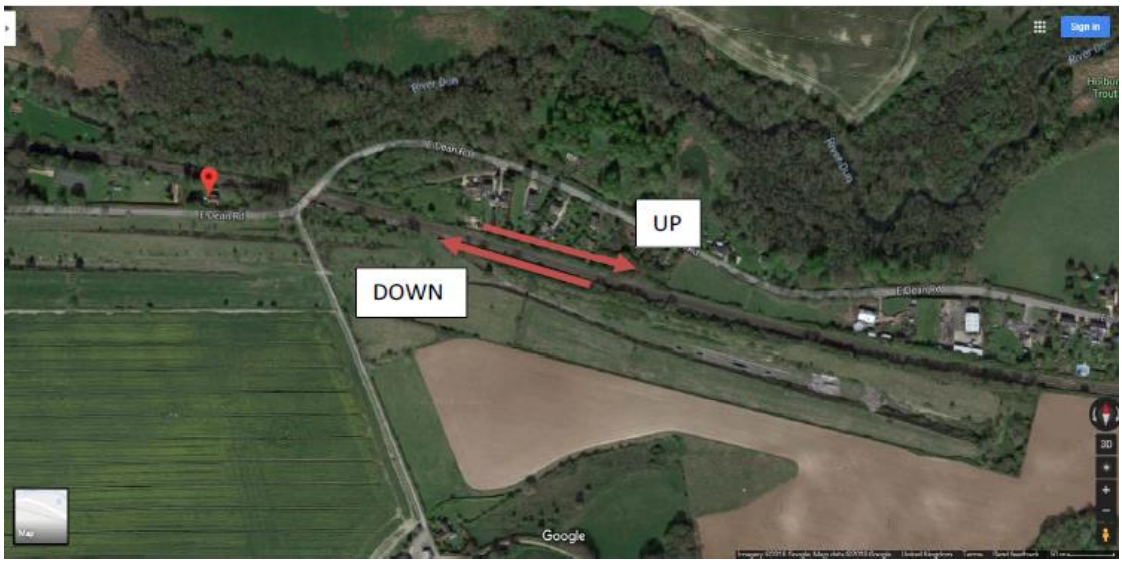
8. Footpath Level Crossing Mitigation

8.1 This proposed footpath would be classed as a passive level crossing.

8.2 This type of crossing does not offer any warning to a user of an approaching train and the decision on whether it is safe to cross is left to the user. The sighting at the proposed footpath site is deficient on the up side. Whistle boards would be considered a source for complaints of noise pollution by local residents, which has been evidenced in other areas and are not a consideration to be installed at new locations. Therefore, at a minimum the mitigation should be an automated type of audible and visual warning system.

8.3 There are 93 trains timetabled over this railway line a day. This consists of both passenger and freight trains. Trains are timetabled to run for 24 hours a day. There can also be various on-track machinery and plant operating over the crossing during engineering works carried out on the network.

8.4 In railway terms, the direction of travel from Salisbury towards Redbridge, is known as the 'Up' line; the Up line is on the side of the residential properties and the River Dun. The direction of trains travelling from Redbridge towards Salisbury is known as the 'Down' line, and is the side nearest the open fields and farm land.



8.5 If whistle boards were a mitigation they could not be positioned at the appropriate position for this proposed footpath crossing. A whistle board is not considered effective if it is positioned more than 400 metres from a level crossing and on the up-line Dean Hill MCB-OD level crossing would have implications. At the recorded line speed of 85mph the optimum position for the whistle boards would be 452 metres.

8.6 It can also prove slippery during wet weather, particularly if this follows a dry spell and again with morning dew. Therefore, the stopping distance of the train can be extremely variable.

8.7 Whistle boards are not implemented during the current Night Time Quiet Period (NTQP) (24:00 – 06:00). Over and above the difficulty during the NTQP, the use of whistle boards as the main mitigation is inherently fallible for a number of reasons:

- Even during hours when a horn can be sounded, local factors (such as wind direction, force, heavy rain, ambient background noise) can reduce the audibility of the warning.

- They are not a suitable means of warning for people with hearing impairments.

- They do not take into account the increasing use of headphones and mobile devices.

- The 'human factor' means that no system can wholly guarantee that train drivers will always sound the horn in accordance with our rule book.

9. Crossing Surface

9.1 The proposed footpath level crossing would be decked and require some type of steps due to where the railway track is to the lay of the land on the down side and gates to close off the railway. With the need to continually look for trains whilst crossing, and with the steps to the proposed crossing, there is a real risk from tripping or slipping – especially when a train is seen approaching and a user may rush to exit the crossing. Slips and trips are a recurrent theme reported as the cause of users being struck by trains; there are numerous mentions of this hazard within the various sources of industry data compiled on accidents. For example, 14% of train strikes at level crossings have been attributed to slips, trips or becoming snagged on the crossing. The crossing surface can therefore be regarded as having a key influence on risk.

10. Stop, Look and Listen (SLL) Signs

10.1 The most prominent crossing feature at passive level crossings is typically the SLL sign, which provides the only warning at a passive footpath level crossing to the user that they are approaching a level crossing. It provides an indication of where the user might be best placed to observe an approaching train and, if read, gives instructions on how to cross safely.

10.2 SLL signs are an integral and important safety system for all passive level crossings. Network Rail has installed such signs as a result of a considered approach to risk assessment and risk management, but they do not safeguard or prevent a user from stepping out into the path of a train, if the train is not seen or heard.

11. Sighting at the Footpath Crossing.

11.1 Deficient sighting means that users do not have enough time to cross, based on the first sighting of a train. Due to the orientation of the crossing users often have an issue with looking directly into the sun glare at certain times of year. This site could also have a hazard issue of fog that can also impair the visibility of approaching trains.

11.2 Network Rail standards dictate that 1.189 metres per second should be used to calculate a pedestrian's traverse time, where the surface is at or near to rail level.

The recommended decision point for a footpath crossing stands at a minimum of 2 metres. The length of the deck is then calculated from this point until 2 metres past the furthest running rail.

11.3 At the proposed footpath, the approximate crossing traverse length is 9 metres. Accordingly, 9 metres x 1.189 (m.p.s.) equals 7.57 seconds.

11.4 The line speed is 85mph. ideal required sighting based on 85mph line speed is 402 metres. Based on this distance the sighting would be hazardously deficient in two directions (upside looking towards up- and down- direction train approaches).

	Ideal Required Sighting for 7.57s traverse time	**Actual Measured Sighting Distance**
Up side looking towards up direction train approach	402m	300m
Up side looking towards down direction train approach	402m	300m
Down side looking towards up direction train approach	402m	550m
Down side looking towards down direction train approach	402m	550m

The sighting of approaching trains has also been hampered by vegetation.

Standing on the down side of the track, one can see the track curve which hampers the up-side sighting

11.5 Tree clearance on third party land may also be required to further sighting, although Network Rail does not have the right to cut back vegetation on adjoining land.

11.6 Significant and adequate sighting improvements are simply not possible at this location due to the curvature of the track. Tree clearance would also require a constant programme of plant removal which could, in any event, merely offer a minimal and transient betterment in terms of sighting – which would ultimately remain inadequate.

12. Footpath Crossings Census Data Gathering

12.1 An important tool among Network Rail's improved approach to risk management is the use of 'smart-cameras', gate counters and other technology based census-gathering techniques. These help to produce full narrative risk assessments.

12.2 A 50% increase to the traverse time at a crossing due to vulnerable usage could be considered appropriate, if census data and local knowledge camera stills captured vulnerable users.

12.3 'Vulnerable Users' are characterised as those who are unable to use the level crossing sufficiently quickly and effectively, and are not sufficiently aware of the dangers at a level crossing. Vulnerable users all effect the risk profile of a crossing either because they do take longer to traverse the railway or because they do not have a mature perception of the risks that are inherent in crossing the railway.

12.4 The term ‘vulnerable user’ does not relate exclusively to the less able-bodied or elderly people with impaired mobility but also young children who do not have a mature perception of the risks that are inherent in crossing the railway and older children in groups.

12.5 Full able-bodied people can become ‘vulnerable’ because they are ‘encumbered’. An encumbered user means someone who is crossing with something at reduces their agility and can cause distraction.

12.6 Encumbered users include those with pushbikes (pushing them or riding), those who are carrying objects (heavy bags or equipment) and those with dogs, either on or off the lead. It is notable that in 17% of train strikes, the pedestrian was walking a dog.

12.7 From observation, users with pushchairs and cycles sometimes have difficulty in opening and closing a crossing gate. In some cases, where the gate is located within 3m of the running rails, the longer forward footprint of these users can mean they are in a position of danger before checking to see if it is safe to cross.

12.8 Many pedestrians also now wear head-obscuring clothing (hoodies) and/or earphones, or are distracted using mobile phones whilst they cross, and just do not see or hear an approaching train until it is too late.

12.9 This area is well known for cyclists and cycle clubs so the likelihood of cyclists using the proposed footpath level crossing is high. This means this could be considered a sight for vulnerable usage and therefore the traverse of the crossing would need to be increased meaning less sighting achieved on an already deficient site due to the track curve.

12.10 With vulnerable usage, the ideal sighting would become 545m resulting in the down side sightings becoming borderline non-compliant (at 550m).

12.11 A study and information presented by the Rail Safety and Standards Board (RSSB), ("User observations at UWCs") suggest that approximately 25% of dog walkers failed to use a leash or any other form of dog restraint when using a level crossing. This can cause the owner to become temporarily distracted with their animal, rather than the hazard that may be presented by a fast-approaching train. The RSSB evidence base shows that a majority number of near misses with trains involve owners of unrestrained dogs.

13. Incident History at Footpath Crossings

13.1 This line of route attracts many train enthusiasts. Known issues of misuse have arisen with members of public congregating at crossings on this line to take photos of approaching trains whilst dangerously having their back turned to the side that trains approach them. It is known dangerous distraction such as this that render

people vulnerable as they may not hear a train horn sounded before the train is upon them.

13.2 It can reasonably be assumed that many incidents of misuse go unreported. Discussing the level crossing with members of the local community and local users is sometimes the best intelligence gathering that can be gained. This process is in accordance with Network Rail's level crossing guidance LCG02v3.

13.3 Trains will cross each other along this line. A commuter passenger train approaching the crossing from the up direction can be wholly obscured to a user on the down side by a slow-moving freight train on the down, having just passed over the crossing. A user may then step out behind the freight train as it passes, and directly into the path of the commuter train. Some freight trains can be over 200 metres in length and can easily hide the shorter commuter trains of 45 metres for some considerable time.

13.4 A freight train could approach the proposed footpath crossing at a slower line speed and could be seen and heard by a user who may be familiar with the line, knowing the train will take more than 20 seconds to reach the crossing. The user may consider that's ample time to cross safely and step out. However, such a scenario can lead to a fast-approaching train travelling on the other line being 'hidden' from the user's sight by the slow freight train. The user could then feasibly walk directly into the path of a 85mph fast train without even realising it is bearing down on them.

13.5 In his Order Decision relating to Alphington Public Footpath Level Crossing, the Inspector noted in his OD, at paragraph 15, that:

> *15. I consider first the current situation, noting that for any sensible and fully mobile adult following the injunction to stop, look and listen, Alphington crossing would present a very low risk of harm – it is reasonably safe. Not all adults, however, and perhaps fewer children, are fully mobile and sensible, and their safety as users of the crossing must be considered as well. I note here that while I was looking at the crossing, a high speed train went past on the down line, having correctly whistled at the whistle board just south of the Clapperbrook Lane East Bridge. After it had passed to the south of the crossing, on a gentle left hand curve, it obscured the view of an approaching train on the up line, and completely masked the sound of its whistle, so that the train on the up line only came into view, with no apparent audible warning, when it was roughly 300 metres from the crossing. This situation cannot happen very often, but I consider it potentially hazardous.*

13.6 The sighting on the up side of the track at this proposed footpath crossing is severely hampered by the notable track curve. This is an acute concern for such scenarios

in 3.11.4 occurring. The ideal sighting cannot be achieved and so the safe scenario is to not instate a footpath level crossing at this site.

14. Railway Incidents at Similar Public Level Crossings

14.1 Arguments around the risk at level crossings are often based on comparison to risk on the road network and the perception that the likelihood of being killed at a level crossing is low. In the 12 months from April 2017 – March 2018, 6 people were killed at level crossings, 4 of these pedestrians – *Annual Safety Performance Report 2017-18, RSSB*. Whilst this is low when compared to road deaths, analysis from Network Rail and Department for Transport data shows that if an average walking trip includes a level crossing, the fatality risk to pedestrian is about double the risk of an average walking trip without a level crossing. Unlike crossing a road, where motorists can swerve and brake and vehicles are lighter than trains, the consequences of being struck by a train are almost always very serious if not fatal.

14.2 There have been many accidental fatalities at similar level crossings in Britain. With three fatalities recorded in 2017, the number of pedestrian users killed at level crossings in 2016/17 was seven. Five of the pedestrian fatalities occurred at footpath crossings.

14.3 In 2017/18 there were seven fatalities at level crossings and 405 significant incidents. This is similar to the number of incidents from the previous year (413).

14.4 The number of pedestrian and cyclists accidentally killed at level crossings from 1st April 2006 through to the date of my evidence stands at 78.

14.5 Notwithstanding a sustained country-wide campaign to educate people of the dangers of crossing, the level of deliberate or accidental misuse still remains unacceptably high. Network Rail has evidence from all level crossing accidents which shows a clear relationship link between the numbers of near-miss events at level crossings and the number of accidents where a train collides with a vehicle or pedestrian. The more near-miss events that happen at a level crossing the more likely a serious accident is to happen. This is aligned to the principle of basic safety management. Therefore, not instating a railway footpath crossing represents the best option in safety terms.

14.6 This reflects ORR advice to Network Rail that new, on the level crossings may only be introduced in exceptional circumstances.

14.7 RAIB has investigated 21 fatal incidents and reviewed others, involving pedestrians at level crossings on Britain's main line railways since it became operational in October 2005:

i. A pedestrian was fatally injured on Barratt's Lane No.1 footpath crossing near Attenborough on 21 November 2005. It was concluded reduced visibility from the fog and the impaired hearing of the pedestrian were the main cause (RAIB report 13/2006)

ii. Two pedestrians were struck and fatally injured on Elsenham station level crossing on 3 December 2005. The teenage girls were waiting for the train to pass at the station level crossing, then stepped out into the path of a fast moving train travelling in the opposite direction on the adjacent track, and which was 'hidden' from their view because of the first train. (RAIB report 23/2006)

iii. A cyclist was struck and seriously injured on Scate Moor bridleway crossing between York and Harrogate on 8 January 2006 (RAIB report 06/2006)

iv. A pedestrian was struck and fatally injured on West Lodge user worked crossing, Haltwhistle, on 22 January 2008. He was making a delivery to the adjacent property and had already crossed over the railway twice, before being hit by the train. (RAIB report 01/2009)

v. A pedestrian was struck and fatally injured on Tackley Station crossing on 31 March 2008 when she stepped onto the crossing directly into the path of an approaching train. The report stated that with restricted sighting the deceased was unaware of the approaching train until after she had committed herself to using the crossing, possibly being unable to hear its approach (RAIB report 09/2009)

vi. A pedestrian was struck and fatally injured on Moor Lane footpath crossing, Staines, on 16 April 2008. The report found that the pedestrian did not stop, look and listen before stepping out onto the crossing and then fell to the ground on the crossing deck. He was unable to avoid being struck by the approaching train (RAIB report 27/2008)

vii. Two pedestrians were struck and fatally injured on Bayles and Wylies footpath crossing, Bestwood, on 22 November 2008. They were unaware of the oncoming train as they crossed in front of it, until it was too late (RAIB report 32/2009).

viii. A local resident and frequent user was struck and fatally injured whilst walking her dogs at Fairfield footpath crossing, Bedwyn, on 6 May 2009 (RAIB report 08/2008)

ix. A pedestrian was fatally injured on Gipsy Lane footpath crossing, Needham Market, on 24 August 2011. The train driver reported that he had seen a person on the crossing but that when he sounded the train's horn the pedestrian continued to cross and was struck. (RAIB report 15/2012)

x. A pedestrian was fatally injured on Mexico footpath crossing, near Penzance on 3 October 2011. On approaching the crossing round a curve, the train driver observed a person standing to the side of the line and sounded the warning horn a 2nd time. However, the pedestrian attempted to cross and was struck (RAIB report 10/2012).

xi. An accident where a pedestrian was fatally injured on Johnson's footpath crossing, near Bishops Stortford on 28 January 2012. The pedestrian started to walk over the crossing into the path of the approaching train, despite warnings provided by a red miniature stop light and an audible alarm (RAIB report 27/2012).

xii. A fatal accident that occurred on Kings Mill No.1 bridleway crossing, Mansfield, Nottinghamshire, on 2 May 2012. Whilst riding his cycle and listening to music on earphones whilst wearing a hoodie, he did not stop or dismount and cycled directly into the path of an approaching train travelling at 56mph. He missed the train's warning horn and did not hear the warning shouts from other pedestrians. He was unaware of the approach of the train (RAIB Report 01/2013).

xiii. A pedestrian was struck and fatally injured on Bayles and Wylies footpath crossing, Bestwood, on 28 November 2012. The young

person was crossing behind friends, who moved into the path of an approaching tram, on the crossing. It was reported that she appeared to be unaware of its approach despite its horn being continually sounded as she walked onto the track. This was the 2nd fatality at this crossing (RAIB report 32/2009).

xiv. A cyclist rode onto the crossing and was struck and fatally injured by a passenger train travelling at 100mph over Motts Lane Bridleway level crossing, Witham, Essex, on 24 January 2013. It was dark at the time but the MSLs at the crossing were showing red and the audible warning was sounding (RAIB report 01/2014).

xv. A pedestrian was fatally injured on Barratt's Lane No.2 footpath crossing near Attenborough on 26 October 2013. The train was travelling from Nottingham towards Birmingham; but at the same time there was a 2nd train travelling from London to Nottingham at a slow speed having stopped at signals. It was believed the pedestrian had concentrated her attention on the slower moving 2nd train and did not notice the faster train approaching from the opposite direction (RAIB report 18/2014).

xvi. A cyclist was struck and killed at Cattishall pedestrian level crossing, near Bury St. Edmonds on 24 March 2014. It is believed the cyclist had dismounted before being struck.

xvii. A motor cyclist was struck and fatally injured by a train on Frampton level crossing, Gloucestershire, on 11 May 2014. The rider was crossing the railway on a trail bike, designed for off-road use. He was the last of a group of three riders who had reached the level crossing along an unsurfaced track leading from a minor road near the village of Sapperton. They were not authorised to use vehicles on the crossing. (RAIB report 05/2015)

xviii. On 27th August 2014 the train driver reported striking a girl with a dog on Fisherman's path level crossing at Freshfields, Southport. The pedestrian was walking her dog over the crossing when it ran onto the tracks; she chased it and both were struck by an oncoming train.

xix. A pedestrian was killed when he walked out in front of an approaching train at Cannons Mill level crossing on 8th April 2015. He seemed to momentarily freeze on seeing the approaching train, then tried to move out of the way at the last minute, but was fatally struck by the train.

xx. A second fatality occurred at Fishermans Path on 21st January 2016, when the driver reported the 54 year old man had stepped out in front of the train at the level crossing on the "Down Southport Line."

xxi. On Tuesday 23rd February 2016, a pedestrian was struck and fatally injured by a train on Grimston Lane footpath level crossing in Trimley St Martin, Suffolk. The driver sounded the train's warning horn soon after first seeing the pedestrian. The pedestrian raised his arm in apparent acknowledgment of the horn and continued to cross in front of the train. It is not possible to be certain why the pedestrian started to cross the railway when he had insufficient time to do so. The RAIB has concluded that he was either unaware of the train at the time he decided to cross, or that he misjudged the time he needed (RAIB report 23/2016).

xxii. On Wednesday 5th October 2016 a mobility scooter was struck by a train, and the scooter user fatally injured, at Alice Holt footpath crossing, Bentley, Hampshire. It is uncertain why the user decided to cross when it was unsafe to do so, as CCTV images suggest that he had previously crossed in a safe manner. It is probable that the user did not see the train or misjudged when it would arrive at the crossing, perhaps due to sun glare, when deciding to cross. The mobility scooter user's opportunity to see the approaching train was limited by the design of Alice Holt crossing, in particular the fencing. The mobility scooter user did not react to the train's horn, possibly because he did not hear it (RAIB report 14/2017).

15. The Options for a Footpath Level Crossing and Cost-Benefit Analysis

15.1 There are precursor events that happen every day across the network and Network Rail has a legal and moral duty to keep people safe if it is reasonable practicable to do so.

15.2 In order to assist this Inquiry I have undertaken modelling based on a footpath crossing (East Dean) which is on the same line, but with adequate sighting; to demonstrate the effect on a risk score of different options including:

15.3 Miniature Stop Lights (MSLs): after a complete closure of a crossing, these offer the next highest level of protection. However, these would not adequately control the risk as this leaves an inappropriate and unsatisfactory dependency upon all users having to constantly obey the lights and signage. Experience at other crossings firmly indicates that we cannot entrust all users to safely obey these safety indications. This is affirmed by robust research which unequivocally shows, if apparently counter-intuitively, that the highest rate of collisions occurs at footpath crossings with MSLs *in situ*. This could in part be due to MSLs usually being

installed at crossings with a high risk and a high number of users. Nonetheless, this is evidenced fact.

15.4 Supplementary Audible Warning Device (SAWD): the SAWD product is designed to assist in alerting footpath and bridleway crossing users of the imminent approach of a train. The product monitors for trains approaching whistle boards using a radar speed detector which transmits a wireless signal to the footpath crossing receiver unit to play a recording of a two-tone train horn through a speaker. This operates as a supplement to existing controls as it cannot be relied upon to operate with every passage of a train. As a result, whistle boards cannot be removed. The key benefit of the system is that it provides mitigation during the night time 'quiet period', although the overall risk reduction is small.

15.5 Full barrier crossing: this option would not be considered suitable for a footpath crossing and was therefore discounted. Full barrier crossings are designed for road crossings with vehicular use.

15.6 Stepped footbridge: Whilst this would eliminate the risk, a footbridge would need to be Equality Act compliant, and require significant land space to construct. This is not however deliverable, due not least to the considerable cost versus the risk reduction (the cost benefit analysis). It has been discounted.

15.7 Subway: this would close the crossing and eliminate the risk. This is however not deliverable, due not least to the considerable cost versus the risk reduction (the cost benefit analysis). It has been discounted.

15.8 The engineering side of such options ordinarily must be investigated in further detail within a Pre-GRIP Feasibility Study document. No such investigation has taken place because these options have already been reasonably discounted. Nevertheless, there is no evidence to suggest feasibility in engineering and land constraint terms.

15.9 Reduction in line speed: this would provide users with additional warning time of approaching trains and could improve safety. However, research into human behaviour confirms that people find it difficult to contextualise speed with large objects. Indeed, too much warning time can have a detrimental impact on risk because people are more susceptible to underestimating train speeds. This can cause people to make a decision to cross at the wrong time. Network Rail is also bound by its Operating Licence which as the operator and owner of the national rail infrastructure, has a key role to play in railway safety and improving railway performance and efficiency. Reducing line speed would impact existing services and have a knock-on effect for train performance.

15.10 The options modelled to improve safety are limited. The cost benefit analysis (CBA) does not provide a safety benefit for the installation of MSL or SAWD and

neither of these options fully controls the risk. A footbridge or subway within Network Rail land are technically feasible options. However, all will incur considerable high costs, be time consuming and would require bespoke design to deal with both planning and topographical constraints. Therefore, the footbridge, subway, MSL and SAWD options have each been rejected as grossly disproportionate against a safety benefit.

15.11 The following CBA criteria are used to support decision making:

i. Benefit to cost ratio is ≥ 1: positive safety and business benefit established;
ii. Benefit to cost ratio is between 0.99 and 0.5: reasonable safety and business benefit established where costs are not grossly disproportionate against the safety benefit; and
iii. Benefit to cost ratio is between 0.49 and 0.0: weak safety and business benefit established.

Option	Current ALCRM	Current FWI	New ALCRM	New FWI	Reduction in FWI	Project Cost (£)	Project life (yrs)	Benefit cost ratio
MSL*	**C5**	**7.11E-04**	**D5**	**5.04E-04**	**2.07E-04**	**150,000**	**35**	**0.04**
Footbridge*	**C5**	**7.11E-04**	**M13**	**0**	**7.11E-04**	**1,700,000**	**60**	**0.01**
SAWD*	**C5**	**7.11E-04**	**C5**	**6.07E-04**	**1.04E-04**	**25,000**	**10**	**0.05**
Full Barrier Crossing*	**C5**	**7.11E-04**	**E7**	**6.34E-05**	**6.48E-04**	**2,032,190**	**60**	**0.01**
Subway*	**C5**	**7.11E-04**	**M13**	**0**	**7.11E-04**	**4,000,000 - 6,000,000**	**60**	**0.01**

**all options would incur ongoing maintenance costs; all costs are low end estimates*

15.12 Even if alternative mitigation measures were to be installed to reduce risk, Network Rail is required to balance its whole portfolio of risk and justify additional expenditure when a safer alternative, removing all risk of an incident with a train, at lower cost, is available. The cost-benefit analysis clearly shows that the expenditure is grossly disproportionate to the benefit received.

15.13 As a Government funded organisation, Network Rail has a direct requirement to adhere to 'Managing Public Money'. Network Rail was re-classified as an arms-length Government body in September 2014. Network Rail must ensure that it manages public money responsibly, which includes adhering to the principles, rules, guidance and advice set out by Government. Network Rail is unable to properly spend public money without first satisfying itself that the expenditure is justifiable. With a defined budget over each 5-year control period, money that is unnecessarily spent where there are more practical alternatives realising a higher benefit at a lower cost, cannot be spent elsewhere, for other projects that also need investment. Unjustified expenditure is therefore not acceptable.

15.14 Below are paragraphs from "*Managing Public Money*" to which Network Rail must adhere:

> "*Because commitments can evolve into spending, they should always be scrutinised and appraised as stringently as proposals for consumption. Some departments may agree with the Treasury blanket authority for defined and limited ranges of non-statutory commitments, e.g. indemnities for board members and commitments taken on the normal course of business. All other non- statutory commitments are novel, contentious or repercussive, so Treasury approval is always essential before they are undertaken* (para 5.5.2)…
>
> *Public sector organisations may be able to deliver public services more successfully if they work with another body. Central government departments may find it advantageous to delegate certain functions to ALBs that can be free to concentrate on them without conflict of interest. Or it may be helpful to harness the expertise of a commercial or civil society sector organisation with skills and leverage not available to the public sector* (para 7.1.1);
>
> *Any such relationship inevitably entails tensions as well as opportunities. The autonomy of each organisation needs to be buttressed by sufficient accountability to give parliament and the public confidence that public resources are used wisely* (7.1.2)…
>
> *To promote better delivery and enhance efficiency, departments often find it useful to work with other government departments. This can make sense where responsibilities overlap, or both operate in the same geographical areas or with the same client groups – arrangements loosely categorised as joined up government. Such arrangements can offer opportunities for departments to reduce costs overall while each partner plays to its strengths* (7.5.1)*"*

16. Conclusion

16.1 Network Rail is subject to the requirements of the Health and Safety at Work Act etc. 1974 to reduce risk so far as is reasonably practicable. This means, consistently with Network Rail being an 'arms-length' public body and the costs/benefit analysis, that the cost, resourcing and time required to implement a dedicated risk reduction measure needs ultimately to be commensurate with the safety benefit identified as being ascertainable in consequence of its implementation.

16.2 Network Rail's system for health and safety management (forming part of its safety authorisation, regulated by the ORR) sets out the company's approach to the prioritisation of safety expenditure.

16.3 In November 2013 Network Rail was questioned in Parliament by the Transport Select Committee over the safety of level crossings and were challenged to close crossings wherever feasible. In its subsequent published report the Select Committee recommended that the Office of Rail Regulation adopt an explicit target of zero fatalities at level crossings by 2020.

16.4 Separately from the unacceptable risk to safety posed by installing a footpath level crossing, and to the application of cost/benefit analysis (which also strongly militates against the installation of a safe crossing), not to install a footpath level crossing in the present case would give rise to no or no material inconvenience. The route over the crossing would largely be characterised as 'recreational' (e.g. serving recreational, circuitous walking, etc.), with any inconvenience being notably less than, say, if the route incorporating the crossing formed part of a necessary or highly commodious, strategic route for users to travel between primary destinations or key facilities (e.g. from home to school).

16.5 Whilst Network Rail remains mindful that a not insignificant degree of risk will always be presented by level crossings, in accordance with the above discussion it has nonetheless proceeded to fully assess the safety and cost/benefit implications of, and all contextual matters relevant to, the question of whether a railway crossing should be installed in the present case. It is Network Rail's firm conclusion that a footpath crossing should not be installed.

STATEMENT OF TRUTH

To the best of my knowledge, the matters stated in this Proof of Evidence are true.

Signed:

Amanda Ingram

Dated: 9 October 2018