



Clare Hall

PROPOSED CAMBOURNE TO CAMBRIDGE BUSWAY – BIN BROOK CROSSING AND IMPACT ON CLARE HALL

Rebuttal to Acoustics Proof of Evidence by Toby Lewis
Jonathan Blacklock, BEng (Hons), CEng, MIOA, MCIBSE

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DOCUMENT AND QUALITY CONTROL

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1.0 QUALIFICATIONS AND EXPERIENCE

- 1.1 My name is Jonathan David Blacklock. I hold a Bachelor of Engineering (with honours) degree in Engineering from the Coventry University. I am a qualified Chartered Engineer.
- 1.2 For specific details, please refer to my details within my main Proof of Evidence (Core Document CD26-08-W4-1)

Witness Declaration

- 1.3 I hereby declare as follows;
- 1.4 This rebuttal document includes my review of the Proof of Evidence provided by Mr Toby Lewis of WSP (Core Document CD26-01-APP-W11-1) and the facts which I regard as being relevant to the opinions which I have expressed, and the Inquiry's attention has been drawn to any matter which would affect the validity of that opinion.
- 1.5 I believe that the facts which I have stated in this rebuttal document are true and that the opinions expressed are correct.
- 1.6 I understand my duty to the Inquiry to help it with matters within my expertise and I have complied with that duty.



Jody Blacklock
BEng (Hons), CEng, MIOA, MCIBSE

2.0 INTRODUCTION

Scope of Rebuttal Evidence

- 2.1 Create Consulting Engineers Ltd has been instructed to review the Proof of Evidence (Core Document CD26-01-APP-W11-1 henceforth referred to as 'WSP PofE') prepared by Toby Lewis, of WSP, in support of the application for the proposed Cambourne to Cambridge Busway, referred to as the Proposed Development.
- 2.2 This rebuttal has reviewed the entire WSP PofE but has focused in particular on the paragraphs 4.3.1 through to 4.3.71 which relates directly to the supplied Statement of Case (Core Document CD23-17 OBJ-213 SoC).
- 2.3 The application under inquiry is the Cambourne to Cambridge Order (REF: DPI/E0535/25/1) and involves the implementation, operation and maintenance of a guided busway between Cambourne and Cambridge.
- 2.4 The application was made by Cambridge City Council in conjunction with Greater Cambridge Partnership.

3.0 COMMENTS BY WSP AND RESPONSES FOM CREATE

Overview of Section 3. Noise and Vibration of CD26-01-APP-W11-1

3.1 The WSP PofE was written by Toby Lewis and the most relevant sections of the document are sections;

- 3 Noise and Vibration,
- 4 Representations Made Relevant to the WSP PofE and
- 5 Conclusions.

3.2 The majority of section 3 of CD26-01-APP-W11-1 lays out the relevant policies that the ES chapter for noise and vibration (Code Document CD1-11.01) has made reference to within the main body of that report. These include the National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE).

3.3 Paragraph 3.2.7 introduces the concept of the Lowest Observed Adverse Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (SOAEL) as detailed within the Design Manual for Roads and Bridges (DMRB LA111) which has been replicated below;

Time Period	LOAEL	SOAEL
Day (06:00 – 24:00)	55 dB $L_{A10,18h}$ façade	68 dB $L_{A10,18h}$ façade
Night (24:00 – 06:00)	40 dB $L_{night, outside}$ free field	55 dB $L_{night, outside}$ free field

Table 3.1: Excerpt of Table 3.49.1 – Operational Noise LOAELs and SOAELs

3.4 Paragraph 3.2.8 of the WSP PofE explains the reasoning behind the change of the LOAELs and SOAELs for the daytime, to account for the conversion to $L_{Aeq,16h}$ from $L_{A10,18h}$, the results of which are below in Table 3.2.

Time Period	LOAEL	SOAEL
Day (07:00 – 23:00)	50.5 dB $L_{Aeq,16h}$ free field	63.5 dB $L_{Aeq,16h}$ free field

Table 3.2: Excerpt of Table 3.49.1 – Operational Noise LOAELs and SOAELs With Correction Applied

3.5 Paragraph 3.6.16 of the WSP PofE explains that the night time noise levels from the guided busway could be reduced further through the use of fuel cell electric buses, because they are relatively quiet at low speeds.

3.6 The paragraph also states that the speed limit at Clare Hall will be 20 mph. Sheet 17 of 17 of the Proposed Site Plans (Core Document C1-16.04) however shows that the speed limit will increase from 20 mph to 30 mph on Rifle Range Road, outside the Brian Pippard Building.

3.7 The document referred to by WSP¹ (Core Document CD15-09) suggests that there would be no reduction in noise levels at a speed of 30 mph, and only a minor reduction at approximately 25 mph as the buses are accelerating.

¹ CD15-09 Modelling Noise Reductions Using Electric Buses in Urban Traffic Case Study 2019

Comments made specifically in relation to the Statement of Case (CD23-18-2 OBJ-213 Clare Hall)

General Observations

- 3.8 Paragraph 4.3.3 of the WSP PofE agrees with my comment that there may be adverse noise impacts from the construction of the scheme but explains that through the implementation of the CoCP (CD1-26) and the Local Environmental Management Plan (LEMP), which would be conditioned if approved, these impacts would be minimised.
- 3.9 It must be noted that at this stage, there are no details available about what mitigation will be included to minimise the potential adverse noise and vibration impacts during the construction works.
- 3.10 Paragraphs 4.3.6 and 4.3.7 of the WSP PofE states that the description of the glazing and ventilation on some of the building façades is immaterial. I disagree with this assertion. When Clare Hall was built, the acoustic climate was such that external sound levels did not warrant a high degree of sound insulation, as mentioned in paragraph 9.18 of my Proof of Evidence (CD26-08 OBJ-213 Clare Hall). Higher levels of noise externally will most likely have an adverse impact on the residents and users of Clare Hall and its associated buildings.
- 3.11 Additionally, given that the ventilation systems within the Clare Hall building and the accommodation suites consist of a wooden shutter with weatherline louvres, these will not perform as well as the more standard acoustic trickle vents which are more widely used in modern constructions as demonstrated within paragraphs 6.40 through to 6.44 of my Proof of Evidence.
- 3.12 Paragraph 4.3.9 of the WSP PofE explains that there are 9 receptor points included in the WSP Plate TRI-5-1. This was missed because the image was too small and densely populated imagery. I accept this correction.

Baseline Acoustic Environment

- 3.13 Paragraphs 4.3.12 through to 4.3.14 of the WSP PofE provide a more detailed explanation of the meteorological conditions during the WSP baseline survey. Without having this information in the early stages of our assessment, there was a high degree of uncertainty associated with the baseline sound levels provided within CD1-11-01, so I instructed my colleague Sam Ward, MloA, to undertake additional baseline sound measurements, leading to additional costs for my client. Given the meteorological data which has now been provided in the WSP PofE, I would agree with the baseline conditions provided in the WSP PofE.
- 3.14 Paragraph 4.3.15 of the WSP PofE refers to a lack of detail available at the time of requesting information on baseline noise measurements carried out by Create. As I explained in my email to Toby Lewis on the 1st July 2025, at that time this information was not available, and that it was work in progress and was to be included within my Proof of Evidence (CD26-08-W4-1). I issued a summary of the information within the email. The more detailed information has been included in my Proof of Evidence in paragraphs 6.14 through to 6.27 and all data included in Appendix C of my Proof of Evidence.
- 3.15 Paragraph 4.3.17 of the WSP PofE acknowledges that the minor variation in the measured baseline sound levels between WSP and Create was an indication that the WSP measurements were representative, but as I have detailed previously in paragraph 3.14 there was a high degree of

uncertainty associated with the WSP baseline levels in the absence of this important information, thus leading to additional costs for our client.

Noise Levels of Buses

- 3.16 Paragraph 4.3.18 of the WSP PofE refers to a lack of detail available at the time of requesting information on the bus noise measurements carried out by Create. As I explained in my email to Toby Lewis on the 1st July 2025, at that time this information was not available, and that it was work in progress and will be included within my Proof of Evidence (CD26-08-W4-1). I issued a summary of the information within the email. The more detailed information has been included in my Proof of Evidence in paragraphs 6.30 through to 6.36 and all data included in Appendix D of my Proof of Evidence.
- 3.17 Paragraphs 4.3.19 through to 4.3.21 of the WSP PofE refers to the measurements carried out by Create with measurements taken included buses stopping, turning and pulling away. These are all relevant to my Proof of Evidence, as the stretch of the guided busway along Rifle Range Road will see the buses stopping and starting, and accelerating and decelerating for the traffic lights, as shown on Sheet 17 of 17 of the Proposed Site Plans (Core Document C1-16.04). The buses will be turning into and from Grange Road. I therefore disagree and am of the opinion that all bus measurements taken by Create were valid and relevant to this investigation.
- 3.18 Comment has been made by Mr Lewis in paragraph 4.3.20 of the WSP PofE, with regards this section of the busway not having the guides fitted. This was not apparent and had not been included in the evidence reviewed and has only come to light following the submission of the WSP PofE (Core Document CD26-01-APP-W11-1). Guided busways have a pair of small guide wheels which run along the vertical face of the guideway, however these are not the primary source of noise. Instead, the dominant noise comes from the bus's engine, exhaust, tyres and to a lesser extent air resistance. I am therefore of the opinion that the removal of the guides along this section will not result in a material change to my assessment due to the more dominant noise sources still being present.
- 3.19 Mr Lewis also stated at the end of paragraph 4.3.21 of the WSP PofE that the lowest measurement was attributed to a diesel bus. This is correct, however the highest measurement was also attributed to a diesel bus. I therefore consider that the final sentence is misleading and immaterial.
- 3.20 In paragraph 4.3.22 of the WSP PofE it has been correctly recognised that the calculations have assumed a line source, which does indeed provide a lesser level of reduction than that for a stationary point source. When representing road noise on the noise propagation software, CadnaA, it is usual practice to use a line source, as this is equivalent to a moving point source over time, even during periods of low traffic flow. In turn the propagation characteristics behave the same as a line source which is important when considered sound levels over distance. The material change in the noise model software used is the assumed sound power of the line source, and this was calibrated to a known position. The average SEL was still calculated to be relatively close to that used by WSP, so I would suggest that this is of minor importance.
- 3.21 In paragraph 4.3.24 of the WSP PofE, Mr Lewis refers to the busway as being a straight section with a 20 mph speed limit. Therefore it is likely that the buses will be travelling more slowly and steadily than the majority of the measurements taken for our investigation. The Clare Hall campus extends down the entirety of Rifle Range Road until the junction with Grange Road which has been shown will include traffic lights at the junction and that the speed will increase to 30 mph at the Brian Pippard building. Therefore I disagree and would suggest that all measured bus movements were valid and relevant.

- 3.22 In paragraph 4.3.26 of the WSP PofE considers that the measurements by Create and WSP were “reasonably consistent” which would suggest that any concerns raised in paragraphs 4.3.21 through to 4.3.25 are now immaterial and of minimal significance.

Façade Sound Insulation Measurements

- 3.23 Paragraph 4.3.28 of the WSP PofE refers to the sound insulation measurements across the façade which states that “because the 13 dB Dw value cited by Create is far too low to be credible, which suggests that the test method has been incorrectly applied, or the data misinterpreted”.
- 3.24 I strongly disagree with this statement. The measurements were conducted by my colleague Mr Ward, who is a full member of the Institute of Acoustics and is a credible acoustician. The results were rated as per the applicable standards and criteria. The extremely low results were mainly caused by the unit ventilators, which have an open area equivalent to that of a partially open window. It is generally accepted that a partially open window provides approximately 15 dB reduction, as used by WSP. A sound reduction measurement of 13 dB for such large vents would appear to be realistic and therefore substantiates my position on why 13 dB reduction has been referred to.
- 3.25 They were indeed very low levels of sound insulation and have been attributed to a number of reasons. The vents were fully open during the test which resulted in the 13 dB reduction. As can be seen in Figure 6.6 of my Proof of Evidence, the vents are large louvres on the side of the window and are simply left open or closed. In addition, the entire building structure is of a lightweight construction, including the walls, single glazed windows and the roof. There is currently no requirement for upgraded sound insulation across these façades so the building structure is suitable for the existing acoustic climate.
- 3.26 In paragraph 4.3.30 of the WSP PofE questions the accuracy of the British Standard 16283-3. The document produced by Mr Jack Harvie-Clark et al (core document CD15-08) suggests that the Element Loudspeaker Method and the measurement of outdoor to indoor measurements over a 25 day period are not reliable. The loudspeaker method is a well-established, and industry standard, method for undertaking “on the spot” measurements of the sound insulation of a building façade. Measuring the sound levels over a 25 day period is simply not realistic given the additional costs and timescales associated with this method.
- 3.27 The same document by Mr Jack Harvie-Clark also reviews laboratory testing (which is not possible for in-situ glazing), field measurement with road traffic as a noise source (which in this instance is not possible to get an adequate difference above the background as the existing acoustic climate is too quiet) or theoretical assessments (which carries a large degree of uncertainty). In my expert opinion, the loudspeaker method is the most suitable and accurate for measuring the façade insulation for this particular situation where other methods are not available or practicable.
- 3.28 Mr Lewis stated in paragraph 4.3.33 that “vents will generally provide far better acoustic insulation than open windows”. This is a correct statement. Modern “trickle vents” do generally provide far better acoustic insulation than open windows, but in this instance, the vents at Clare Hall have a large open area which is greater than that of the partially open window. In this instance therefore, the windows and ventilation will not perform as a typical arrangement. In the same paragraph Mr Lewis states that testing of windows or vents is not necessary for this assessment. I would agree with this in principle, but I have however shown that these are not standard windows and vents, so I feel that this is a fully robust assessment, taking this into consideration.
- 3.29 For many developments the assumption of 10-15 dB reduction may be applicable, but it is clear that this assumption does not hold true in this instance.

Construction Noise

- 3.30 In paragraph 4.3.34 of the WSP PofE Mr Lewis has explained that Plate TRI-5-3 of CD1-11.01 only refers to the receptors thought to be impacted by the works at the replacement Bin Brook Bridge crossing. I am still of the opinion that the construction noise will adversely impact the residents and users of Clare Hall campus along the length of Rifle Range Road, as explained in more detail within Chapter 7 of my Proof of Evidence (Core Document C26-08-W4-1).
- 3.31 Paragraph 4.3.26 of the WSP PofE suggests that handheld pneumatic breakers would only be used at the section of the busway at the junction of Grange Road and Rifle Range Road. For reference, the junction of Grange Road and Rifle Range Road is adjacent to the main library building on Clare Hall. The omission of the breakers is accepted, but my concerns remain that the level of construction noise is still seriously understated, as there has been no consideration for additional plant which will be required, including dump trucks whilst they are empty, road planer, HGVs removing waste/spoils from the site, HGVs arriving with new hardcore, tarmac and concrete, or the use of rollers.
- 3.32 In my expert opinion even without the handheld breakers being included, the noise levels would still be excessive inside the properties and out in the amenity spaces.
- 3.33 In paragraph 4.3.38 of the WSP PofE Mr Lewis states that even using the higher sound level predictions, this would not result in a higher incidence of significant adverse effects, based on the ES criteria of not exceeding 10 days in any 15 consecutive days. I am of the opinion that stating that the works will not exceed this duration criteria provides a more favourable outcome for the applicant, as opposed to considering the possibility that works could occur for longer. Whilst I understand Mr Lewis' opinion on this, I believe 10 days in any consecutive 15 days will most likely be exceeded along Rifle Range Road, outside Clare Hall.
- 3.34 It has not been mentioned in any evidence provided by WSP that the only Accommodation Works is to be located adjacent to the Brian Pippard Building. This is a significant fact as this is the only such area shown on the proposed plans so will presumably be used for the entire duration of the works. These areas commonly include security huts (manned 24 hours per day so will need power and lighting), material deliveries, material removal, workers accessing and egressing the site, vehicles turning and laybys for material storage etc.
- 3.35 It is accepted that WSP have stated that the noise from the main construction works may not last for more than 10 days in any consecutive 15 days. There will however be noise generated from the Accommodation Works area continuously, which has been shown to be situated directly outside the Brian Pippard Building and Clare Hall, which will presumably run continuously for the duration of the construction project.
- 3.36 In paragraph 4.3.41 of the WSP PofE reference is made to the implementation of the CoCP and that the appointed principal contractor would be expected to prepare a LEMP, which "if necessary this LEMP could control the timings and durations of the works as well as the noise levels". This is of paramount importance as this appears to be the only method proposed, at this time, of reducing the effect of the construction noise and reducing it from a Significant Adverse Impact for the majority of the residential dwellings and study areas within the Clare Hall campus.
- 3.37 As stated in paragraph 3.21 of the DMRB (CD15-05) , there are two types of mitigation for construction noise which **shall** be incorporated into the design of the construction project, which are;

1. *“Best practice noise mitigation techniques to minimise the generation and impact of noise applied to all construction activities;*
2. *Specific noise mitigation measures to reduce the noise impact from activities which result in moderate or major magnitude of effect.”*

- 3.38 The first point within the DMRB relates to the CoCP and the LEMP. Typically, a LEMP is still quite a generic document, of which I have included an example of one prepared for the HS2 (Document No: IMC08-BBV-EV-PLN-N000-000026²) in the appendices of this rebuttal document. It can be seen that there are no specific mitigation measures made within the document. Therefore, in my opinion, the preparation of a LEMP will not suitably mitigate the construction noise I have predicted will occur at the properties within Clare Hall, as detailed within my Proof of Evidence.
- 3.39 The second point within the DMRB refers to specific noise mitigation measures. By definition, this would involve WSP proposing suitable mitigation measures to protect the users and residents of Clare Hall from the extremely high anticipated noise levels resulting from the construction noise. This is an important factor as I need to understand the feasibility of the mitigation at this stage, before any decisions are made. I would like to see an appropriate pre-commencement planning condition requiring the details for mitigation, and the anticipated noise levels post mitigation be provided. This would include a detailed assessment of both construction noise and vibration at the worst impacted properties and provide specific mitigation measures to reduce the impact from the proposed works. This would typically be established through the use of a Section 61 application under the Control of Pollution Act 1974.
- 3.40 As the existing ambient sound level falls below the Category A threshold from BS 5228 Part 1, then the noise threshold limits for the proposed construction works should be conditioned so the potential for significant effect is reduced significantly. The noise limits should be set so as to not exceed the Category A threshold values, 65 dB L_{Aeq,12h}.
- 3.41 I do not anticipate that it would be possible, or practicable, to mitigate the noise from the construction and operation of the proposed scheme, without providing additional soundproofing to the affected properties within the Clare Hall campus. I have spoken with Professor Short and Fiona Lamb about the possibilities of retro-fitting mitigation systems, including secondary glazing and passive ventilation, forced ventilation, or ducting fresh air in from the northern façades.
- 3.42 I have been advised that for secondary glazing to be successfully installed, to mitigate the noise from the construction works and operational noise from the passing buses, then the secondary glazing would need to be installed in such a manner as to enable unobscured cleaning and maintenance, reduce the risk of condensation build up internally. New ventilation would need to be added into the Grade II* Listed Building façade overlooking Rifle Range Road and the existing louvres vents be closed off. There are obviously associated costs with the design, supply and installation, as well as the requirement for listed building consent.
- 3.43 I have also been advised on the practicalities, constraints and installation of providing mechanical ventilation. Currently most rooms are naturally ventilated via openable windows and vents. The introduction of mechanical ventilation would need to be reviewed on a room-by-room basis to determine if the required air handling equipment could even be retro-fitted. Due to constraints with the Grade II* Listed Building, it is unlikely that MVAC plant could be added to the sloping roofs due to the visual impact. Floor ventilation via floor ducts is likely to be difficult to retro-fit due to the existing

² Example of LEMP prepared for the HS2. Chapter 13 relates to Noise and Vibration and can be found on pages 39 through to 42 of the document. Can be found at https://assets.publishing.service.gov.uk/media/671bab50956d9b52e8c6d2b3/IMC08-BBV-EV-PLN-N000-000026_WDC_LEMP.pdf

construction and the requirement for breaking out for duct runs. Currently the operational costs of the openable window ventilation scheme are zero and with the introduction of any forced ventilation system would see an increase in operation and maintenance costs. Again, there would be additional costs for the design, supply and installation of any MVAC system.

- 3.44 It would appear that without serious and potentially lengthy investigations and additional works to the Clare Hall campus, there is no simple method for providing the required air changes per hour whilst keeping the windows closed.
- 3.45 As there would appear to be no simple method for material mitigation measures for treating the properties, this further justifies my reasoning for adjustments to the construction proposals and methods and providing secondary mitigation for the operational phase.
- 3.46 Annex E.4 of BS 5228 Part 1 (CD15-01) refers to thresholds used to determine eligibility for noise insulation due to noisy construction works. As detailed in section a) of E.4, this could involve new glazing and ventilation, or providing forced ventilation whilst maintaining appropriate air changes in the room, but in my opinion these would be extreme measures within a Grade II* Listed Building. Table E.2 of Annex E.4 of BS 5228 Part 1 provides the Noise Insulation Trigger Level, which would need to be triggered before noise insulation should be offered by the developer. If the works are predicted to exceed 75 dB $L_{Aeq,10h}$ between 08:00h to 18:00h Monday to Friday, then noise insulation **will** be offered.
- 3.47 As shown in paragraph 7.21 of my Proof of Evidence (CD26-08-W4-1) I have predicted that the construction noise levels at the closest façades and amenity spaces would be approximately 86 dB $L_{Aeq,T}$ for the site clearance and 82 dB $L_{Aeq,T}$ for the Road/Structure Construction phases, both of which significantly exceed the Noise Insulation Trigger Levels. Even with the limited WSP assumed plant, I predict that the construction noise would be 81 dB $L_{Aeq,T}$ for the site clearance phase, using the WSP plant schedule. The WSP predicted noise levels still exceed the Noise Insulation Trigger Levels by 6 dB, so in my opinion makes the inclusion of additional noise insulation to the relevant buildings within Clare Hall worthy for consideration.
- 3.48 Admittedly, this level needs to exceed “a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months” for the Noise Insulation Trigger Levels to apply. As I have stated previously in paragraph 3.35 of my rebuttal, I have not been furnished with a detailed construction plan, however there will be an element of these works running continuously along Rifle Range Road due to the presence of the Accommodation Works area.
- 3.49 In paragraph 4.3.42 of the WSP PofE Mr Lewis lists four reasons why it is immaterial to compare the predicted internal noise levels to those listed in BS 8233. For clarity, the bullet points in bold are the comments made by WSP and the plain text are my responses to these comments.
- **BS 8233 does not include “requirements” but it is guidance.** Although factually correct, Note 2 of Table 4 states that *“the levels shown in Table 4 are based on the existing guidelines issued by the WHO³”*. The levels in the WHO document (thus also BS 8233) have been derived from scientific research conducted on behalf of the World Health Organisation specifically to address the health significance of noise pollution, including adverse effects such as; *“noise-induced hearing impairment; interference with speech communication; disturbance of rest and sleep; psychophysiological; mental-health and performance effects; effects on residential behaviour and annoyance; and interference with intended activities⁴”*. Given the obvious importance of the proposed noise levels within these two important documents, I

³ Quoted from Note 2 of Table 4 within BS 8233

⁴ Quoted from section 3 (page viii of the Executive Summary) in the WHO Guidelines for Community Noise

accept that these are guidance levels, but in my expert opinion, adherence to these internal and external noise levels are important factors for the health and wellbeing of the residents of the Clare Hall campus.

- **BS 8233 is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.** Again, although factually correct, I refer to my comments made to the first point. I believe that the context of materially changing the external noise climate should be a consideration as this will alter the internal acoustic characteristics considerably for these worst impacted properties and I am of the opinion that the change to internal levels is such a large change, that this should be worthy of consideration.
- **The data referred to by Create are based on annual average data and do not have to be achieved under all circumstances.** This refers to the text in Note 3 of Table 4 in BS 8233. The actual text is as follows; *“These levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year’s Eve⁵”*. The examples for periods to be excluded given within Note 3 are for very occasional events, with a short duration. The impacts of the noise levels from these construction activities could be considerably longer durations than a single evening, such as fireworks night.
- **Given the relatively short duration of the proposed works, construction noise would not lead to exceedances of the criteria referred to by Create in any event.** The works along Rifle Range Road will not be for a short duration. As noted in paragraph 3.34 of this document, the only welfare accommodation is to be located outside the Brian Pippard building, so there will be a continuous flow of vehicles, presumably HGVs bringing in raw materials and removing excess spoils for the duration of these works.

3.50 In paragraph 4.3.43 of the WSP PofE, Mr Lewis states that the Create position is “fundamentally flawed”. I stated that the works for the new Bin Brook Crossing would last for longer than 10 days. I agree that I did not state the full text of “that the works would extend beyond 10 or more days or nights in any 15 consecutive days or nights” but that is what I was trying to convey. In paragraph 5.1.10 of the WSP report (CD1-11.01) the wording is “With the exception of works for the travel hub, the retaining walls north of St Neots Road and the construction of Bin Brook Bridge, the construction works are very likely to exceed these duration criteria.” This would suggest that the works for the Bin Brook Bridge will indeed last for longer than the duration criteria without careful consideration and mitigation practices put in place. I am of the opinion that my statement is correct and that it is not fundamentally flawed.

3.51 Paragraph 4.3.45 of the WSP PofE refers to the requirement for additional mitigation during the construction phases whilst close to the Clare Hall campus. Within paragraphs 4.19 and 4.20 my main Proof of Evidence I made reference to additional acoustic treatment through the use of acoustic screening. I also added that a screen is only really useful for the properties on the ground floor, as those on the first floor could still have a direct line of sight to the noisy works, over the top of the screen. Mr Lewis appears to disagree with this recommendation. He also stated that *“I also consider it unnecessary and impractical to seek to predict detailed construction noise levels and mitigation solutions at this stage of the project.”* I believe that this should be carried out at an early stage in order to highlight any potential risks associated with any construction project. I have included my recommendations within both the Statement of Case (CD23-17) and my Proof of Evidence (CD26-08-W4-1) as I feel it is important to note that at the predicted construction noise levels, both outside and inside the properties closest to the works, the levels will warrant additional noise mitigation. Simply

⁵ Quoted from Note 3 of Table 4 within BS 8233

relying on the implementation of the CoCP and the production of a LEMP is, in my opinion, difficult to justify.

3.52 I would expect to see a set of planning conditions relating specifically to construction noise, should this scheme be approved. Within the planning condition, the following points should be included;

- The CoCP will be adopted and the principal contractor will implement a Local Environmental Management Plan.
- A Section 61 application will be made, in line with the Control of Pollution Act 1974, to include a full set of construction noise calculations to the worst impacted properties prior to mitigation. The application will include a detailed list of all mitigation measures anticipated to reduce the noise to sufficient levels, and include the predicted noise levels post mitigation.
- Should the predicted noise levels exceed the Noise Insulation Trigger Levels, then additional mitigation to the most affected buildings within the Clare Hall campus will be offered by the developer.
- Continuous noise monitoring will be taken for the entire duration of time, for as long as works continue along Rifle Range Road. The continuous noise monitoring will include the monitoring of noise levels at The Brian Pippard Building and Clare Hall. Noise monitoring trigger limits will be set at 65 dB $L_{Aeq,12h}$ and 65 dB $L_{Aeq,1h}$ at these closest façades. Should these limits be exceeded without prior warning, then works must be paused until a suitable alternative method has been agreed with all parties involved. The LPA and Clare Hall will be provided access to the live noise monitoring results via the cloud-based system.

Construction Vibration

3.53 Paragraphs 4.3.46 and 4.3.47 of the WSP PofE provides Mr Lewis' opinions on the levels of vibration from the proposed construction activities. Within both my Statement of Case and Proof of Evidence, I have questioned the use of the vibratory roller with the lowest vibration setting that is included within Table E.1 of BS 5228-2:2009+A1:2014. The amplitude level used within the first two calculations for vibratory compaction of BS 5228-2 ranges from 0.4 mm up to 1.72 mm. In short, the lower the amplitude level of the vibratory rollers, the lower the resultant vibration levels will be at the receptors. The equations below are used to predict the groundborne vibration arising from vibratory compaction for the steady state, and the start up and run down. Both equations show the importance of the amplitude value (A)

$$V_{res} = k_s \sqrt{n_d} \left[\frac{A}{X + L_d} \right]^{1.5}$$

Equation 3.1: Prediction of Groundborne Vibration Levels for Vibratory Compaction (Steady State)

$$V_{res} = \sqrt{k_t} \left[\frac{A^{1.5}}{(X + L_d)^{1.3}} \right]$$

Equation 3.2: Prediction of Groundborne Vibration Levels for Vibratory Compaction (Start Up / Run Down)

3.54 Even using the lowest level of vibration at a distance of 2.5m (which is the distance from the closest edge of the Emergency & Maintenance Access Track to the closest façades of the Brian Pippard Building and Clare Hall) the vibration levels will be approximately 7 mm/s PPV.

3.55 As stated in paragraph 3.50 of this rebuttal, I questioned the use of the lowest vibration level for predicting the levels of vibration during these works. Still using a small vibratory roller (amplitude of 0.56 mm) the predicted vibration levels would be higher than 10 mm/s PPV, which is important, as this

is the level at which BS 5228-2 states that a vibration level of 10 mm/s PPV would *“likely to be intolerable for any more than a very brief exposure to this level in most building environments”*.

- 3.56 Using a “mid-range” vibratory roller (approximately 1 mm) the vibration levels at the same façades (distance of 2.5m again) would be in excess of 25 mm/s PPV. For the avoidance of doubt, I have only increased the amplitude from 0.4 mm up to 0.56 mm with all other parameters remaining unchanged from the WSP calculations.
- 3.57 It is clear therefore that the levels of vibration that the residents would be exposed to would be highly dependent on the amplitude level of the roller, hence my concerns with the calculations all being based on the lowest amplitude level.
- 3.58 In my experience, contractors would most likely opt for a roller with a larger amplitude of vibration as the same job would be completed quicker, as there would be fewer pass-bys required with a higher vibration setting.
- 3.59 I would expect to see a set of planning conditions relating specifically to construction vibration, should this scheme be approved. Within the planning condition, the following points should be included;
- The CoCP will be adopted and the principal contractor will implement a Local Environmental Management Plan.
 - A Section 61 application will be made, in line with the Control of Pollution Act 1974, to include a full set of construction vibration calculations to the worst impacted properties prior to mitigation. The application will include a detailed list of all mitigation measures anticipated to reduce the vibration to sufficient levels, and include the predicted vibration levels post mitigation.
 - Should the predicted vibration levels exceed the Noise Insulation Trigger Levels, then additional mitigation to the most affected buildings within the Clare Hall campus will be offered by the developer.
 - Continuous vibration monitoring will be taken for the entire duration of time, or for as long as works continue along Rifle Range Road. The continuous vibration monitoring will include the monitoring of vibration levels at The Brian Pippard Building and Clare Hall. Vibration monitoring trigger limits will be set at 0.3 mm/s PPV and 1.0 mm/s PPV at these closest façades. Should these limits be exceeded without prior warning and agreement, then works must be paused until a suitable alternative method has been agreed with all parties involved. The LPA and Clare Hall will be provided access to the live noise monitoring results via the cloud-based system.

Operational Noise

- 3.60 Paragraphs 4.3.48 through to 4.3.51 of the WSP PofE repeat what Mr Lewis had previously stated in his Proof of Evidence.
- 3.61 Paragraph 4.3.52 of the WSP PofE refers to the level of sound reduction offered by using electric buses over diesel buses. Mr Lewis has referred to a reduction of 10 dB at 30 kph (approximately 20 mph), as shown in Figure 1 of CD15-09.

- 3.62 Following on from historic accidents between pedestrians and electric vehicles, the European Parliament produced Commission Delegated Regulation (EU) 2017/1576⁶, which is not a law in the UK, but is listed on the government's legislation website⁷. This document details the requirements for the Acoustic Vehicle Alerting System (AVAS), which generates an alert sound for electric vehicles at low speeds.
- 3.63 Section III.3, paragraph a) of 2017/1576 states that "The sound to be generated by the AVAS shall be a continuous sound that provides information to the pedestrians and other road users of a vehicle in operation. The sound shall be easily indicative of vehicle behaviour, for example, through the automatic variation of sound level or characteristics in synchronisation with vehicle speed. The sound shall be similar to the sound of a vehicle of the same category equipped with an internal combustion engine".
- 3.64 Section III.3, paragraph c) of 2017/1576 states that "The sound level generated by the AVAS shall not exceed the approximate sound level of a vehicle of the M1 category equipped with an internal combustion engine and operating under the same conditions". I appreciate that the vehicle class M1 applies to vehicles with up to 8 seats, however as this document applies to both M and N vehicles, the document shows that the noise level of the AVAS system would ultimately be up to the manufacturer's discretion.
- 3.65 These points states that the nature of the sound could be similar to the sound of a diesel bus and the noise level of the AVAS cannot be noisier than the Euro VI buses. This does suggest that, in theory, the AVAS could be as noisy as the more traditional diesel bus. Although the move to electric fuel cell buses would undoubtedly lead to reduced noise levels, it simply is not possible to categorically state that the electric buses would be 10 dB quieter than the diesel alternative.
- 3.66 Mr Lewis has stated that the speed limit at the Clare Hall college will be 20 mph, however as shown in the Proposed Site Plans (Core Document CD1-16.04 Sheet 17 of 17), the speed limit is due to increase from 20 mph up to 30 mph outside the Brian Pippard Building.
- 3.67 Figure 1 of CD15-09 also shows that there would be a 4 dB reduction and 0 dB change in noise levels between an electric bus and a diesel bus travelling at 40 kph (approximately 25 mph) and 50 kph (approximately 30 mph) respectively. Therefore at these speeds, the difference in the noise levels of electric and diesel buses becomes less or negligible.
- 3.68 Paragraphs 4.3.53 through to 4.3.57 of the WSP PoE all question how the difference of 8 dB was calculated by me. The CadnaA noise propagation model predicted a noise level at the building façades at 56 dB $L_{Aeq,1h}$. The ambient sound level at Flat 5 was measured was 48 dB $L_{Aeq,16h}$, thus equating to the 8 dB increase over the existing ambient sound levels.
- 3.69 My noise model used hard reflective ground, as the ground between the busway to the closest façades will be concrete/tarmac topping. There would only be a small strip of soft vegetation between the Emergency & Maintenance Access Track and the university buildings.
- 3.70 I have revisited my noise model and changed the ground absorption from 0 (hard ground) to 1 (soft ground as I have assumed WSP has modelled) and the predicted noise levels reduced from 56 dB $L_{Aeq,1h}$ down to 52 dB $L_{Aeq,1h}$ at the closest building façades. I believe that the use of hard ground for

⁶ Amendment to Regulation (EU) No 540/2014 of the European Parliament and of the Council as regards the Acoustic Vehicle Alerting System requirements for vehicle EU-type approval, which can be found at <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R1576>

⁷ <https://www.legislation.gov.uk/eur/2017/1576/2017-06-26>

ground absorption, along with the slightly higher SEL of 74 dB(A) and the reduced distance to the buildings from the busway, resulted in the predicted level of 56 dB $L_{Aeq,1h}$ and is more reflective of the future scenario with tarmac and pavements between the buildings and the busway.

- 3.71 Regardless of the use of the higher SEL, I have applied the same SEL of 72 dB(A) to my noise model that WSP used, but with the hard ground conditions and the reduced distance to the building façades and the resultant noise level came to 54 dB $L_{Aeq,1h}$. This is still 6 dB above the ambient sound level, which would still result in a Moderate Magnitude of Change, in line with Table 3.54b of the DMRB, which is classed as a Likely Significant Effect in line with Table 3.58 of the DMRB guidance. For clarity, with the existing ambient sound level measured at 48 dB $L_{Aeq,16h}$ at Flat 5 Clare Hall, a change in noise level of 5 dB or more constitutes Moderate Magnitude of Change in the long term, which would lead to a Likely Significant Effect. Therefore, a predicted noise level of 53 dB $L_{Aeq,1h}$, or higher, at the closest façades would result in a Moderate Magnitude of Change and be classed as a Significant Adverse Impact.
- 3.72 Paragraph 4.3.61 of the WSP PofE suggests that Mr Lewis does not agree with my predictions that a significant adverse impact for the residents of Clare Hall and Brian Pippard would be likely. For the reasons stated in paragraphs 3.50 through to 3.52 I believe that these effects (a reflective ground, slightly higher SEL and the reduced distances to the building façades) will result in noise levels of 56 dB $L_{Aeq,1h}$, hence the 8 dB change in sound level outside these closest properties, which would constitute a significant adverse impact as stated in both my Statement of Case (CD23-17 OBJ-213 SOC Page 12) and my Proof of Evidence (CD26-08-W4-1 page 56).
- 3.73 Paragraph 4.3.62 questions the context of changing the acoustic character of the site from the introduction of the proposed guided busway. Mr Lewis has stated that most of the contextual factors would justify a reduction in the magnitude of an impact. This statement is incorrect. Indeed, some of the factors can result in a reduction to the significance, however other factors can effectively increase the significance on noise sensitive receptors. I have reconfigured Table 3.60 of CD15-05 below to highlight this.

Local circumstance	Influence on Significance Judgement	
	Reduction to Significance	Increase to Significance
Absolute noise level with reference to LOAEL and SOAEL (by design this includes sensitivity of receptor)	1) A noise change where all do-something absolute noise levels are below SOAEL requires no modification of the initial assessment	2) Where any do-something absolute noise levels are above the SOAEL, a noise change in the short term of 1.0dB or over results in a likely significant effect
Location of noise sensitive parts of a receptor	1) If the sensitive parts of a receptor are protected from the noise source, it can be appropriate to conclude a moderate or major magnitude of change in the short term and/or long term is not a likely significant effect. 2) An example of this would be where no windows of sensitive rooms face the road, and outdoor spaces are protected from the road by buildings.	3) Conversely, if the sensitive parts of the receptor are exposed to the noise source, it can be more appropriate to conclude a minor change in the short term and/or long term is a likely significant effect. 4) An example of this would be when a house has many windows of sensitive rooms and outdoor spaces facing the road.
	5) It will only be necessary to look in detail at individual receptors in terms of this circumstance where the decision on whether the noise change gives rise to a significant environmental effect is marginal.	
Acoustic Context		1) If a project changes the acoustic character of an area, it can be appropriate to conclude a minor magnitude of change in the short term and/or long term is a likely significant effect.
Likely perception of change by residents	2) Conversely, if the project results in no obvious changes for the landscape, particularly if the road is not visible from the receptor, it can be appropriate to conclude that a moderate change in the short term and/or long term is not a likely significant effect.	1) If the project results in obvious changes to the landscape or setting of a receptor, it is likely that noise level changes will be more acutely perceived by the noise sensitive receptors. In these cases it can be appropriate to conclude that a minor change in the short term and/or long term is a likely significant effect.

Table 3.3: Table 3.60 of DMRB (C15-05) Laid Out to Highlight Reductions and Increases to Significance and How These Factors May Influence the Judgement (Note: Bold text relates to this application)

- 3.74 Table 3.60 of the DMRB (CD15-05) lists several local circumstances which can influence the final operational significance. The Acoustic Context point states “1) *If a project changes the acoustic character of an area, it can be appropriate to conclude a minor magnitude of change in the short term and/or long term is a likely significant effect*”. Through the introduction of a guided busway along Rifle Range Road, in my opinion this is a significant alteration to the acoustic character of the area, seeing as Rifle Range Road is currently predominantly used by cyclists or pedestrians only. Additionally, as the bedrooms, study rooms and outdoor spaces within the Clare Hall and The Brian Pippard Buildings overlook the road, this would fall under the category of “Location of noise sensitive parts of a receptor” and would a minor change would be deemed to be a Likely Significant Effect. Finally on Table 3.60 of the DMRB, as the residents will be able to see the new busway, there would be a change in the “perception of change by residents” as the landscape for the receptors would change, so again would effectively increase a minor change to a likely significant effect. Therefore, predicted noise levels of 51 dB $L_{Aeq,1h}$ to 52.9 dB $L_{Aeq,1h}$ would be classed as a Minor Magnitude of Change, but could see the significance increase from Not Significant to a Likely Significant Effect when taking the context of the proposals into consideration. I must add however that any change to the effect significance should not be based on context alone; context is a contributing factor, which must be considered alongside the main assessment.
- 3.75 The following bullet points are from Mr Lewis’ Proof of Evidence, following on from paragraph 4.3.62. For clarity, the bullet points in bold are the comments made by WSP and the plain text are my responses to these comments.

- **Magnitude of change in the long-term would be assessed as negligible based on CD15-05 Table 3.54b.** A difference in sound levels of 8 dB, as explained in paragraphs 3.49 through to 3.53 would result in a Moderate long term change, as shown in Table 3.54b of CD15-05. Table 3.58 of CD15-05 rates a Moderate change as being Significant. This is based on my noise propagation model with hard ground between the busway and Clare Hall and The Brian Pippard Building, a slightly higher SEL for the buses and a closer distance to the façades of these buildings.
- **The predicted sound levels are significantly below the SOAEL and marginally below the LOAEL.** Again, from my noise predictions, the noise level would be below the SOAEL but higher than the LOAEL, which means that there would be an adverse impact due to a change in noise levels and mitigation should be provided.
- **All habitable rooms would meet appropriate internal acoustic criteria.** As discussed previously, based on my calculations, the internal noise levels would be higher than the recommended internal noise levels within CD15-07.
- **All external amenity areas would meet acceptable external criteria.** The wording in CD15-07 states that *"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments"*. My predicted noise level is 56 dB $L_{Aeq,T}$, for these areas closest to the guided busway, so would be above the upper guideline value and significantly higher than the desirable level. Currently, the ambient sound levels are below the desirable level.

- 3.76 Paragraph 4.3.63 of the WSP PofE adds some personal opinions of Mr Lewis on the use of the residential accommodation as being "temporary accommodation" and that new residents who newly occupy the affected rooms at Clare Hall will not be aware of any change in sound levels or the previous acoustic characteristics of the site. This is a concept which I would partially agree with under certain circumstances, however this is not typical student accommodation.
- 3.77 Clare Hall has no undergraduate members. The residents on site include Official and Professional Fellows, some of whom are permanent residents and visiting life members. Some of the Doctoral studies can last for up to four years. Research Fellows are elected for three years in the first instance and are regularly elected for a further three years.
- 3.78 Regardless of the type of accommodation, Mr Lewis' opinion is immaterial. In paragraph 7.7.5.1.1 of CD15-05 it recommends that ambient noise levels in hotel bedrooms are similar to those for living accommodation (see 7.7.2). Paragraph 7.7.2 of Cd15-05 then lists the standard indoor ambient noise levels for dwellings in Table 4.
- 3.79 From my interpretation of this wording, I understand that traditional "permanent" residential dwellings should experience the same internal acoustic criteria as those in "temporary" residential accommodation. In a similar fashion, Mr Lewis' reasoning could also apply to people who rent their housing on short term contracts who could be exposed to different criteria to homeowners or to hoteliers.
- 3.80 Paragraph 4.3.65 of the WSP PofE refers back to the proposed planning condition for reduced flows of Euro VI buses, or the use of electric fuel cell buses to avoid a significant adverse noise effects. I refer back to paragraph 3.48 of this document for my thoughts on this. Additionally, at the low speeds mentioned, acoustic warning sound systems could be emitted, at an unknown level. I appreciate that the move to electric buses may result in a lower operational noise level, however it cannot be simply suggested that there would be a 10 dB reduction in these operational noise levels when tyre noise becomes dominant at 25 mph and the AVAS system is employed to avoid incident at lower speeds.

- 3.81 Paragraph 4.3.67 appears to question the use of the “very narrow strip of land” as being useable amenity space in any event. This is clearly Mr. Lewis’ opinion and has not been based on any acoustic criteria. Some people have very small private amenity spaces, such as a courtyard, balcony or indeed, in this instance, at Clare Hall. Although alternative amenity locations are available within the campus, it would not be for an acoustic consultant to suggest that small amenity pockets are not worth assessing to.
- 3.82 It is clear that Mr Lewis has not been privilege to a detailed site walkover, as when I visited the site on the 12th March 2025, there were indeed garden toys in these areas and chalk markings on the floor where children have been playing. I would therefore disagree with this statement as the areas were witnessed to be used as private outdoor amenity spaces.
- 3.83 In paragraph 4.3.69 of the WSP PofE, Mr Lewis disagrees with our prediction that the operational noise from the introduction of the guided busway would amount to a significant adverse impact and that Mr Lewis concludes that there will be no adverse impact, in planning terms, from operational noise. I have demonstrated that there would be a significant adverse impact from the introduction of this guided busway throughout the Statement of Case (CD23-17 OBJ-213 SOC) and my Proof of Evidence (CD26-08-W4-1) and my overall opinion remains unchanged upon reviewing the Proof of Evidence submitted in CD26-01-APP-W11-1.
- 3.84 I would expect to see a set of planning conditions relating specifically to operational noise, should this scheme be approved. Within the planning condition, the following points should be included;
- Low noise road toppings, such as Stone Mastic Asphalt or Porous Asphalt, to be used along the existing Rifle Range Road as the final road topping and be adequately maintained.
 - Until such time as the buses on the busway are electric fuel cell buses, the busway will operate with a restricted service of no more than 9 hourly bus movements, between 23:00h to 00:00h and 06:00h to 07:00h, east of Charles Babbage Road.
 - Upon completion of the guided busway noise monitoring will be carried out at the closest façades of Clare Hall and The Brian Pippard Building. Should the hourly noise level exceed 51 dB $L_{Aeq,1hr}$ during the daytime hours, then additional noise mitigation will be implemented.

4.0 CONCLUSIONS

4.1 To conclude my rebuttal to Mr Lewis' conclusions within his Proof of Evidence, the following three points have been summarised, with Mr Lewis' opinions in bold and my response in standard weight text.

- **Create believe that construction noise could result in a significant adverse impact at Clare Hall. I do not agree and am confident that the draft CoCP (CD1.26) and the LEMP that will be developed in due course will ensure that appropriate management controls and mitigation measures are in place to avoid significant adverse effects of impacts occurring.**
As stated throughout CD23-17 OBJ-213 SOC, CD26-08-W4-1 and throughout this document, I have shown that the construction noise levels will be higher than predicted by WSP whilst the works are in close proximity to the residential and educational buildings within the Clare Hall campus. I accept that by restricting the works, so as to not extend beyond 10 or more days or nights in any 15 consecutive days or nights, the impact could be downgraded in line with the DMRB, however the fact remains that the Accommodation Works has been shown to be situated directly outside the Brian Pippard Building, which will likely be manned 24 hours a day. With this in mind, it is impractical to simply rely solely on the draft CoCP and LEMP to be the only measures to mitigate the noise and reduce the impact. My detailed response within this document has shown that the noise levels will be intolerable both outside and inside the most affected properties.
- **Create believe that construction noise (*presume meant vibration*) will result in a significant adverse impact at Clare Hall. I do not agree. WSP has predicted that a significant adverse impact could be avoided by the selection and use of appropriate plant. I am confident that the draft CoCP (CD1.26) and the LEMP that will be developed in due course will be capable of ensuring that significant adverse effects from construction vibration can be avoided.** I question the use of the vibratory rollers with the lowest level of vibration as assumed by WSP and I believe that any contractor would tend to use larger scale rollers for efficiency. As stated throughout CD23-17 OBJ-213 SOC, CD26-08-W4-1 and throughout this document, I have shown that the construction vibration levels will be intolerable whilst the works are in close proximity to the residential and educational buildings within the Clare Hall campus. I accept that by restricting the works, so as to not extend beyond 10 or more days or nights in any 15 consecutive days or nights, the overall impact could be downgraded, however the fact remains that the predicted vibration levels, using the empirical data that WSP have used will be intolerable for any more than a very brief exposure.
- **Create has predicted that operational noise from the guided busway would result in a significant adverse impact. I do not agree. Whilst I recognise that significant noise impacts could occur during the first hour of the night-time (23:00-00:00), this can be avoided by limited the numbers, or types, of buses using the busway at that time. This was acknowledged in the ES (paragraph 5.4.77 of CD1-11.01, page 30) and I have explained, in paragraphs 3.6.15 to 3.18 above, the applicant's willingness to commit to bus numbers/types that will avoid significant adverse impact from occurring.** As stated throughout CD23-17 OBJ-213 SOC, CD26-08-W4-1 and throughout this document, I have shown that using our acoustic model and predictions, the operational noise levels will be 8 dB higher than the existing ambient sound levels, which would constitute a Moderate long term change, which is classed as being Significant. The use of electric buses would result in lower noise levels, but at 30 mph, as is shown to be the speed limit in the proposed plans for part of Rifle Range Road, the document referred to (CD15-09) shows that there would be 0dB reduction for using electric buses over diesel buses.

- 4.2 In my opinion, I do not think that it will be possible to sufficiently mitigate the noise from the construction and operation of the busway without significantly altering the Grade II* Listed Building.

5.0 DISCLAIMER

- 5.1 Create Consulting Engineers Ltd disclaims any responsibility to the Client and others in respect of any matters outside the scope of this report.
- 5.2 The copyright of this report is vested in Create Consulting Engineers Ltd and Clare Hall. The Client, or his appointed representatives, may copy the report for purposes in connection with the development described herein. It shall not be copied by any other party or used for any other purposes without the written consent of Create Consulting Engineers Ltd or Clare Hall.
- 5.3 Create Consulting Engineers Ltd accepts no responsibility whatsoever to other parties to whom this report, or any part thereof, is made known. Any such other parties rely upon the report at their own risk.

APPENDICES

APPENDIX A

Example LEMP Prepared for HS2 Project
(Chapter 13 included only)

13. Noise and Vibration

13.1 General

- 13.1.1 General control measures relating to noise and vibration are provided in Section 13 of the CoCP and additional information is provided in Information Paper E23: Control of construction noise and vibration.

13.2 Sensitive Receptors

- 13.2.1 Noise and vibration construction assessment locations, at sensitive residential and non-residential properties, are identified within the main ES, Map Series SV-03 (Volume 5, Sound, noise, and vibration map book: country north, ref ES 3.5.1.9.3). For further details of these receptors and the potential adverse impacts identified, refer to the main ES (Volume 2: CFA17 and CFA 18 reports, Section 11, and the Volume 5: Appendices SV-003-017 and SV-003-018 reports).
- 13.2.2 Noise insulation is being offered for qualifying buildings as defined in the noise insulation and temporary rehousing policy within HS2 Information Paper E23. Noise insulation or temporary rehousing will mitigate residents being significantly affected by levels of construction noise inside their dwellings.
- 13.2.3 If a risk of eligibility is identified, then as a first action further BPM of noise control will be adopted to avoid noise insulation being triggered. If following the application of further BPM in the modelling, any dwellings still qualify for noise insulation then offers for noise insulation, or temporary rehousing, will be issued to residents. Where a resident accepts an offer of noise insulation or temporary rehousing, the noise insulation package (or temporary rehousing) will be installed before the start of the works predicted to exceed noise insulation or temporary rehousing criteria. Residents are given a six-month period in which to accept or reject noise insulation before the start of the works predicted to exceed noise insulation criteria.
- 13.2.4 There are numerous residential and non-residential properties located in proximity to the proposed works sites which without appropriate mitigation are likely to experience adverse effects from construction noise and/or vibration. Specific noise sensitive receptors identified include:

Residential

- Welsh Road, Offchurch;
- Stonebridge Lane, Offchurch;
- Valley Fields, Hunningham Road, Offchurch;
- Rugby Road, Cubbington;

- Oakdene, Coventry Road, Cubbington;
- Heathfield, Leicester Lane, Cubbington;
- Furzon Hill Cottages, Leicester Lane, Cubbington;
- Stareton, Kenilworth;
- Stoneleigh business park, Stoneleigh Park, Kenilworth;
- Kingswood Farmhouse, Dalehouse Lane, Kenilworth;
- Dalehouse Lane, Kenilworth;
- Dale House Farm, Dalehouse Lane, Kenilworth;
- Millburn Grange, Kenilworth Road, Kenilworth;
- Kenilworth Road, Kenilworth;
- South Hurst Farm, Crackley Lane, Kenilworth;
- Red Lane, Burton Green;
- Cromwell Lane, Burton Green; and
- Hodgett's Lane, Burton Green.

Non-residential

- Metcalfe Timber Ltd, Rugby Road, Cubbington;
- Oakdene Day Nursery, Coventry Road, Cubbington;
- Stoneleigh business park, Stoneleigh Park, Kenilworth; and
- Two Oaks Day Nursery, Red Lane, Burton Green.

13.3 Local Control Measures

- 13.3.1 Consents under Section 61 of the Control of Pollution Act 1974 will be obtained for the construction works and applications will normally be made at least 28 days before the relevant work is due to start. The works will be carried out in accordance with the conditions of the consent. Furthermore, site specific measures will be identified by the works Contractor on a site-by-site and activity-by-activity basis and agreed with WDC through the Section 61 process, as set out in the HS2 S61 guidance document.

- 13.3.2 Site specific best practicable means (BPM) measures to control noise and vibration have been identified through the Parliamentary process, and discussions with WDC, and are reflected in this document. Furthermore, site specific measures will be identified by the Contractor on a site-by-site and activity-by-activity basis and agreed with WDC through the Section 61 process.
- 13.3.3 As identified in the CoCP, examples of BPM measures that may be employed by the lead Contractor to control noise and vibration include:
- Controlling noise and vibration at source - for example, the selection of quiet and low vibration equipment, review of construction programme and methodology to consider quieter methods;
 - Arranging the layout of compounds to reduce noise impacts where compounds are in proximity to noise sensitive receptors. This may include placing any stacked porta-cabins between noisy works and sensitive receptors; and
 - Additional height hoardings which may, on occasion, be used to control construction noise. These will be subject to approval in accordance with the requirements of Schedule 17 Part 1 of the Act.
- 13.3.4 Where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the CoCP (section 13), the Contractor may offer noise insulation or ultimately temporary re-housing.
- 13.3.5 Taking account of the avoidance and mitigation measures as set out in the CoCP, for residential buildings, there are two dwellings located at eastern boundary of Stoneleigh Park adjacent to Stoneleigh Road and two dwellings along Hodgett's Lane whose rear facades face onto the Kenilworth Greenway (represented by assessment location IDs 219016 and 204103 on plans SV-03-047 and SV-03-050a respectively within the Volume 5, Sound, noise and vibration - Country North map book) and are forecast to experience noise levels higher than the noise insulation trigger levels as defined in the CoCP for both day time and night time periods.
- 13.3.6 Local control measures will be periodically reviewed, including following any material changes in the proposed construction method and appointment of the works Contractor.

13.4 Monitoring

- 13.4.1 The Nominated Undertaker requires its Contractors to undertake and report such monitoring as is necessary to ensure and demonstrate compliance with all noise and vibration commitments and the requirements of the CoCP.
- 13.4.2 Where predicted noise or vibration levels are close to the SOAEL values, noise and/or vibration monitoring will be undertaken throughout the construction period.

- 13.4.3 As set out in section 4.3.10 of the CoCP, where the Nominated Undertaker's Contractors are monitoring noise, dust, and air quality with equipment capable of streaming data in real time, this will be made available to WDC if a written request is made. In addition, monthly noise monitoring reports will be made publicly available throughout construction. The monthly reports will include information such as measurement methodology and monitoring locations. These can be found on the HS2 website at this address:
<https://www.gov.uk/government/collections/monitoring-the-environmental-effects-of-hs2>.
- 13.4.4 All noise and vibration monitoring equipment should hold a valid calibration certificate issued by either a United Kingdom Accreditation Service (UKAS) accredited calibration laboratory or equipment manufacturer.

APPENDIX B

Commission Delegated Regulation (EU) 2017/1576

“Acoustic Vehicle Alerting System Requirements for
Vehicle EU Type Approval”

COMMISSION DELEGATED REGULATION (EU) 2017/1576**of 26 June 2017****amending Regulation (EU) No 540/2014 of the European Parliament and of the Council as regards the Acoustic Vehicle Alerting System requirements for vehicle EU-type approval****(Text with EEA relevance)**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) No 540/2014 of the European Parliament and of the Council of 16 April 2014 on the sound level of motor vehicles and of replacement silencing systems, and amending Directive 2007/46/EC and repealing Directive 70/157/EEC ⁽¹⁾, and in particular the second paragraph of Article 8 and Article 9 thereof,

Whereas:

- (1) Regulation (EU) No 540/2014 lays down requirements for the EU type-approval of all new vehicles of categories M (vehicles used for the carriage of passengers) and N (vehicles used for the carriage of goods) with regard to their sound level. That Regulation also lays down measures concerning the Acoustic Vehicle Alerting System (AVAS) for hybrid electric and pure electric vehicles, aiming at the warning of vulnerable road users.
- (2) Following the adoption, at the 168th session of the World Forum for Harmonization of Vehicle Regulations of the United Nations Economic Commission for Europe (UNECE), which took place on 8 — 11 March 2016, of UN Regulation 138 on the approval of quiet road transport vehicles, Annex VIII to Regulation (EU) No 540/2014 should be reviewed in order to improve the accuracy of the AVAS requirements on type and volume of emitted sound, the sound generation method, the pause switch and stationary sound.
- (3) The information document pursuant to Annex I to Directive 2007/46/EC of the European Parliament and of the Council ⁽²⁾ relating to EU type-approval of a vehicle with respect to the permissible sound level and the addendum to the EU type-approval certificate should be reviewed to reflect the detailed requirements on AVAS.
- (4) In addition, to allow for the approval of hybrid electric and pure electric vehicles which are equipped with AVAS, it is appropriate to introduce testing requirements on the AVAS sound emission minimum levels in forward and reverse motion as well as on the emitted sound frequency shift.
- (5) Regulation (EU) No 540/2014 should therefore be amended accordingly.
- (6) Given that Regulation (EU) No 540/2014 has become applicable on 1 July 2016 and that it cannot be fully applied without the amendments to Annex VIII included in this act, this Regulation should enter into force as soon as possible,

HAS ADOPTED THIS REGULATION:

Article 1**Amendments to Regulation (EU) No 540/2014**

Regulation (EU) No 540/2014 is amended as follows:

(1) Annex I is amended as follows:

(a) in Appendix 1, the following point 12.8 is added:

‘12.8. AVAS

12.8.1. Approval number of a type of vehicle with regard to its sound emission pursuant to UNECE Regulation No 138 ⁽¹⁾⁽¹⁾ OJ L 158, 27.5.2014, p. 131.⁽²⁾ Directive 2007/46/EC of the European Parliament and of the Council of 5 September 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles (Framework Directive) (OJ L 263, 9.10.2007, p. 1).

or

12.8.2. Complete reference to the test results of AVAS sound emission levels, measured in accordance with Regulation (EU) No 540/2014 ⁽⁷⁾;

(b) in Appendix 2, the Addendum is amended as follows:

(i) point 3 is replaced by the following:

‘3. AVAS fitted: yes/no ⁽⁷⁾;

(ii) the following point 4 is added:

‘4. Remarks’;

(2) Annex VIII is replaced by the text in the Annex to this Regulation.

Article 2

Entry into force

This Regulation shall enter into force on the third day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 26 June 2017.

For the Commission
The President
Jean-Claude JUNCKER

ANNEX

ANNEX VIII

MEASURES CONCERNING THE ACOUSTIC VEHICLE ALERTING SYSTEM (AVAS)

SECTION I

This Annex sets out measures concerning the Acoustic Vehicle Alerting System (AVAS) for hybrid electric and pure electric vehicles.

I.1. Notwithstanding points 2(a) and (b), the provisions of section II shall apply to an AVAS installed:

- (a) in any vehicle type approved before 1 July 2019;
- (b) in any new vehicle based on the type referred to in point (a) before 1 July 2021.

I.2. The provisions of section III shall apply to an AVAS installed:

- (a) in any vehicle type approved before 1 July 2019, where the manufacturer so chooses;
- (b) in any new vehicle based on the type referred to in point (a);
- (c) in any vehicle type approved on or after 1 July 2019;
- (d) in any new vehicle based on the type referred to in point (c);
- (e) in any new vehicle on or after 1 July 2021.

SECTION II

II.1. System performance

If AVAS is installed on a vehicle, it shall comply with the requirements referred to in points II.2 and II.3.

II.2. Operation conditions

(a) Sound generation method

The AVAS shall automatically generate a sound in the minimum range of vehicle speed from start up to approximately 20 km/h and during reversing. Where the vehicle is equipped with an internal combustion engine that is in operation within the vehicle speed range defined above, the AVAS shall not generate a sound.

For vehicles having a reversing sound warning device, it is not necessary for the AVAS to generate a sound whilst reversing.

(b) Switch

The AVAS shall be fitted with a switch which is easily accessible by the vehicle driver in order to allow engaging and disengaging. Upon restarting the vehicle, AVAS shall default to the switched on position.

(c) Attenuation

The AVAS sound level may be attenuated during periods of vehicle operation.

II.3. Sound type and volume

- (a) The sound to be generated by the AVAS shall be a continuous sound that provides information to the pedestrians and other road users of a vehicle in operation. The sound should be easily indicative of vehicle behaviour and should sound similar to the sound of a vehicle of the same category equipped with an internal combustion engine.
- (b) The sound to be generated by the AVAS shall be easily indicative of vehicle behaviour, for example, through the automatic variation of sound level or characteristics in synchronisation with vehicle speed.
- (c) The sound level generated by the AVAS shall not exceed the approximate sound level of a vehicle of the M1 category equipped with an internal combustion engine and operating under the same conditions.

SECTION III

III.1. System performance

The AVAS shall comply with the requirements set out in points III.2 to III.6.

III.2. Operation conditions

(a) Sound generation method

The AVAS shall automatically generate a sound in the minimum range of vehicle speed from start up to approximately 20 km/h and during reversing. Where the vehicle is equipped with an internal combustion engine that is in operation within that vehicle speed range, the AVAS shall not generate a sound.

Vehicles having overall sound levels complying with the requirements in paragraph 6.2.8 of UNECE Regulation No 138 ^(*) with a margin of +3 dB(A), are not required to be equipped with AVAS. The requirements laid down in paragraph 6.2.8 of UNECE Regulation No 138 for one-third octave bands and the requirements laid down in paragraph 6.2.3 of UNECE Regulation No 138 for the frequency shift as defined in paragraph 2.4 of the same UNECE Regulation ("frequency shift") shall not apply to those vehicles.

For vehicles having a reversing sound warning device, it is not necessary for the AVAS to generate a sound whilst reversing, on condition that the reversing sound of the warning device complies with the requirements laid down in the second subparagraph of paragraph 6.2 and in paragraph 6.2.2 of UNECE Regulation No 138.

The sound generated by the vehicle type submitted for approval shall be measured in accordance with the methods set out in Annex 3 and subparagraphs 6.2.1.3 and 6.2.2.2 of UNECE Regulation No 138.

(b) Switch

The AVAS may be fitted with a mechanism to enable the driver to halt the operation of an AVAS ("pause function"), which is easily accessible by the vehicle driver in order to allow engaging and disengaging. Where a pause function is fitted, the AVAS shall default to the switched on position upon restarting of the vehicle.

In addition, the pause function shall comply with the requirements laid down in paragraph 6.2.6 of UNECE Regulation No 138.

(c) Attenuation

The AVAS sound level may be attenuated during periods of vehicle operation. In those cases, the AVAS sound level shall comply with the requirements laid down in paragraph 6.2.8 of UNECE Regulation No 138.

III.3. Sound type and volume

- (a) The sound to be generated by the AVAS shall be a continuous sound that provides information to the pedestrians and other road users of a vehicle in operation. The sound shall be easily indicative of vehicle behaviour, for example, through the automatic variation of sound level or characteristics in synchronisation with vehicle speed. The sound shall be similar to the sound of a vehicle of the same category equipped with an internal combustion engine.

The following rules shall apply:

- (i) where it is generated when the vehicle is in motion, the AVAS sound shall comply with the requirements laid down in paragraphs 6.2.1.1, 6.2.1.2, 6.2.1.3, 6.2.2.1, 6.2.2.2 and 6.2.3 of UNECE Regulation No 138, as applicable;
- (ii) the vehicle may emit a sound when stationary, as set out in paragraph 6.2.4 of UNECE Regulation No 138.
- (b) The vehicle manufacturer may provide for the possibility for the driver to select from among different sounds, which shall comply with the requirements laid down in paragraph 6.2.5 of UNECE Regulation No 138.
- (c) The sound level generated by the AVAS shall not exceed the approximate sound level of a vehicle of the M₁ category equipped with an internal combustion engine and operating under the same conditions. In addition, the requirements in paragraph 6.2.7 of UNECE Regulation No 138 shall apply.
- (d) The overall sound level emitted by a vehicle complying with the second subparagraph of point 2(a) shall not exceed the approximate sound level of a vehicle of the M₁ category equipped with an internal combustion engine and operating under the same conditions.

(*) OJ L 9, 13.1.2017, p. 33.

III.4. Test track requirements

Until 30 June 2019, the standard ISO 10844:1994 may be applied as an alternative to the standard ISO 10844:2014 to check compliance of the test track as described in Annex 3, paragraph 2.1.2, of UNECE Regulation No 138.

III.5. Type-approval certificate

The vehicle manufacturer shall provide, as an attachment to the EU type-approval certificate, any of the following documents:

- a) the communication referred to in paragraph 5(3) of UNECE Regulation No 138, in accordance with the model set out in Annex 1 to that Regulation;
- b) the test results of AVAS sound emission levels, measured in accordance with this Regulation.

III.6. Markings

Each component of the AVAS shall bear the following markings:

- (a) the trade name or mark of the manufacturer;
- (b) a designated identification number.

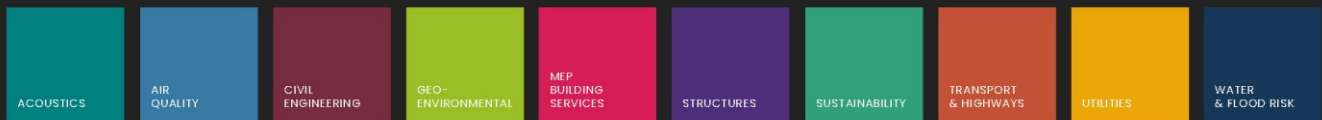
The markings shall be indelible and clearly legible.'

Clare Hall

PROPOSED CAMBOURNE TO CAMBRIDGE BUSWAY – BIN BROOK CROSSING AND IMPACT ON CLARE HALL

Rebuttal to Acoustics Proof of Evidence by Toby Lewis
Jonathan Blacklock, BEng (Hons), CEng, MIOA, MCIBSE

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