



Clare Hall

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

Summary of Acoustics Proof of Evidence by
Jody Blacklock, BEng (Hons), CEng, MIOA, MCIBSE
Objector No: OBJ213

Inquiry Reference: TWA/24/APP/03

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Client: Clare Hall

Engineer: Create Consulting Engineers (Create) Limited
15 Princes Street
Norwich
NR3 1AF

Tel: 01603 877010
Email: enquiries@createce.co.uk
Website: www.createce.co.uk

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GLOSSARY

Term	Meaning
IOA	Institute of Acoustics
ANC	Association of Noise Consultants
CIBSE	Chartered Institute of Building Services Engineers
C2C	Cambourne to Cambridge
CCC	Cambridgeshire County Council
CCE	Create Consulting Engineers
Clare Hall College	The land under the ownership of Clare Hall college
ES	Environmental Statement
GCP	Greater Cambridge Partnership
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance
The Applicant	Cambridgeshire County Council.
The Application	This is the November 2024 DfT submission by the applicant.
The Proposed Busway/Development	The proposed C2C Busway development
C1-11.01	Core Document 11 Technical Report 1: Acoustics
GIS	Geographic Information System
SOAEL	Significant Observed Adverse Effect Level
LOAEL	Lowest Observed Adverse Effect Level
NOEL	No Observed Effect Level
dB	Decibel
$L_{Aeq,T}$	The A-weighted equivalent continuous sound level over a time period (T)
WHO	World Health Organisation
BS	British Standards
DMRB	Design Manual for Roads and Bridges
BPM	Best Practicable Means

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 I have been a full Member of the Institute of Acoustics (IOA) since September of 2007 and a full Member for the Chartered Institute of Building Services Engineers (CIBSE) since October of 2012. Create Consulting Engineers Ltd gained full accreditation with the Association of Noise Consultants (ANC) in 2022. Since becoming accredited, we have won several awards with the ANC for some of our select projects, due to the thorough background research and innovative approaches to problem solving.
- 1.3 I am employed as a Technical Director at Create Consulting Engineers Ltd and lead the Acoustics Team across all regions of the UK. I have over 19 years of experience in acoustic consultancy, covering both noise and vibration. Over the years, I have specialised in advising developers and landowners on the various aspects of acoustics, including providing advice of the most suitable mitigation systems for both noise and vibration.
- 1.4 I am a member of the Engineering Council Membership Committee and a member of the CIBSE CPD Panel. In 2023, I was elected by my peers as the Chairperson for the Eastern Branch of the Institute of Acoustics.
- 1.5 I was invited by Clare Hall to provide expert evidence regarding the proposed Cambourne to Cambridge Busway, specifically to examine the impact on Clare Hall. I can confirm that I assisted in the preparation of the Clare Hall's statement of case and that I have visited the Clare Hall campus on a number of occasions now to fully understand the area and the existing acoustic climate and the constraints associated with the site.
- 1.6 Additional sound level measurements were undertaken for this site by my colleague Mr. Sam Ward, MSc, BSc (Hons), MIOA. Sam is a full Member of the Institute of Acoustics and has six years of experience in Acoustics.

Witness Declaration

- 1.7 I hereby declare as follows;
- 1.8 This Proof of Evidence that I have prepared and provided for this Inquiry (Ref. TWA/24/APP/03) includes the facts which I regards 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.
- 1.9 I believe that the facts which I have stated in this Proof of Evidence are true and that the opinions expressed are correct.
- 1.10 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

The Submitted Application

- 2.1 Create Consulting Engineers Ltd has been instructed to provide acoustic expertise relating to the application for the Cambourne to Cambridge Busway, referred to as the Proposed Development, in particular the section from the Bin Brook Bridge to the termination point at the junction of Rifle Range Road and Grange Road, adjacent to the Clare Hall campus. The application was submitted to the Secretary of State in accordance with the Transport and Works (Applications and Objections Procedure) 2006¹ for an order under sections 1, 3 and 5 of the Transport and Works Act 1992².
- 2.2 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.
- 2.3 The application was made by Cambridge City Council in conjunction with Greater Cambridge Partnership.
- 2.4 WSP were commissioned to complete the Environmental Statement in support of the application. Their document CD1-11.01 provides the details of the submitted Noise and Vibration chapter, including baseline measurements, an assessment of the construction noise and vibration, operational noise and vibration and the mitigation proposed.

Scope of Works

- 2.5 My Proof of Evidence focuses on the acoustics elements covering the proposed application only, covering both construction and operational noise and vibration, specifically in relation to the section of the Proposed C2C busway by the Bin Brook crossing, along Rifle Range Road and finishing at Grange Road.
- 2.6 This Proof of Evidence provides my expert acoustics evidence and my perceived impact that the proposed scheme will have on the internal and external sound levels within the Clare Hall campus; and assess the compliance of the proposed scheme against international, national and local policies.

S.I. 2006/1466 as amended by S.I. 2010/439, S.I. 2011/556, S.I. 2011/2085, S.I. 2012/147, S.I. 2012/1658, S.I. 2012/2590, S.I. 2013/755, S.I. 2014/469, S.I. 2015/377, S.I. 2015/627, S.I. 2015/1682, S.I. 2017/979, S.I. 2017/1070, S.I. 2019/311 and S.I. 2023/795.

² 1992 c.42; section 1 was amended by paragraphs 51 and 52 of Schedule 2 to the Planning Act 2008 (c.29). Section 5 was amended by S.I. 2012/1659

3.0 ASSESSMENT OF THE PROPOSED SCHEME

Brief Overview

- 3.1 The proposed plans include a two-way guided busway spanning approximately 13.8 km between Cambourne and the termination at the junction of Rifle Range Road and Grange Road, Cambridge, where there will be a new traffic light system introduced. The scheme includes the guided busway and an access and maintenance track, which will run for the entire length of the busway. There is also a single accommodation welfare unit proposed which appears will serve the proposed works. There will be two new bridges constructed, as part of the proposals, one spanning the M11 and the other spanning Bin Brook.

Brief Description of Clare Hall

- 3.2 Clare Hall is situated on a parcel of land between Rifle Range Road and Herschel Road, Grange Road and Bin Brook. Figure 4.1 of my Proof of Evidence shows the extent of the college campus. There is a small grass verge with existing mature trees along the verge, separating the Clare Hall campus and Rifle Range Road, as shown within Figure 4.6 of my Proof of Evidence.
- 3.3 The Clare Hall campus is made up of several individual buildings which are used for studying, including the main Clare Hall Building (Porters Lodge), Ashby Library and the McLean Studies. In addition to these sensitive buildings, there are multiple residential buildings including; The College Flats, Michael Stoker Building, Brian Pippard Building, Leslie Barnett House, 9 & 9a Herschel Road, Salje Building, Gillian Beer Building, Richard Eden Suite, Robert Honeycombe Building, Paul Mellon Building and the Doshisha Room.
- 3.4 Figure 4.2 of my Proof of Evidence show a site plan of the Clare Hall Campus and Figure 4.3 shows the location of these buildings in a GIS image, with a breakdown of the relevant uses that they were intended for. The Brian Pippard Building, College Flats and the main Clare Hall Building all directly overlook Rifle Range Road and the external façades of the bedrooms of the flats were measured to be 5.5m from the nearside of Rifle Range Road.
- 3.5 The existing ambient sound level close to the Gillian Beer Building was originally measured by WSP to be 49 dB $L_{Aeq,16h}$ and 45 dB $L_{Aeq,8h}$. These measurements are suitable for non-acoustically rated glazing and ventilation whilst still adhering to the requirements for internal sound levels for bedrooms as stipulated by the WHO and BS 8233.
- 3.6 Additional existing ambient sound levels were carried out by Create on the balcony of Flat 5 of the College Flats and Flat 8 of the Brian Pippard Building. The measured sound levels outside these flats were measured to be 48 dB $L_{Aeq,16h}$ and 46 dB $L_{Aeq,8h}$ for Flat 5 and 49 dB $L_{Aeq,16h}$ and 47 dB $L_{Aeq,8h}$ for Flat 8 for the daytime and nighttime periods respectively. These measurements are suitable for non-acoustically rated glazing and ventilation whilst still adhering to the requirements for internal sound levels for bedrooms as stipulated by the WHO and BS 8233.
- 3.7 External amenity spaces are provided throughout the campus for relaxation purposes. On my previous site visits, it was noted that the external amenity spaces at the College Flats and the Brian Pippard Building were also used by families with young children, as there was evidence of outdoor toys being used by the families of the residents. Currently, the external amenity spaces comply with all international, national and local policies, including the WHO Guidelines, BS 8233 and Policy 35.

Overview of the Proposed Scheme

- 3.8 The proposals would introduce a guided busway along the stretch of Rifle Range Road and the construction of a new 14.3m wide bridge over Bin Brook. As part of the proposals, there will be only one Welfare Accommodation unit and vehicle turning point serving the whole development site. This has been proposed to be located directly adjacent to the Brian Pippard Building. It is said by the Applicant that the buses will be, as a minimum, a Euro IV compliant engine, with an “aspiration” for electric vehicles.
- 3.9 The distance from the closest façades of Clare Hall, College Flats and the Brian Pippard Building to the nearside of the proposed guided busway has been scaled from the proposed drawings to be **less than 7m**.
- 3.10 The distance from the closest façades of Clare Hall, College Flats and the Brian Pippard Building to the nearside of the proposed Emergency & Maintenance Track has been scaled from the proposed drawings to be approximately **2.5m**.
- 3.11 The distance from the edge of the new bridge to the closest façade of the Gillian Beer Building has been scaled to be approximately **23m**.

Construction Noise Impacts

- 3.12 WSP have predicted that all properties within a 40m radius of the proposed works will be exposed to noise levels equivalent to a **significant adverse effect**, however this effect has been downgraded by WSP due to the works taking less than 10 consecutive days to complete. There has however been no construction timetables or project programmes provided to substantiate this.
- 3.13 WSP have confirmed that the proposed construction works for the proposed river crossing at Bin Brook will take longer than 10 consecutive days, so the residents of the Gillian Beer Building will be exposed to a **significant adverse effect** during these construction works.
- 3.14 What has not been considered by WSP, and therefore has not been assessed, is that the drawings supplied only show a single accommodation Welfare unit, which is to be located directly outside The Brian Pippard Building. This will typically comprise of a security cabin which are usually manned 24 hours, 7 days per week, so it is most likely that there would be diesel generators outside the Brian Pippard Building, running continuously.
- 3.15 I believe that there would be additional plant and equipment requirements and as such, I have predicted in my Proof of Evidence that all residential properties within a 60m radius of the construction works will be exposed to noise levels equivalent to a Significant Observed Adverse Effect Level. This 60m zone would encompass nearly all of the residential, amenity and study areas within the Clare Hall campus.
- 3.16 Furthermore, I predict that the noise levels at the façade of the most impacted buildings (Brian Pippard, College Flats and the main Clare Hall Building) during peak construction times, would be approximately **86 dB LAeq,1h**. This is significantly higher than the Significant Observed Adverse Effect Level and would result in internal noise levels of approximately **69 dB LAeq,1h**, which is **34 dB higher** than the WHO and BS 8233 require for bedrooms during the day.

- 3.17 These predicted noise levels are above the point where the HSE stipulate for the Upper Exposure Level for the Control of Noise at Work Regulations 2005. Any persons using their outdoor amenity spaces close to the road during these times would therefore experience dangerous noise levels, with the possibility of hearing impairment, as a result of these works.
- 3.18 WSP has not provided any guidance on their proposed or recommended mitigation strategies to reduce the impact of noise on the nearby properties, other than the use of BPM.

Construction Vibration Impacts

- 3.19 In paragraph 5.2.2 of the CD1-11.01 document, WSP have predicted that the construction vibration will have a **significant adverse effect** on all properties within a **15m** radius of the works.
- 3.20 This was calculated through the use of a single two drum vibratory roller with a maximum amplitude of 0.4mm and roller width of 1.4m. It is important to note that an amplitude of 0.4mm is the lowest in the range of vibratory rollers that BS 5228-2 provide calculations for. BS 5228-2 refers to an amplitude range of 0.4mm up to 1.72mm.
- 3.21 There has been no assessment of vibration made for the construction of the new Bin Brook Bridge by WSP.
- 3.22 WSP has stated in paragraph 5.2.3 that all works would take less than 10 days to complete. Again, there has been no evidence provided to substantiate this.
- 3.23 I believe that if the scheme is approved, then the contractors undertaking the compaction and rolling activities would look to use a vibratory roller with a far greater amplitude as this would complete the compaction with fewer pass-bys as the larger and more vibratory rollers are more efficient and will complete the compaction tasks in less time than the less vibratory rollers.
- 3.24 By using a slightly larger vibratory roller, with an amplitude of 0.56mm, the **significant adverse effect** zone would **increase from 15m to 24m**.
- 3.25 Additionally, the roller would be used to compact the ground for the Emergency and Maintenance Track, as well as rolling the final topping. I have scaled the distance from the edge of the Emergency and Maintenance Track to the closest façade of The Brian Pippard Building, College Flats and the main Clare Hall Building to be 2.5m.
- 3.26 The vibration level at the façade of these buildings would be approximately 13 mm/s PPV. DMRB states that a vibration level of 10 mm/s PPV, or more, would be considered a major adverse impact and BS 5228-2 states that at levels of 10 mm/s, or more, would be intolerable for anything more than a very brief exposure.
- 3.27 WSP has not provided any guidance on their proposed or recommended mitigation strategies to reduce the impact of vibration on the nearby properties, other than the use of BPM.

Operational Noise Impacts

- 3.28 WSP used a sound exposure level of 72 dB(A) for the sound level of a suitable bus and the proposed bus schedule of 10 buses each way, every hour to generate a noise model of the site when in operation. This noise model predicted that the likely levels of road traffic noise from the proposed busway would

be approximately **50 dB $L_{Aeq,1h}$** at a distance of **8m**. This is below the Significant Observed Adverse Effect Level, but 3 dB higher than the Lowest Observed Adverse Effect Level, which is the existing ambient noise level.

- 3.29 My colleague undertook several manned noise measurements of similar buses with Euro VI engines on the existing guided busway track close to Kings Hedges Road. The average sound exposure level was measured at **74 dB(A)**, with a maximum sound exposure level of **77 dB(A)**.
- 3.30 I have scaled the distance of the buses to the closest façades of The Brian Pippard Building, the College Flats and the main Clare Hall building to be 8m.
- 3.31 Using the average sound exposure level of 74 dB(A) I predict that the noise level at these façades will be approximately **56 dB $L_{Aeq,1h}$** . This is an **8 to 9 dB increase** over the existing ambient sound level.
- 3.32 Using Table 9.1 in my Proof of Evidence, the significance of change due to the introduction of the guided busway would be a **significant impact** for both the short and long terms.
- 3.33 It must be reiterated that currently all areas within the Clare Hall campus comply with the WHO and BS 8233 for noise levels within private external amenity spaces. This level of 56 dB $L_{Aeq,1h}$ is higher than the upper design level, so would effectively move from being compliant to non-compliant, as a direct result of the introduction of the guided busway.
- 3.34 During the nighttime hours, I have not been furnished with a proposed bus schedule, so I have assessed the noise levels to the façade of the College Flats and Brian Pippard buildings. I predict that the external noise level would be approximately **50 dB $L_{Aeq,15 min}$** based on two bus passes. Internally, that could result in internal noise levels of approximately **37 dB $L_{Aeq,T}$** , within the bedrooms overlooking Rifle Range Road. This is **7 dB higher** than the required level of 30 dB $L_{Aeq,T}$ within bedrooms during the night. Furthermore the proposed operating times are shown to be during a period of the nighttime which is recognised as significantly more impactful to people's quality of sleep, i.e. as people are falling asleep and when people are likely to wake prematurely. I see no evidence that this was considered in WSP's assessment.
- 3.35 Following the submission of the Statement of Case, WSP have reviewed the information and provided an addendum to CD1-11.01 entitled Environmental Statement (Addendum 2 and Clarifications). Within this document it has been proposed that a planning condition could restrict the buses during these times, until the bus fleet has migrated to electric buses.
- 3.36 It is acknowledged that at lower speeds, the electric motor will be far quieter than the Euro VI compliant diesel engines, however electric vehicles are fitted with acoustic warning systems which would be emitted for safety reasons. In addition to this, the speed limit outside the Brian Pippard Building has been shown to be 30 mph. At this speed, the majority of noise is generated by tyre noise so an electric bus would be at a very similar noise level as a diesel bus, at these speeds.

Operational Vibration Impacts

- 3.37 I do not believe that the vibration caused by vehicle pass-bys would generate any meaningful levels of vibration, so concur with WSP.

4.0 APPROACH TO MITIGATION

- 4.1 WSP has only referred to the use of Best Practicable Means to control the noise and vibration generated by the proposed construction works. A 5 dB reduction was assumed and applied to all predicted noise levels within C1-11.01
- 4.2 Within the earlier section of this Summary, and my Proof of Evidence, I have shown that the predicted noise and vibration levels will be significantly high. I therefore believe that the use of BPM alone is insufficient.
- 4.3 WSP have also stated that there is no need for any specific measures to control noise impacts from the operation of the guided busway.
- 4.4 As the operational noise level will result in a significant adverse impact for the residents in the College Flats and The Brian Pippard Building, and the users of Clare Hall main building, I believe that mitigation is warranted.
- 4.5 Within section 5 of my Proof of Evidence, I have shown that a 6.19m tall acoustic screen would be sufficient to reduce both the internal and external noise levels from the guided busway. The screen would not need to be required to be this tall for the length of Rifle Range Road, but to provide adequate screening to the second floor apartments of The Brian Pippard Building, the height would be required close to The Brian Pippard Building.
- 4.6 An alternative acoustic screen would be a cantilevered type, which would span over a section of the top of the busway.
- 4.7 In my opinion, these would not be aesthetically pleasing and could drastically alter the appearance of the Grade II* Listed Building, although this is outside of my area of expertise.

5.0 SUMMARY AND CONCLUSIONS

- 5.1 CD1-11.01 submitted by WSP has seriously understated the number of residential properties within Clare Hall and those of which will be exposed to significant adverse effects from the construction of the proposed guided busway scheme.
- 5.2 My Proof of Evidence shows that nearly all properties within the Clare Hall campus will be exposed to significantly high noise levels during the construction works, and a significant portion of these properties would also be exposed to high vibration levels during the construction works.
- 5.3 The noise and vibration levels within The Brian Pippard Building, the College Flats and the main Clare Hall Building will be intolerable whilst the works are underway.
- 5.4 The change in noise level, as a result of the operation of the guided busway should be considered a significant adverse impact and as such warrants noise mitigation.
- 5.5 From the Proof of Evidence I have provided I am of the opinion that the proposed scheme has not shown to be compliant with paragraphs 187 and 198 of the NPPF. Similarly it has not complied with Policy 35 of the Cambridge City Council Local Plan, in particular paragraph 4, or the Supplementary Planning Document for the Greater Cambridge Shared Planning. Both internal and external noise levels currently comply with the WHO Guidelines and those set out in BS 8233 but will not comply should the scheme be approved.
- 5.6 On the basis of the above I must conclude that significant weight should be given to the increased construction noise and vibration levels, and the operational noise levels posed by the proposed C2C busway in the vicinity of Clare Hall.

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The information contained within this report and any appendices or supporting information provided are to be treated as confidential.



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