PENINSULAR
ACOUSTICS

CB Two Ltd C/O Lingar Holdings (Chester) Ltd

33 – 35 Bridge Street, Wrexham

Acoustics Assessment

PUBLIC

CB Two Ltd C/O Lingar Holdings (Chester) Ltd

33 – 35 Bridge Street, Wrexham

Acoustics Assessment

Type of Document (VERSION) Public

Project No. PA0200

Date: April 2024

Peninsular Acoustics

Liverpool: Office 14 Clock Tower Building, Clock Tower Park, Liverpool, England, L10 1LD

Birmingham: Studio 222, Custard Factory 2, Gibb Street, Birmingham, B9 4AA

London: 16 Upper Woburn Pl, London, WC1H 0AF

Website: www.peninsularacoustics.co.uk

Quality Control

Issue/revision	P01	P02	P03	P04
Remarks	Issue for planning			
Date	April 2024			
Prepared by	Adam Walker			
Signature				
Checked by	Jonathan Howell			
Signature	Jonathan Howell			
Authorised by	Jonathan Howell			
Signature	Jonathan Howell			
Project number	PA0200			
Report number	R01			
File reference	PA0200-R01-P01 33-35 Bridge Street, Wrexam Acoustics Report			

Contents

Appendices

Appendix A

Technical Terminology

Appendix B

Sound Survey Data

Appendix C

Sample Model Outputs

Appendix D

Break-In Calculations

Appendix E

Mitigation References

Appendix F

Glazing Requirements

Appendix G

Report limitations

1. Introduction

1.1. Introduction

Peninsular Acoustics have been commissioned by CB Two Ltd C/O Lingar Holdings (Chester) Ltd (hereafter referred to as 'the Client') to undertake an Acoustics Assessment for a proposed residential development at a 33 – 35 Bridge Street , Wrexham (hereafter referred to as 'the Site').

An acoustic glossary is provided in Appendix A to assist the reader.

1.2. Site Description

1.2.1. Existing Site

The Site lies within the centre of Wrexham and is bounded to the north by Craft & Tails, an entertainment premises open on Friday and Saturday nights with Brook Street beyond the existing buildings; to the east by Bridge Street; to the south by existing buildings comprising a restaurant and vacant commercial unit; and to the west by vacant open land.

Craft & Tails is open on a Friday and Saturday night from 18:00 – 03:00. There is a small external area for patrons to smoke, however, the music is confined to inside the building with doors closed.

Additionally, there is a public house, "The Cambrian Vaults" located approximately 60m to the north-east- of the Site.

An approximate redline boundary along with the location of the entertainment premises are presented in Figure 1.1.

Figure 1.1: Approximate Redline Boundary

1.2.2. Development Proposals

Development proposals comprise the erection of a 4-storey building comprising 15no. residential apartments.

To avoid significant repetition within the appendices of this report, the proposed development plans are presented along with appropriate acoustic marks-ups in Appendix E.

1.3. Scope of Works

The following scope of works has been undertaken:

- The Environmental Health officer (EHO) at Wrexham Borough Council (hereafter referred to as 'the Local Authority') has been contacted on the approach to this acoustics assessment;
- An Environmental Sound Survey has been undertaken to determine prevailing acoustic conditions at the Site in summary as follows;
    - Continuous measurements were undertaken within the Site in accordance with BS 7445-2[1] to determine acoustic exposure from road traffic noise;
    - Sample measurements of specific entertainment noise were undertaken during the night-time of Friday 15th and Saturday 16th March 2024 to understand the noise propagation characteristics from Craft & Tails and The Cambrian Vaults.
- Using available architectural drawings and following analysis of the survey data, a 3D acoustic model has been created and sound levels have been predicted outside proposed apartment windows;
- Consideration has been given to a number of proposed external amenity areas in accordance with TAN 11[2] and BS 8233[3];
- Using the predicted sound levels from the acoustic model, break-in calculations in accordance with BS EN ISO 12354-3[4] have been undertaken to determine the required sound insulation performance of the external to achieve the internal acoustic criteria outlined in the documents above, as well as the MCC PCGN[5], whilst achieving the relevant ventilation requirements of AD-F[6].

[1] BS 7445-2: 1991 Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use.
[2] Technical Advice Note 11: Noise, 1997
[3] BS 8233:2014 *'Guidance on sound insulation and noise reduction for buildings.'*
[4] BS EN ISO 12354-3:2017 *'Building acoustics – Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound.'*
[5] Manchester City Council Planning and Noise, Technical Guidance, October 2022.
[6] The Building Regulations 2010, Ventilation, Approved Document 'F'.

2. Standards and Guidance

2.1. TAN 11

TAN 11 provides technical guidance for the assessment of noise on proposed developments in Wales. The guide was released in 1997 and has not been formally updated in recent times. For noise sensitive developments such as the Site the guide states that it should be considered whether proposals for new noise sensitive development would be incompatible with existing activities, taking into account the likely level of noise exposure.

Based upon this, the guide recommends considering the Site in Noise Exposure Categories (NECs) as A through D and provides noise levels corresponding to the categories and advice ranging from Category A, whereby noise is not considered an issue, to Category D whereby noise is considered to be a significant issue.

TAN 11 also states that measures to control noise should be taken into account and could include the following:

- Reduction of noise at the point of generation;
- Internal layout with adequate distances between the noise source and sensitive areas;
- Administrative considerations such as limiting operating time of the noise source albeit this is considered outside the scope of this report.

The guide does not provide recommended internal acoustic conditions; however, it has been widely accepted that for indistinguishable sources such as those influencing the Site (excluding entertainment noise) should satisfy the internal acoustic conditions outlined within BS 8233.

2.2. WHO Guidelines

BS 8233 does not give a definitive level for internal maximum noise levels or define an appropriate number of exceedances per night. However, the WHO Guidelines for Community Noise, state "*for a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more that 10-15 times per night. (Vallet & Vernet),"* therefore this will be considered as additional criteria as well as the aforementioned ambient sound levels from BS 8233 and TAN 11.

2.3. Numerical Criteria

For the avoidance of doubt, the following internal acoustic conditions are taken from BS 8233 and WHO Guidelines and are targeted for residential amenity with respects to day to day noise from indistinguishable sources.

Table 2.1: Numerical Criteria Summary

Location	Daytime 07:00 – 23:00	Night-time 23:00 – 07:00	
		Ambient	Maximum
	$L_{Aeq, 16hr}$ dB	$L_{Aeq, 8hr}$ dB	$L_{AFmax, 2min}$ dB
Living Room	35	-	-
Bedroom	35	30	45

2.4. Entertainment Noise Criteria

There is a lack of consensus on an adopted assessment method for noise levels within habitable rooms from entertainment noise. The IOA Good Practice Guide[7] seeks to consider a level of 'inaudibility' but the document was never formalised; NANR45[8] adopted a similar approach of reviewing 1/3 octave bands between 10 Hz and 160 Hz, however, it was specifically stated that this document was not directly relatable to entertainment noise.

Manchester City Council has adopted the NANR45 curve to provide recommended internal criteria for 63 Hz and 125 Hz octave bands as follows:

- 47 dB $L_{eq, T}$ @ 63 Hz; and
- 41 dB $L_{eq, T}$ @ 125 Hz.

This criteria is typically used when introducing a new noise sensitive receptor to nearby existing entertainment premises and will therefore be used as internal criteria during periods whereby noise is emanating from Craft & Tails and The Cambrian Vaults.

[7] The Institute of Acoustics Good Practice Guide on Noise from Pubs and Clubs
[8] Procedure for the Assessment of Low Frequency Noise Complaints, Contract NANR45, December 2011, University of Salford.

3. Environmental Sound Survey

3.1. Methodology

An environmental sound survey was undertaken between Wednesday 13th and Saturday 16th March 2024. Measurements were undertaken at the following positions:

- Continuous Measurement 1 (CM1): Located within the Site adjacent to Bridge Street to capture road traffic noise;
- Sample Measurement 1 (SM1): located within the Site 2m away from the boundary of Craft & Tails external area;
- Sample Measurement 2 (SM2): located 3m away from the entrance of The Cambrian Vaults.

Continuous monitoring was undertaken between 14:30 on Wednesday 14th March and 23:00 on Friday 15th March. Sample measurements were undertaken at the two entertainment premises between

15:00 on Friday 19th and 10:00 on Tuesday 23rd January 2024 with sample measurements conducted between 23:00 and 01:40 on Friday 15th/Saturday 16th March 2024. The measurement positions are identified in Figure 1.1.

3.2. Equipment

Measurements were taken using Class 1 integrating/averaging SLMs housed, where appropriate, in environmental protection apparatus. The SLMs were field calibrated before and after the survey, using a Class 1 calibrator, with no significant drift in calibration noted.

At all locations, SLMs were setup to monitor L_{Aeq}, L_{A90}, L_{A10} and L_{AFmax} values along with 1/3rd octave band L_{eq} values where necessary.

All equipment was calibrated to traceable standards within 12 or 24 months for calibrators and SLMs respectively. Full details of the equipment used to undertake the survey are available on request.

3.3. Survey Conditions and Observations

3.3.1. Meteorologic Conditions

Weather conditions during installation and collection of the continuous measurement sound level meter were dry with low wind speeds of < 1.0 m/s. During the attended measurement, weather conditions were similar with low wind speeds and no precipitation.

3.3.2. Site Observations

Site observations indicate that the dominant source of noise is typically from vehicles along Bridge Street and the wider road traffic network. During the entertainment noise survey on Friday night, music was not audible on Site from Craft & Tails until circa 23:45. Prior to this, music from The Cambrian Vaults was audible on Site and thus monitoring was undertaken to establish the tonality of the entertainment noise.

3.4. Results

3.4.1. CM1 – Road Traffic

A summary of the measured sound levels at CM1 are presented in Table 3.1.

Survey data from the daytime period on Friday 19th January has been omitted from analysis as there was influence from the survey installation, sound checks, patron noise and entertainment noise; the latter of which will be analysed and assessed separately.

Table 3.1: Summary of Results, CM1

Date	Daytime Sound Level $L_{Aeq, 16hr}$ dB	Night-time Sound Level	
		Ambient $L_{Aeq, 8hr}$ dB	Typical Maximum[(a)] $L_{AFmax, 2min}$ dB
Weds 13th March	63[(b)]	53	74
Thurs 14th March	65	55	77
Fri 15th March	62	-	-

[(a)] Maximum event level not exceeded more than 10 times per night.
[(b)] T = 9hr, data omitted from road traffic analysis during sound check and live music event.

From analysis of the data, it is considered that the following sound levels are appropriate for assessment and will be used to calibrate the 3D acoustic model at CM1:

- Daytime Ambient Sound Level: 65 dB $L_{Aeq, 16hr}$;
- Night-time Ambient Sound Level: 55 dB $L_{Aeq, 8hr}$; and
- 10th Highest Night-time Maximum Sound Level: 77 dB $L_{AFmax, 2min}$.

3.4.2. SM1 – Craft & Tails

Sound levels were monitored at Craft & Tails between 00:00 – 01:40 on the morning of Saturday 16th March 2024 with the low frequency and A-weighted results presented in Table 3.2.

Sound levels remained steady in both the A-weighted domain and low frequency region from Craft & Tails throughout the survey period with site notes saying that low frequency music was audible on Site and that sound levels only increased when doors were temporarily opened, or people were audible in the smoking area.

In order to determine an appropriate spectrum for assessment, the survey data has been analysed which showed that the loudest measured periods were as follows:

Table 3.2: Summary of Measured Data, Craft & Tails

Parameter	Loudest Sound Pressure Level	Time Period
A-Weighted	64 dB $L_{Aeq, 5mins}$	01:00
63 Hz	77 dB $L_{eq, 5mins}$	00:50
125 Hz	75 dB $L_{eq, 5mins}$	00:45

In order to protect residents against entertainment noise, the critical factors for determining the required façade measures are typically in the 63 Hz and 125 Hz region as the sound insulation performance of glass it typically weaker in the low frequency region.

Therefore, to inform the assessment, the spectrum presented in Table 3.3 has been derived using the highest $L_{Aeq, 5mins}$ octave band data with the exception of the 63 Hz and 125 Hz values which have been replaced to match the highest measured 5-minute value in these particular octave bands.

This ensures that the overall A-weighted sound level used to inform the assessment is the highest measured value as well as the critical performance elements in the low frequency region.

Table 3.3: Assessment Spectrum at Octave Band Centre Frequencies ($L_{eq, 5mins}$), Craft & Tails

63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
77 dB	75 dB	64 dB	62 dB	58 dB	53 dB	51 dB	30 dB

This spectrum shall be included within the acoustic model and calibrated such that the A-weighted, 63 Hz and 125 Hz are modelled at the relevant measurement position, in this case, SM1 which is located circa 2m away from the Site boundary with Craft & Tails.

3.4.3. SM2 – The Cambrian Vaults

Sound levels were monitored at The Cambrian Vaults between 00:20 – 00:40 on the morning of Saturday 16th March 2024 with the low frequency and A-weighted results presented in Table 3.4

Sound levels remained steady in both the A-weighted domain and low frequency region from Craft & Tails throughout the survey period with site notes saying that low frequency music was audible on Site and that sound levels only increased when doors were temporarily opened, or people were audible in the smoking area.

In order to determine an appropriate spectrum for assessment, the survey data has been analysed which showed that the loudest measured periods were as follows:

Table 3.4: Summary of Measured Data, The Cambrian Vaults

Parameter	Loudest Sound Pressure Level	Time Period
A-Weighted	68 dB $L_{Aeq, 5mins}$	00:25
63 Hz	73 dB $L_{eq, 5mins}$	00:20
125 Hz	77 dB $L_{eq, 5mins}$	00:25

Similarly to the above, the following spectrum, presented in Table 3.5, shall be used to inform the assessment and results in a robust assessment as it considers the highest measured weighted and low frequency levels.

Table 3.5: Assessment Spectrum at Octave Band Centre Frequencies ($L_{eq, 5mins}$), The Cambrian Vaults

63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
73 dB	77 dB	70 dB	65 dB	62 dB	56 dB	47 dB	40 dB

This spectrum shall be included within the acoustic model and calibrated such that the A-weighted, 63 Hz and 125 Hz are modelled at the relevant measurement position, in this case, SM2 which is located circa 3m away from the doors of The Cambrian Vaults.

The raw data used to inform the above analysis is provided in Appendix C.

4. Acoustic Modelling and Acoustic Exposure

4.1. Acoustic Modelling

4.1.1. Input Parameters

An acoustic model of the Site and environs has been generated in Datakustik CadnaA® modelling software. The model was generated to determine sound levels at each habitable room and source emissions have been informed by survey data.

CandaA® considers various inputs, including topography, buildings, and road noise sources, and calculates sound levels in accordance with national and international standards; in this case, the relevant UK standards are the procedures set out in CRTN and ISO 9613-2[9].

The modelling assumptions and input information for the acoustic model are as follows:

- Digital Terrain Model – Lidar 1m (Environment Agency, downloaded on 20th March 2024);
- Open Street Map data (publicly available);
- Ground absorption for the Site = 0 (hard ground);
- Buildings set to non-absorptive and purely reflecting objects;
- Building heights estimated following site observations and through a review of the available drawings provided by the Client; and
- First order reflections included in the modelling.

4.1.2. Model Calibration

Based upon the survey results and analysis presented above, the model has been calibrated in the following manner.

Road Traffic

- For ambient daytime and ambient night-time assessments, roads have been modelled in CadnaA® using the road function with propagation modelled in accordance with CRTN;
- For night-time L_{AFmax} assessment protocols, point sources have been modelled along the road area calibrated to the measured sound level at CM1.

Receivers have been positioned at the centre of proposed windows at each floor. Due to the fact the façade and road run parallel to one another, all windows along the façade impacted have been assumed to experience the same exposure level.

Entertainment Noise

For entertainment noise assessments, the model has been calibrated based upon site notes with the dominant sources contributing to the model via the external area and doors of Craft & Tails and from the doors of The Cambrian Vaults.

The modelled spectrum in comparison to the measured levels is presented in Table 4.1 which shows good levels of correlation between the measured and modelled sound levels. For Craft & Tails, whilst the overall A-weighted modelled value is marginally less than measured, this is considered to be acceptable given the low frequency sound levels are matched which will drive the acoustic design.

[9] ISO 9613-2 *'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.'*

Table 4.1: Measured and Modelled Comparison

Measurement Positions	Parameter	Sound Pressure Level ($L_{eq,}$ dB) in Weighted or Octave Band Centre Frequency		
		A-Weighted	63 Hz	125 Hz
SM1 Craft & Tails	Measured	64	77	75
	Modelled	63	78	75
SM2 The Cambrian Vaults	Measured	68	73	77
	Modelled	68	73	77

4.2. Acoustic Exposure

Noise Exposure Category

In accordance with TAN 11, the measured sound levels at CM1 have been analysed for road traffic noise which indicates a Noise Exposure Category (NEC) of 'C' for daytime (65 dB $L_{Aeq, 16hr}$) and 'B' for night-time (55 dB $L_{Aeq, 8hr}$).

TAN 11 states that for NEC 'B' noise should be taken into account when determining planning applications and for NEC 'C', conditions should be imposed to ensure a commensurate level of protection against noise.

4.3. Acoustic Modelling Results

For conciseness, a selection of modelled sound level results are presented in Table 4.2 with a selection of façades graphically shown in Appendix C.

The sound levels presented within the table are the highest sound level on that façade section, as such, all other habitable rooms for the Site will result in lower sound levels.

Figure 4.1: Typical Floor Level Façade Naming Convention

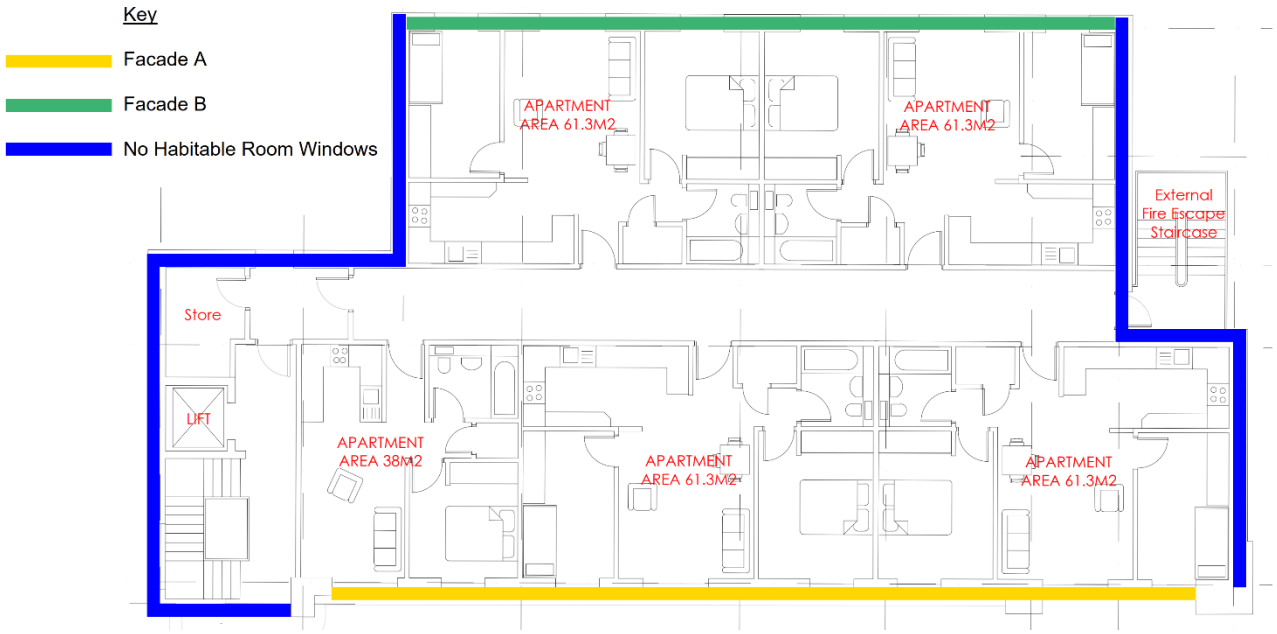


Table 4.2: External Modelled Results, dB

Façade	Floor	Road Traffic			Entertainment[(a)]		
		Daytime $L_{Aeq, 16hr}$	Night-time $L_{Aeq, 8hr}$	Max $L_{AFmax, 2min}$	A	63 Hz	125 Hz
A	1	66	56	80	38	54	50
	2	66	56	79	38	54	50
	3	66	56	77	38	54	50
	4	65	55	75	38	55	51
B	1	34	24	43	59	73	71
	2	36	26	43	59	73	70
	3	38	28	43	58	73	70
	4	41	31	43	58	72	70

[(a)] Entertainment noise assessed as ambient sound level over 5 minutes.

5. Assessment

5.1. Ventilation and Cooling Strategy

The ventilation strategy for the building is to utilise natural ventilation wherever possible as outlined below. This strategy has been developed based upon the aforementioned noise criteria and the guidance contained within AD-F and AD-O[10].

Facade	Whole-Dwelling Ventilation	During Entertainment Noise
A	Window Mounted Trickle Ventilators	Open Windows Permissible
B		Mechanical Ventilation – to supply sufficient ventilation in the absence of open windows.

Due to the low frequency noise from the nearby entertainment premises, openable windows will not be suitable for providing increased airflow whilst still achieving suitable internal acoustic conditions on façade B. However, it is important to note that this is only applicable on Friday and Saturday nights and for the remainder of the week, openable windows will be permissible due to significant screening provided by the Site itself from road traffic noise along Bridge Street.

On the occasion where entertainment noise is present, suitable supplementary ventilation will be provided for all habitable rooms, such that appropriate overheating criteria can be satisfied whilst windows remain closed.

Given the recent introduction of AD-O, which requires overheating and noise to be considered concurrently, this strategy is no different to the majority of residential developments adjoining road networks and is considered to be a pragmatic approach to mitigating noise levels from Craft & Tails.

An overheating assessment will need to be conducted at the detailed design stage which will determine the required increased airflow, or the need for tempered air provisions, to achieve the necessary thermal criteria outlined in CIBSE[11] and subsequently AD-O.

5.2. Internal Acoustic Conditions

5.2.1. Target Sound Levels

The following internal noise level criteria is targeted for residential occupancy:

- For road traffic influenced areas, compliance with BS 8233 internal levels; and
- For entertainment noise influenced areas, an internal noise level not to exceed the levels provided in Table 5.1[12]

Table 5.1: Internal Entertainment Noise Criteria, $L_{eq, 5mins}$

63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
47 dB	41 dB	35 dB	29 dB	25 dB	22 dB	20 dB	18 dB

[10] The Building Regulations 2010, Overheating, Approved Document 'O'.
[11] Design Methodology for the Assessment of Overheating Risk in Homes, TM59:2017.
[12] Based upon Manchester City Council guidance on noise and entertainment premises.

5.2.2. Non-Glazed Sound Insulation Elements

The non-glazed façade element performance should achieve an external to internal level reduction of 58 dB $R_w + C_{tr}$ with low frequency attenuation providing 30 dB and 46 dB external to internal reduction at 63 and 125 Hz, respectively.

This can typically be achieved through a single layer of 100mm blockwork, 85mm cavity with 2no. layers of 12.5mm plasterboard fixed to an independent lining system and a layer of 50mm acoustic insulation in the cavity. Alternative constructions may achieve the necessary sound reduction; however, they should be reviewed at the detailed design stage in more detail.

The specifications in octave band format are provided in Appendix F.

5.2.3. Glazing Specification

Based upon the architectural drawings available at the time of submission, the calculations have been undertaken using the specifications outlined in Table 5.2.

Table 5.2: Typical Glazing Constructions

Glazing Reference	Critical Mininimum Performance Elements	Typical Construction
Reference 1	35 dB $R_w + C_{tr}$ 24 dB SRI @ 63 Hz 30 dB SRI @ 125 Hz	9mm panel 6mm airgap 8mm panel
Reference 2	29 dB $R_w + C_{tr}$ 18 dB SRI @ 63 Hz 24 dB SRI @ 125 Hz	4mm panel 16mm air gap 6mm panel

The specifications in octave band format are provided in Appendix F.

5.2.4. Calculated Internal Levels

Based upon the above specification, internal sound levels have been calculated in accordance with BS 8233 and BS EN ISO 12354-3. The results are presented in Table 5.3.

Table 5.3: Calculated Internal Levels, dB

Façade	Floor	Road Traffic			Entertainment[(a)]		
		Daytime $L_{Aeq, 16hr}$	Night-time $L_{Aeq, 8hr}$	Max $L_{AFmax, 2min}$	A	63 Hz	125 Hz
A	1	29	19	43	6	27	17
	2	29	19	42	6	27	17
	3	29	19	40	6	27	17
	4	28	18	38	6	28	18
B	1	< 10	< 10	< 10	24	44	36
	2	< 10	< 10	< 10	24	44	35
	3	< 10	< 10	< 10	23	44	35
	4	< 10	< 10	< 10	23	43	35

[(a)] Entertainment noise assessed as ambient sound level over 5 minutes.

The results are compliant with the project criteria for low frequency noise and road traffic noise.

The most exposed apartment with respects to entertainment noise (Façade B, Floor 1) is presented in octave band format below as a comparison against the full criteria.

Table 5.4: Façade B, Floor 1, Internal Sound Level Results

Parameter	Sound Pressure Level ($L_{eq, 5mins}$ dB) in Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Criteria	47	41	35	29	25	22	20	18
Calculated Level	44	36	23	21	< 10	< 10	< 10	< 10

The results show compliance with the low frequency criteria outlined in the Manchester City Council technical guidance which is assumed to represent acceptable conditions by the Local Authority.

A copy of the break-in calculations is provided in Appendix D.

5.2.5. Mitigation Summary

A summary table of the required mitigation is presented in Table 5.5 which should be read in conjunction with the drawings provided in Appendix E and the octave band minimum requirements outlined in Appendix F.

Table 5.5: Minimum Performance Requirements

Ref.	Non-Glazed Requirements	Glazing Requirements	AD-F Ventilation Requirements	Supplementary Ventilation
A	58 dB $R_w + C_{tr}$ 30 dB SRI @ 63 Hz 46 dB SRI @ 125 Hz	35 dB $R_w + C_{tr}$ 24 dB SRI @ 63 Hz 30 dB SRI @ 125 Hz *Glazing Ref 1*	Acoustically Rated Window Mounted Trickle Ventilator Min. 37 dB $D_{n,e,w} + C_{tr}$	Open Windows Permissible
B		29 dB $R_w + C_{tr}$ 18 dB SRI @ 63 Hz 24 dB SRI @ 125 Hz *Glazing Ref 2*	Window Mounted Trickle Ventilator Min. 32 dB $D_{n,e,w} + C_{tr}$	
C		35 dB $R_w + C_{tr}$ 24 dB SRI @ 63 Hz 30 dB SRI @ 125 Hz *Glazing Ref 1*	Acoustically Rated Window Mounted Trickle Ventilator Min. 37 dB $D_{n,e,w} + C_{tr}$	Mechanical Ventilation during ENT Noise.

In summary, the glazing in reference A and C can commonly be found in marginally increased thickness glazing. For reference B, standard thermal double glazing to achieve the requirements of Approved Document L are sufficient.

With regards to the whole dwelling ventilation, direct airpath trickle ventilators are permissible for living rooms (reference B) fronting Bridge Street. Acoustically rated trickle ventilators should be installed in all other habitable rooms.

6. Conclusions

Peninsular Acoustics have been commissioned by CB Two Ltd C/O Lingar Holdings (Chester) Ltd to undertake an Acoustics Assessment for a proposed residential development at a 33 – 35 Bridge Street, Wrexham.

The survey and assessment methodologies outlined in this report have been devised in accordance with all relevant, extant policy and guidance at a national and local level.

The assessment has considered the effect of acoustic exposure on the Site, including from road traffic on the surrounding road network and exposure from entertainment activities emanating from 'Craft & Tails' and 'The Cambrian Vaults'.

A means of mitigating the sound in the form of acoustically specified façade packages have been devised following current best practice measures and guidance to ensure the Site is suitable for residential occupancy.

Therefore, in summary, the Site is suitable for residential use, subject to the provision of building envelope sound insulation measures outlined in Table 5.5.

The limitations on how to use this report are presented in Appendix G.

Appendix A

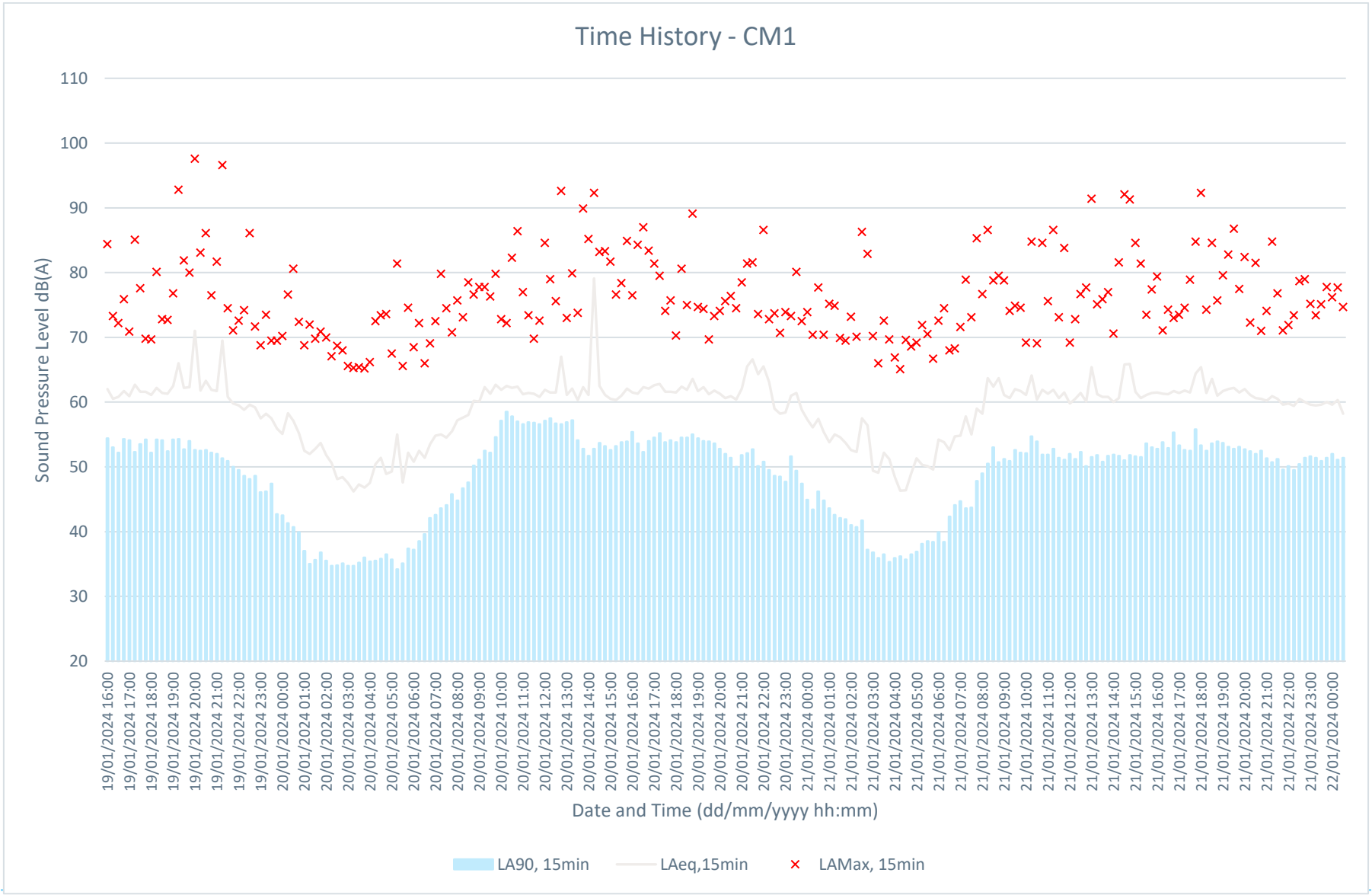
Technical Terminology

Noise	Typically defined as unwanted, unpleasant or disturbing sound
Frequency (Hz)	The number of oscillations in acoustic pressure per second. It represents the 'tone' of the sound. Often determined in octave bands
Maximum sound pressure level (L_{Fmax})	The maximum or highest sound pressure level measured with a 'fast' time weighting
Equivalent continuous sound pressure level ($L_{eq,T}$)	The average of the total sound energy over a specified time period (T). L_{eq} represents the equivalent sound level that a fluctuating source would have compared to a steady source with the same total sound energy over a specific time period. Commonly used as a descriptor of human perception of sound over time.
'A' weighting	Frequency-dependent weighting based on the response of the human auditory system which has been found to correlate well with the subjective response to sound. Denoted by the use of the letter 'A'. For example, dBA denotes an 'A' weighted sound level in decibels, or L_{Amax} denotes an 'A' weighted maximum sound pressure level.
Internal Ambient Noise Level (IANL)	The noise level within a room or enclosed space. Usually determined as an equivalent continuous sound pressure level over a specific time period ($L_{Aeq,T}$, dB)
Noise Rating (NR) curve	A single figure term used to reflect the spectral frequency content of noise. Although originally proposed to assess environmental noise, NR curves are now typically used to describe noise from mechanical ventilation systems in buildings.
$L_{night,outside}$	The incident external A-weighted long-term average sound level as defined in ISO 1996-2: 1987, determined over all the night periods of a year, in which the night is eight hours between 23:00 and 07:00.
Purge ventilation	Ventilation to aid removal of high concentrations of pollutants and water vapour released from occasional activities such as painting and decorating or accidental releases such as smoke from burnt food or spillage of water.
Mechanical cooling	Cooling by means of a refrigerant cycle. This would include 'air conditioning' systems and the use of fan coil units (FCUs).
MEV	Mechanical extract ventilation.
$D_{n,e}$ / $D_{n,e,w}$	The laboratory tested sound insulation of small building elements, normalised to an equivalent absorption area of 10m2.
Façade level	The sound pressure level measured close to a building façade that includes contribution from both the incident sound and the sound reflected from the façade. Normally taken to be 3dB higher than the equivalent free-field level, when located at 1 metre from a façade.
Free-field level	A measured sound pressure level that is independent of any contributions due to reflections from nearby surfaces and is therefore representative of the direct path only.

R / R_w	The laboratory tested airborne sound insulation of a building element
Sound insulation	The capacity of a structure to prevent sound from reaching a receiving location. Sound energy is not necessarily absorbed; impedance mismatch, or reflection back toward the source, is often the principal mechanism

Appendix B

Sound Survey Data


Time History - CM1
Sound Pressure Level dB(A)
110
100
90
80
70
60
50
40
30
20
19/01/2024 16:00
19/01/2024 17:00
19/01/2024 18:00
19/01/2024 19:00
19/01/2024 20:00
19/01/2024 21:00
19/01/2024 22:00
19/01/2024 23:00
20/01/2024 00:00
20/01/2024 01:00
20/01/2024 02:00
20/01/2024 03:00
20/01/2024 04:00
20/01/2024 05:00
20/01/2024 06:00
20/01/2024 07:00
20/01/2024 08:00
20/01/2024 09:00
20/01/2024 10:00
20/01/2024 11:00
20/01/2024 12:00
20/01/2024 13:00
20/01/2024 14:00
20/01/2024 15:00
20/01/2024 16:00
20/01/2024 17:00
20/01/2024 18:00
20/01/2024 19:00
20/01/2024 20:00
20/01/2024 21:00
20/01/2024 22:00
20/01/2024 23:00
21/01/2024 00:00
21/01/2024 01:00
21/01/2024 02:00
21/01/2024 03:00
21/01/2024 04:00
21/01/2024 05:00
21/01/2024 06:00
21/01/2024 07:00
21/01/2024 08:00
21/01/2024 09:00
21/01/2024 10:00
21/01/2024 11:00
21/01/2024 12:00
21/01/2024 13:00
21/01/2024 14:00
21/01/2024 15:00
21/01/2024 16:00
21/01/2024 17:00
21/01/2024 18:00
21/01/2024 19:00
21/01/2024 20:00
21/01/2024 21:00
21/01/2024 22:00
21/01/2024 23:00
22/01/2024 00:00
Date and Time (dd/mm/yyyy hh:mm)
LA90, 15min
LAeq,15min
LAMax, 15min

SM1 Sound Level Data

Time Period	Measured Sound Pressure Level ($L_{eq, 5mins}$ dB) in Octave Band Centre Frequencies (Hz)								$L_{Aeq, 5mins}$ dB
	63	125	250	500	1k	2k	4k	8k	
00:00	69	68	60	56	54	48	46	24	59
00:05	73	71	64	60	57	53	50	29	63
00:10	74	70	64	58	52	48	47	29	60
00:15	74	74	64	57	52	48	46	26	61
00:20	74	70	62	56	51	47	47	27	59
00:25	73	73	62	55	51	49	46	24	60
00:30	72	70	62	55	51	48	46	26	59
00:35	73	73	63	56	51	47	46	26	60
00:40	75	74	63	58	53	48	47	32	61
00:45	75	75	61	58	55	50	49	28	62
00:50	77	74	61	59	55	51	49	27	62
00:55	73	72	64	62	57	53	51	30	64
01:00	77	72	64	62	58	53	51	30	64
01:05	75	72	63	57	55	50	50	28	61
01:10	73	74	64	60	57	53	52	26	63
01:15	73	71	64	62	59	53	53	28	64
01:20	74	72	63	60	57	51	52	27	63
01:25	75	73	64	61	57	52	51	27	63
01 :30	73	71	64	65	60	56	56	33	66
01:35	70	66	61	63	57	52	53	32	63

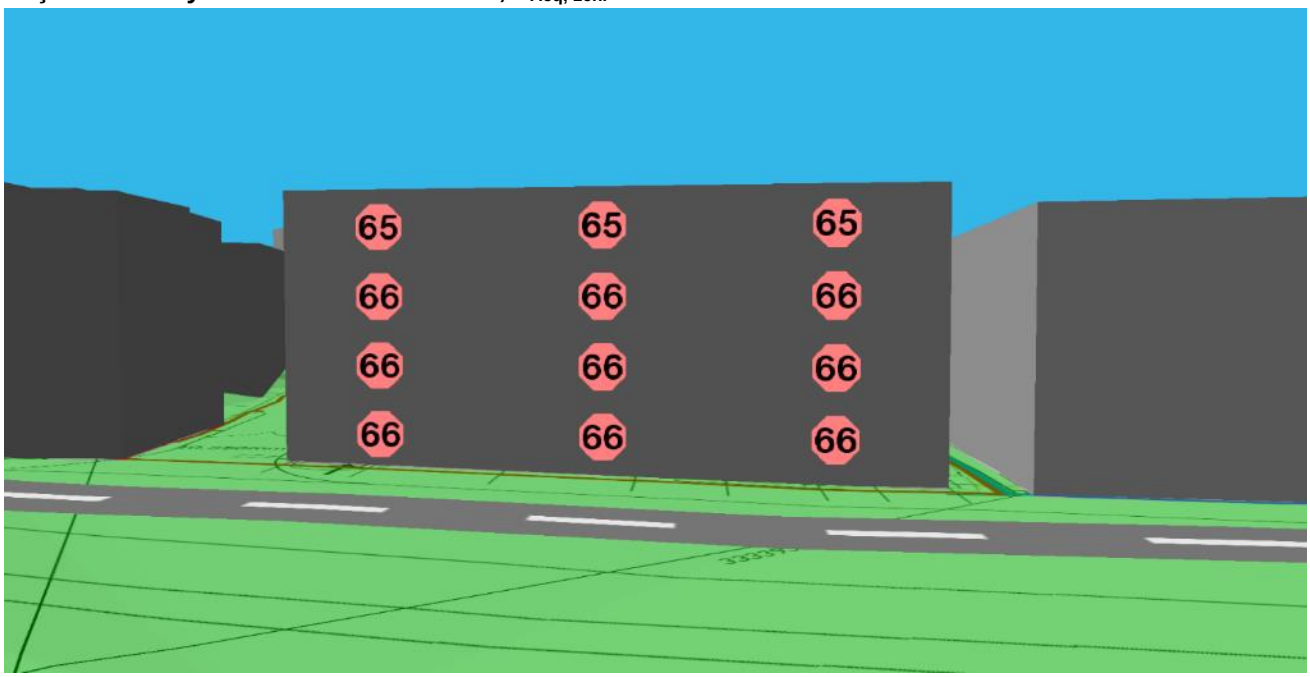
SM2 Sound Level Data

Time Period	Measured Sound Pressure Level ($L_{eq, 5mins}$ dB) in Octave Band Centre Frequencies (Hz)								$L_{Aeq, 5mins}$ dB
	63	125	250	500	1k	2k	4k	8k	
00:15	73	73	65	62	59	53	46	38	65
00:25	70	77	70	64	60	55	46	33	68
00:40	73	72	67	65	62	56	47	40	67

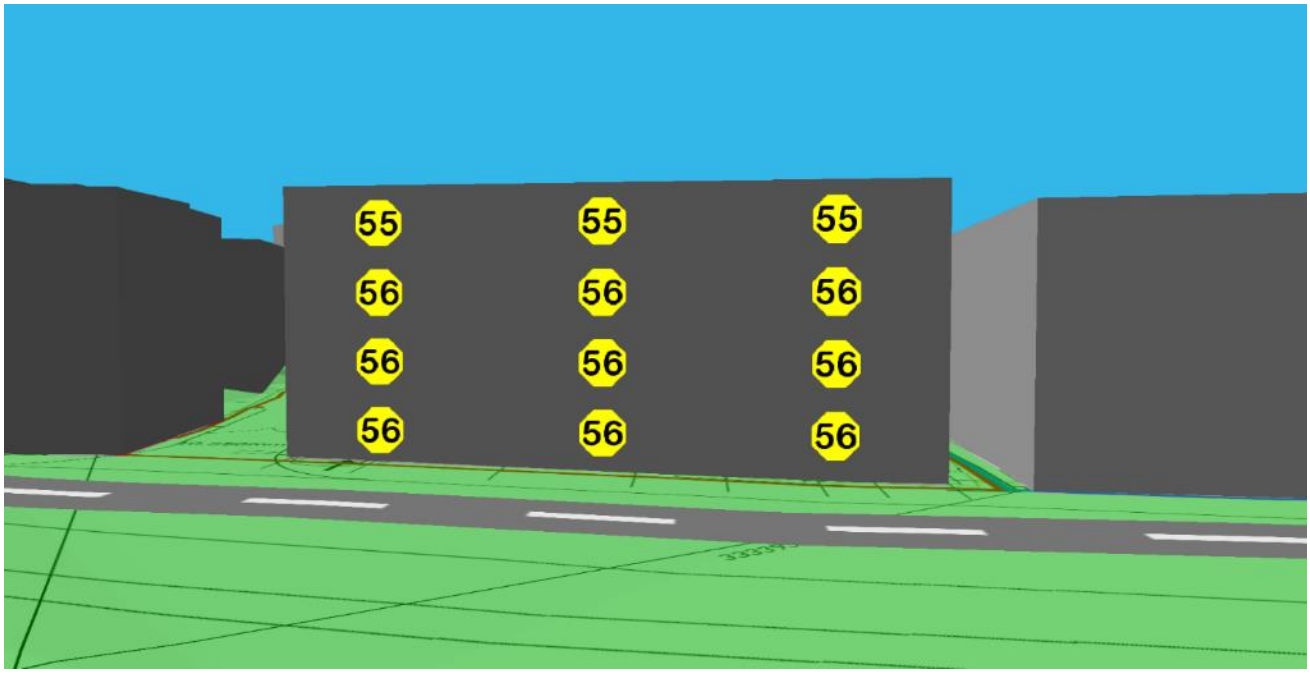
Appendix C

Sample Model Outputs

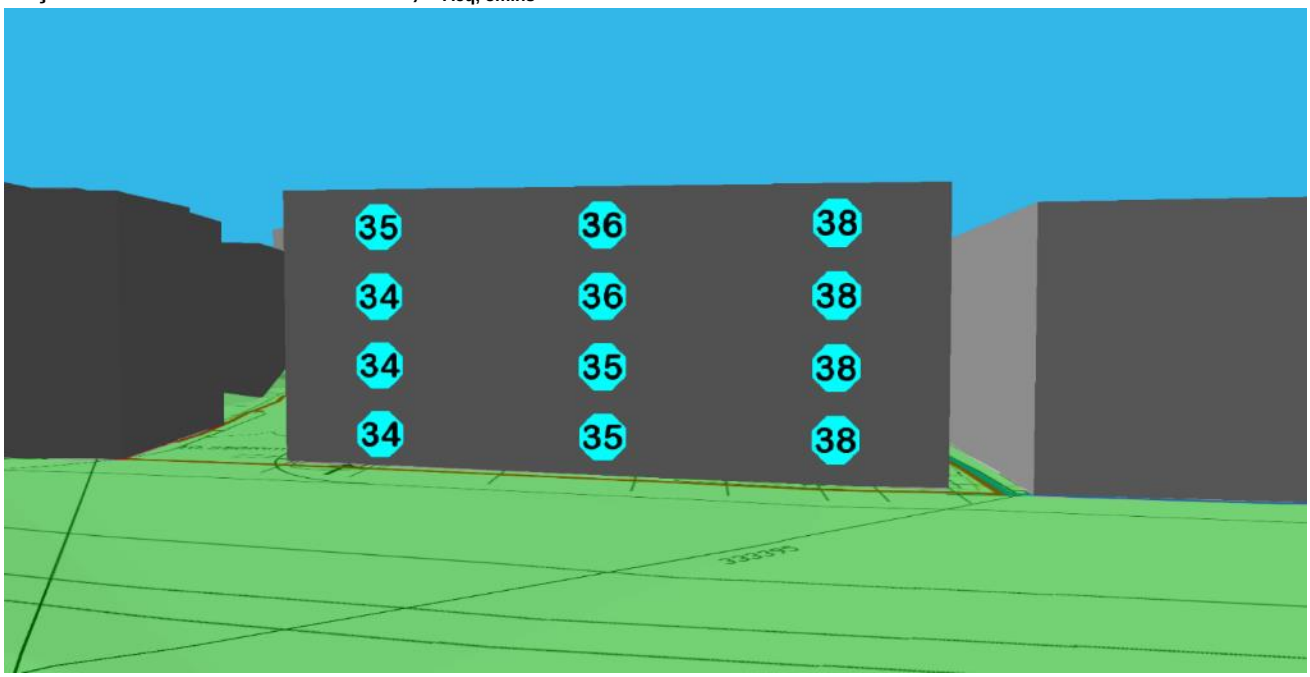
Façade A – Daytime Road Traffic Noise, $L_{Aeq, 16hr}$ dB



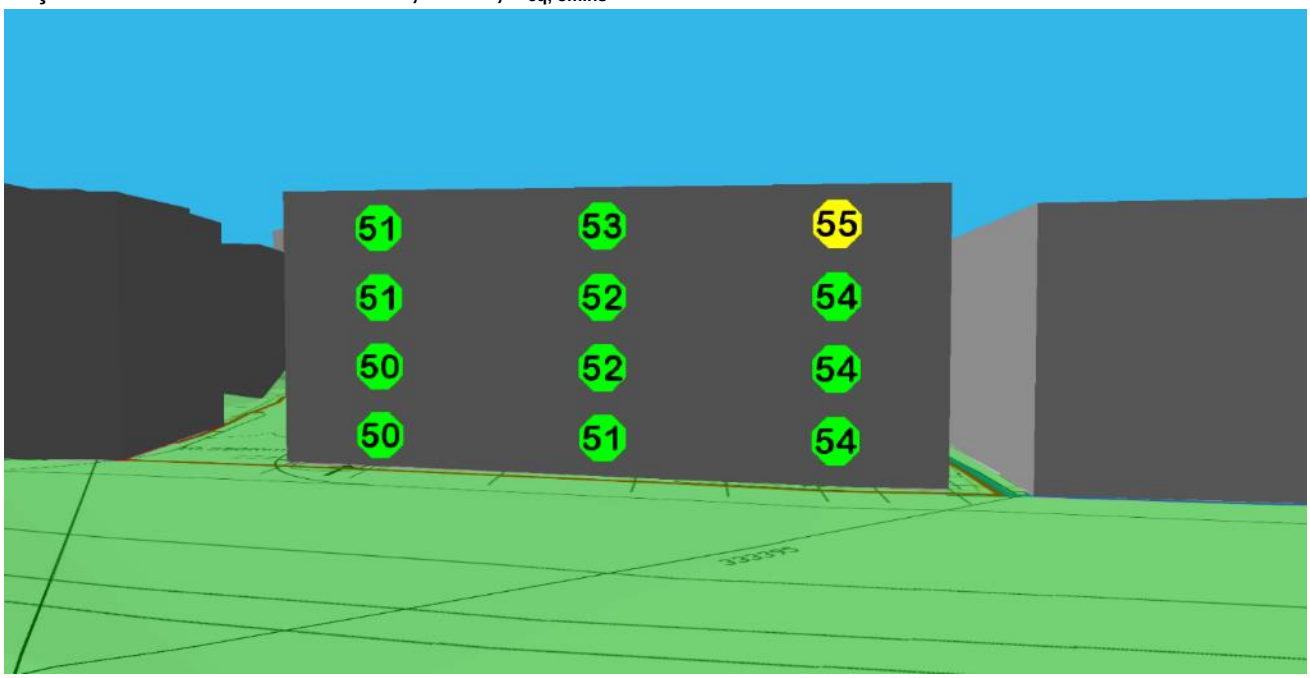
Façade A – Night-time Road Traffic Noise, $L_{Aeq, 8hr}$ dB



Façade A – Entertainment Noise, $L_{Aeq, 5mins}$ dB



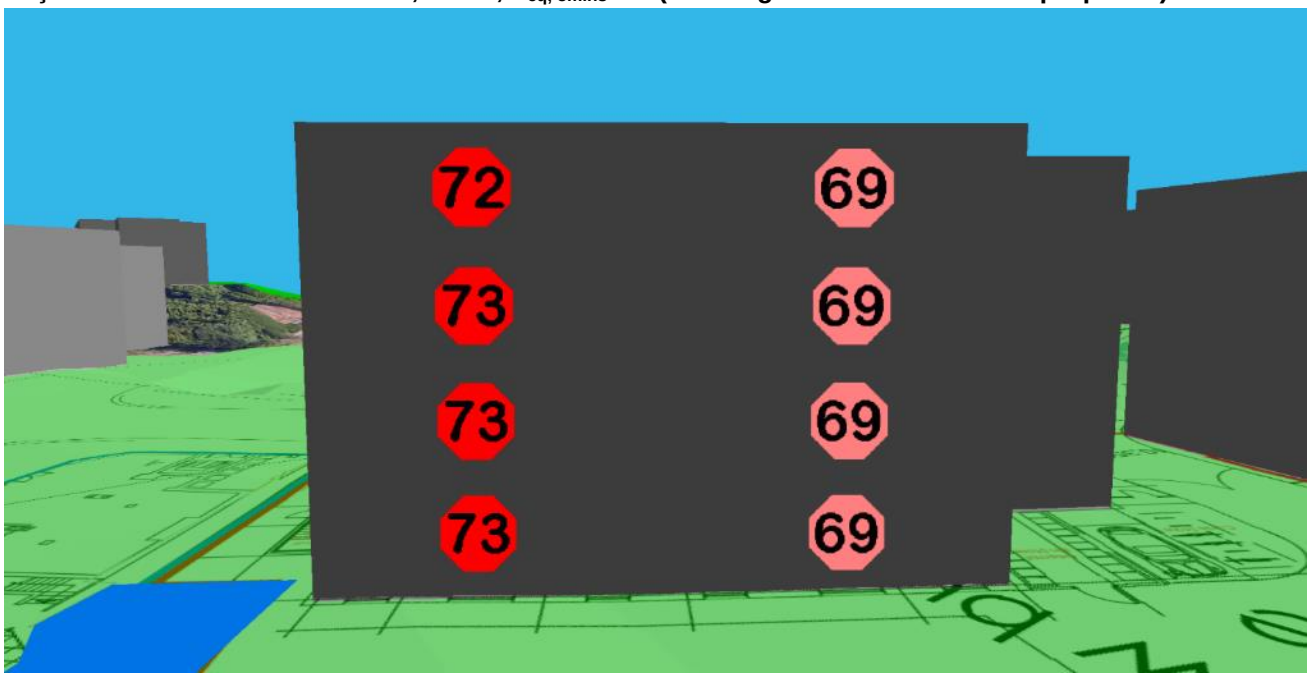
Façade A – Entertainment Noise, 63 Hz, $L_{eq, 5mins}$ dB



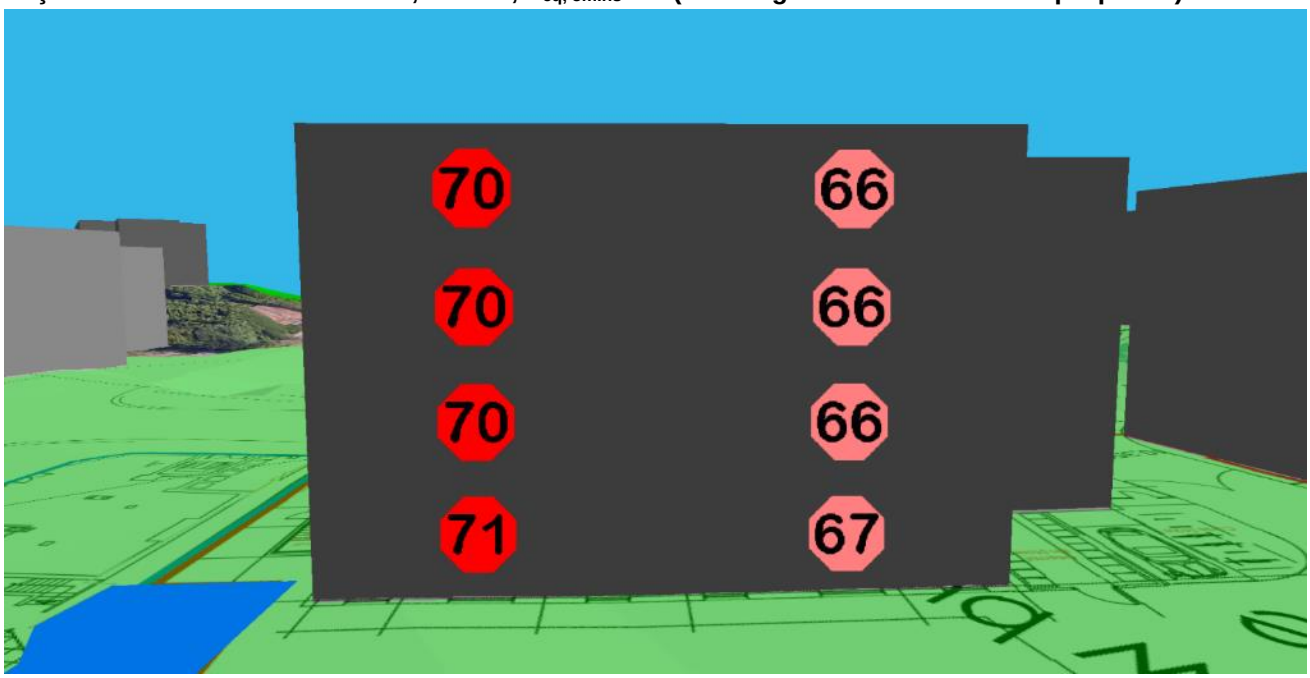
Façade B – Daytime Road Traffic Noise, $L_{Aeq, 16hr}$ dB (Buildings removed for visual purposes)

Façade B – Night-time Road Traffic Noise, $L_{Aeq, 8hr}$ dB (Buildings removed for visual purposes)

Façade B – Entertainment Noise, 63 Hz, $L_{eq, 5mins}$ dB (Buildings removed for visual purposes)



Façade B – Entertainment Noise, 125 Hz, $L_{eq, 5mins}$ dB (Buildings removed for visual purposes)



Appendix D

Break-In Calculations

Façade A, Loudest Modelled Sound Levels, Double Bedroom Break-In Calculation

Internal Noise Break-in — **Calculation to BS12354-3:2000**

Project Name	Bridge Street, Wrexham
Project No.	PA0200
Room Name	Double Bedroom Façade A
Consultant	AW
Checker	JH
Date	20/03/2024

Peninsular ACOUSTICS

Room Details

Width	3.1	m	Height	2.6	m	
Depth	4	m	Volume	32.24	m^3	
Façade Area	8.1	m^2	Surface Area	61.72	m^3	
Additional Façade Area		m^2	Total Façade Area	8.1	m^2	

		63	125	250	500	1000	2000	4000	8000	R_w / D_{new}	C_{tr}	
Area of glass / SRI	3.36	24	30	29	32	41	46	49	43	38	-3	5G Phonip 9mm/6mm/8mm
Area of façade / SRI	4.7	30	46	54	63	73	81	84	83	65	-7	BTC 2044A - 103mm brick, 85mm cavity, 2x 12.5mm gproc wallboard, 50mm gypg
Vent No. off / D_{ne}	1	30	39	37	31	44	42	40	40	39	-2	Greenwood 5000EAW.AC1 Peninsular

Composite Façade Sound Reduction

Composite SRI	26	34	33	36	45	50	53	47	42	-3

Measured Incident Sound Level (Free field)	63	125	250	500	1000	2000	4000	8000	dB(A)	Notes
Daytime Ambient	68.4	64.4	61.4	60.4	61.4	58.4	57.4	53.4	66	
Night-time Ambient	58.4	54.4	51.4	50.4	51.4	48.4	47.4	43.4	56	
Night-time Maximum	82.4	78.4	75.4	74.4	75.4	72.4	71.4	67.4	80	
Entertainment	55.0	51.0	35.6	33.6	29.6	25.6	23.6	1.6	39	

Reverberation Time

Receive Room Low Frequency Correction	No								
Receive Room Reverberation Time (s)	furnished Bedrc	0.2	0.3	0.2	0.2	0.2	0.3	0.3	0.3
Total Absorption A (m^2)		28.66	19.84	21.49	23.45	21.49	20.63	20.63	20.63
10log(S/A)		-5.51	-3.91	-4.26	-4.64	-4.26	-4.08	-4.08	-4.08

Daytime Ambient									
Lp Via Vent	36.9	25.9	24.3	28.4	16.7	16.4	17.7	13.3	28
Lp via Façade (BS8233:2014)	39.4	29.9	27.4	23.0	15.4	7.5	3.5	5.5	24
L_{eq} Total	**41.4**	**31.3**	**29.1**	**29.5**	**19.1**	**16.9**	**17.8**	**14.0**	29

Night-time Ambient	2300-0700								
Lp Via Vent	26.9	15.9	14.3	18.4	6.7	6.4	7.7	3.3	18
Lp via Façade (BS8233:2014)	29.4	19.9	17.4	13.0	5.4	-2.5	-6.5	-4.5	14
L_{Aeq} Total	**31.4**	**21.3**	**19.1**	**19.5**	**9.1**	**6.9**	**7.8**	**4.0**	19

Night-time Maximum	2300-0700								
Lp Via Vent	50.9	39.9	38.3	42.4	30.7	30.4	31.7	27.3	42
Lp via Façade (BS8233:2014)	53.4	43.9	41.4	37.0	29.4	21.5	17.5	19.5	38
L_{AFmax} Total	**55.4**	**45.3**	**43.1**	**43.5**	**33.1**	**30.9**	**31.8**	**28.0**	43

Entertainment									
Lp Via Vent	23.5	12.5	-1.6	1.6	-15.2	-16.5	-16.2	-38.5	3
Lp via Façade (BS8233:2014)	26.0	16.4	1.5	-3.9	-16.5	-25.3	-30.3	-46.3	4
L_{Aeq} Total	**27.9**	**17.9**	**3.2**	**2.7**	**-12.8**	**-15.9**	**-16.0**	**-37.9**	6

Façade A, Loudest Modelled Sound Levels, Single Bedroom Break-In Calculation

Internal Noise Break-in — **Calculation to BS12354-3:2000**

Project Name	Bridge Street, Wrexham	Consultant	AW		
Project No.	PA0200	Checker	JH		
Room Name	Single Bedroom Façade A	Date	20/03/2024		

Room Details

Width	2.5	m	Height	2.6	m		
Depth	4	m	Volume	26	m^3		
Façade Area	6.5	m^2	Surface Area	53.8	m^3		
Additional Façade Area		m^2	Total Façade Area	6.5	m^2		

		63	125	250	500	1000	2000	4000	8000	R_w / D_{new}	C_{tr}	
Area of glass / SRI	3.36	24	30	29	32	41	46	49	43	38	-3	SG Phonip 9mm/6mm/8mm
Area of façade / SRI	3.1	30	46	54	63	73	81	84	83	65	-7	BTC 2044A - 103mm brick, 85mm cavity, 2x 12.5mm gproc wallboard, 50mm gypp
Vent No. off / D_{ne}	1	30	39	37	31	44	42	40	40	39	-2	Greenwood 5000EAW.AC1 Peninsular

Composite Façade Sound Reduction

Composite SRI	26	33	32	35	44	49	52	46	41	-3	

Measured Incident Sound Level (Free field)	63	125	250	500	1000	2000	4000	8000	dB(A)	Notes
Daytime Ambient	68.4	64.4	61.4	60.4	61.4	58.4	57.4	53.4	66	
Night-time Ambient	58.4	54.4	51.4	50.4	51.4	48.4	47.4	43.4	56	
Night-time Maximum	82.4	78.4	75.4	74.4	75.4	72.4	71.4	67.4	80	
Entertainment	55.0	51.0	35.6	33.6	29.6	25.6	23.6	1.6	39	

Reverberation Time

Receive Room Low Frequency Correction	No								
Receive Room Reverberation Time (s)	furnished Bedrc	0.2	0.3	0.2	0.2	0.2	0.3	0.3	0.3
Total Absorption A (m^2)		23.11	16.00	17.33	18.91	17.33	16.64	16.64	16.64
10log(S/A)		-5.51	-3.91	-4.26	-4.64	-4.26	-4.08	-4.08	-4.08

Daytime Ambient									
Lp Via Vent	37.8	26.9	25.2	29.4	17.6	17.3	18.6	14.3	29
Lp via Façade (BS8233:2014)	40.0	30.8	28.3	23.9	16.3	8.5	4.5	6.5	25
L_{eq} Total	**42.0**	**32.2**	**30.0**	**30.5**	**20.0**	**17.9**	**18.8**	**14.9**	30

Night-time Ambient	2300-0700								
Lp Via Vent	27.8	16.9	15.2	19.4	7.6	7.3	8.6	4.3	19
Lp via Façade (BS8233:2014)	30.0	20.8	18.3	13.9	6.3	-1.5	-5.5	-3.5	15
L_{Aeq} Total	**32.0**	**22.2**	**20.0**	**20.5**	**10.0**	**7.9**	**8.8**	**4.9**	20

Night-time Maximum	2300-0700								
Lp Via Vent	51.8	40.9	39.2	43.4	31.6	31.3	32.6	28.3	43
Lp via Façade (BS8233:2014)	54.0	44.8	42.3	37.9	30.3	22.5	18.5	20.5	39
L_{AFmax} Total	**56.0**	**46.2**	**44.0**	**44.5**	**34.0**	**31.9**	**32.8**	**28.9**	44

Entertainment									
Lp Via Vent	24.4	13.4	-0.7	2.5	-14.3	-15.5	-15.3	-37.6	4
Lp via Façade (BS8233:2014)	26.5	17.3	2.4	-2.9	-15.6	-24.4	-29.4	-45.4	5
L_{Aeq} Total	**28.6**	**18.8**	**4.2**	**3.6**	**-11.9**	**-15.0**	**-15.1**	**-36.9**	7

Façade A, Loudest Modelled Sound Levels, Living Room Break-In Calculation

Internal Noise Break-in — **Calculation to BS12354-3:2000**

Project Name	Bridge Street, Wrexham	Consultant	AW		
Project No.	PA0200	Checker	JH		
Room Name	LKD Façade A	Date	20/03/2024		

Room Details

Width	3.8	m	Height	2.6	m		
Depth	6.5	m	Volume	64.22	m^3		
Façade Area	9.9	m^2	Surface Area	102.96	m^3		
Additional Façade Area		m^2	Total Façade Area	9.9	m^2		

		63	125	250	500	1000	2000	4000	8000	R_w / D_{new}	C_{tr}	
Area of glass / SRI	5.04	18	24	21	29	43	43	45	39	33	-4	Guardian 4/16/6
Area of façade / SRI	4.8	30	46	54	63	73	81	84	83	65	-7	BTC 2044A - 103mm brick, 85mm cavity, 2x 12.5mm gproc wallboard, 50mm gypg
Vent No. off / D_{ne}	1	32	32	32	31	33	31	31	31	32	0	Trickle vent with direct air path

Composite Façade Sound Reduction

	63	125	250	500	1000	2000	4000	8000	R_w / D_{new}	C_{tr}
Composite SRI	21	27	24	32	46	46	48	42	36	-4

Measured Incident Sound Level (Free field)	63	125	250	500	1000	2000	4000	8000	dB(A)	Notes
Daytime Ambient	68.4	64.4	61.4	60.4	61.4	58.4	57.4	53.4	66	
Night-time Ambient	58.4	54.4	51.4	50.4	51.4	48.4	47.4	43.4	56	
Night-time Maximum	82.4	78.4	75.4	74.4	75.4	72.4	71.4	67.4	80	
Entertainment	54.0	50.0	35.6	33.6	29.6	25.6	23.6	1.6	38	

Reverberation Time

		63	125	250	500	1000	2000	4000	8000
Receive Room Low Frequency Correction	No								
Receive Room Reverberation Time (s)	furnished Bedrc	0.2	0.3	0.2	0.2	0.2	0.3	0.3	0.3
Total Absorption A (m^2)		57.08	39.52	42.81	46.71	42.81	41.10	41.10	41.10
10log(S/A)		-7.62	-6.02	-6.37	-6.75	-6.37	-6.19	-6.19	-6.19

Daytime Ambient

	63	125	250	500	1000	2000	4000	8000	dB(A)
Lp Via Vent	31.9	29.5	26.2	25.8	25.2	24.3	23.3	19.3	31
Lp via Façade (BS8233:2014)	43.1	34.5	34.1	24.8	12.1	9.3	6.3	8.3	28
L_{eq} Total	**43.5**	**35.7**	**34.8**	**28.3**	**25.4**	**24.5**	**23.4**	**19.7**	33

Entertainment

	63	125	250	500	1000	2000	4000	8000	dB(A)
Lp Via Vent	17.5	15.1	0.3	-1.1	-6.7	-8.5	-10.5	-32.5	3
Lp via Façade (BS8233:2014)	28.7	20.1	8.3	-2.1	-19.7	-23.6	-27.6	-43.6	7
L_{Aeq} Total	**29.0**	**21.3**	**8.9**	**1.4**	**-6.5**	**-8.4**	**-10.5**	**-32.2**	9

Façade B, Loudest Modelled Sound Levels, Double Bedroom Break-In Calc

Internal Noise Break-in — **Calculation to BS12354-3:2000**

Project Name	Bridge Street, Wrexham	Consultant	AW	
Project No.	PA0200	Checker	JH	
Room Name	Double Bedroom Façade B	Date	20/03/2024	

Room Details

Width	3.1	m	Height	2.6	m	
Depth	4	m	Volume	32.24	m^3	
Façade Area	8.1	m^2	Surface Area	61.72	m^3	
Additional Façade Area		m^2	Total Façade Area	8.1	m^2	

		63	125	250	500	1000	2000	4000	8000	R_w / D_{new}	C_{tr}	
Area of glass / SRI	0.3	24	30	29	32	41	46	49	43	38	-3	SG Phonip 9mm/6mm/8mm
Area of façade / SRI	7.8	30	46	54	63	73	81	84	83	65	-7	BTC 2044A - 103mm brick, 85mm cavity, 2x 12.5mm gproc wallboard, 50mm gypg
Vent No. off / D_{ne}	1	30	39	37	31	44	42	40	40	39	-2	Greenwood 5000EAW.AC1 Peninsular
Composite Façade Sound Reduction												
Composite SRI		30	42	43	46	55	60	63	57	52	-3	

Measured Incident Sound Level (Free field)	63	125	250	500	1000	2000	4000	8000	dB(A)	Notes
Daytime Ambient	43.4	39.4	36.4	35.4	36.4	33.4	32.4	28.4	41	
Night-time Ambient	33.4	29.4	26.4	25.4	26.4	23.4	22.4	18.4	31	
Night-time Maximum	45.4	41.4	38.4	37.4	38.4	35.4	34.4	30.4	43	
Entertainment	73.0	71.0	56.6	54.6	50.6	46.6	44.6	22.6	59	

Reverberation Time									
Receive Room Low Frequency Correction	No								
Receive Room Reverberation Time (s)	furnished Bedrc	0.2	0.3	0.2	0.2	0.2	0.3	0.3	0.3
Total Absorption A (m^2)		28.66	19.84	21.49	23.45	21.49	20.63	20.63	20.63
10log(S/A)		-5.51	-3.91	-4.26	-4.64	-4.26	-4.08	-4.08	-4.08

Daytime Ambient									
Lp Via Vent	11.9	0.9	-0.7	3.4	-8.3	-8.6	-7.3	-11.7	3
Lp via Façade (BS8233:2014)	11.4	-3.6	-7.8	-12.4	-20.1	-27.9	-31.9	-29.9	-10
L_{eq} Total	**14.7**	**2.2**	**0.1**	**3.6**	**-8.0**	**-8.5**	**-7.3**	**-11.6**	3

Night-time Ambient	2300-0700								
Lp Via Vent	1.9	-9.1	-10.7	-6.6	-18.3	-18.6	-17.3	-21.7	-7
Lp via Façade (BS8233:2014)	1.4	-13.6	-17.8	-22.4	-30.1	-37.9	-41.9	-39.9	-20
L_{Aeq} Total	**4.7**	**-7.8**	**-9.9**	**-6.4**	**-18.0**	**-18.5**	**-17.3**	**-21.6**	-7

Night-time Maximum	2300-0700								
Lp Via Vent	13.9	2.9	1.3	5.4	-6.3	-6.6	-5.3	-9.7	5
Lp via Façade (BS8233:2014)	13.4	-1.6	-5.8	-10.4	-18.1	-25.9	-29.9	-27.9	-8
L_{Afmax} Total	**16.7**	**4.2**	**2.1**	**5.6**	**-6.0**	**-6.5**	**-5.3**	**-9.6**	5

Entertainment									
Lp Via Vent	41.5	32.5	19.4	22.6	5.8	4.5	4.8	-17.5	23
Lp via Façade (BS8233:2014)	40.9	28.0	12.3	6.7	-5.9	-14.8	-19.8	-35.8	17
L_{Aeq} Total	**44.2**	**33.8**	**20.2**	**22.7**	**6.1**	**4.6**	**4.8**	**-17.5**	24

Façade B, Loudest Modelled Sound Levels, Single Bedroom Break-In Calc

Internal Noise Break-in — **Calculation to BS12354-3:2000**

Project Name	Bridge Street, Wrexham	Consultant	AW	
Project No.	PA0200	Checker	JH	
Room Name	Single Bedroom Façade B	Date	20/03/2024	

Room Details												
Width		2.5	m	Height		2.6	m					
Depth		4	m	Volume		26	m^3					
Façade Area		6.5	m^2	Surface Area		53.8	m^3					
Additional Façade Area			m^2	Total Façade Area		6.5	m^2					
		63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**R_w / D_{new}**	**C_{tr}**	
Area of glass / SRI	0.3	24	30	29	32	41	46	49	43	38	-3	SG Phonip 9mm/6mm/8mm
Area of façade / SRI	6.2	30	46	54	63	73	81	84	83	65	-7	BTC 2044A - 103mm brick, 85mm cavity, 2x 12.5mm gproc wallboard, 50mm gypgl
Vent No. off / D_{ne}	1	30	39	37	31	44	42	40	40	39	-2	Greenwood 5000EAW.AC1 Peninsular
Composite Façade Sound Reduction												
Composite SRI		29	42	42	45	54	59	62	56	51	-3	
Measured Incident Sound Level (Free field)		**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dB(A)**		**Notes**
Daytime Ambient		43.4	39.4	36.4	35.4	36.4	33.4	32.4	28.4	41		
Night-time Ambient		33.4	29.4	26.4	25.4	26.4	23.4	22.4	18.4	31		
Night-time Maximum		45.4	41.4	38.4	37.4	38.4	35.4	34.4	30.4	43		
Entertainment		73.0	71.0	56.6	54.6	50.6	46.6	44.6	22.6	59		
Reverberation Time												
Receive Room Low Frequency Correction	No											
Receive Room Reverberation Time (s)	furnished Bedrc	0.2	0.3	0.2	0.2	0.2	0.3	0.3	0.3			
Total Absorption A (m^2)		23.11	16.00	17.33	18.91	17.33	16.64	16.64	16.64			
10log(S/A)		-5.51	-3.91	-4.26	-4.64	-4.26	-4.08	-4.08	-4.08			
Daytime Ambient												
Lp Via Vent		12.8	1.9	0.2	4.4	-7.4	-7.7	-6.4	-10.7	4		
Lp via Façade (BS8233:2014)		11.5	-3.0	-6.9	-11.5	-19.1	-27.0	-31.0	-29.0	-9		
L_{eq} Total		**15.2**	**3.1**	**1.0**	**4.5**	**-7.1**	**-7.6**	**-6.4**	**-10.7**	4		
Night-time Ambient	2300-0700											
Lp Via Vent		2.8	-8.1	-9.8	-5.6	-17.4	-17.7	-16.4	-20.7	-6		
Lp via Façade (BS8233:2014)		1.5	-13.0	-16.9	-21.5	-29.1	-37.0	-41.0	-39.0	-19		
L_{Aeq} Total		**5.2**	**-6.9**	**-9.0**	**-5.5**	**-17.1**	**-17.6**	**-16.4**	**-20.7**	-6		
Night-time Maximum	2300-0700											
Lp Via Vent		14.8	3.9	2.2	6.4	-5.4	-5.7	-4.4	-8.7	6		
Lp via Façade (BS8233:2014)		13.5	-1.0	-4.9	-9.5	-17.1	-25.0	-29.0	-27.0	-7		
L_{AFmax} Total		**17.2**	**5.1**	**3.0**	**6.5**	**-5.1**	**-5.6**	**-4.4**	**-8.7**	6		
Entertainment												
Lp Via Vent		42.4	33.4	20.3	23.5	6.7	5.5	5.7	-16.6	24		
Lp via Façade (BS8233:2014)		41.1	28.5	13.2	7.6	-5.0	-13.9	-18.9	-34.9	17		
L_{Aeq} Total		**44.8**	**34.7**	**21.1**	**23.6**	**7.0**	**5.5**	**5.8**	**-16.5**	25		

Façade B, Loudest Modelled Sound Levels, Living Room Break-In Calc

Internal Noise Break-in — **Calculation to BS12354-3:2000**

Project Name	Bridge Street, Wrexham	Consultant	AW		
Project No.	PA0200	Checker	JH		
Room Name	LKD Façade B	Date	20/03/2024		

Peninsular ACOUSTICS

Room Details

Width	3.8	m	Height	2.6	m
Depth	6.5	m	Volume	64.22	m^3
Façade Area	9.9	m^2	Surface Area	102.96	m^3
Additional Façade Area		m^2	Total Façade Area	9.9	m^2

		63	125	250	500	1000	2000	4000	8000	R_w / D_{new}	C_{tr}	
Area of glass / SRI	5.04	24	30	29	32	41	46	49	43	38	-3	SG Phonip 9mm/6mm/8mm
Area of façade / SRI	4.8	30	46	54	63	73	81	84	83	65	-7	BTC 2044A - 103mm brick, 85mm cavity, 2x 12.5mm gproc wallboard, 50mm gypl
Vent No. off / D_{ne}	1	30	39	37	31	44	42	40	40	39	-2	Greenwood 5000EAW.AC1 Peninsular

Composite Façade Sound Reduction

	63	125	250	500	1000	2000	4000	8000	R_w / D_{new}	C_{tr}
Composite SRI	26	33	32	35	44	49	52	46	41	-3

Measured Incident Sound Level (Free field)	63	125	250	500	1000	2000	4000	8000	dB(A)	Notes
Daytime Ambient	43.4	39.4	36.4	35.4	36.4	33.4	32.4	28.4	41	
Night-time Ambient	33.4	29.4	26.4	25.4	26.4	23.4	22.4	18.4	31	
Night-time Maximum	45.4	41.4	38.4	37.4	38.4	35.4	34.4	30.4	43	
Entertainment	73.0	71.0	56.6	54.6	50.6	46.6	44.6	22.6	59	

Reverberation Time

		63	125	250	500	1000	2000	4000	8000
Receive Room Low Frequency Correction	No								
Receive Room Reverberation Time (s)	furnished Bedrc	0.2	0.3	0.2	0.2	0.2	0.3	0.3	0.3
Total Absorption A (m^2)		57.08	39.52	42.81	46.71	42.81	41.10	41.10	41.10
10log(S/A)		-7.62	-6.02	-6.37	-6.75	-6.37	-6.19	-6.19	-6.19

Daytime Ambient

	63	125	250	500	1000	2000	4000	8000	dB(A)
Lp Via Vent	8.9	-2.1	-3.7	0.4	-11.3	-11.6	-10.3	-14.7	0
Lp via Façade (BS8233:2014)	12.8	3.6	1.2	-3.2	-10.9	-18.7	-22.7	-20.7	-2
L_{eq} Total	**14.3**	**4.6**	**2.4**	**2.0**	**-8.1**	**-10.8**	**-10.1**	**-13.7**	2

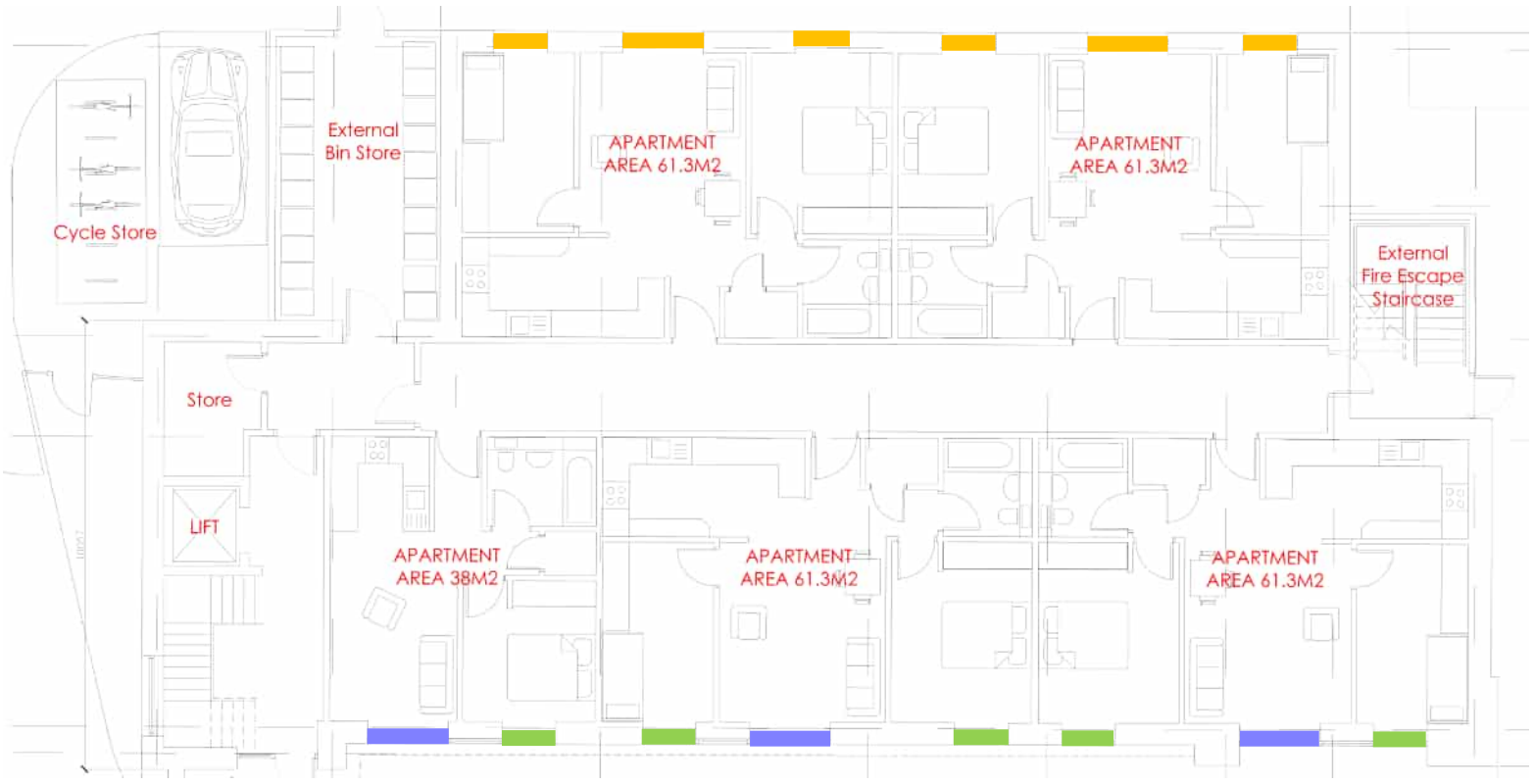
Entertainment

	63	125	250	500	1000	2000	4000	8000	dB(A)
Lp Via Vent	38.5	29.5	16.4	19.6	2.8	1.5	1.8	-20.5	20
Lp via Façade (BS8233:2014)	42.4	35.2	21.3	15.9	3.3	-5.6	-10.6	-26.6	22
L_{Aeq} Total	**43.9**	**36.2**	**22.5**	**21.1**	**6.1**	**2.3**	**2.1**	**-19.6**	24

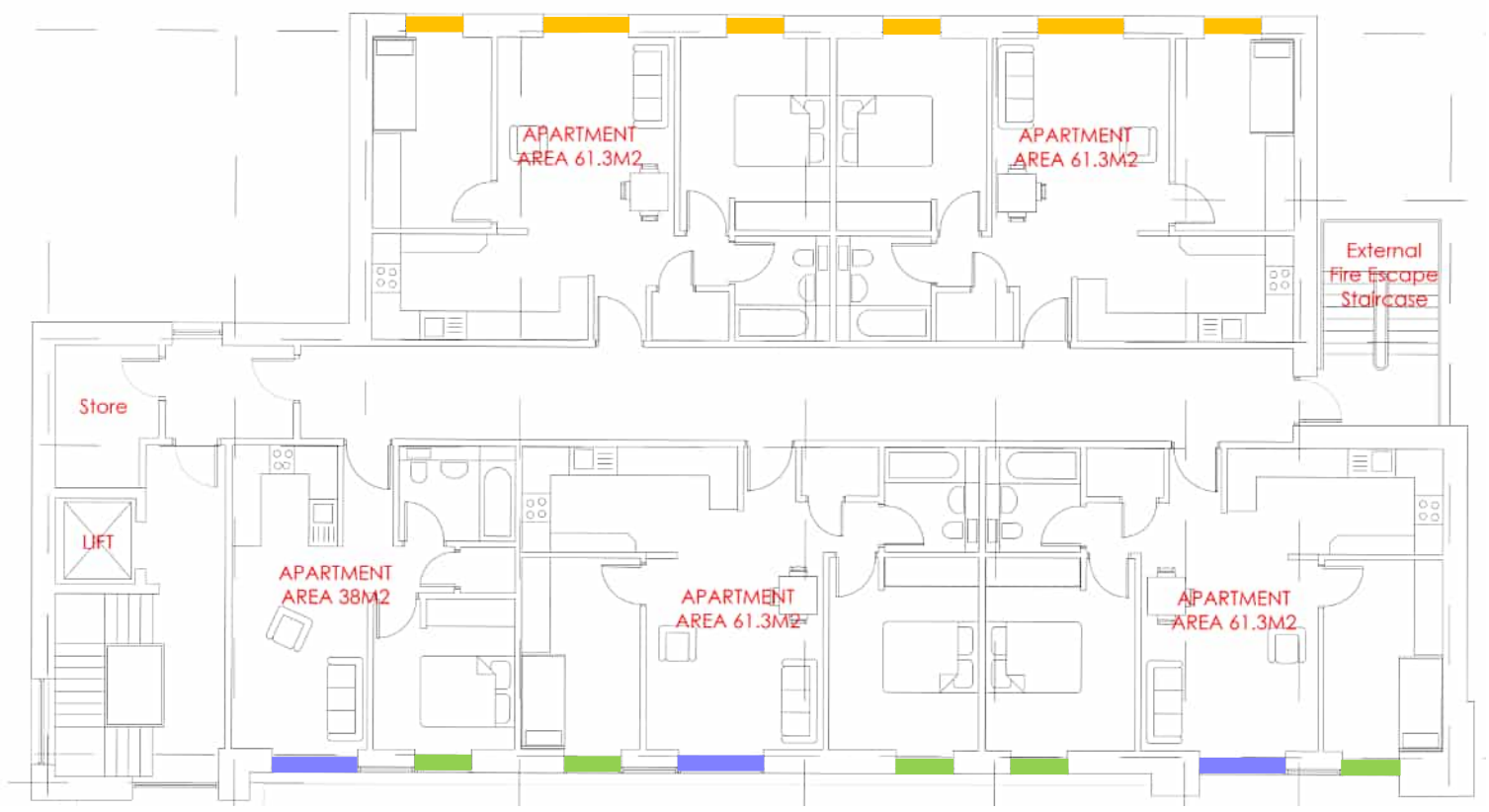
Appendix E

Mitigation References

Ground Floor



First and Second Floor



Third Floor

Mitigation Reference Drawing

Reference A

Reference B

Reference C

Reference	Glazing	Ventilator
Reference A	35 dB $R_w + C_{tr}$	37 dB $D_{n,e,w} + C_{tr}$
Reference B	29 dB $R_w + C_{tr}$	32 dB $D_{n,e,w} + C_{tr}$
Reference C	35 dB $R_w + C_{tr}$	37 dB $D_{n,e,w} + C_{tr}$

Notes

Please refer to acoustics report PA0200-R01-P01 for further information.

For rooms with Reference C, supplementary mechanical ventilation should be included in the absence of opening windows during entertainment noise periods.

21/03/24	P01	PLANNING	AW
DATE	REV	DESCRIPTION	BY

PROJECT: 33-35 Bridge Street
REF: Acoustic Mitigation References
PA0200-ACO-001-P01

PENINSULAR ACOUSTICS

Appendix F

Glazing Requirements

Mitigation Reference Performance Requirements, Façade

Façade Element	Sound Insulation Performance Requirements (dB) in Octave Band Centre Frequencies (Hz)								$R_W + C_{tr}$ (dB)
	63	125	250	500	1k	2k	4k	8k	
Non-Glazed	38	45	50	60	66	68	74	74	56
Glazing 1	24	30	29	32	41	46	49	43	35
Glazing 2	27	32	42	46	46	52	60	60	45

It is appreciated that it may be challenging to achieve every octave band performance requirement. Therefore, based upon the dominant noise sources at the Site the minimum performance of the final selections for the Site should achieve the 63 Hz, 125 Hz octave bands along with the overall $R_w + C_{tr}$ value.

Mitigation Reference Performance Requirements, Trickle Ventilators

Ventilation Reference	Sound Insulation Performance Requirements (dB) in Octave Band Centre Frequencies (Hz)								$D_{n,e,w} + C_{tr}$ (dB)
	63	125	250	500	1k	2k	4k	8k	
Mitigation Ref A and C	30	39	37	31	44	42	40	40	37
Mitigation Ref B	30	32	32	31	33	31	31	31	32

Appendix G

Report Limitations

This report has been prepared for the titled project or named part thereof and should not be used in whole or part and relied upon for any other project without the written authorisation of Peninsular Acoustics Limited. Peninsular Acoustics Limited accept no responsibility or liability for the consequences of this document if it is used for a purpose other than that for which it was commissioned. Persons wishing to use or rely upon this report for other purposes must seek written authority to do so from the owner of this report and/ or Peninsular Acoustics Limited and agree to indemnify Peninsular Acoustics Limited for any and all loss or damage resulting therefrom. Peninsular Acoustics Limited accepts no responsibility or liability for this document to any other party other than the person by whom it was commissioned.

The findings and opinions expressed are relevant to the dates of the site works and design drawings/specifications and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and from our experience. If additional information becomes available which may affect our comments, conclusions or recommendations Peninsular Acoustics Limited reserve the right to review the information, reassess any new potential concerns and modify our opinions accordingly.

Peninsular Acoustics

Liverpool: Office 14 Clock Tower Building, Clock Tower Park, Liverpool, England, L10 1LD

Birmingham: Studio 214, Scott House, Custard Factory, Gibb Street, Birmingham, B9 4AA

London: 16 Upper Woburn Pl, London, WC1H 0AF

Website: www.peninsularacoustics.co.uk