Residential Noise Assessment

Site Address: The Old Bank, 2 High Street, Wombwell, Barnsley, S73 0AW

Client Name: 212 Residential Ltd.

Project Reference: NP-013130

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Disclaimer

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Delivering sustainable development by promoting good health and well-being through effective management of noise.

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1. Introduction

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for a residential development ('the proposed development') at The Old Bank, 2 High Street, Wombwell, Barnsley, S73 0AW ('the site'). The site is subject to noise from road traffic emissions and commercial activity.

The applicant has submitted a full planning application (ref. 2025/0356) to the local planning authority ('LPA'), Barnsley Metropolitan Borough Council. Following review, the LPA has advised that a noise impact assessment is required. Accordingly, this report has been prepared to address this requirement.

A noise survey has been undertaken to establish the prevailing sound levels at the proposed development. The findings have been used to assess the suitability of the site for residential use. Measures required to mitigate noise impacts have been assessed in accordance with the relevant performance standards, legislation, policy, and guidance.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.1 Standards, Legislation, Policy & Guidance

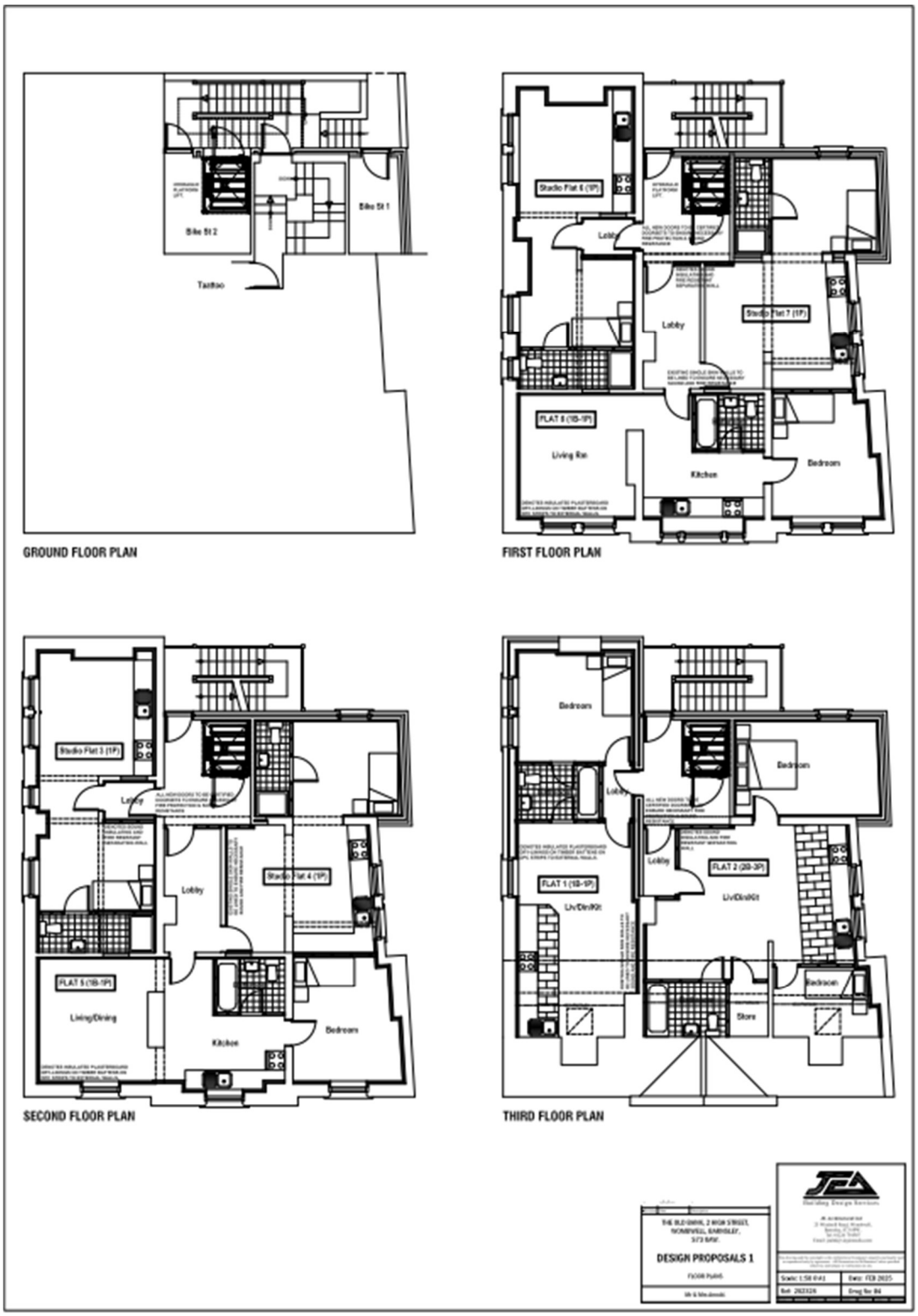
The following performance standards, legislation, policy, and guidance have been considered to ensure good acoustic design in the assessment:

- National Planning Policy Framework (2024)
- Noise Policy Statement for England (2010)
- British Standard BS8233:2014 – 'Guidance on sound insulation and noise reduction for buildings'
- Approved Document F: Volume 1 Dwellings (2021)
- Acoustics Ventilation Overheating: Residential Design Guide 2020' (AVO Guide).

Further information on the legislation can be found in Appendix B.

1.2 Proposal Brief

The proposal is for change of use of an existing building from commercial to a mixed-use development comprising of a commercial unit on the ground floor and 8no. residential studio apartments across the upper floors. The proposed layout is shown in the figure overleaf.



Drawing Ref. 202328 from 'JE Architectural Ltd.'

Figure 1 – Proposed Development Floor Plans

1.3 Local Planning Authority & Background

As previously discussed, the client has submitted an application for review to the LPA. In response, the LPA has provided the following comments:

"This development has the potential to have an adverse impact on health and quality of life of those living and/or working in the locality.

A Noise Impact Assessment is required which shall be used to inform the layout and design of the scheme such that mitigation to achieve the following sound levels are achieved within all dwellings.

- *Bedrooms: LAeq (8 hours) – 30dB (2300 to 0700 hours)*
- *Living Rooms & Bedrooms: LAeq (16 hour) – 35dB (0700 to 2300 hours)*
- *Bedrooms: LAFmax – 45dB (2300 to 0700 hours).*

Where the above noise criteria cannot be achieved with windows partially open, include a system of alternative acoustically treated ventilation to all habitable rooms. The assessment shall be accompanied by a plan which clearly identifies the different types of mitigation measures proposed, where each type of mitigation is proposed and a programme of implementation."

2. Environmental Noise Survey

2.1 Measurement Methodology

The measurement dates and particulars are outlined in the following table. Details regarding the equipment used and the weather conditions recorded during the survey can be found in Appendix D.

During the survey, a 130mm diameter windshield was fitted to the microphone, which is effective in windspeeds up to 7m/s. The equipment was field calibrated before and after the survey and negligible drift was noted.

Location	Survey Dates	Measurement Particulars
MP1	28/08/2025 – 01/09/2025	Equipment mounted protruding from a first-floor window at 1m distance from the building façade on High Street.
MP2	28/08/2025 – 01/09/2025	Equipment mounted protruding from a first-floor window at 1m distance from the north-western building façade overlooking the car park and High Street.
MP3	28/08/2025 – 01/09/2025	Equipment mounted protruding from a first-floor window at 1m distance from the rear building façade overlooking the carpark and the neighbouring properties.

Table 1 – Measurement Methodology

The site surroundings and measurement locations are highlighted in the figure below:

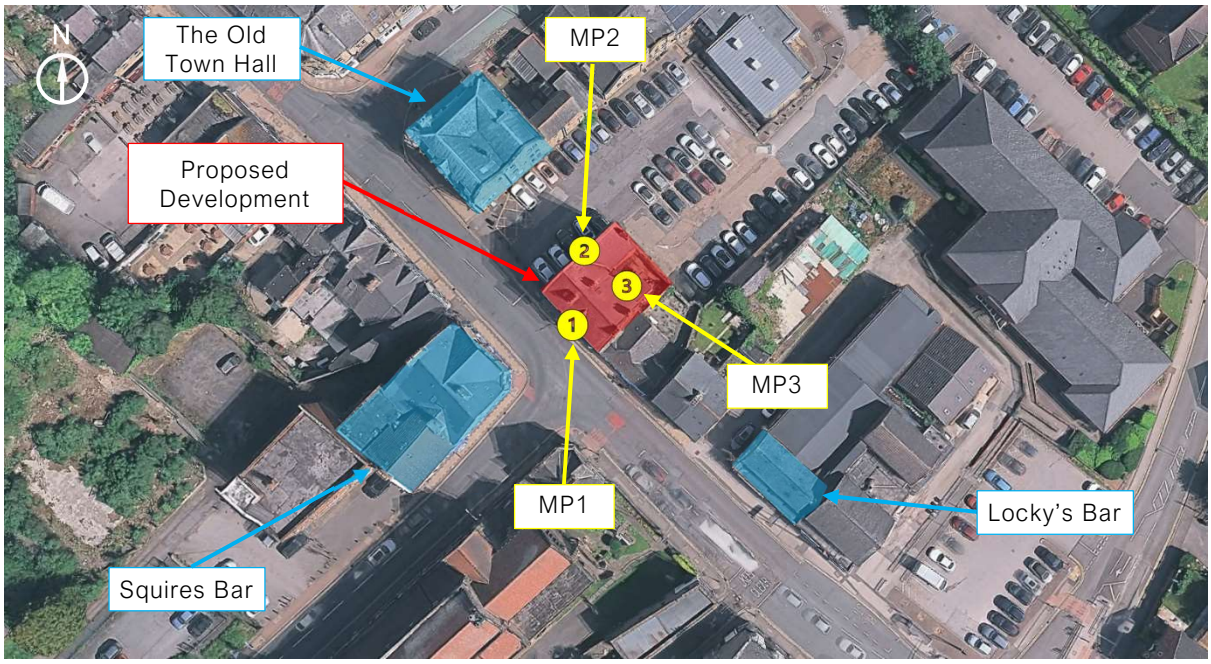


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Figure 2 – Measurement Locations and Site Surroundings

2.2 Context & Subjective Impression

The proposed development site is located on High Street in Wombwell, Barnsley. The area surrounding the site is mixed in nature and primarily consists of commercial properties with possible residential dwellings above. A car park borders the site to the northern façades, which is regularly used by patrons of the surrounding businesses.

The commercial unit located on the ground floor of the development site is currently a tattoo parlour. Operational hours are understood to be 09:30–18:00, Monday to Saturday, and 10:00–16:00 on Sundays.

The majority of the commercial premises in the vicinity are general retail units; however, there are also several public houses that provide regular live entertainment during weekends. The most prominent of these venues have been highlighted in the preceding figure for reference. Operating hours vary, with the earliest opening being *The Old Town Hall* at 10:00 daily, and the latest closing being *Lucky's Bar* at midnight on Fridays and Saturdays. All other public houses in the area typically close by 23:00, Monday to Thursday. During site visits, it was observed that these venues advertised live entertainment, which is likely to have been audible at the development site during the assessment period. This is reflected in the time-history data presented in Appendix D. For clarity, further analysis is provided in the following sections.

The acoustic environment at the site is considered to be of low to moderate intensity, with the prevailing noise climate is primarily influenced by road traffic emissions from High Street. Noise associated with activity in the car park was also audible at the northern façades, and while plant noise from surrounding commercial units was noted, it was low in level. Typically, when plant noise is dominant in an environment this presents as a consistent background level in the L_{A90} measurements, forming a 'noise floor.' This was not evident during the survey period, suggesting that existing plant installations in the area are not a significant concern and do not require further investigation.

2.3 Environmental Noise Survey Results

A summary of the sound levels measured during the survey is presented in the table overleaf. Also presented are the 1-hour measurements recorded between 22:00 and 00:00 on 29/08/25, when low-frequency noise levels were louder due to the operations of the nearby public houses.

The time history results can be found in Appendix D.

Location	Measurement Period ('T')	Octave Frequency Band (Hz, $L_{eq,T}$, dB)							$L_{Aeq,T}$ (dB)	'Typical' $L_{AFmax,1min}$ (dB)
		63	125	250	500	1k	2k	4k		
MP1	Average $L_{eq,16hr}$ (Day)	68	62	60	58	59	57	53	63	--
	Average $L_{eq,8hr}$ (Night)	60	55	52	49	50	48	44	55	79
	$L_{eq,1hr}$ (22:00 – 23:00)	72	67	63	60	59	55	49	63	--
	$L_{eq,1hr}$ (23:00 – 00:00)	66	59	55	54	54	50	44	57	79
MP2	Average $L_{eq,16hr}$ (Day)	62	58	55	53	52	50	46	57	--
	Average $L_{eq,8hr}$ (Night)	54	50	46	44	44	41	37	49	71
	$L_{eq,1hr}$ (22:00 – 23:00)	69	67	60	57	55	51	46	60	--
	$L_{eq,1hr}$ (23:00 – 00:00)	60	54	49	52	51	46	40	55	71
MP3	Average $L_{eq,16hr}$ (Day)	59	54	50	46	46	43	38	51	--
	Average $L_{eq,8hr}$ (Night)	48	45	41	39	39	36	34	43	65
	$L_{eq,1hr}$ (22:00 – 23:00)	69	64	57	48	44	39	34	53	--
	$L_{eq,1hr}$ (23:00 – 00:00)	53	49	45	43	43	37	31	47	65

Notes:

[1] The 'typical' $L_{AFmax,1min}$ is the value exceeded fewer than 10 times throughout the night-time periods.

Table 2 – Sound Level Results Summary

3. Entertainment Noise Assessment

In order to assess if entertainment noise is likely to have been audible during the monitoring period, a low-frequency noise assessment has been undertaken.

Typically, when music noise is dominant in an environment this can be seen in the 63Hz and 125Hz octave bands as noise at the frequencies is often not effectively attenuated by the venue building envelope.

The 63Hz and 125Hz measurements are shown in the following figures.

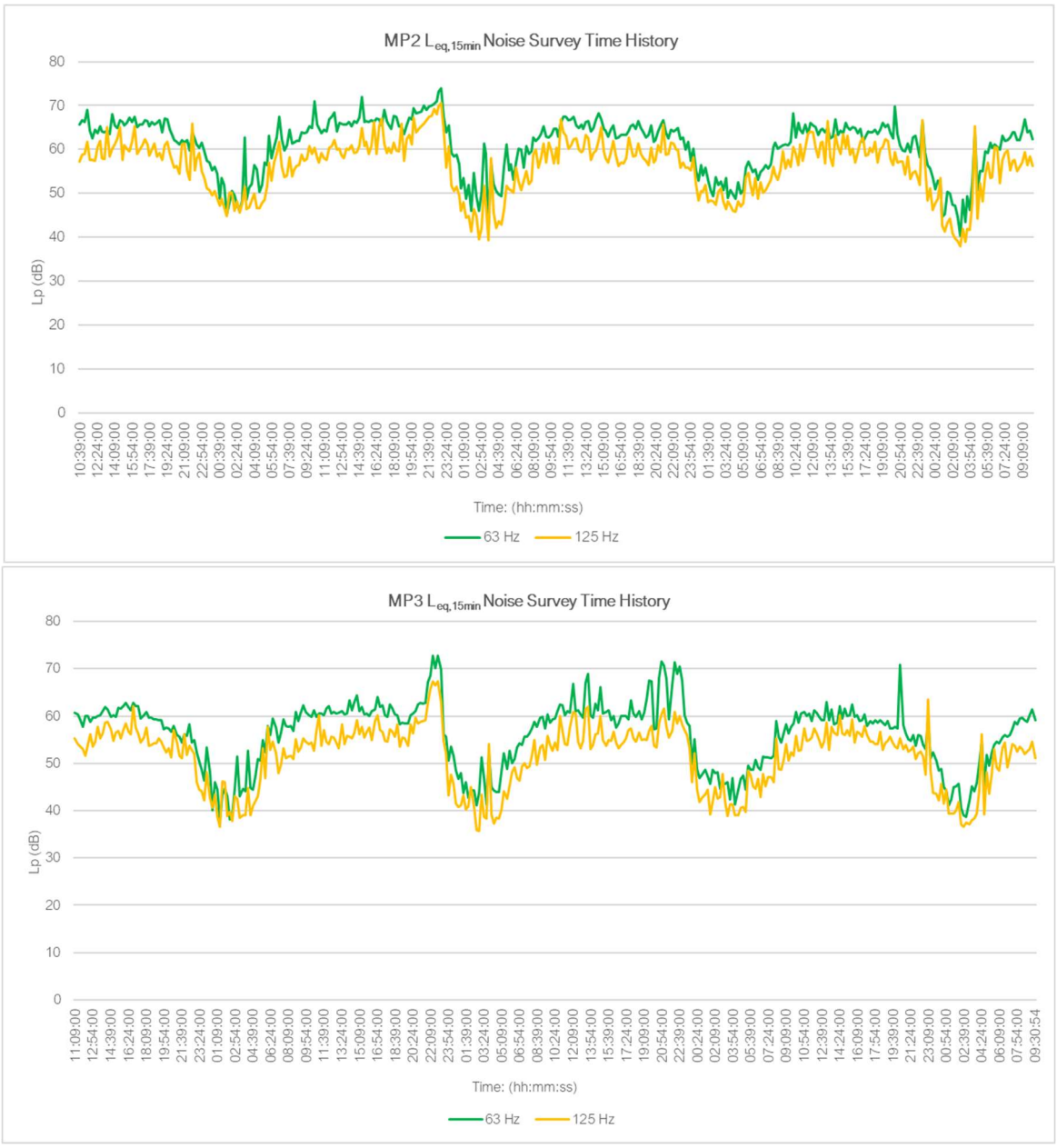


Figure 3 – MP1 Low Frequency Noise Analysis

As can be seen, the low-frequency measurements do not follow a typical diurnal pattern at MP2 and MP3 and are particularly prominent during the 22:00 to 00:00 hours period. This corresponds with the operating hours of the venues in close proximity to the site.

Whilst it is understood that the future occupant(s) of the proposed flat may expect slightly higher levels during weekend operational hours of the local venues, this cannot be relied upon and it is still possible that they could be negatively impacted by entertainment noise sources in the area, which may lead to complaints. Given this, it is thought that the agent of change principle must be considered.

The following is stated in paragraph 200 of the NPPF regarding the agent of change:

"Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

Considering this, it is thought that good acoustic design principles must be implemented at the site to protect the amenity of future residents and avoid placing undue restrictions on the adjacent establishments.

The 'ProPG Planning and Noise' (May 2017) guidance, was produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. ProPG aims to encourage better acoustic design of new residential developments by promoting good health and wellbeing through the effective management of noise. It outlines four key elements which should be considered in the assessment of noise:

- Element 1 – demonstrating a "Good Acoustic Design Process".
- Element 2 – observing internal "Noise Level Guidelines".
- Element 3 – undertaking an "External Amenity Area Noise Assessment"; and
- Element 4 – consideration of "Other Relevant Issues".

The ProPG supplementary document 2 provides the following 'Good Acoustic Design' hierarchy of noise management measures which are considered to be relevant to this development:

1. Reduction of noise at the source.

It should first be investigated whether noise emissions can be reduced at the source. As the neighbouring businesses are not owned or operated by the client, it is advised that the client contacts the operators to discuss the possibility of noise mitigation (such as the installation of upgraded glazing and doorsets). It is understood however that this may not be feasible.

2. Reorientation of the development

Considering the nature of the development and the location of the existing windows, it is thought that it would not be possible to locate the sensitive rooms away from the northern elevations.

3. Using existing topography and existing structures (that are likely to last the expected life of the noise-sensitive scheme) to screen the proposed development site from significant sources of noise.

Acoustic shielding is deemed unsuitable given the urban location of the site, and the fact that the flats will be located above 1st floor level.

4. Enhanced façade sound insulation treatment.

Finally, it is recommended that an enhanced façade sound insulation treatment is implemented in order to reduce internal noise levels as much as possible. This is proposed as follows:

- The sound insulation scheme should be specified using the loudest of either the average daytime/night-time measurements or the 1-hour evening/night-time measurements in each frequency band (shown in Table 2). This should protect future residents against both noise during events and noise from traffic. It should be noted that this is considerably more stringent than using the standard BS8233 criteria (average 16-hour daytime and 8-hour night-time measurements).
- The sound insulation scheme should be specified using the Moorhouse low-frequency curve, as specified by DEFRA. This is designed to reduce the possibility of adverse impact from low-frequency (63Hz and 125Hz) noise emissions.
- A mechanical ventilation system should be installed for all sensitive rooms so that windows are not required to be opened in order to mitigate overheating and provide ventilation. This is not a recommendation for 'sealed closed' windows, however, it will avoid the requirement for windows to be opened.

The LPA will need to be satisfied that achieving the lowest practicable noise levels appropriately considers the 'Agent of Change' principle and will not affect the viability of existing businesses.

Providing the criteria shown above are implemented, it is thought that future occupants will be fully protected from entertainment noise emissions.

4. Noise Break-in Assessment and Sound Insulation Scheme

4.1 Internal Noise Level Criteria

The criteria used in the assessment are outlined in the following tables. As stated previously, due to the presence of low frequency noise within the immediate area during night-time hours, the Moorhouse Curve criteria are applied.

Moorhouse Low Frequency Criteria		
Location	**Day [1]**	**Night**
All Rooms	63Hz limit of 52dB 125Hz limit of 46dB	63Hz limit of 47dB 125Hz limit of 41dB

Notes:

[1] A 5dB reduction in each frequency band has been applied during the daytime. This is in line with the procedure outlined in Section 4 of the applicable guidance.

Table 3 – Low Frequency Acoustic Design Criteria (Moorhouse)

BS8233:2014 Acoustic Design Criteria			
Activity	**Location**	**Daytime (07:00 – 23:00)**	**Night-time (23:00 – 07:00)**
Resting	Living Room	35 dB $L_{Aeq,16hr}$ / NR30	--
Dining	Dining Room/Area	40 dB $L_{Aeq,16hr}$ / NR35	--
Sleeping (Daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$ / NR30	30 dB $L_{Aeq,8hr}$ / NR25 45 dB L_{AFmax}*

**NOTE 1: The maximum criteria have been taken from the World Health Organisation (WHO) Guidelines for Community Noise.*

**NOTE 2: ProPG:2017 which is relevant to 'New Residential' states; "In most circumstances in noise sensitive rooms at night (e.g., bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,\ F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability, and regularity of noise events".*

Note 3: BS8233:2014 states: "Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved".

Note 4: BS8233:2014 states: "The levels shown in Table 4 (criteria shown above) are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g., 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended in Table 4.

Note 5; BS8233:2014 states: "If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.

Table 4 – Internal Acoustic Design Criteria

The measured sound levels at the proposed development are assessed against the relevant criteria and a sound insulation scheme is provided to achieve a good internal acoustic environment.

4.2 Glazing and Ventilation Specification

Glazing specifications that achieve the relevant internal noise criteria is provided in the following table. The calculations considering the following sound insulation scheme can be found in Appendix E.

Sound Insulation Scheme – Front Living Rooms & Bedrooms								
Description	Octave Frequency Band (Hz, dB)							Overall (dB)
	63	125	250	500	1k	2k	4k	
Front, Road-facing Façade								
6mm Glass / 16mm Argon Cavity / 6.8mm Optiphon Glass	21	21	28	37	48	48	54	40 (R_w) 34 ($R_w + C_{tr}$)
Rear and Side Facades								
8mm Glass / 16mm Air Cavity / 4mm Glass (SRI)*	21	22	21	28	38	40	47	33 (R_w) 29 ($R_w + C_{tr}$)

Table 5 – Glazing Specification

**Any other window specification capable of providing this attenuation will be suitable provided the glazing suppliers can provide an acoustic test report in accordance with BS EN ISO 10140-2:2010 or an evidence-based calculation.*

4.3 Overheating and Ventilation

As outlined in the preceding sections, it is recommended that mechanical ventilation is installed in all occupied rooms. The selected systems must be capable of providing both background and purge ventilation, as well as addressing potential overheating. Furthermore, it is essential that the proposed ventilation strategy complies fully with the requirements of Approved Document F.

4.4 Structural Envelope

It is recommended that the structural elements of the building envelope provide a minimum sound reduction of 50-55dB R_w. This is expected to be achieved with a typical masonry external wall construction without further upgrades. However, as rooms are to be located within the roof space and there appears to be no voided loft spaces, it is recommended that the following roof construction detail is followed:

- Roofing slates or tiles
- 200mm rafters with 100mm acoustic insulation (min. density of 45kg/m^3)
- Resilient bars or isolation clips and furring channels attached to rafters
- 2no. 15mm SoundBloc plasterboards

5. Noise Breakthrough Assessment and Sound Insulation Scheme

5.1 Noise Breakthrough Criteria

The proposed development structurally adjoins a commercial property via a separating floor. It is stated in BS8233:2014 that the internal noise criteria includes 'overall noise', which is the sum of structure borne and airborne noise sources. Noise breaking through from structurally adjoining commercial property must be considered to ensure the cumulative noise does not exceed the proposed acoustic design criteria. Guidance on sound insulation between adjoining domestic and non-domestic dwellings is discussed in Approved Document E (ADE) of the Building Regulations. The following is stated in Section 0.8:

> *"The performance standards set out in Tables 1a and 1b are appropriate for walls, floors and stairs that separate spaces used for normal domestic purposes. A higher standard of sound insulation may be required between spaces used for normal domestic purposes and communal or non-domestic purposes. In these situations, the appropriate level of sound insulation will depend on the noise generated in the communal or non-domestic space. Specialist advice may be needed to establish if a higher standard of sound insulation is required and, if so, to determine the appropriate level."*

The higher standard of sound insulation required is dependent on the level of noise generated within the commercial property. Noise from structurally adjoining commercial sources can lead to elevated impact and as such further consideration is given to the level of audibility, dominance, attention grabbing features, spectral distribution, regularity, change in level, duration, and time of day the sound is occurring.

5.2 Noise Breakthrough Assessment and Specification

The expected level of risk associated with the 'Class Use' of the structurally adjoining commercial property is shown in the following table.

Planning Class	Level of Risk from Noise	Required Sound Insulation Standard (dB)
E(c)(iii) Other appropriate services in a commercial, business or service locality	Low	≥53 $D_{nT,w} + C_{tr}$

Discussion: The noise emissions produced by a tattoo shop includes both amplified music, noise from patrons and noise from equipment. Amplified music associated with this type of premises is normally of a background level to facilitate conversation and as such is not a primary concern. The noise from patrons can vary significantly and is highly dependent on the nature of the establishment. The required level of sound insulation should consider raised and elevated vocal efforts occurring regularly. The permitted opening hours do not extend into the night-time period (23:00 – 07:00) and as such the sensitivity of the adjoining residential does not require additional consideration during this period.

Table 6 – Noise Breakthrough Assessment

During the site visit, a sound insulation test was undertaken, which confirmed that the existing partition performs significantly below the required standard. The attending engineer also reviewed the existing construction details to inform potential upgrade strategies.

It should be emphasised that any substantial improvement in airborne sound insulation within this area can only realistically be achieved through treatment applied to both sides of the partition (above and below). However, as the ground floor commercial unit remains operational, it is assumed that any upgrades will need to be undertaken predominantly from within the proposed residential accommodation. This constraint places considerable limitations on the available solutions; therefore, upgrade specifications have been presented for both possible scenarios.

Based on the current construction, an indicative specification capable of achieving the required sound insulation performance has been modelled using INSUL 9 software. The following options are recommended:

Option 1 – Ceiling Removal and Upgrade Beneath Joists

This option requires removal of the existing ceiling to allow installation of an upgraded build-up from below:

- 12mm overlay plywood
- 4mm MuteBarrier mass-loaded vinyl (minimum density: 10kg/m²)
- Existing flooring board (assumed 18mm)
- Existing 180mm timber joists, infilled with 150mm Rockwool RW3 insulation (60kg/m³)
- MuteClip™ and Furring Channel System fixed to the underside of joists (in accordance with manufacturer guidance)
- Two layers of 15mm SoundBloc plasterboard, with overlapping joints and perimeter sealed using flexible acoustic mastic

Option 2 – Retention of Existing Ceiling

This option retains the existing ceiling, supplemented with mineral wool infill and sealing of all gaps to achieve airtightness. While it may fall marginally short of the enhanced criteria set out in Table 6, it is expected to exceed the minimum ADE requirements:

- 12mm overlay plywood
- 8mm MuteBarrier mass-loaded vinyl (minimum density: 10kg/m²)
- Existing flooring board (assumed 18mm)
- Existing 180mm timber joists, infilled with 150mm Rockwool RW3 (60kg/m³)
- Existing lath and plaster ceiling, repaired to eliminate holes and gaps
- Existing MF ceiling system fixed to the underside of joists
- 400mm air cavity with 50mm Rockwool RW3 (60kg/m³)
- Existing mineral fibre ceiling tiles (assumed 19mm)

Option 3 – Proprietary HUSH System 1

Alternatively, installation of HUSH System 1 may be considered, comprising:

- 18mm chipboard (minimum surface mass: 11.9kg/m²)
- HUSH-FELT 25 resilient joist strip
- HUSH-FILL 60 heavy pugging
- Plywood shelf on noggins/dwangs

- HUSH-SLAB 100 mineral wool insulation
- HUSH-MESH firewire
- Lath and plaster ceiling

Due to the bespoke nature of this system, the performance cannot be modelled using INSUL software. Consequently, compliance with manufacturer performance claims cannot be guaranteed. However, independent sound testing at a comparable site demonstrated an airborne sound insulation rating of 52dB $D_{nT,W}$ + C_{tr}. At this level, a variance of ±1–2dB would be considered negligible.

Summary and Compliance Requirements

The specifications provided above are indicative only and assume that all flanking transmission paths are appropriately controlled. As with all acoustic treatments, performance will depend heavily on workmanship quality. Care should be taken to ensure that isolation measures are not compromised, for example by creating rigid connections across isolated junctions.

Ultimately, compliance with BS8233 and Approved Document E can only be confirmed through post-completion sound insulation testing by a UKAS-accredited testing body, assessed against the relevant performance standards.

6. Conclusion and Action Plan

The proposed development has been assessed against the acoustic design criteria, and a sound insulation scheme has been provided to ensure the criteria can be achieved.

The following 'Action Plan' is outlined to ensure the design considerations and specifications from this report are duly implemented:

1. The proposed glazing and ventilation systems, or suitable alternatives, should be installed as shown in Section 4.
2. The separating floors between the structurally adjoining commercial properties and the proposed development should be designed to achieve the required sound insulation. The existing construction details have been considered, and indicative specifications have been provided in Section 5. Further design assistance can be provided by NOVA Acoustics Ltd if required.

The findings of this report will require written approval from the Local Authority prior to work commencing.

Appendix A – Acoustic Terminology

A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure given by the following formula in decibels (dBA). $L_{pA} = 10 \log_{10} (pA/p_0)^2$. Where: pA is the A-weighted sound pressure in pascals (Pa) and $p0$ is the reference sound pressure (20 µPa)
Background Sound	Underlying level of sound over a period, T, which might in part be an indication of relative quietness at a given location
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T, has the same mean-squared sound pressure as the sound under consideration that varies with time
Facade level	Sound pressure level 1 m in front of the facade
Free-field level	Sound pressure level away from reflecting surfaces
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants
Noise Criteria	Numerical indices used to define design goals in a given space
Noise Rating (NR)	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves
Octave Band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit
Percentile Level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting “F”, which is exceeded for N% of a specified time interval
Rating Level, $L_{Ar,Tr}$	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise
Reverberation time, T	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped
Sound Pressure, p	root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound
Sound Pressure Level, L_p	Quantity of sound pressure, in decibels (dB), given by the formula: $L_p = 10\log_{10}(p/p_0)^{2.}$ Wherehere: p is the root-mean-square sound pressure in pascals (Pa) and $p0$ is the reference sound pressure (20 µPa)
Weighted sound reduction index, R_w	Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies

Appendix B – Standards, Legislation, Policy, and Guidance

This report is to be primarily based on the following standards, legislation, policy, and guidance.

B.1 – National Planning Policy Framework (2024)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2024. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 187e, it states:

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.

Paragraph 198 states:

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) *Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life:*
b) *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
c) *Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes, and nature conservation.*

B.2 – Noise Policy Statement for England (2010)

Paragraph 198 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

To achieve this vision the Statement identifies the following three aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life:
- Mitigate and minimise adverse impacts on health and quality of life:
- Where possible, contribute to the improvement of health and quality of life.

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that "significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development".

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: "all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise. This can be related to the third aim above, which seeks: "where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."

This is further expanded using the updated "Noise Exposure Hierarchy Table" which includes an additional level of impact referred to as the 'No Observed Adverse Effect Level' ('NOAEL'). It is stated that at this level: *"noise can be heard, but does not cause any change in behaviour, attitude or other physiological response"*. In addition, noise at this level *"can slightly affect the acoustic character of the area but not such that there is a change in the quality of life".*

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 – BS8233:2014 'Guidance on Sound insulation and noise reduction for buildings'

BS8233 provides guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organization; specifically, 'WHO Guidelines on Community Noise, 1999'. The Guidelines on Community Noise (1999) document defines community noise to include noise from "industries" and "construction". The desirable criteria levels of steady state, "anonymous" noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below.

BS8233:2014 Internal Ambient Noise Level Criteria			
Activity	**Location**	**Daytime (07:00 – 23:00)**	**Night-time (23:00 – 07:00)**
Resting	Living Room	35 dB $L_{Aeq,16hour}$	--
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	--
Sleeping (Daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB L_{AFmax}*

Table 7 – BS8233:2014 Internal Ambient Noise Level Criteria

**ProPG:2017 states that's good acoustic design can be used so that individual noise events do not normally exceed 45 dB L_{AFmax} more than 10 time a night within noise sensitive rooms such as bedrooms. However, where it is not reasonably practicable to achieve the guideline then the judgment of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number distribution, predictability, and regularity of noise events.*

It is noted, however, that where development is considered necessary or desirable, despite external noise level above WHO guidelines, the above target levels may be relaxed by up to 5 dB.

General recommendations for mitigation to enable these targets to be achieved are provided, including the use of bunds and barriers to reduce external noise and space planning and sound insulation for the control of internal noise levels.

For this assessment, the above criteria are considered to be the 'LOAEL' as defined in the NPSE in Appendix B.

B.4 – Approved Document F Volume 1: Dwellings (2021)

Approved Document F states the following in relation to noise:

- Mechanical ventilation systems, including both continuous and intermittent mechanical ventilation, should be designed and installed to minimise noise. This includes doing all of the following.
    - Correctly sizing and jointing ducts.
    - Ensuring that equipment is appropriately and securely fixed, such as using resilient mountings where noise carried by the structure of the building could be a problem.
    - Selecting appropriate equipment, including following paragraph
- For mechanical ventilation systems, fan units should be appropriately sized so that fans operating in normal background ventilation mode are not overly noisy. This might require fans to be sized so that they do not operate near maximum capacity when in normal background ventilation mode.
- Account should be taken of outside noise when considering whether openable windows are appropriate for purge ventilation.
- If an exposed façade is close to an area of sustained and loud noise (e.g. a main road), then a noise attenuating background ventilator should be fitted.

B.5 – Acoustics Ventilation and Overheating – Residential Design Guide 2020

It is suggested that the desirable internal noise criteria within BS8233:2014 should be achieved considering adequate ventilation as defined by Building Regulations 'Approved Document F' ('ADF') whole dwelling ventilation. However, for a whole dwelling ventilation system such as MVHR it is considered reasonable to allow higher levels of internal ambient noise from transport sources when higher rates of ventilation are required in relation to the overheating condition.

The 'Institute of Acoustics' ('IOA') and the 'Association of Noise Consultant's ('ANC') have published 'The AVO Guide: 2020' document 2020. It provides guidance for those acousticians involved in the design of buildings to prevent noise ingress to and achieve reasonable internal levels. This provides valuable guidance on ventilation and overheating in support of the "Good Acoustic Design" principle advocated by ProPG. Along with guidance showing an acoustic assessment during the overheating condition, the AVO Guide (2020) provides a framework that has a two-level assessment procedure to estimate the potential impact on occupants:

Level 1 Risk Assessment

AVO 'Level 1' risk assessment criteria guide based on external free field ambient noise levels for dwellings relying on purge ventilation (e.g., opening windows) to prevent summertime overheating. AVO Guide Table 3-2 detailed in the figure below. To assess the possibility of overheating it is reasonable to relax the BS 8233:2014 internal ambient noise levels from opening a window by 5 decibels (5 dB). Also, it is assumed that a partially open window will provide a sound reduction of 13 dB. Therefore, to achieve internal noise levels in line with BS 8233:2014 the façade external noise levels should fall inside the levels shown in Table 3-2.

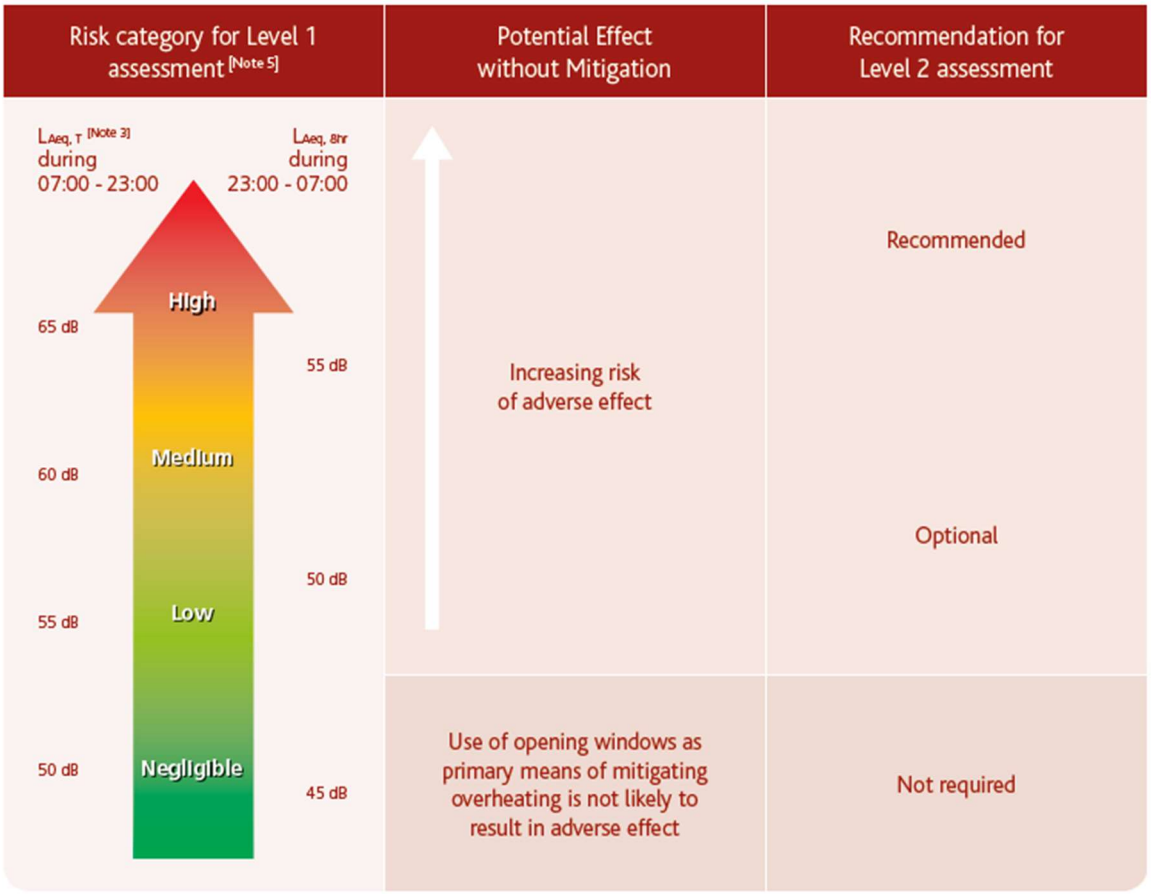


Table 3-2 of AVO Guide (2020)

Figure 4 – AVO Guide Level 1 Risk Category

The AVO Guide (2020) seeks to determine the level of risk associated with overheating in a new residential development based on the existing noise climate. The AVO risk categories are detailed in the table below with clearer categorisation.

AVO Guide (2020) Level 1 Risk Assessment			
Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	Risk Category	Mitigation
≥63 dB $L_{Aeq,16hour}$	≥55 dB $L_{Aeq,8hour}$	High Risk	Level 2 assessment recommended. Windows which are unopenable on grounds of noise will inevitably create issues for the overheating strategy.
57 – 62 dB $L_{Aeq,16hour}$	52 – 54 dB $L_{Aeq,8hour}$	Medium Risk	Level 2 assessment optional to give more confidence regarding the suitability of internal noise conditions.
54 – 56 dB $L_{Aeq,16hour}$	49 – 51 dB $L_{Aeq,8hour}$	Low Risk	
≤53 dB $L_{Aeq,16hour}$	≤48 dB $L_{Aeq,8hour}$	Negligible Risk	None required – openable windows suitable for ventilation

Table 8 – AVO Guide (2020) Level 1 Risk Assessment

Level 2 Risk Assessment:

A 'Level 2' assessment of noise is recommended where a dwelling using purge ventilation (e.g., open windows) reaches Level 1 'High Risk' or 'Medium Risk'. The Level 2 assessment guidance comments that where internal ambient noise levels are >50 dB $L_{Aeq,16hr}$ (day) or >42 dB $L_{Aeq,8hr}$ (night) then the outcome might be that the noise causes a material change in behaviour, e.g., having to keep windows closed for the majority of the time, or there is the potential for sleep disturbance.

To conduct a Level 2 assessment, the following minimum information is required:

- Statement of the overheating criteria being applied.
- Description of the provisions for meeting the stated overheating criteria. This should include, where relevant, the area of façade opening.
- Details of the likely internal ambient noise levels whilst using provisions for mitigating overheating, and the method used to predict these.
- Estimation of how frequently and for what duration such provisions are required to mitigate overheating.
- Consideration of the effect of individual noise events.
- Assessment of the adverse effect on occupants.

The figure below outlines the AVO Guide (2020) guidance for a Level 2 assessment of noise from transport sources relating to the Overheating Condition.

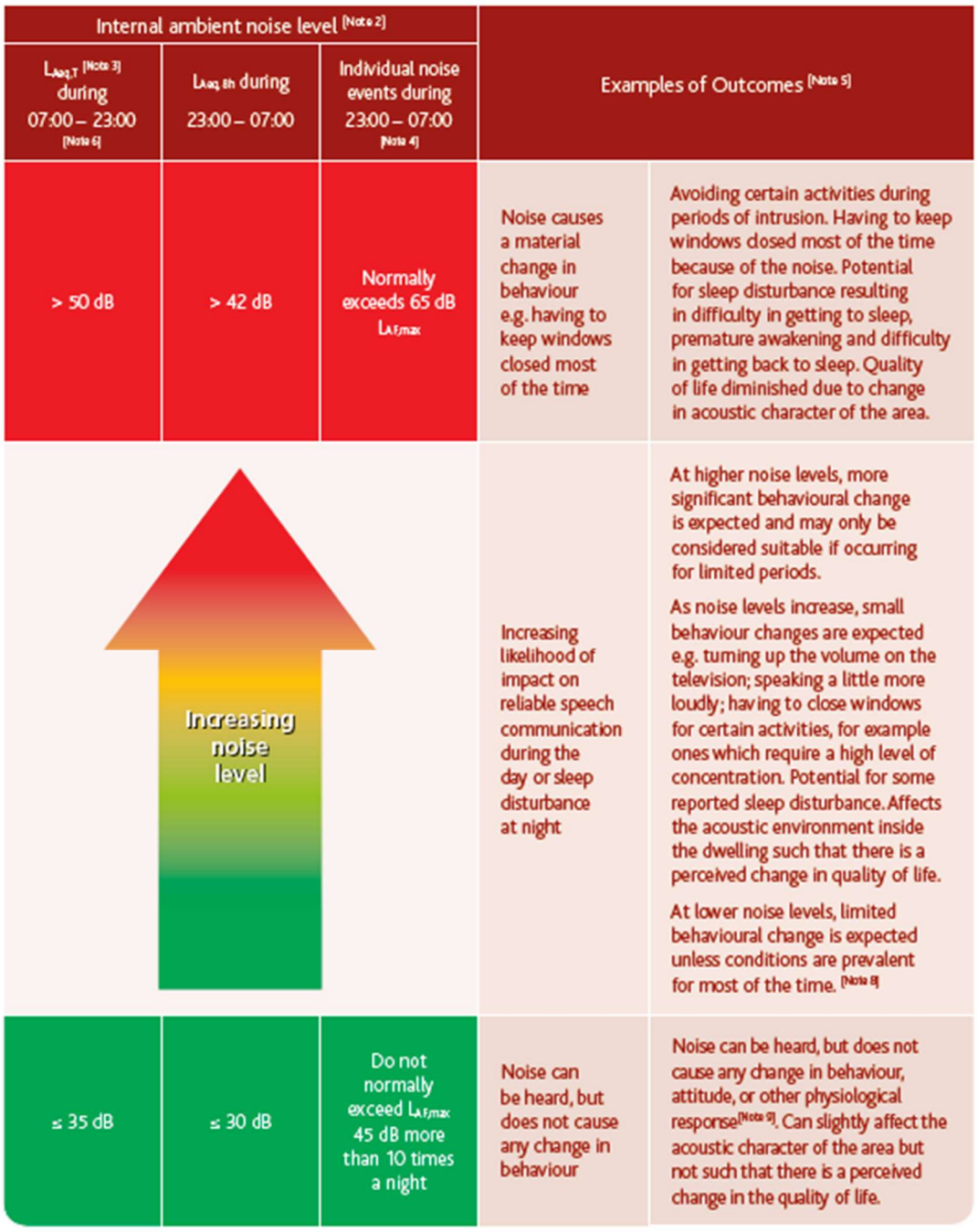


Table 3-3 of AVO Guide (2020)

Figure 5 – AVO Guide Level 2 Internal Ambient Noise Levels

Appendix C – Floor Plans and Elevation Plans

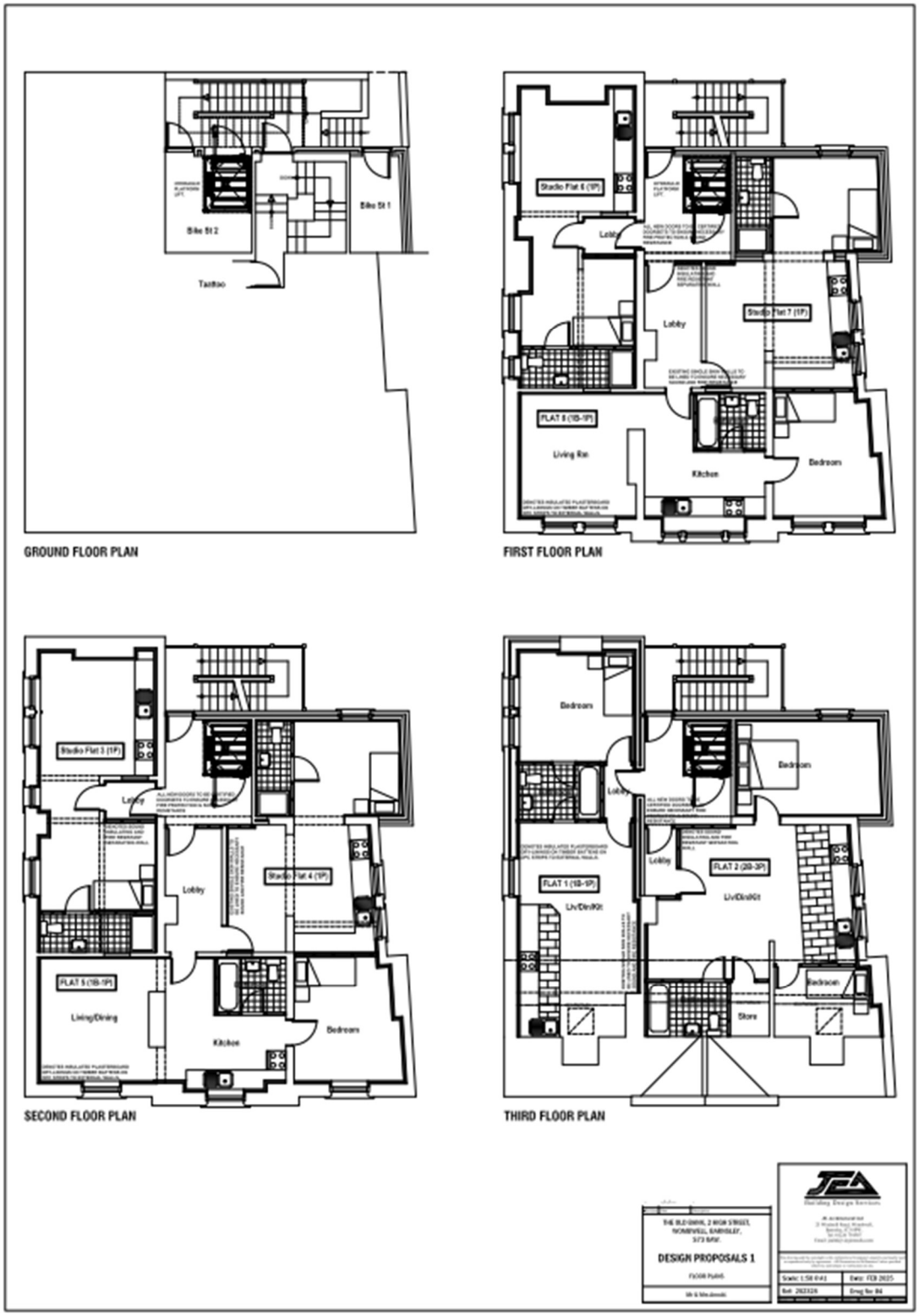


Figure 6 – Site Plans

Appendix D – Environmental Survey

D.1 – Time History Noise Data

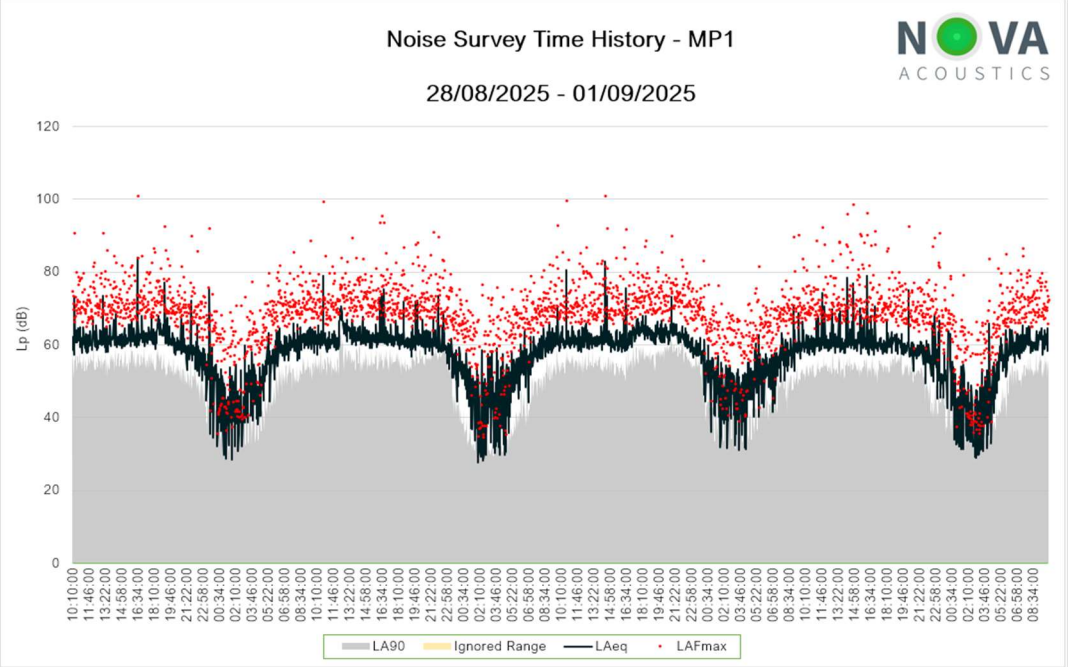


Figure 7 – MP1 Noise Survey Time History

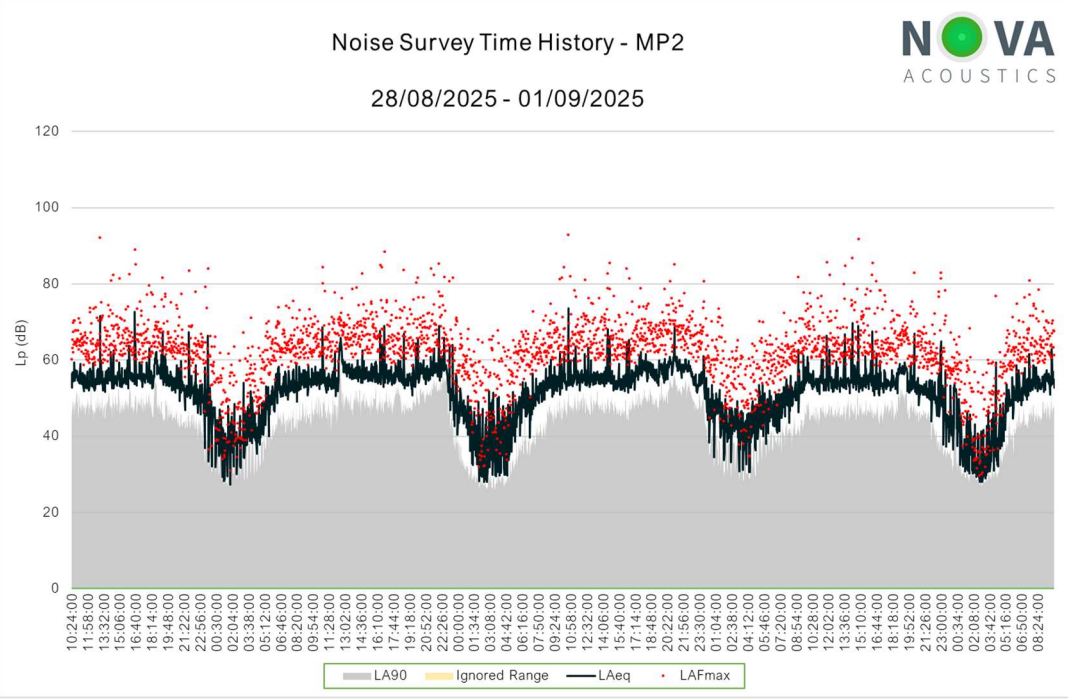


Figure 8 – MP2 Noise Survey Time History

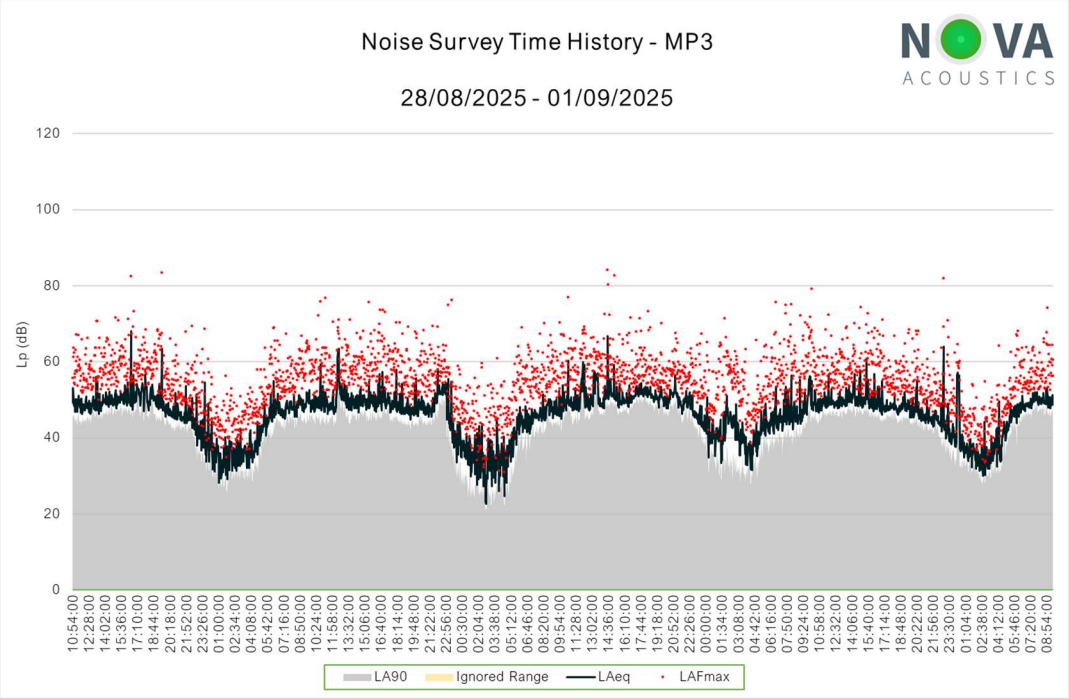


Figure 9 – MP3 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
Svantek SV971A Class 1 Sound Level Meter	141425	≤0.1
Svantek SV33B Class 1 Calibrator	125695	
Svantek SV971A Class 1 Sound Level Meter	141427	≤0.1
Svantek SV33B Class 1 Calibrator	125695	
Svantek SV971A Class 1 Sound Level Meter	141346	≤0.2
Svantek SV33B Class 1 Calibrator	125695	

Table 9 – Surveying Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.2dB. All sound level meters are calibrated every 24 months, and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 – Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localised records of weather conditions were taken. However, all measurements have been compared with met office weather data of the area, specifically the closest weather station, and the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of

the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather Conditions – Old Town (Approx. 8km NW of Site)				
Time Period	Air Temp (^{0}C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s)
28/08/25 – 00:00 – 23:59	11.9 – 20.9	0.0 – 1.0	SW	0.0 – 3.1
29/08/25 – 00:00 – 23:59	12.5 – 20.9	0.0 – 1.7	SSW	0.0 – 2.2
30/08/25 – 00:00 – 23:59	13.0 – 21.3	0.0 – 1.6	SSW	0.0 – 3.5
31/08/25 – 00:00 – 23:59	12.1 – 21.4	0.0	SSW	0.0 – 3.1
01/08/25 – 00:00 – 23:59	12.6 – 20.6	0.0 – 0.9	SW	0.0 – 2.6

Table 10 – Weather Conditions

Appendix E – Noise Break-in Calculations

The façade sound reduction and predicted internal noise levels are calculated assuming the following:

- The calculation method for façade sound reduction is in accordance with BS8233:2014 and BS EN 12354-3.
- The reverberation time is typically 0.5 seconds across the relevant frequency range for a furnished living room in the UK. This value is used for both living rooms and bedrooms.
- Based on the technical drawings provided to NOVA Acoustics, window areas of 2-4m^2 and room volumes of 30-33m^3 are used in the calculations for bedrooms as a worst-case scenario. For living rooms, the calculations are based on a window area of 2-9m^2 and room volume of 60-70m^3 as a worst-case scenario.
- The acoustic performance of the façade elements is taken from the relevant manufacturer's technical information, or the sound reduction has been predicted using INSUL 9.0.
- For background trickle ventilation a total Equivalent Area of 5000mm^2 per habitable room has been used in the calculations, which equates to 2 No. trickle vents (2500mm^2 each).
- Exceedances of 1-2dB are considered negligible and acceptable.

Living Room (MP1) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	64	72	67	63	60	59	57	53	53
Glazing Noise Ingress	27	45	40	29	17	5	3	-7	-7
Ventilation Noise Ingress									
Wall Noise Ingress	-5	15	5	-1	-14	-16	-18	-22	-22
Roof Noise Ingress	15	40	21	12	4	3	1	-3	-3
Room Absorption Correction		4	3	3	2	2	2	1	-1
Total Noise Ingress	**33**	**53**	**46**	**35**	**23**	**12**	**10**	**2**	**1**
NR30 & Moorhouse (Relaxed)	35	52	46	39	33	30	26	24	22
Exceedance of Criteria	-2	1	0	-4	-10	-18	-16	-22	-21

Bedroom (MP1) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	64	72	67	63	60	59	57	53	53
Glazing Noise Ingress	25	44	39	28	16	4	2	-8	-8
Ventilation Noise Ingress									
Wall Noise Ingress	5	24	14	8	-5	-7	-9	-13	-13
Roof Noise Ingress	14	38	19	10	2	1	-1	-5	-5
Room Absorption Correction		5	4	4	4	4	3	2	1
Total Noise Ingress	**33**	**53**	**46**	**35**	**22**	**12**	**10**	**2**	**1**
NR30 & Moorhouse (Relaxed)	35	52	46	39	33	30	26	24	22
Exceedance of Criteria	-2	1	0	-4	-11	-18	-16	-22	-21

Bedroom (MP1) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	58	66	59	55	54	54	50	44	44
Glazing Noise Ingress	18	38	31	20	10	-1	-5	-17	-17
Ventilation Noise Ingress									
Wall Noise Ingress	-2	18	6	0	-11	-12	-16	-22	-22
Roof Noise Ingress	8	32	11	2	-4	-4	-8	-14	-14
Room Absorption Correction		5	4	4	4	4	3	2	1
Total Noise Ingress	**26**	**47**	**38**	**27**	**16**	**7**	**3**	**-7**	**-8**
NR25 & Moorhouse	30	47	41	35	28	25	21	19	17
Exceedance of Criteria	-4	0	-3	-8	-12	-18	-18	-26	-25

Bedroom (MP1) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Lmax	79	75	67	64	71	76	74	61	52
Glazing Noise Ingress	29	47	39	28	27	21	18	0	-9
Ventilation Noise Ingress									
Wall Noise Ingress	14	28	15	9	6	10	8	-4	-14
Roof Noise Ingress	22	42	20	11	13	18	16	4	-6
Room Absorption Correction		5	4	4	4	4	3	2	1
Total Noise Ingress	**37**	**56**	**46**	**35**	**33**	**30**	**27**	**11**	**0**
NR40	45	67	56	49	43	40	37	34	33
Exceedance of Criteria	-8	-11	-10	-14	-10	-10	-10	-23	-33

Living Room (MP2) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	60	69	67	60	57	55	51	46	46
Glazing Noise Ingress	21	35	32	26	16	4	-2	-14	-14
Ventilation Noise Ingress									
Wall Noise Ingress	1	20	13	4	-9	-12	-16	-21	-21
Roof Noise Ingress	12	37	21	9	1	-1	-5	-10	-10
Room Absorption Correction		3	3	3	2	2	2	1	-1
Total Noise Ingress	**28**	**46**	**39**	**32**	**22**	**11**	**5**	**-5**	**-6**
NR30 & Moorhouse (Relaxed)	35	52	46	39	33	30	26	24	22
Exceedance of Criteria	-7	-6	-7	-7	-11	-19	-21	-29	-28

Bedroom (MP2) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	60	69	67	60	57	55	51	46	46
Glazing Noise Ingress	23	37	34	28	18	6	0	-12	-12
Ventilation Noise Ingress									
Wall Noise Ingress	3	22	15	6	-7	-10	-14	-19	-19
Roof Noise Ingress	11	36	20	8	0	-2	-6	-11	-11
Room Absorption Correction		5	4	4	3	3	3	2	0
Total Noise Ingress	**31**	**47**	**42**	**35**	**25**	**13**	**7**	**-3**	**-5**
NR30 & Moorhouse (Relaxed)	35	52	46	39	33	30	26	24	22
Exceedance of Criteria	-4	-5	-4	-4	-8	-17	-19	-27	-27

Bedroom (MP2) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	55	60	54	49	52	51	46	40	40
Glazing Noise Ingress	14	28	21	17	13	2	-5	-18	-18
Ventilation Noise Ingress									
Wall Noise Ingress	-6	13	2	-5	-12	-14	-19	-25	-25
Roof Noise Ingress	2	27	7	-3	-5	-6	-11	-17	-17
Room Absorption Correction		5	4	4	3	3	3	2	0
Total Noise Ingress	**21**	**38**	**29**	**24**	**20**	**9**	**2**	**-9**	**-11**
NR25 & Moorhouse	30	47	41	35	28	25	21	19	17
Exceedance of Criteria	-9	-9	-12	-11	-8	-16	-19	-28	-28

Bedroom (MP2) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Lmax	71	64	60	60	64	69	63	57	57
Glazing Noise Ingress	26	32	27	28	26	20	12	-1	-1
Ventilation Noise Ingress									
Wall Noise Ingress	7	17	8	6	1	4	-2	-8	-8
Roof Noise Ingress	14	30	12	7	7	11	6	-1	-1
Room Absorption Correction		5	4	4	3	3	3	2	0
Total Noise Ingress	**33**	**42**	**34**	**35**	**32**	**27**	**19**	**8**	**6**
NR40	45	67	56	49	43	40	37	34	33
Exceedance of Criteria	-12	-25	-22	-14	-11	-13	-18	-26	-27

Living Room (MP3) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	54	69	64	57	48	46	43	38	38
Glazing Noise Ingress	23	40	34	28	12	0	-5	-17	-17
Ventilation Noise Ingress									
Wall Noise Ingress	-4	18	8	-1	-20	-23	-26	-31	-31
Roof Noise Ingress	11	36	17	5	-9	-11	-14	-19	-19
Room Absorption Correction		4	3	3	2	2	2	1	-1
Total Noise Ingress	**29**	**49**	**41**	**34**	**18**	**6**	**1**	**-10**	**-12**
NR30 & Moorhouse (Relaxed)	35	52	46	39	33	30	26	24	22
Exceedance of Criteria	-6	-3	-5	-5	-15	-24	-25	-34	-34

Bedroom (MP3) Day Time Leq

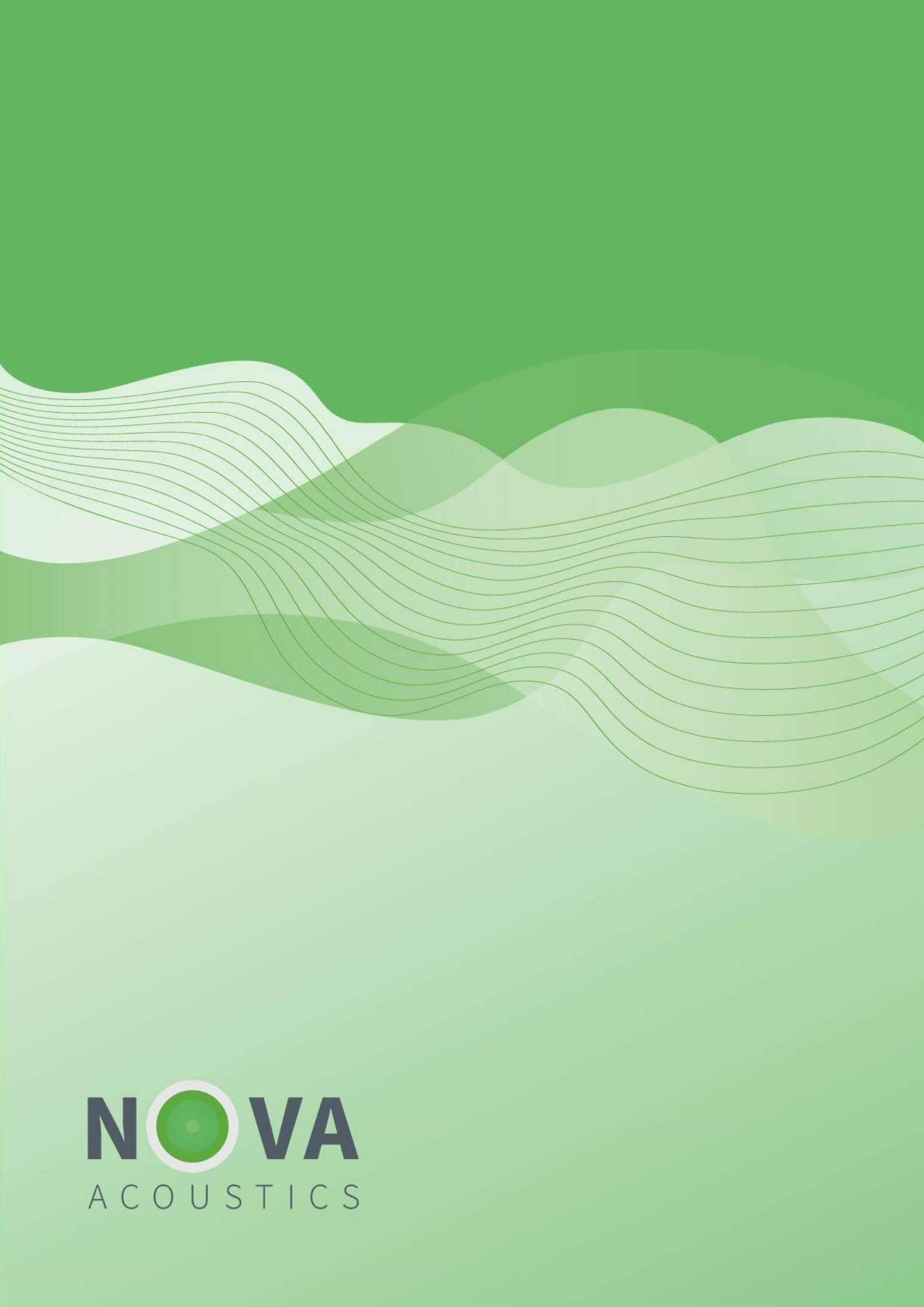
Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	54	69	64	57	48	46	43	38	38
Glazing Noise Ingress	23	41	35	29	13	1	-4	-16	-16
Ventilation Noise Ingress									
Wall Noise Ingress	0	21	11	2	-17	-20	-23	-28	-28
Roof Noise Ingress	10	35	16	4	-10	-12	-15	-20	-20
Room Absorption Correction		5	4	4	4	4	3	2	1
Total Noise Ingress	**31**	**50**	**42**	**36**	**19**	**7**	**2**	**-9**	**-11**
NR30 & Moorhouse (Relaxed)	35	52	46	39	33	30	26	24	22
Exceedance of Criteria	-4	-2	-4	-3	-14	-23	-24	-33	-33

Bedroom (MP3) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	47	53	49	45	43	43	37	34	34
Glazing Noise Ingress	11	25	20	17	8	-2	-10	-20	-20
Ventilation Noise Ingress									
Wall Noise Ingress	-13	5	-4	-10	-22	-23	-29	-32	-32
Roof Noise Ingress	-5	19	1	-8	-15	-15	-21	-24	-24
Room Absorption Correction		5	4	4	4	4	3	2	1
Total Noise Ingress	**18**	**34**	**27**	**24**	**14**	**4**	**-4**	**-13**	**-15**
NR25 & Moorhouse	30	47	41	35	28	25	21	19	17
Exceedance of Criteria	-12	-13	-14	-11	-14	-21	-25	-32	-32

Bedroom (MP3) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Lmax	65	64	60	59	58	63	57	51	45
Glazing Noise Ingress	26	36	31	31	23	17	9	-3	-9
Ventilation Noise Ingress									
Wall Noise Ingress	2	17	8	4	-7	-3	-9	-14	-20
Roof Noise Ingress	10	31	13	6	0	5	-1	-6	-12
Room Absorption Correction		5	4	4	4	4	3	2	1
Total Noise Ingress	**33**	**45**	**38**	**38**	**29**	**24**	**16**	**4**	**-3**
NR40	45	67	56	49	43	40	37	34	33
Exceedance of Criteria	-12	-22	-18	-11	-14	-16	-21	-30	-36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