



Residential Noise Assessment

Site Address: 7 King Street, Gravesend, Kent, DA12 2EB

Client Name: 725 Ltd

Project Reference: NP-013491



Authorisation and Version Control

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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 7 King Street, Gravesend, Kent, DA12 2EB ('the site'). The proposed development is for the conversion of the 1st to 3rd floors of commercial office spaces into studio flats. The site is subject to noise from the local road network, pedestrian activity and an adjacent sports bar which operates into the night.

The applicant is preparing to submit a planning application to Gravesham Borough Council. This report has been prepared to accompany the planning application to be submitted to the Local Planning Authority ('LPA').

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 for the proposed development 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 (NPPF, 2024)
- Noise Policy Statement for England (NPSE, 2010)
- British Standard BS8233:2014 – 'Guidance on sound insulation and noise reduction for buildings'
- ProPG: 'Planning and Noise 2017' (including supplementary documents 1 & 2)
- Approved Document F: Volume 1 Dwellings (2021)
- Acoustics Ventilation Overheating: Residential Design Guide 2020' (AVO Guide)
- Entertainment Noise Legislation

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

1.2 Proposal Brief

The figure below are the upper floor layouts of the proposed development.



Drawing Ref No. 003 – Rev B from 'Dream Design Develop'

Figure 1 – Proposed Development

1.3 Local Planning Authority and Background

The developer for this project had previously applied for planning permission, which was not approved, and the decision was later appealed (ref: APP/K2230/W/25/3362506).

This report shall address the concerns of the LPA regarding entertainment noise from the adjacent “Kings Sports Bar” and other associated noise emissions. The relevant comments are detailed below:

Appeal Decision APP/K2230/W/25/3362506

“6. A Noise Impact Assessment¹ (NIA) has been undertaken which describes the primary noise sources as noise from The Goose PH and pedestrians passing the site, with secondary noise from people visiting shops, air traffic and birdsong. Its findings are based on noise monitoring over a three day period, which encompassed busy weekday and weekend periods, including overnight.

7. The Council's Environmental Protection Team did not raise any objection to the methodology in the NIA but highlighted that the Sports Bar was temporarily closed when noise monitoring was undertaken. According to their advice, this premises has a late-night licence and has been the source of noise problems in the past, with potential noise sources including amplified music and loud voices continuing until late at night. The NIA acknowledges that the Sports Bar was closed only temporarily, and it was open for business at the time of my site visit. Although the NIA includes adjustments to the target internal noise

levels, to account for the likely characteristics of the night-time noise climate, the level of noise likely to originate from the Sports Bar has been neither measured nor modelled.

8. The Sports Bar is considerably closer to the proposed flats than the Goose PH. Since it is in the attached building, there is potential for internal noise transmission, particularly as the two adjacent premises appear originally to have been a single building. Customers may also congregate outside the Sports Bar or converse loudly when arriving and departing. Noise from that source would be significantly closer to the proposed flats than similar activity outside other evening uses further along the street.

9. Although the NIA includes recommendations for internal sound insulation, they focus on insulation of floor and ceiling fabric, and do not consider noise transmitted horizontally. The figures in Appendix F indicate that the recommended secondary glazing and passive ventilation would bring the internal noise environment only just within the acceptable target level. In the absence of any measurement or modelling of noise emissions from the Sports Bar, that does not convincingly demonstrate that a suitable internal environment could be achieved. While there are other residential uses nearby, there is no clear evidence that any have a comparable relationship with this particular use, or whether other residential occupiers already experience harmfully intrusive noise and disturbance.

10. Furthermore, since studio flats are proposed, effective sound insulation of the large front windows would be particularly important to ensure a suitable sleeping environment. Although the NIA provides a recommended technical specification for secondary glazing, there are no details of how it would be implemented on this particular building, with its large, curved bay window openings. In the absence of such details, the NIA does not convincingly demonstrate that the required level of noise mitigation can be achieved. Furthermore, there is sufficient uncertainty that leaving these details to be secured by condition would not be an appropriate approach in this case.

¹Peak Acoustics Noise Impact Assessment 23 October 2024 Appeal Decision APP/K2230/W/25/3362506

11. For the reasons given above, based on the evidence before me, it has not been satisfactorily demonstrated that the proposal would provide suitable living conditions for future occupiers, with particular regard to the effect of noise from nearby commercial premises. That conflicts with Policy CS19 of the Core Strategy² which requires amongst other things that new development will be designed and constructed to safeguard the amenity of its occupants and avoid adverse environmental impacts from noise pollution.

12. The proposal would also conflict with relevant paragraphs in the National Planning Policy Framework (the Framework), notably paragraphs 198 and 200 which require that new developments adequately take into account the likely effects of pollution, including noise, on living conditions and that suitable mitigation is provided so as to integrate new uses with existing businesses including those generating noise. It would also be contrary to the more general requirement in paragraph 135 of the Framework that development provides a high standard of amenity for future users."

2. Environmental Noise Survey

2.1 Measurement Methodology

The following table outlines the measurement dates and particulars. In all instances a 130mm diameter windshield was fitted to the microphones.

Location	Survey Dates	Measurement Particulars
MP1	28/11/25 – 01/12/25	Equipment tripod mounted protruding 1.5m from the 3 rd floor front façade window overlooking Kings Street.
MP2		Equipment tripod mounted protruding 1.5m from the 2 nd floor rear façade window overlooking a flat roof area and rear yard.
MP3		Equipment tripod mounted 1.5m above the floor in the centre of the propose living area on the 1 st floor.
AT1	28/11/25 09:08 – 09:19	An attended measurement approximately 1.5m above the floor in the centre of the proposed living area on the 2 nd floor.

Table 1 – Measurement Methodology

Outlined in the figure below are the site surroundings and measurement locations.

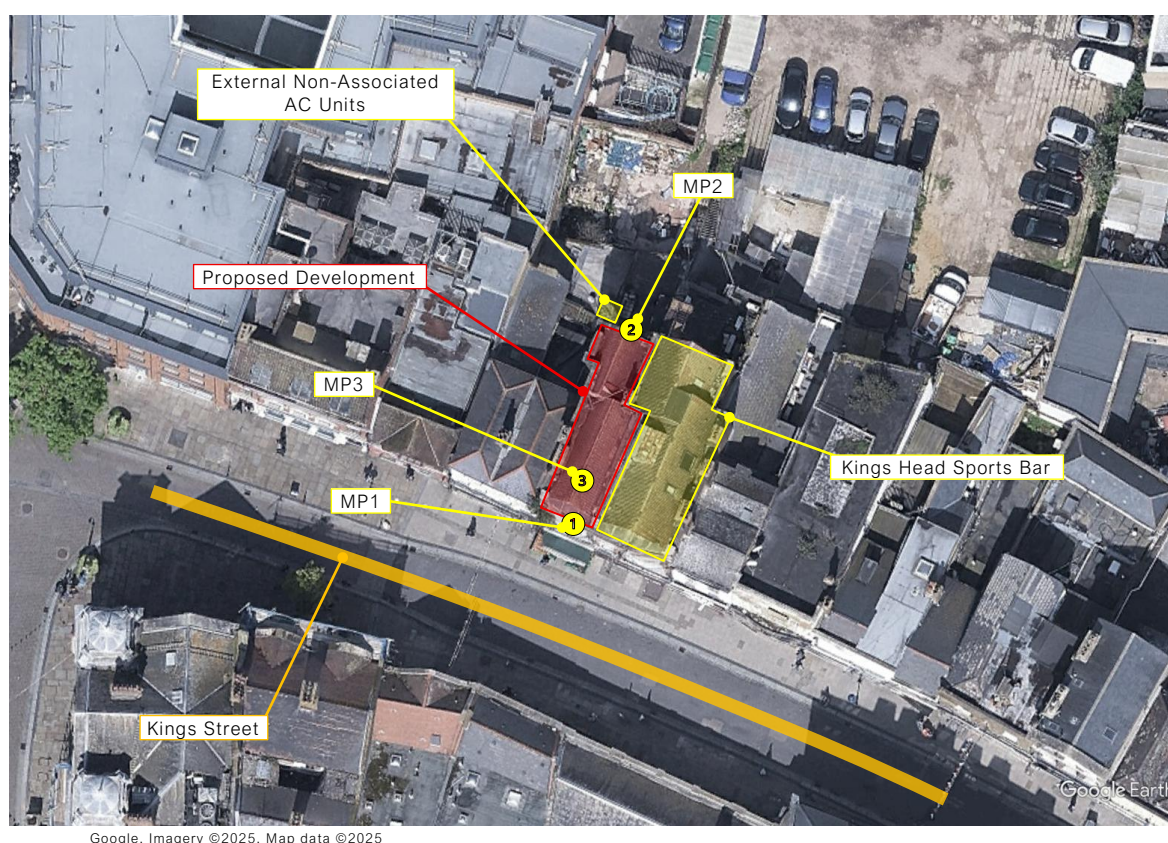


Figure 2 – Measurement Locations and Site Surroundings

2.2 Context & Subjective Impression

The site is located in the urban centre of the Gravesend, Kent area, surrounded by commercial properties and possible upper floor residential spaces.

The acoustic environment at the front of the proposed development is dominated by traffic noise emissions during the day, and entertainment noise during the evening and night-time operational hours of the adjacent “Kings Head Sports Bar”. The sports bar is operational between 11:00 – 02:00 hours, however, amplified music noise intensified between 20:00 – 02:00 hours on the Friday and Saturday night.

The majority of other nearby commercial noise sources at the front façade are retail and office type activities, with little to no impact. The time history of the noise at the rear façade also aligns with the activity from the “Kings Head Sports Bar”, and there is no indication that external plant noise becomes dominant.

2.3 Environmental Noise Survey Results

The following section outlines the measured sound levels during the unattended survey. The time history results can be found in Appendix D.

Location	Measurement Period ('T')	1/1 Octave Frequency Band (Hz, dB)							Overall (dBA)
		63	125	250	500	1k	2k	4k	
MP1	L _{eq,16hr} (Day)	65	58	55	55	54	49	41	57
	Highest L _{eq,1hr} (20:00 – 23:00)	78	65	58	57	56	51	45	60
	L _{eq,8hr} (Night)	72	60	55	55	54	49	43	58
	Highest L _{eq,1hr} (23:00 – 03:00)	78	66	62	60	62	56	53	65
	L _{Fmax,2min} (Night) ^[1]	82	73	71	77	78	74	66	81
MP2	L _{eq,16hr} (Day)	63	52	46	46	46	39	32	49
	Highest L _{eq,1hr} (20:00 – 23:00)	80	67	57	59	56	50	44	61
	L _{eq,8hr} (Night)	71	56	47	49	46	40	33	51
	Highest L _{eq,1hr} (23:00 – 03:00)	80	67	57	60	57	50	43	61
	L _{Fmax,2min} (Night) ^[1]	86	74	66	71	66	59	52	72
MP3 Internal Ambient	Highest L _{eq,1hr} (20:00 – 23:00)	60	55	42	40	36	31	26	43
	Highest L _{eq,1hr} (23:00 – 03:00)	64	57	46	44	40	34	25	46

Notes:

[1] Exceeded 10 times or fewer per night.

Table 2 – Sound Level Results Summary

Note, as the façade data at the front was taken from the 3rd floor level, a distance correction factor will be applied in calculations to offer the most 'robust' assessment of the most affected window on the 1st floor.

3. Acoustic Design Considerations & The Proposal

3.1 Low Frequency (Entertainment) Noise Analysis

A review of the measurement data shows that entertainment noise is prominent at the front of the property during the evening/night-time periods on Fridays and Saturdays. The heightened noise levels have likely been caused by activity during the operational hours of the adjacent “Kings Head Sports Bar”. It also appears that low frequency noise is prevalent to the rear, reinforcing the presence of entertainment noise between 20:00 – 02:00.

The noise survey time history of the L_{Zeq} sound levels in the 25Hz to 160Hz 1/3 octave bands is shown below.

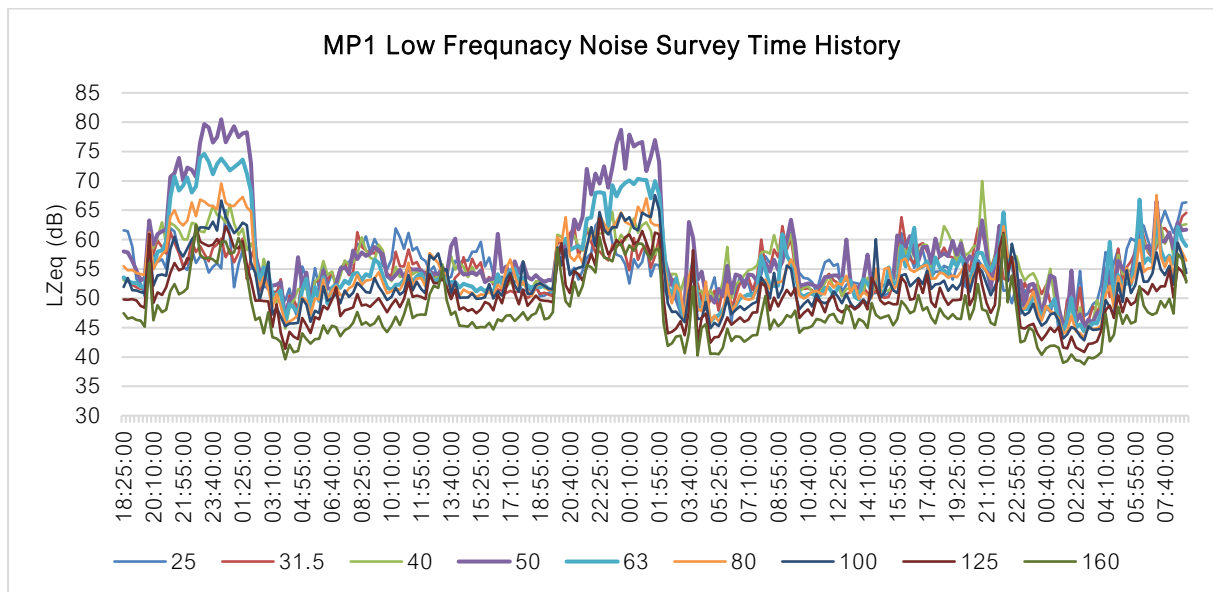


Figure 3 – Low-frequency Time History Graph – MP1

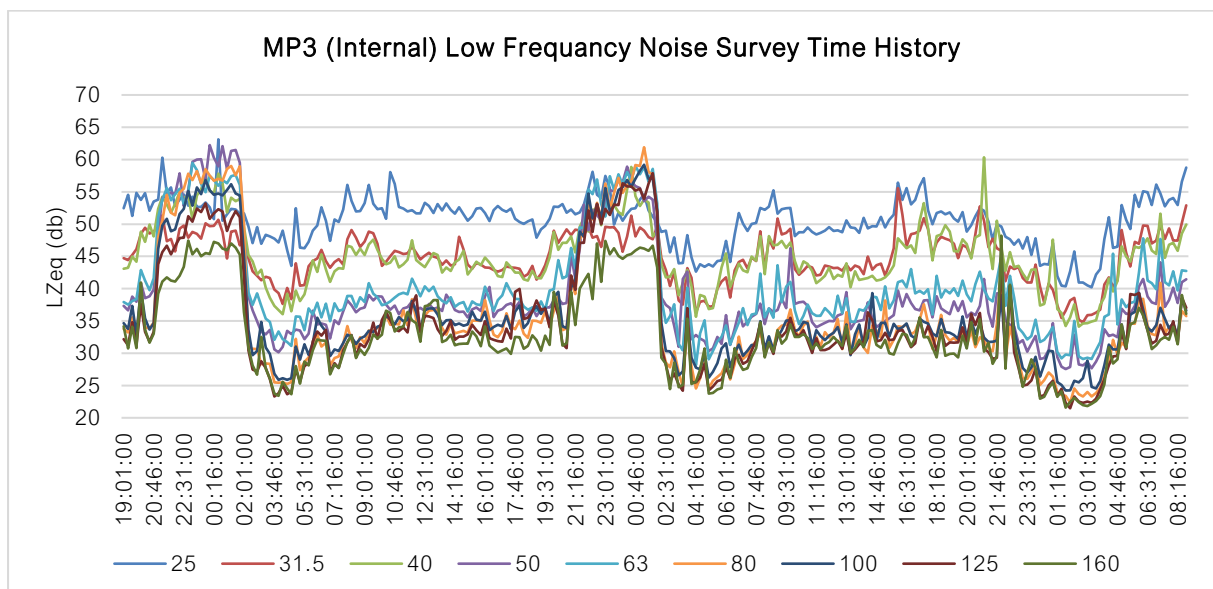


Figure 4 – Low-frequency Time History Graph – MP3 (Internal)

As can be seen in Figure 3, the external acoustic climate is dominated by low frequency entertainment noise emissions coinciding with the opening times for the adjacent sports bar. This is then also seen within the property for the time history of MP3 in Figure 4; the change in internal ambient noise levels is substantial.

3.2 The 'Agent of Change' Principle & Recommendations

Considering that entertainment noise is often dominant in the environment, especially during sensitive evening and night-time periods, it is thought that the 'Agent of Change' principle must be considered to reduce the likelihood of complaints from future residents and to avoid placing undue restrictions on the neighbouring venue.

Regarding this, the following is stated in Paragraph 200 of the NPPF:

"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."

It should be noted that an element of commercial noise is likely to be acceptable considering that anyone moving to the area will be aware of the urban town centre location and the surrounding pubs. However, whilst this may limit the level of impact, it should not be solely relied upon for mitigation.

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

As there is no affiliation between the applicant and the nearby venues, there is no scope to reduce the noise levels generated or change the event types being hosted. However, the applicant should investigate whether other controls are feasible, such as ensuring the operators of the venues are closing all doors and windows during operations; this may include the installation of lobbied door systems.

2. Reorientation of the development and acoustic shielding

As both the front and rear facades of the proposed development are exposed to low-frequency entertainment noise during the late-night/early-morning hours, it is not possible to alter the internal layout of the development so that sensitive rooms are located on less affected facades.

3. Enhanced façade sound insulation treatment

To ensure the possibility of adverse impact across both facades is reduced as much as is practicable, it is recommended that an enhanced façade sound insulation treatment is implemented. This should be calculated using the loudest periods during events (as shown in Table 2) for both the daytime and night-time hours respectively, which are both higher than the average daytime and night-time equivalents. To avoid disturbance due to low-frequency noise emissions, the Moorhouse Curve should not be exceeded in the 63Hz and 125Hz octave bands.

It is thought that the internal noise level criteria can be achieved with windows closed; however, the criteria are likely to be significantly exceeded if future occupants open their windows for ventilation purposes. Given this, it is recommended that secondary mechanical ventilation systems are installed that allow for appropriate internal conditions to be achieved without the need for opening windows. The acceptability of this strategy will have to be agreed with the LPA as there will still be an inherent risk in developing residential accommodation in this location.

The ventilation systems must be compliant with the requirements of Approved Document F and should be capable of providing the following:

- Background ventilation
- Purge ventilation
- Overheating mitigation

4. Noise Break-in Assessment and Sound Insulation Scheme

4.1 Internal Noise Level Criteria

The following tables outlines the internal acoustic design criteria used in the following assessment. Due to the presence of low frequency noise within the immediate area during night-time hours, the Moorhouse Curve criteria are applied, as presented in the table below.

Location	Day & Night
All Rooms	63Hz limit of 47dB 125Hz limit of 41dB

Table 3 – Low Frequency Acoustic Design Criteria (Moorhouse)

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} ^[2]

Notes:

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

[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".

[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".

[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.

[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

As discussed in Section 3 the acoustic environment does not follow a typical diurnal pattern, and as such, the highest measured $L_{eq,1hr}$ sound levels will be compared to relevant criteria from Table 3 and 4.

4.2 Glazing & Whole Dwelling (Background) Ventilation Specification

Currently, the glazing specification is thought to consist of a single pane of 4mm float glass. Given the extent of the low frequency noise emissions incident upon the façades, typical secondary glazing will not suffice.

The following is recommended:

- The existing 4mm float glass should be made good in line with the listed requirements.
- A 200mm (min.) cavity should be formed between the existing single glazing and the new secondary double glazing, depending on the location.
- Any passive ventilation systems must be removed, and the gaps filled with a material that can provide the equivalent level of sound reduction to the window frame or wall (depending on the location).

The predicted sound reduction provided by the proposed upgraded glazing specification is shown in the following table. The calculations considering the following sound insulation scheme can be found in Appendix E.

Given the bespoke nature of the glazing specification, it is strongly advised to consult with manufacturers for comment and early testing. Any glazing configuration could be installed provided it meets the sound 1/1 octave band sound reduction requirements shown in the table below.

Sound Insulation Scheme – Studio Living Spaces (front façade)								
Existing glazing: 4mm float glass (made good)								
Proposed Upgrades (Secondary double glazing): 200mm air cavity, 6mm glass, 16mm argon cavity, 8.8mm Optiphon laminated glass								
Description	Octave Frequency Band (Hz, dB)							Overall (dB)
	63	125	250	500	1k	2k	4k	
Predicted SRI of Entire System	30	36	39	49	59	62	71	52 (R _w) 46 (R _w + C _{tr})
Whole Dwelling Ventilation	MVHR (Mechanical Ventilation with Heat Recovery)							

Table 5 – Glazing & Whole Dwelling Ventilation Specification

An assessment of the noise levels to the rear has been undertaken which assumes that all living spaces maybe combined into a single dwelling, and as a worst case, a bedroom established to the rear. It has been determined that due to high levels of low frequency noise and the limited size of the potential living space that it is not practicable to install sufficient mitigation to the rear. Therefore, it should not be permitted to make a living space which faces the rear without reduction in low frequency noise in the area.

5. Internal Mechanical Plant Design

5.1 Mechanical Ventilation Regenerated Noise Considerations

Please note that where a mechanical ventilation system is to be installed, consideration will need to be made to ensuring that regenerated noise within the apartments from these systems, is appropriately controlled.

ADF and AVO provide desirable internal ambient noise levels that should be met during periods where these systems are in use for the provision of background ventilation; these figures are presented below. Criteria during periods when the system is to be used for periods of overheating are also provided.

Ventilation Condition	Desirable Internal Ambient Noise Levels for Mechanical Services (dB L _{Aeq,T})		
	Bedrooms	Living / Dining Rooms	Bathroom / WC / Kitchen
ADF – Whole Dwelling (Background) Ventilation	≤ 26 or 30 ^[1]	≤ 30	--
ADF – Extract Ventilation	≤ 26 or 30 ^[1]	≤ 35	≤ 45
ADF – Purge Ventilation	-- ^[2]		
AVO – Overheating Provision	≤ 30 ^[3]	≤ 35	--

Notes:

[1] AVO states that a figure of 26dB(A) may be more appropriate 'to prevent an adverse reaction from most occupants while falling asleep'.

[2] AVO states that 'no desirable noise levels are currently proposed based on the lack of evidence of acceptable noise levels when providing purge ventilation for the purpose of rapidly diluting indoor pollutants'.

[3] Section 1.10.10 of CIBSE Guide A 2015 states that a range of +/- 5 dB may be acceptable depending on the situation.

Table 6 – Internal Noise Level Design Criteria

Based on the above, the mechanical ventilation system should be designed to no greater than 30dB L_{Aeq,T} (NR25) in bedrooms at night and 35dB L_{Aeq,T} (NR30) in living rooms during the daytime. However, should there be any terminal units located in rooms, a 5dB relaxation may be acceptable as the occupant will have control over these units and the noise would be broadband and steady state (considered less acoustically characterful).

In line attenuators may be required to the room supply and extract branches of the system. This will require final confirmation. In addition, the heat recovery units should only be fixed to the soffit of the slab.

Based on the above and as a general design guide, the following maximum duct velocities for conventional low velocity systems should not be exceeded. The below information has been taken from Table 2.16 of CIBSE Guide B2 'Ventilation and ductwork: 2016'.

Noise Level (dBA)	Duct Velocity (m/s)		
	Main Duct	Branch Duct	Final Runout
30 (NR25)	3.0	2.5	<2.0
35 (NR30)	5.0	4.5	2.5
45 (NR40)	7.5	6.0	3.5

Table 7 – Maximum Duct Velocities

6. Noise Breakthrough Assessment and Sound Insulation Scheme

6.1 Noise Breakthrough Criteria

The proposed development structurally adjoins commercial properties via separating a separating wall and floor. It is stated in BS8233 that the internal noise criteria include 'overall noise', which is the sum of structure borne and airborne noise sources. As such, noise breaking through from structurally adjoining businesses must be controlled so that the cumulative noise emissions do not exceed the design criteria.

Guidance on sound insulation between adjoining domestic and non-domestic properties is discussed in Section 0.8 of Approved Document E (ADE):

"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.

6.2 Noise Breakthrough Assessment and Specification

Detailed Breakthrough for Sports Bar

It has been indicated that the existing partition outperforms a 200mm brick wall as the levels recorded at MP3 are lower than that expected when modelling the wall in INSUL 10.

When performing a speculative breakthrough assessment (assuming internal noise levels of the sports bar to be comparable to "Music Bar / Nightclub" as taken from 'The Little Red Book of Acoustics'), it was found that a 300mm brick wall would still underperform but is more comparable, and still a reasonable assumption given the age and type of building.

Given that there will be noise from live music and patrons, it is recommended that the NR20 curve and low-frequency Moorhouse curve criteria are not exceeded.

Although it is acknowledged that not every event will incorporate live music, this presents a worst-case scenario. As such, the noise levels specified in the Little Red Book of Acoustics for a 'music bar/nightclub' are used for the assessment.

The minimum levels of airborne sound insulation required in order to achieve the criteria are presented in the table overleaf.

Description	1/1 Octave Frequency Band (Hz, dB)							Overall (dB)
	63	125	250	500	1k	2k	4k	
Internal Noise Level within Bar (L_{eq})	110	110	100	100	95	90	85	101 (A)
NR20 & Moorhouse Curve Criteria (dB)	47 ^[1]	41 ^[1]	31	24	20	17	14	25 (A)
Required Sound Reduction (D_{nT})	63	69	69	76	75	73	71	76 ($D_{nT,w}$)
Notes: [1] Moorehouse Curve criteria.								

Table 8 – Minimum Required Airborne Sound Insulation Performance

To achieve the required criteria, it is recommended that the existing studwork is moved to allow for a 50mm air gap between the existing masonry, ensuring that the studwork is completely isolated from the structure, as outlined below.

Proposed Upgrade:

- Existing 250-300mm masonry
- Min. 50mm air cavity
- Min. 90mm independent timber stud filled with 140mm (full-fill) acoustic mineral wool insulation (min. density 60kg/m³, e.g., Rockwool RW3) between studs
- 2no. 22mm cement particle board (min. density of 1300kg/m³)
- 1no. 19mm iKoustic MuteBoard 2 (or equivalent)

The noise breakthrough assessment considering the proposed sound insulation upgrades is shown in the table overleaf.

The calculations are based on the reverberation time within the bedroom of ~0.3 seconds; the surface finishes should be developed at a later stage, as to control external noise ingress and noise breakthrough, a lower reverberation time is required compared to the typical 0.5s for an unfurnished bedroom in the UK.

Measurement Period ('t')	1/1 Octave Band (Hz, dB)							Overall (dB)
	63	125	250	500	1k	2k	4k	
Amplified Music Limit Levels (L _{eq})	110	110	100	100	95	90	85	101 (A)
Predicted Sound Reduction of Upgraded Wall (R) ^[1]	61	77	≥95	≥95	≥95	≥95	≥95	≥95 D _{nT,w}
Furnished Bedroom Reverberation Time Correction	-2.0	-2.4	-2.8	-3.2	-3.2	-3.6	-4.7	--
Predicted Internal Noise Level within Residential (L _{eq})	47	31	2	2	-3	-9	-15	22 (A)
NR20 & Moorhouse Curve Criteria (dB)	47	41	31	24	20	17	14	25 (A)
Exceedance of Criteria	0	-10	-29	-22	-23	-26	-29	-3

Notes:

[1] Moorhouse Curve at 63Hz and 125Hz

Table 9 – Noise Breakthrough Assessment – Post-Mitigation

Flanking Risks

During the site visit it was not established whether there are any common structural elements between the proposed development site and adjacent building containing the sports bar. Should common elements such as timber joists or steel beams exist, consideration to re-radiated noise from these elements must be given at the early design stages; this will likely include independent frame encasements.

Ground Floor Retail Breakthrough Assessment

The following table outlines the expected level of risk associated with the 'Class Use' of the structurally adjoining commercial property and provides a required sound insulation standard including a discussion to justify the standard.

Planning Class	Level of Risk from Noise	Required Sound Insulation Standard (dB)
Ea E(a) Display or retail sale of goods, other than hot food	Medium	≥55 D _{nT,w} + C _{tr}

Discussion: The noise emissions produced by retail premises may include both background level amplified music, noise from patrons and noise from storage areas. Amplified music associated with primarily retail premises is normally of a background level to facilitate conversation and as such is not a primary concern. 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 requires additional consideration during this period.

Table 10 – Noise Breakthrough Criteria – Separating Floor

A sound test was conducted between the ground floor retail unit and the proposed first floor studio flat. The testing indicated an airborne sound insulation performance of 45dB $D_{nT,W}$ (-6 C_{tr}); which falls below requirement of the separating floor. The test results can be provided upon request.

To isolate the proposed studio flats from any low frequency vibration from the adjacent sports bar that may be re-radiated from the existing timber floor joists, it is recommended that a floating floor system be incorporated into the design.

An indicative specification that can achieve the required sound insulation standard is outlined below. The airborne sound reduction provided by the proposed system has been modelled in INSUL 10.

- 4mm mass-loaded vinyl (iKoustic MuteBarrier or equivalent)
- DECKfon 26T floating floor
- 20mm flooring particle board
- Assumed 200mm timber joists with 150mm mineral wool slab insulation (45kg/m^3) tightly and evenly fitted
- Isolation clips & furring channels (e.g., MuteClip™ and Furring channel system or equivalent)
- 2no. 15mm Gyproc SoundBloc Plasterboards (min surface mass 12.6kg/m^2 per board
Overlapping joints and sealed with flexible mastic at the perimeter.

It should be noted that this report provides an indicative specification that can achieve the required acoustic performance and considers that all flanking routes for sound have been appropriately suppressed. As with any construction project, the ability to meet the specification will rely upon the quality of the built structure.

As such the works should be carried out to a high standard of workmanship to ensure that any sound insulation measures are not breached, for example by installing a rigid connection across an isolated connection. The development cannot achieve compliance until sound insulation testing is carried out by a UKAS accredited sound insulation testing company upon completion and assessed against the required sound insulation standard.

7. 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 has been achieved.

Due to the proposed development being in a conservation area and the dominance of entertainment noise, a secondary glazing system has been suggested which will sufficiently reduce the noise break-in levels to below the BS8233 recommendations. This will also require the installation of an alternative ventilation strategy/system; a whole dwelling ventilation MVHR system is recommended.

A more robust separating wall buildup is recommended between the sports bar and the proposed development. This will include a separating air gap and higher density cement impregnated chipboard providing significantly more mass to reduce the low frequency breakthrough.

To isolate the proposed studio flats from any low frequency vibration from the adjacent sports bar that may be re-radiated from the existing timber floor joists, it is recommended that a floating floor system be incorporated into the designs.

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

1. The proposed glazing and background ventilation system, or a suitable alternative, should be installed as shown in **Section 4.2**.
2. Secondary mechanical ventilation systems should be installed for all studio flats. The ventilation systems must be compliant with the requirements of Approved Document F and should be capable of providing background ventilation, purge ventilation and overheating mitigation. Guidance of noise limits for internal mechanical plant has been provided in **Section 5**.
3. The wall separating the sport bar from the proposed development should provide the sound reduction specified in **Section 6.2**. Indicative specifications have been provided, and further design assistance can be provided by NOVA Acoustics if required.
4. The floor separating the proposed development from the ground floor retail unit should provide the sound reduction also shown in **Section 6.2**. However, it is recommended that a floating flooring system is also used throughout the development.
5. During the site visit it was not established whether there are any common structural elements between the proposed development site and adjacent building containing the sports bar. Should common elements such as timber joists or steel beams exist, consideration to re-radiated noise from these elements must be given at the early design stages; this will likely include independent frame encasements.
6. As the development introduces a noise-sensitive element to an established commercial / entertainment area, the 'Agent of Change Principle' must be considered. This is discussed in **Section 3.2**, and it is at the discretion of the LPA as to whether further development is 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 p_0 is the reference sound pressure (20 μ Pa)
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: $L_p = 10 \log_{10}(p/p_0)^2$. Where: p is the root-mean-square sound pressure in pascals (Pa) and p_0 is the reference sound pressure (20 μ Pa)
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), updated 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.”

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 11 – 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 – ProPG: Planning and Noise (2017)

ProPG Planning and Noise published May 2017 by the Association of Noise Consultants (ANC) 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 promoting good health and wellbeing through the effective management of noise. It therefore 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”.
- Element 4 – consideration of “Other Relevant Issues”.

The ProPG supplementary document 2 provides the following 'Good Acoustic Design' hierarchy of noise management measures which LPAs should encourage. These are shown below, In descending order of preference:

Order of Preference	Noise Management Measure
1	Reduction of the noise generated at source by redesign, relocation or containment. *
2	Maximising the spatial separation of noise source(s) and receptor(s).
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.
4	Investigating the necessity and feasibility of reducing existing noise levels and relocating existing noise sources.
5	Incorporating noise barriers as part of the scheme to screen the proposed development site from significant sources of noise.
6	Using the layout of the scheme to reduce noise propagation across the site.
7	Using the orientation of buildings to reduce the noise exposure of noise sensitive rooms.
8	Using the building envelope to mitigate noise to acceptable levels.

Table 12 – Hierarchy of Noise Management Measures

*Not from ProPG

B.5 – 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.
 - a) Correctly sizing and jointing ducts.
 - b) 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.
 - c) 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.6 – 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.

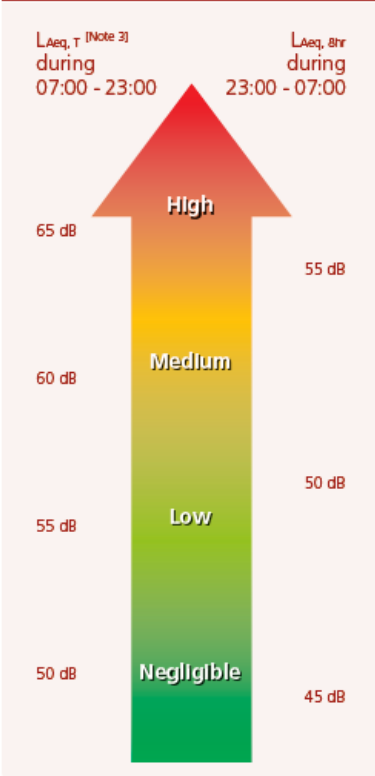
Risk category for Level 1 assessment ^[Note 5]	Potential Effect without Mitigation	Recommendation for Level 2 assessment
	Increasing risk of adverse effect	Recommended Optional
	Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect	Not required

Table 3-2 of AVO Guide (2020)

Figure 5 – 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 13 – 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.

Internal ambient noise level [Note 2]			Examples of Outcomes [Note 5]	
$L_{Aeq,T}$ [Note 3] during 07:00 – 23:00 [Note 6]	$L_{Aeq,8h}$ during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 [Note 4]		
> 50 dB	> 42 dB	Normally exceeds 65 dB $L_{A,Fmax}$	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time	Avoiding certain activities during periods of intrusion. Having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.
 Increasing noise level			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods. As noise levels increase, small behaviour changes are expected e.g. turning up the volume on the television; speaking a little more loudly; having to close windows for certain activities, for example ones which require a high level of concentration. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in quality of life. At lower noise levels, limited behavioural change is expected unless conditions are prevalent for most of the time. [Note 8]
≤ 35 dB	≤ 30 dB	Do not normally exceed $L_{A,Fmax}$ 45 dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response [Note 9]. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

Note 1 The noise levels suggested in Tables 3-2 and 3-3 assume a steady road traffic noise source but may be adapted for other types of transport.

Table 3-3 of AVO Guide (2020)

Figure 6 – AVO Guide Level 2 Internal Ambient Noise Levels

B.7 – Entertainment Noise Legislation

Noise from entertainment venues, e.g. noise from recorded music, live bands or karaoke, can be particularly annoying for residents and business if it is not adequately contained within the venue. When considering the potential impact of a proposal for an entertainment premises or residential near to entertainment premises a consideration for the overall noise level (L_{Aeq}) and the 63Hz and 125Hz octave band noise levels. Music noise in the 63Hz and 125Hz octave bands, which is described as 'bass noise' is particularly difficult to contain and the impulsive and non-steady character of low frequency music noise is particularly disturbing for residents exposed to it.

A lively city centre bar can operate around 95 dB L_{Aeq} and nightclubs can be even higher at 105 dB L_{Aeq} . The range of level of 63Hz and 125Hz octave bands is wider than the a-weighted levels and can be up to 115 dB L_{eq} and 110 dB L_{eq} respectively (Davies et al 2005).

There is a lack of consensus on an assessment method for noise levels within habitable rooms regarding entertainment noise. The design aim should be to design to 'inaudible*'. The building structure is therefore key, and will usually involve a high performing solution in either the music venue or residential premises. Existing noise standards/criteria are not appropriate for evaluating low frequency noise; in almost all other situations the established noise descriptors are based on the A-weighted sound level (dBA) which effectively filters out low frequency sound (Moorhouse et al 2011).

**Noise is considered to be inaudible when it is at a sufficiently low level such that it is not recognizable as emanating from the source in question and it does not alter the perception of the ambient noise environment that would prevail in the absence of the source in question. The DEFRA report 'Noise from Pubs and Clubs – Phase 1', which, on page 17 reproduces the Institute of Acoustics (IOA) working group guidance to achieve music noise levels which are 'virtually inaudible' inside a residential property.*

When dealing with noise control, especially at the lower frequencies it is usual to look at the octave band data as a Z-weighting (linear) and not the A-weighting, due in main to the amount you have to 'take off', resulting in meaningless data (-26.2dB at 63Hz) and also with respect to the sound insulation performance of various construction materials. Rather than just A-weighted levels being assessed e.g. internal noise levels as per BS8233:2014; a low frequency band analysis should be carried out (McCullough et al 2004).

In the 'Procedure for the assessment of low frequency noise complaints – Revision 1', Moorhouse et al (2011) use limits for low frequency noise levels in 1/3 octave bands between 10Hz and 160Hz. For the assessment of low frequency music noise, it is more practical to consider the 63Hz and 125 Hz octave bands. The Noise Council's Code of Practice on 'Environmental Noise Control at Concerts' suggests limits on both these octave bands. The DEFRA report 'Noise from Pubs and Clubs – Phase 1' suggests limits on 1/3 octave bands. However, the problem with this suggestion, and one of the reasons it is not widely used, is due to the difficulty in obtaining 1/3 octave band sound insulation performance data for various construction materials. With regards to assessing music noise at the 63 Hz and 125 Hz octave band levels a good correlation is shown between the NR 15 curve and Moorhouse curve at low frequencies. See figure below.

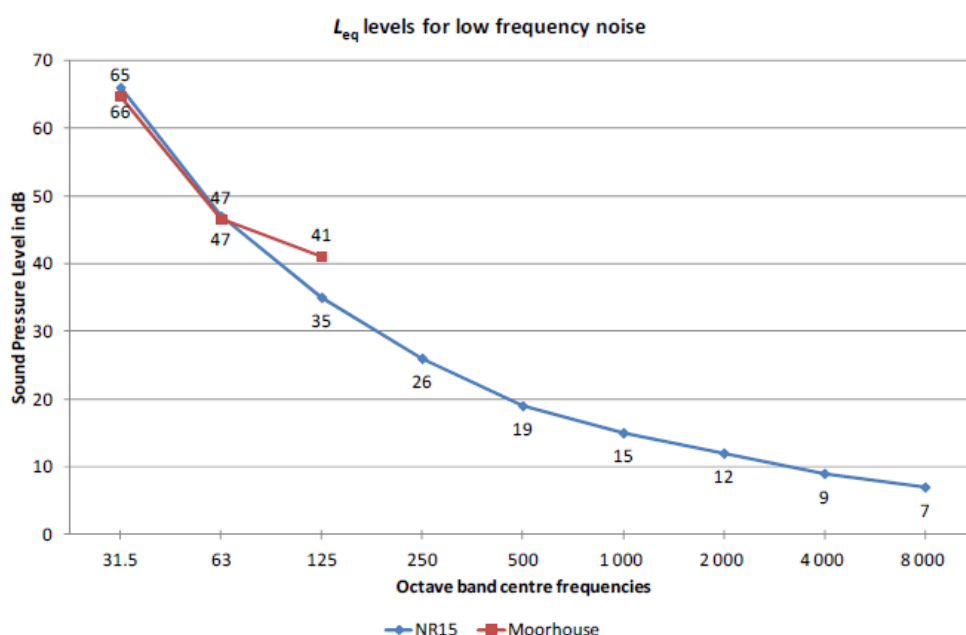


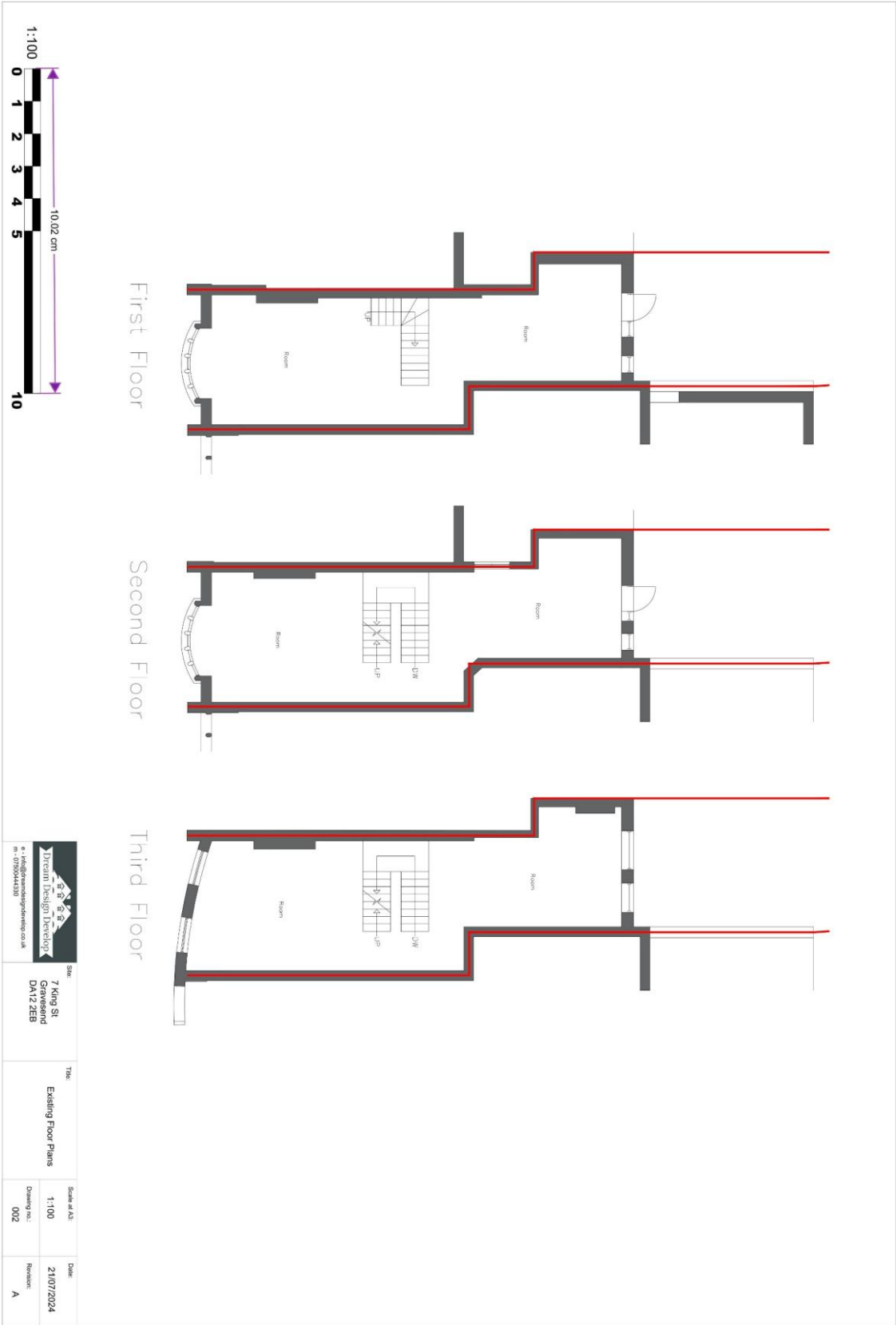
Figure 7 – Moorhouse Low Frequency Noise Rating Curve

However, The NR curve may be too stringent at mid and higher frequencies and may be lower than background noise levels in habitable spaces. Further, the NR curve is most commonly used to set limits for mechanical services noise in buildings i.e. steady, continuous noise sources. Music noise has distinctive characteristics and as such can be described as unsteady and non-continuous in comparison. Even though the Moorhouse curve does not specifically relate to entertainment noise (as per the caveat in the revised edition) these levels provide a good practical basis to assess low frequency music noise. They also provide a workable prediction for planning applications and a measurement method and assessment for in-situ low frequency issues in existing habitable spaces. Therefore, a criterion that would achieve a condition of 'inaudible' / 'virtually inaudible' which is applicable for new residential developments that are structurally connected to entertainment venues (or vice versa) would be: *'Music noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{eq}) should be controlled so as not to exceed (in habitable rooms) 47dB and 41dB (L_{eq}), respectively'*. This criterion may also be applicable for new residential developments that are structurally separate from an existing entertainment venue.

References:

- i) Institute of Acoustics (2002) – Good practice guide on the control of noise from pubs and clubs – Draft Annex 2.
- ii) McCullough et al (2004) A practical evaluation of objective noise criteria used for the assessment of disturbance due to entertainment music.
- iii) Moorhouse et al (2005) Proposed criteria for the assessment of low frequency noise disturbance, Defra (updated in 2008 and 2011).

Appendix C – Existing Floor Plans



Appendix D – Environmental Survey

D.1 – Time History Noise Data

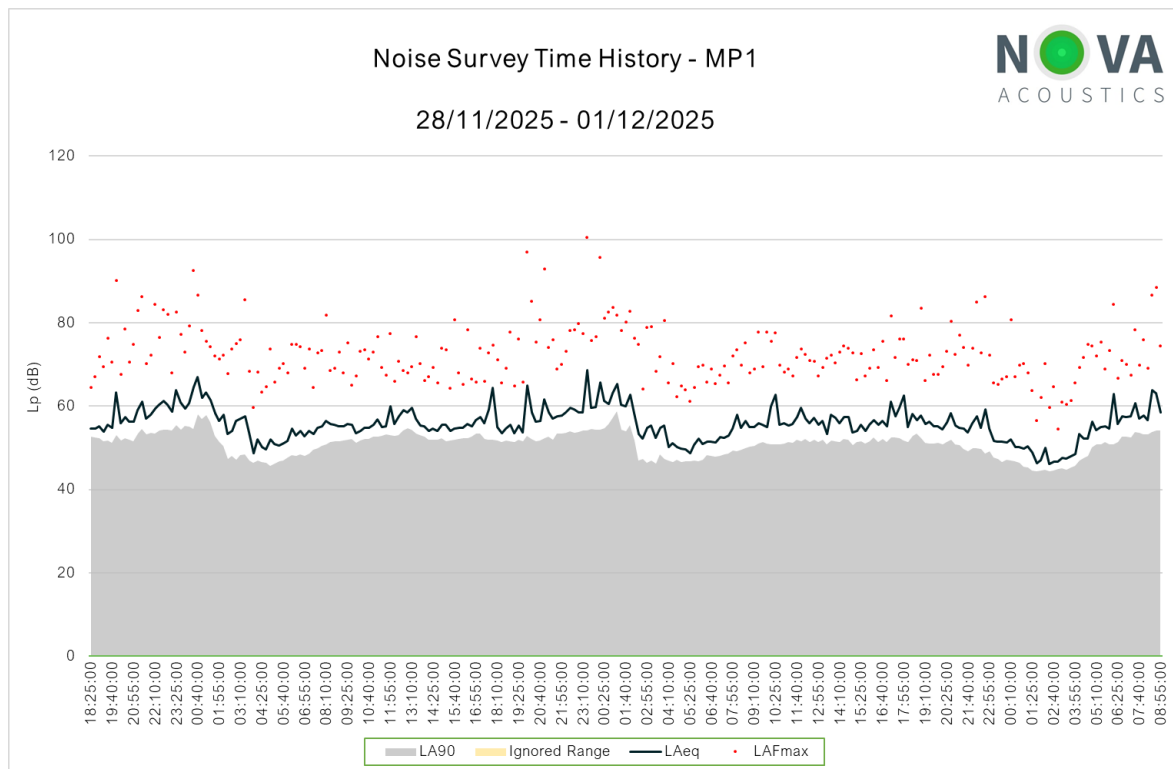


Figure 8 – MP1 Noise Survey Time History

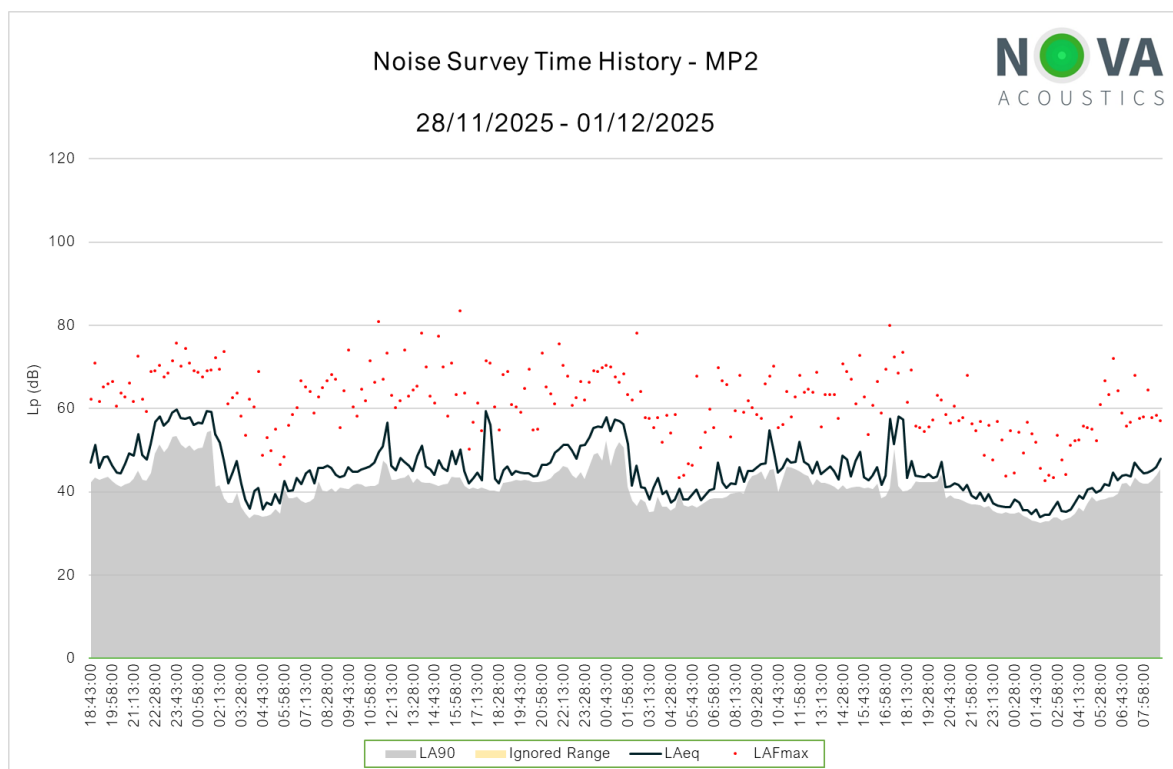


Figure 9 – MP2 Noise Survey Time History

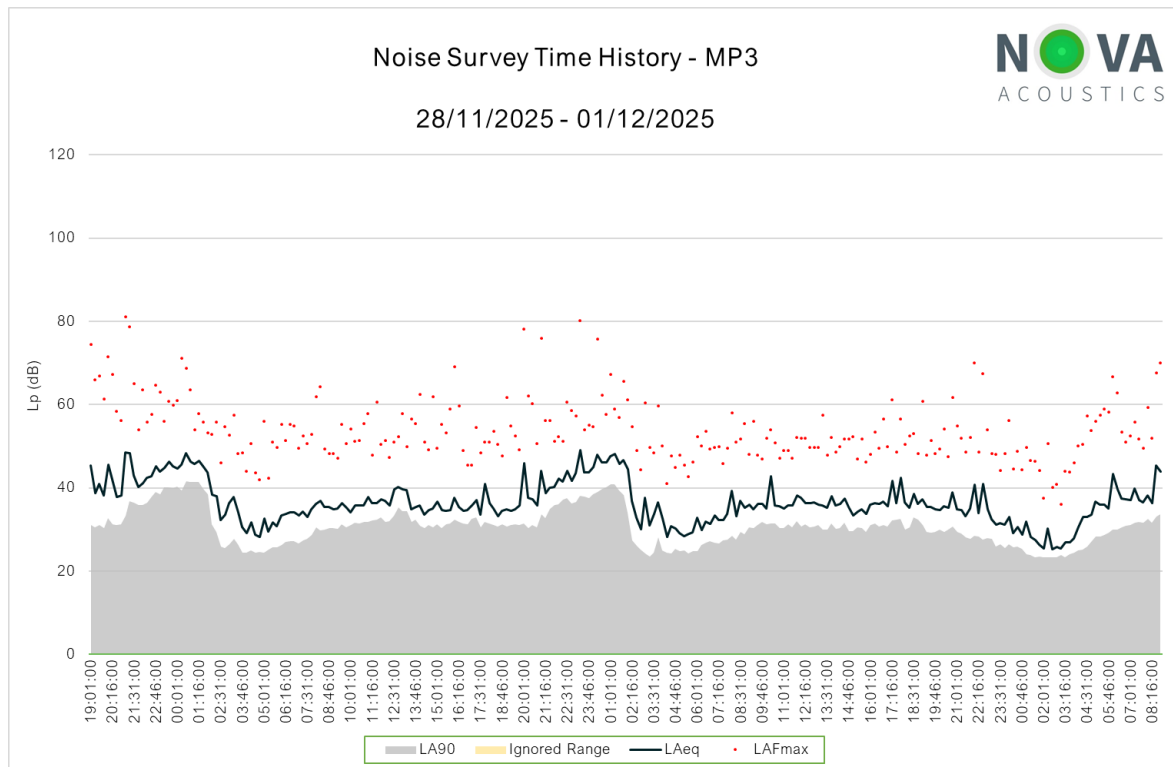


Figure 10 – MP2 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
Svantek SV971a Class 1 Sound Level Meter	141420	≤0.1
Svantek SV971a Class 1 Sound Level Meter	141413	≤0.1
Svantek SV971a Class 1 Sound Level Meter	141417	≤0.1
Svantek SV33B Class 1 Calibrator	125636	--

Table 14 – 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 ≤0.1dB. 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 – 'rpgGRV' Off Parrock Road (Approx. 0.8km SSE of Site)				
Time Period	Air Temp (°C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s)
28/11/25: 00:00 – 23:59	9.1 – 13.2	0.0	SSW	0.0 – 2.7
29/11/25: 00:00 – 23:59	4.6 – 11.9	0.0 – 2.3	SSW	0.0 – 5.8
30/11/25: 00:00 – 23:59	2.8 – 8.0	0.0	SW	0.0 – 3.6
01/12/25: 00:00 – 23:59	6.7 – 11.1	0.0 – 3.8	SSW	0.0 – 6.3

Table 15 – Survey Weather Conditions

Upon correlation of recorded noise and weather data, it has been determined that there was no overall effect on the data and as such, no data has been removed from analysis. The peak in windspeed on the 01/12/25 occurred outside of the monitoring period.

Appendix E – Noise Break-in Calculations

E.1 – Front Façade

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 taken as 0.3 seconds across the relevant frequency range for a furnished bedroom in the UK, this must be ensured during design.
- Based on the technical drawings provided to NOVA Acoustics, the window areas and room volumes below were used as a worst-case scenario for calculations:

Room / Building Element	Glazing Area (m ²)	Room Volume (m ³)
MP1 Studio Living Space	4.4	76.1

- The acoustic performance of the façade elements are taken from the relevant manufacturers technical information or the sound reduction has been predicted using INSUL 10.

Studio Bedroom Living Area (MP1) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Corrected Leq,T Spectrum	65	82	69	62	61	60	55	49	49
Glazing Noise Ingress	23	49	30	20	9	-2	-10	-25	-25
Ventilation Noise Ingress									
Wall Noise Ingress	16	38	27	17	8	2	-8	-14	-14
Roof Noise Ingress									
Room Absorption Correction		-5	-5	-6	-6	-6	-7	-8	-9
Total Noise Ingress	22	47	29	19	8	0	-9	-18	-19
NR30 & Moorhouse	35	47	41	39	33	30	26	24	22
Exceedance of Criteria	-13	0	-12	-20	-25	-30	-35	-42	-41

Studio Bedroom Living Area (MP1) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Corrected Leq,T Spectrum	69	82	70	66	64	66	60	57	52
Glazing Noise Ingress	24	49	31	24	12	4	-5	-17	-22
Ventilation Noise Ingress									
Wall Noise Ingress	18	38	28	21	11	8	-3	-6	-11
Roof Noise Ingress									
Room Absorption Correction		-5	-5	-6	-6	-6	-7	-8	-9
Total Noise Ingress	23	47	30	23	11	6	-4	-10	-16
NR25 & Moorhouse	30	47	41	35	28	25	21	19	17
Exceedance of Criteria	-7	0	-11	-12	-17	-19	-25	-29	-33

Studio Bedroom Living Area (MP1) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Corrected Lmax Spectrum	85	86	77	75	81	82	78	70	59
Glazing Noise Ingress	31	53	38	33	29	20	13	-4	-15
Ventilation Noise Ingress									
Wall Noise Ingress	30	42	35	30	28	24	15	7	-4
Roof Noise Ingress									
Room Absorption Correction		-5	-5	-6	-6	-6	-7	-8	-9
Total Noise Ingress	31	51	37	32	28	22	14	3	-10
NR40	45	67	56	49	43	40	37	34	33
Exceedance of Criteria	-14	-16	-19	-17	-15	-18	-23	-31	-43



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