Residential Noise Assessment

Site Address: The Time Piece, 11 Northgate, Dewsbury, WF13 1DS

Client Name: MAS Design Consultants

Project Reference: NP-013760

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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 mixed-use development ('the proposed development') at The Time Piece, 11 Northgate, Dewsbury, WF13 1DS ('the site'). The site is subject to noise from road traffic emissions and possible low level commercial activity.

The applicant has received conditional approval for planning application ref. 2025/62/92714/E ('the Application') from Kirklees Council. This report has been prepared to assess conditions imposed by the Local Planning Authority ('LPA').

A noise survey has been undertaken to establish the prevailing sound levels at the proposed development and closest noise-sensitive receptors ('NSRs'). The findings have been used to assess the suitability of the site for the proposed 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:

- The LPA's conditional approval; specifically, 'Conditions 6 – 9'
- 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)
- British Standard BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'
- Entertainment Noise Legislation
- IEMA 'Guidelines for Environmental Impact Assessment'

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

1.2 Proposal Brief

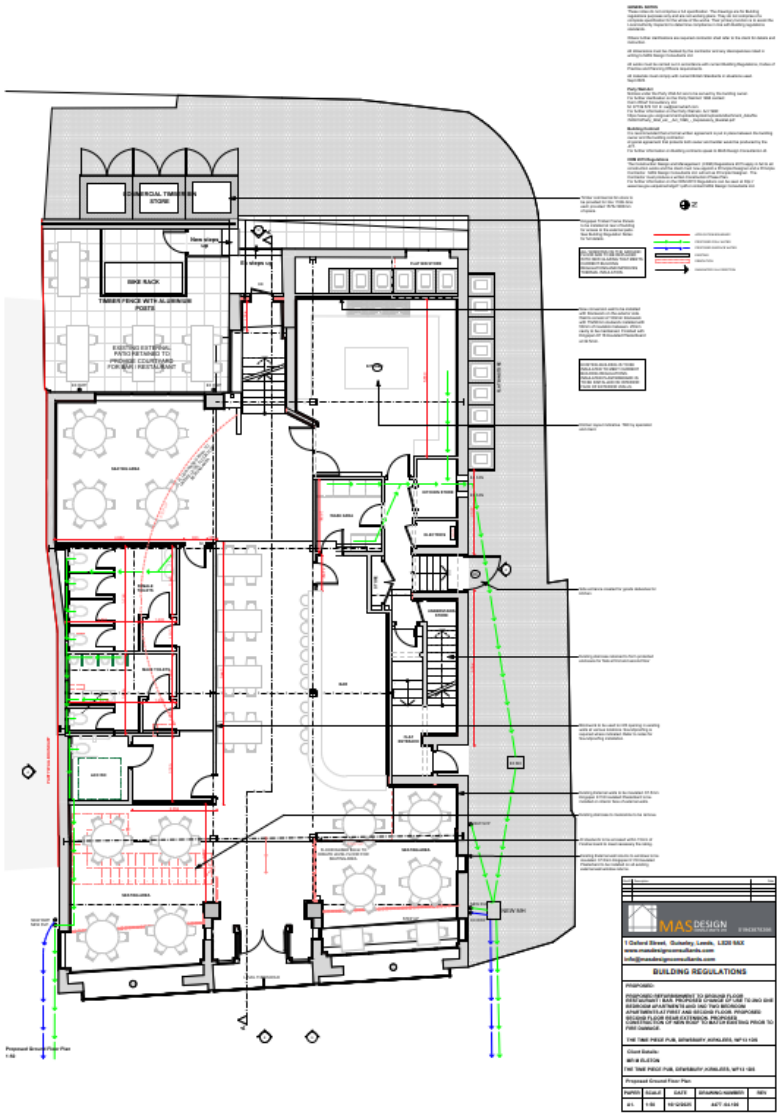
The proposal is for the change of use of an existing building to include a commercial unit on the ground floor, 5no. residential dwelling flats across the upper floors and a second-floor extension with a new roof.

The planning application for the development is titled as follows:

"Alterations and refurbishment of ground floor restaurant/bar, alterations to first and second floors to form 5 apartments, erection of second floor extension and construction of new roof (within a Conservation Area)".

NOVA Acoustics has been informed that there will be **no live amplified music** within the restaurant/bar and that all music will be for **background ambience exclusively** (set to a level at which conversations can be had at a normal level).

The ground floor site plan is shown below.



Drawing Ref. 4477.04.100 from 'MAS Design Consultants Ltd'

Figure 1 – Proposed Development Ground Floor Plan

1.3 Local Planning Authority & Background

The following conditions relevant to noise require discharging:

"6. Before the development is brought into use, a report specifying the measures to be taken to protect the development from noise from all significant noise sources that are likely to affect the proposed development including road traffic, commercial/licensed premises shall be submitted to and approved in writing by the Local Planning Authority. The report shall:

a) Determine the existing noise climate

b) Predict the noise climate in living rooms (daytime), bedrooms (night-time) and other habitable rooms of the development

c) Detail the proposed attenuation/design necessary to protect the amenity of the occupants of the new residences (including ventilation if required).

The development shall not be occupied until all works specified in the approved report have been carried out in full and such works shall be thereafter retained.

Reason: To protect the amenity of occupiers of the proposed development from noise or disturbance from nearby noise generating premises to accord with the aims of Policies LP24 and LP52 of the Kirklees Local Plan and Chapters 12 and 15 of the National Planning Policy Framework.

7. Before the development is brought into use written evidence to demonstrate that the airborne sound insulation performance of the party floors/walls/ceiling of the development is of a minimum of 53dB $D_{nT,w}$ + C_{tr} shall be submitted to and approved in writing by the Local Planning Authority. If it cannot be demonstrated that the aforementioned airborne sound insulation performance has been achieved, a scheme incorporating further measures to achieve the sound insulation performance shall be submitted to and approved in writing by the Local Planning Authority.

All works comprised within those further measures shall be completed and further written evidence to demonstrate that the aforementioned sound insulation performance level has been achieved shall be submitted to and approved in writing by the Local Planning Authority before the development is first brought into use.

Reason: To protect the amenity of occupiers of the proposed development from noise or disturbance from nearby noise generating premises to accord with the aims of Policies LP24 and LP52 of the Kirklees Local Plan and Chapters 12 and 15 of the National Planning Policy Framework.

8. Before the development is brought into use, a Noise Management Plan shall be submitted to and approved in writing, by the Local Planning Authority. The plan shall detail the measures that will be taken to effectively control noise arising at the premises from all likely noise sources so that it does not have an adverse impact on nearby residents. The plan shall include a scheme to deal with noise from, but not limited to:

- music and/or other amplified sound at the premises loud voices from customers at the premises including those at outside areas (inc. smoking shelters) and those leaving the premises

- disposal of glass bottles

The approved Noise Management Plan shall be fully implemented before use commences and operated in accordance with the approved plan thereafter.

Reason: To ensure the proposed development does not cause harmful noise pollution within neighbouring noise sensitive locations, in the interest of amenity, to comply with the aims and objectives of Policies LP24 and LP52 of the Kirklees Local Plan and Chapters 12 and 15 of the National Planning Policy Framework.

9. Prior to the installation of any kitchen extract and/or mechanical ventilation, details shall be submitted to and approved in writing by the Local Planning Authority. The details shall provide the following information:

- A risk assessment for odour which considers amount and type of food that will be cooked together with the proposed dispersion of odours and proximity of receptors likely to be affected by any cooking odours.

- Based on the risk assessment, details of the proposed methods of odour control and dispersion of any extracted odours. The effective stack height (discharge height plus plume rise) must be high enough to ensure that adequate dilution takes place before the plume interacts with the nearest sensitive receptor.

- Details showing the proposed location of all the major components of the extract system.

- The noise mitigation measures that will be incorporated in the extract system and details of the likely resulting noise levels that will be caused by operation of the extract system, in particular how loud it will be at nearby noise sensitive locations.

- The proposed ongoing maintenance schedule that will be carried out to ensure that the extract system continues to effectively control odours and not cause excessive noise.

- The approved extract system shall be installed before food cooking commences and thereafter retained and maintained in accordance with the approved details.

Reason: To ensure the proposed development does not cause harmful odour pollution within either a public area or at neighbouring premises in the interest of amenity, to comply with the aims and objectives of Policies LP24 and LP52 of the Kirklees Local Plan and Chapters 12 and 15 of the National Planning Policy Framework."

2. Environmental Noise Survey

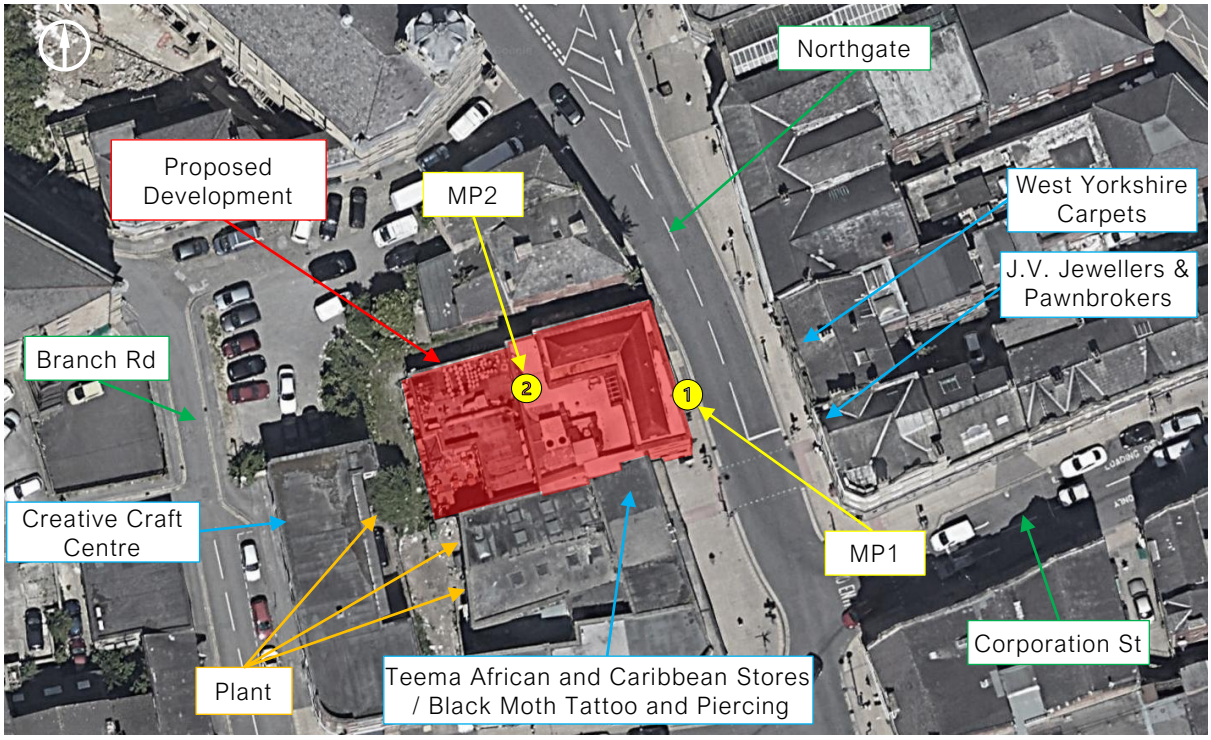
2.1 Measurement Methodology

An environmental noise survey was carried out at the site the define the acoustic climate of the area. 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.

Location	Survey Dates	Measurement Particulars
MP1	30/01/26 – 02/02/26	Equipment mounted protruding from a first-floor window at 1m distance from the building façade overlooking Northgate.
MP2	30/01/26 – 02/02/26	Equipment mounted on a tripod at 1m distance from the building façade overlooking the rear of site.

Table 1 – Measurement Methodology

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



Imagery ©2026 Airbus, Map data ©2026

Figure 2 – Measurement Locations and Site Surroundings

2.2 Context & Subjective Impression

The proposed development site is located off Northgate in Dewsbury, West Yorkshire. The area surrounding the site consists primarily of commercial premises in all directions. Adjacent to site is Teema African and Caribbean Stores (a small food shop) at ground level and Black Moth Tattoo and Piercing located across the upper floors. Operational hours of Teema African and Caribbean Stores are advertised as 09:00 – 19:00, Monday to Saturday and 14:00 – 19:00, Sunday. Black Moth Tattoo and Piercing is advertised as being operational between 10:00 and 18:00, Monday to Saturday.

Further to this, general retail premises are also located directly opposite site on Northgate and to the rear on Union Street, including a carpet retailer, a jeweller, a wholesaler and a craft shop. Operational hours of these businesses are also advertised as falling within 'typical' daytime working hours. During the site visits, noise emissions from the retail premises were not clearly audible or impactful.

It was noted that fixed plant units are installed at the rear of site; however, none were audible above the prevailing residual noise level. This observation is supported by the long-term monitoring data. When plant noise is audible and dominant in an environment, it typically presents as a steady 'flat-line' profile in the L_{A90} background noise level time-history. This is because the plant noise is present when other noise sources in the area fluctuate to lower levels, creating a consistent noise floor. As shown in the time history graphs in Appendix D, the measured noise levels are clearly diurnal in nature, with distinct daytime and night-time variations, confirming that road traffic noise is significantly dominant. On this basis, noise associated with plant serving neighbouring commercial premises is not considered significant in the context of the overall acoustic environment, and no further assessment of these sources is deemed necessary.

Overall, the acoustic environment is thought to be low to moderate in level and the noise profile is dominated by road traffic noise emissions from the local road network, primarily Northgate.

2.3 Environmental Noise Survey Results

A summary of the ambient noise levels measured during the survey is shown in the table below. The time history results can be found in Appendix D.

Location	Measurement Period ('T')	Octave Frequency Band (Hz, dB)							Overall (dBA)
		63	125	250	500	1k	2k	4k	
MP1	$L_{eq,16hr}$ (Day)	69	63	61	59	61	58	52	65
	$L_{eq,8hr}$ (Night)	60	53	52	50	53	50	44	56
	Typical $L_{AFmax,2min}$ (Night)	77	74	70	70	72	68	61	75
MP2	$L_{eq,16hr}$ (Day)	55	50	49	46	48	43	36	52
	$L_{eq,8hr}$ (Night)	48	43	42	40	42	44	39	48
	Typical $L_{AFmax,2min}$ (Night)	64	59	57	56	57	55	47	61

Notes:
[1] The 'typical' $L_{AFmax,2min}$ is the value exceeded no more than 10 times during the night-time periods.

Table 2 – Sound Level Results Summary

Background Sound Level Analysis

The ranges and distributions of background noise levels measured during the full daytime periods (07:00 – 23:00) and the full night-time periods (23:00 – 07:00) can be seen in the histogram graphs below. To provide a robust assessment, background levels measured at both MP1 and MP2 are presented to represent the typical background noise levels across all façades of the building.

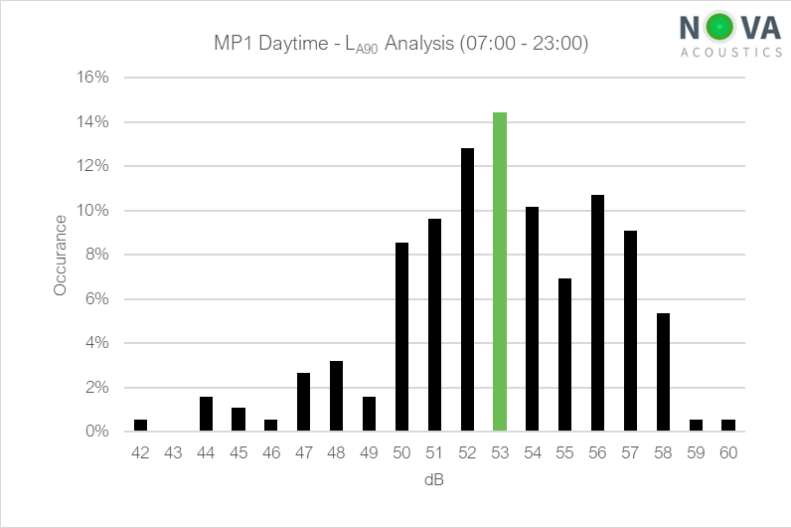


Figure 3 – MP1 – Daytime Background Sound Level Analysis

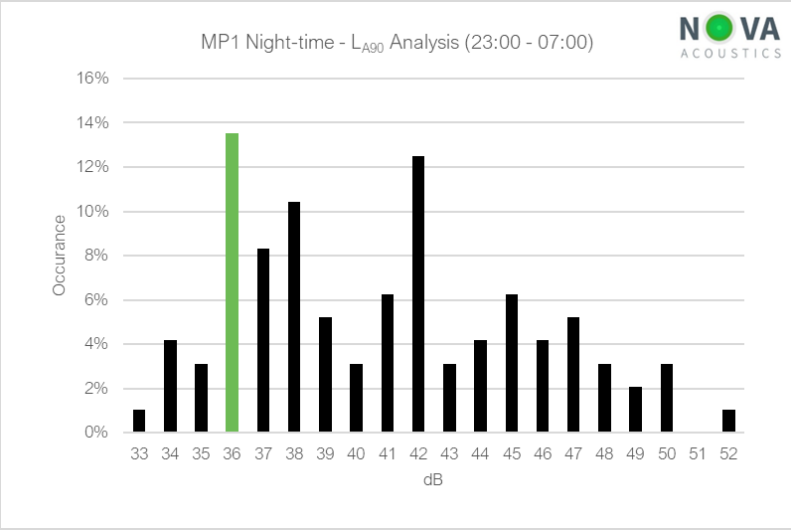


Figure 4 – MP1 – Night-time Background Sound Level Analysis

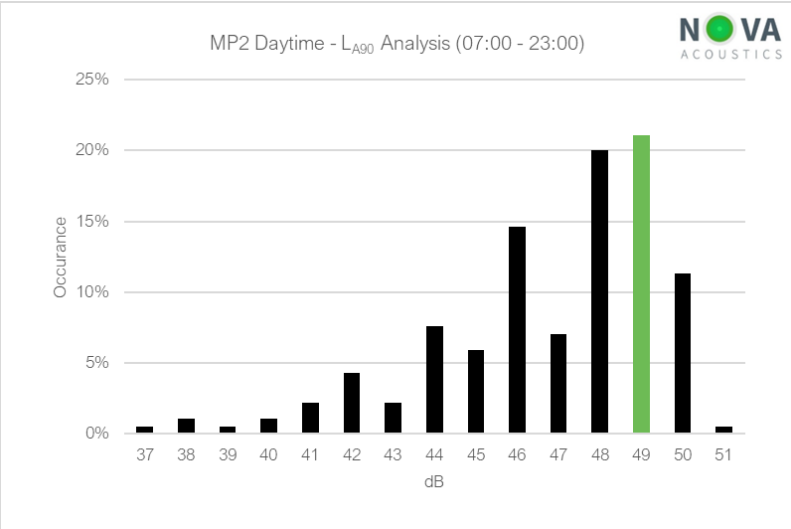


Figure 5 – MP2 – Daytime Background Sound Level Analysis

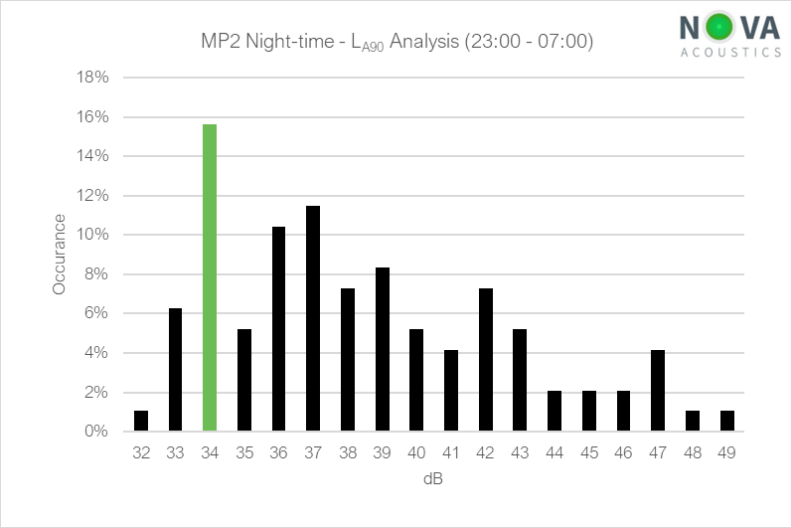


Figure 6 – MP2 – Night-time Background Sound Level Analysis

As can be seen, the lowest 'typical' background sound levels are deemed to be as follows:

- Daytime: **49dBA**
- Night-time: **34dBA**

Octave Band Background Sound Levels

At this stage, the operating hours of the venue are not finalised. To present a worst-case scenario, it is assumed that operational hours could extend to **02:00**.

The octave band background noise levels measured during the most sensitive operational period of 23:00 – 02:00 are shown in the table below.

Location	Measurement Period ('T')	Octave Frequency Band (L_{90}, Hz, dB)							Overall (L_{90}, dBA)
		63	125	250	500	1k	2k	4k	
MP1	23:00 – 02:00	46	41	39	37	39	35	26	42
MP2	23:00 – 02:00	44	38	35	32	33	27	19	36

Table 3 – Typical Lowest Background Noise Level

3. Noise Break-in Assessment and Sound Insulation Scheme

3.1 Internal Noise Level Criteria

As the noise profile of the area is significantly dominated by road traffic noise, which is generally considered to be an 'anonymous' noise source, the following internal noise criteria defined in BS8233 are thought to be appropriate.

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

3.2 Façade Allocation

In order to correctly specify the required sound reduction, the façades have been divided into colour groups as shown in the figure overleaf. Appropriate models of glazing for each façade colour are shown in Table 5.

Figure 7 – Façade Allocation – 1st and 2nd Floor

3.3 Glazing and Background Ventilation Specification

The following section provides a glazing and background ventilation specification that achieves the relevant internal noise criteria. The calculations considering the following sound insulation scheme can be found in Appendix E.

Description	Octave Frequency Band (Hz, dB)							Overall (dB)
	63	125	250	500	1k	2k	4k	
Sound Insulation Scheme - Living Rooms & Bedrooms (Red Façades)								
6mm Glass / 16mm Argon Cavity / 6.8mm Glass (SRI)*	21	21	28	37	48	48	54	40 (R_w) 34 (R_w + C_{tr})
Greenwoods 2500EA.AC1 (2 No. Trickle) ($D_{n,e}$)*	31	41	40	37	47	43	46	42 ($D_{n,e,w}$) 40 ($D_{n,e,w}$ + C_{tr})
Sound Insulation Scheme – Living Rooms & Bedrooms (Green Façades)								
6mm Glass / 16mm Air Cavity / 4mm Glass (SRI)*	20	21	20	26	38	37	39	32 (R_w) 28 (R_w + C_{tr})
Titon Standard Vent + C75 (2 No. Trickle) ($D_{n,e}$)*	28	38	36	35	42	39	42	35 ($D_{n,e,w}$) 34 ($D_{n,e,w}$ + C_{tr})

Table 5 – Glazing & Background Ventilation Specification

**Any other window or ventilation 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.*

3.4 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, if rooms are to be located within the roof space and there are 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

4. Overheating Screening Assessment

In order to avoid excessively high temperatures and provide adequate levels of thermal comfort within dwellings, an overheating mitigation strategy must be developed. In low noise areas, this strategy can often rely upon opening windows as the primary source of ventilation, however, in areas with higher levels of noise, this would present a risk of adverse effects on health and quality of life.

4.1 Overheating Criteria

Considering that the development is a change of use and not new build, it is not a requirement to achieve the criteria defined in Approved Document O ('ADO'). However, to allow for a reasonable living environment, it is recommended that the less onerous criteria given in the 'Acoustics Ventilation and Overheating Design Guide' ('AVO') should be applied. Considering that a partially open window provides approximately 13 dB of attenuation (as stated in 'AVO') the proposed internal and external noise criteria are summarised as follows:

Period	Proposed Criteria (dB)		External Level (dB)	
	Internal	External	Measured	Exceedance
Red Façades				
Daytime ($L_{Aeq,16hr}$)	50 [1]	63	65	+2
Night-time ($L_{Aeq,8hr}$)	42 [1]	55	56	+1
Night-time ($L_{AFmax,T}$) [2]	65 [1]	78	75	-3
Green Façades				
Daytime ($L_{Aeq,16hr}$)	50 [1]	63	52	-11
Night-time ($L_{Aeq,8hr}$)	42 [1]	55	48	-7
Night-time ($L_{AFmax,T}$) [2]	65 [1]	78	61	-17

Notes:

[1] Criterion taken from the AVO guide. Above this level, it is stated: "Noise causes a material change in behaviour, e.g., having to keep windows closed most of the time."
[2] L_{AFmax} exceeded fewer than 10 times per night.

Table 6 – External Noise Level Limits for Overheating Criteria

4.2 Assessment

The noise levels measured at MP1 exceed the external noise criteria shown in the table above. As such, it is recommended that an assessment of whether rooms located on the 'red' façade are at risk of overheating is undertaken by a suitably qualified person. Should the outcome indicate the site is at low risk, then a secondary ventilation strategy may not be required. If the outcome is that the site is at moderate to high risk, then it is recommended that openable windows are not used as the primary source of ventilation.

Alternative forms of ventilation include passive systems (such as acoustic louvres) and mechanical systems (such as 'centralised mechanical extract ventilation' and 'mechanical ventilation with heat recovery'). The installation of passive systems is generally preferable; however, the precise requirements must be confirmed with a ventilation specialist.

It should be noted that this assessment relates exclusively to overheating mitigation, and as such, open windows may be used for purge ventilation without acoustic constraint.

The external noise levels measured at MP2 are below the threshold criteria shown in Table 6. Given this, it is thought that opening windows can be used as the primary means of mitigating overheating for rooms located on the green façades.

It must be ensured that all ventilation strategies are compliant with the requirements of Approved Document F. Further advice can be provided by NOVA Acoustics if required.

5. Residential External Amenity Space Noise Level Assessment

The measured noise levels at the rear of the building (MP2) are compared with the external amenity noise level criteria defined in BS8233 in the table below.

Plot No.	$L_{Aeq,16hr}$ Noise Level (dB)	BS8233:2014 Criteria (dB)	Exceedance (dB)
All Plots	51	50 – 55 $L_{Aeq,16hr}$	0

Table 7 – BS8233:2014 External Amenity Area Noise Level Assessment

As can be seen, noise levels within the proposed external amenity area comply with the BS8233 guideline values. It is also noted that a 1.2m high fence will be installed around the perimeter of the amenity areas. It is recommended this fencing should be of solid construction, with no holes or gaps, and a minimum surface mass of 10kg/m².

Furthermore, as outlined in Section 7, once the ground-floor commercial unit becomes operational, external noise levels are predicted to increase by approximately 2dB. Even with this increase, the resulting noise level within the amenity areas is predicted to be approximately 53dB, which remains within the applicable BS8233 criteria. On this basis, no additional mitigation measures are considered necessary

6. Noise Breakout Assessment

In the following section, the impact of the noise breaking out of the ground floor venue is assessed.

6.1 Guidance and Acoustic Design Criteria

'The Good Practice Guide on the Control of Noise from Pubs and Clubs' comments that where entertainment noise takes place on a regular basis, associated sources should be inaudible within noise-sensitive properties at any time.

To achieve relative inaudibility within residential properties, it is recommended that noise breakout emissions from the site do not exceed the background sound levels (L_{90}) in each octave band at the external façades of the closest NSRs. This will also ensure that the is a low risk of adverse impact for the residential element of the development.

6.2 Noise Breakout Assessment

Prediction Internal Ambient Noise Level

NOVA Acoustics has been informed that there will be **no live amplified music** within the restaurant/bar and that all music will be for **background ambience exclusively** (set to a level at which conversations can be had at a normal level).

Given this, the internal noise levels within the development are based on those given for a 'busy pub/bar' in the Little Red Book of Acoustics. This is thought to be representative of a typical pub environment consisting of loud speech and amplified background music.

Sound Insulation of Building Envelope

Considering the layout of the ground floor, it is expected that noise breakout will be most prominent at the front façade. This is thought to be constructed as follows:

- Walls: 200mm solid brickwork with 67.5mm Kingspan insulated plasterboard liner
- Doors: Approx. 4m^2 double glazed doors
- Glazing: Approx 21m^2 standard double glazing (assumed 2no. 6mm panes separated by a 16mm air gap).

The predicted sound insulation values for these construction elements have been predicted using Insul 9 software. The results are shown in the table below.

Description	1/1 Octave Frequency Band (SRI, Hz, dB)							R_w (dB)
	63	125	250	500	1k	2k	4k	
External Walls	41	39	42	50	57	62	67	54
External Doors and Glazing	23	22	22	36	43	38	40	36

Table 8 – Sound Reduction of Building Elements

As the sound insulation performance of the glazing is anticipated to perform more than 10dB below the external walls in all octave bands, noise breakout is considered via the glazing is considered exclusively. Noise breaking out through the walls is expected to be negligible in comparison.

It is assumed that the door entrance will be kept closed, other than for brief periods of entry and exit. This will require ongoing management.

The noise breakout calculations have been conducted assuming the following:

- The sound power levels of the building elements have been calculated using the formula: $L_{W,rad} = L_{P,rev} - C_d - R + 10\ log\ (S)$, where, S is the surface area of the transmission element, C_d is the correction from reverberant internal conditions to non-reverberant external conditions (-5 dB), and R is the sound reduction provided by the element. The planar propagation loss from these elements has been calculated from the point source region.
- The closest NSR is the 1st floor of the development building.
- Each NSR window is adjacent to approximately 10m^2 of the venue glazing.

The resulting L_{eq} noise breakout emissions are assessed against the proposed criteria in the table below.

Description	Octave Frequency Band (Hz, dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Internal Noise Level (L_{eq})	80	85	85	85	85	80	70	88
Sound Power Level of Glazing (L_w)	62	68	68	54	47	47	35	61
Propagation Correction (x=0, y=3, d=2)	-20							--
Total External Noise Level at NSR1 (L_{eq})	42	48	48	34	27	27	15	41
Background Noise Level ($L_{A90,T}$) (MP1, 23:00 – 02:00)	46	41	39	37	39	35	26	42
Exceedance of Background	-4	+7	+9	-3	-12	-8	-11	-1

Table 9 – Noise Breakout Assessment – NSR1

As can be seen, the noise breakout during the most sensitive period is predicted to exceed the criteria in the 125Hz and 250Hz frequency bands.

In order to achieve the criteria and retain reasonable internal noise levels, it is recommended that the glazing is upgraded. An appropriate model of glazing is shown in the table below.

Description	Octave Frequency Band (Hz, dB)							Overall (dB)
	63	125	250	500	1k	2k	4k	
10mm Glass / 16mm Argon Cavity / 8.8mm Optiphon Glass (SRI)*	25	28	31	42	45	50	58	44 (R_w) 38 ($R_w + C_{tr}$)

Table 10 – Glazing & Background Ventilation Specification

The resulting L_{eq} noise breakout emissions considering the proposed glazing upgrades are assessed against the criteria in the table overleaf.

Description	Octave Frequency Band (Hz, dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Internal Noise Level (L_{eq})	80	85	85	85	85	80	70	88
Sound Power Level of Glazing (L_w)	60	62	59	48	45	35	17	53
Propagation Correction (x=0, y=3, d=2)	-17							--
Total External Noise Level at NSR1 (L_{eq})	40	42	39	28	25	15	-3	33
MP1, Background Noise Level ($L_{A90,T}$) (23:00 – 07:00)	46	41	39	37	39	35	26	42
Exceedance of Background	-6	+1	0	-9	-14	-20	-29	-9

Table 11 – Noise Breakout Assessment – NSR1

As can be seen in the table above, provided recommended mitigation is adhered to, the requirements would be met at every frequency band with the exception of the 125Hz where there is a negligible exceedance. This is an indication of 'low impact'.

6.3 Noise Limiting Device

In addition to the above mitigation, amplified music levels within the venue must be effectively controlled using a noise limiter. The following limits should be set as a baseline during installation of the equipment:

Description	Octave Frequency Band (L_{Fmax}, Hz, dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Internal Noise Limit Levels (L_{AFmax})	80	84	85	85	85	80	70	88

Table 12 – Internal Noise Limit Levels

An example of an appropriate product that could be installed is the *'MRC Audio EQ Limit, Data Logging Automatic Volume Sound Limiter with DD1 Display & Microphone'.*

The maximum amplified music limit levels presented above should be set as a baseline, and during the calibration of the equipment, they must be adjusted to achieve relative inaudibility within/at the closest NSRs.

Further to this, to minimise the internal sound level required to achieve a uniform and evenly distributed noise environment within the venue, the installation of a multi-speaker public address system is recommended. This would provide improved control over maximum noise levels and allow speakers to be positioned closer to patrons, thereby reducing overall sound levels while maintaining a perceived sense of loudness.

7. Noise Breakthrough Assessment and Sound Insulation Scheme

7.1 Partition Floor Noise Breakthrough

As the ground floor bar will adjoin the residential dwellings at the first-floor level, the impact of noise breaking through the partition floor must be considered.

The following is stated in Approved Document regarding situations where domestic properties adjoin commercial properties:

"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. This is defined considering various factors, such as type of noise and overall noise level.

In order to ensure adverse impact is avoided, it is recommended that noise levels within the residential properties do no exceed the NR20 frequency curve (equivalent to an L_{Aeq} of approximately 25dB) and the Moorhouse thresholds in the 63Hz and 125Hz octave bands. This is considerably more stringent than the standard BS8233 night-time criteria, and should ensure that noise from the venue is relatively inaudible.

Further to the above, in order to be compliant with the requirements of Condition 7, the floor must provide a minimum sound reduction of **53dB $D_{nT,w}$ + C_{tr}**.

7.2 Proposed Floor Specification

The client has provided drawings detailing the proposed construction of the intermediate floor partition between the commercial ground floor level and the residential flats above.

The proposed floor construction is understood to consist of the following:

- Cellecta Mojave underfloor heating system consisting of
    - Cellecta Screedboard 30
    - 0.05mm ULTRAplate
    - 20mm XFLOOR 250
    - 3mm Cellecta RUBBERfon Impact 3
- 10mm levelling screed (assumed min. density 2000kg/m^3)
- Beam and Block (assumed min. 300mm, min. density 1800kg/m^3)
- MF ceiling (min. drop 170mm) partially filled with 50mm FIBREfon Micro 50 fibre insulation (Min. density 1350kg/m^3)
- 2no. 15mm SoundBloc plasterboards (min. surface mass 12.5kg/m^3)

It is noted that steel beams are present within the cavity of the MF ceiling. To minimise the risk of sound transmission through the structure, it should be ensured that the plasterboard lining does not make contact with the steel beams at any point.

The impact of the noise from the venue on the residential areas above is assessed in the table below.

Description	Octave Frequency Band (Hz, dB)							Overall (dB)
	63	125	250	500	1k	2k	4k	
Total Internal Noise Level (L_{eq})	80	85	85	85	85	80	70	88 (A)
Floor SRI ($D_{n,T}$)	50	50	55	65	>70	>70	>70	>60 ($D_{nT,w}$ + C_{tr})
Predicted Internal Noise Level (L_{eq})	30	35	30	20	<15	<10	0	26
NR20 / Moorhouse	47	41	31	24	20	17	14	30
Exceedance of Criteria	-17	-6	-1	-4	-5	-7	-14	-4

Table 13 – Breakthrough Assessment

As can be seen, this floor construction is predicted to achieve the required criteria in all octave bands. It is also compliant with the requirements of Condition 7.

7.3 Partition Walls Noise Breakthrough

As previously discussed, the proposed residential dwellings also adjoin neighbouring retail premises (tattoo business) via a partition wall.

A specification that can achieve the required attenuation (53dB $D_{nT,w}$ + C_{tr}) is as follows:

- Existing masonry wall (assumed min. 200mm brick, min. density 1600kg/m^3)
- iKoustic MuteClip™ and Furring Channel System directly affixed to the brickwork with 25mm acoustic mineral wool insulation (min. density 12kg/m^3) within cavity (isolation clips and channel system installed in accordance with the manufacturers guidelines).
- 2no. 15mm SoundBloc plasterboards (with overlapping joints and sealed with flexible mastic at the perimeter)

It should be noted that these are indicative specifications 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.

8. External Patron Noise Assessment

8.1 Specific Sound Level Calculations

In the following section, the impact of noise emissions from patrons using the external seating area is assessed. Based on the drawings provided by the client, it is assumed that the external area could accommodate up to 16 patrons at any one time under worst-case conditions. The assessment has therefore been undertaken on the following conservative assumptions:

- 4no. patrons speaking in a normal voice and 4no. patrons speaking in a raised voice simultaneously. This assumes that all 16no. patrons are in conversation with one person speaking and the other listening. The source noise levels are taken from ANSI S3.5-1997 (R2017) in the 250Hz to 4kHz octave bands.
- Acoustic screening from the building façade and the proposed 1.2m high boundary fence has been included in the calculations. The fence is assumed to be of solid construction, with no holes or gaps, and a minimum surface mass of 10kg/m².
- The closest NSR (NSR1) is assumed to be a first floor flat above the beer garden. The closest window is approximately 6m from the beer garden, and the external amenity area is approximately 3m from the beer garden.

Description	Octave Frequency Band (Hz, dB)					Overall (dBA)
	250	500	1k	2k	4k	
4no. Normal Voices Noise Level (L_W)	71	75	69	62	56	74
4no. Raised Voices Noise Level (L_W)	76	81	78	70	63	82
Cumulative Noise Level of Patron Area (L_W)	77	82	79	71	64	82
Distance Correction to NSR1 (6m, Q4)	-21					--
Acoustic Screening	-15	-18	-20	-20	-20	--
Patron Noise Level at NSR1 Façade (L_{eq})	42	43	38	30	23	43

Table 14 – External Patron Noise Level Calculations – NSR1 Façade

Description	Octave Frequency Band (Hz, dB)					Overall (dBA)
	250	500	1k	2k	4k	
4no. Normal Voices Noise Level (L_W)	71	75	69	62	56	74
4no. Raised Voices Noise Level (L_W)	76	81	78	70	63	82
Cumulative Noise Level of Patron Area (L_W)	77	82	79	71	64	82
Distance Correction to NSR1 (3m, Q4)	-15					--
Acoustic Screening	-14	-17	-20	-20	-20	--
Patron Noise Level at NSR1 External Amenity Area (L_{eq})	49	50	44	36	29	50

Table 15 – External Patron Noise Level Calculations – NSR1 External Amenity Area

8.2 IEMA 'Increase in Ambient Noise Level' Assessment

In order to predict the level of impact at the most affected NSRs, an IEMA 'Increase in Ambient Noise Level Assessment' has been undertaken. For the assessment, the predicted noise emissions from the patron area are added to the existing ambient noise levels (shown in Table 3). The higher the increase in level, the higher the level of impact.

The predicted noise levels are presented in the table below. The impact is assessed in the external amenity area considering the evening noise levels (when the space is likely to be used by residents for rest and relaxation) and to the façade during the night (when residents are likely to be asleep).

Measurement Period ('T')		MP2 $L_{Aeq,T}$ (dB)	Cumulative Ambient Noise Levels (dB)	Increase (dB)	IEMA Impact Rating
Date	Hours (hh:mm)				
Friday, 30/01/2026	18:00 – 19:00	55	56.2	1.2	"Not Significant"
	19:00 – 20:00	55	56.2	1.2	
	20:00 – 21:00	54	55.5	1.5	
	23:00 – 00:00	54	54.3	0.3	
	00:00 – 01:00	51	51.6	0.6	
	01:00 – 02:00	48	49.2	1.2	
Saturday, 31/01/2026	18:00 – 19:00	55	56.2	1.2	"Not Significant"
	19:00 – 20:00	54	55.5	1.5	
	20:00 – 21:00	53	54.8	1.8	
	23:00 – 00:00	51	51.6	0.6	
	00:00 – 01:00	50	50.8	0.8	
	01:00 – 02:00	47	48.5	1.5	
Sunday, 01/02/2026	18:00 – 19:00	62	62.3	0.3	"Not Significant"
	19:00 – 20:00	53	54.8	1.8	
	20:00 – 21:00	52	54.1	2.1	
	23:00 – 00:00	49	50.0	1.0	
	00:00 – 01:00	46	47.8	1.8	
	01:00 – 02:00	45	47.1	2.1	

Table 16 – External Patron Noise Assessment

As can be seen in the assessment above, the ambient noise levels are expected to increase by a maximum of **2.3dB**. This level of impact would be classed as 'not significant' when assessed with the IEMA guidelines, which equates to 'No Observed Adverse Effect Level' ('NOAEL') when assessed in accordance with the NPSE and NPPF. However, to ensure that noise levels are appropriate for residents during the night-time period when windows may be opened for ventilation purposes, it is recommended that the beer garden operates **no later than 23:00 hours**.

9. Noise Management Plan

In order to further reduce the likelihood of adverse impact, it is recommended that the following Noise Management Plan ('NMP') is adhered to.

9.1 Management Control Measures

- Site staff will be made aware that they are working in the vicinity of noise-sensitive receptors and avoid all unnecessary noise due to music levels, opening of doors/windows or excessive noise from patrons. The DPS (Designated Premises Supervisor) will be required to implement strict staff rules to ensure that the staff immediately respond to unnecessary elevated noise levels.
- Staff training will involve reviewing the Noise Management Plan.
- All operational staff will be responsible for reporting any noise problems immediately to the DPS.
- Shouting will be discouraged at all times in the area immediately outside the bar. Any patrons found to be violating this will be moved inside.

9.2 Issue Management and Complaints Log

An 'Issue Management System' ('IMS') will be implemented and completed by the DPS. This will include records of subjective noise monitoring and complaints. Further to this, a complaints procedure will be implemented which will allow for all complaints, feedback and requests made by third parties regarding the premises operational activities to be dealt with effectively.

An email address for the premises will be made available online to allow any member of the public to lodge a complaint without entering the premises. The DPS will be specifically assigned to deal with complaints.

All complaints received from third parties including statutory authorities, statutory consultees, members of the general public and representatives of the company will be forward to the DPS to action as below within 1-hour (where feasible). The complaint will be noted in the complaints log within 24-hours.

The operations manager will ensure that:

- The complaint is investigated to identify the cause, if necessary, this may involve direct communication with the complainant.
- In the event of elevated noise being detected, action will be taken immediately to prevent a recurrence of the same problem. These actions must be documented.
- The complainant will be contacted and given information on the investigations conducted and actions taken as appropriate.
- Details of other complaints are sent to other company personnel as appropriate.
- If the investigation indicates that the complaint has not been justified this will be clearly recorded on the incident report.

9.3 External Activities

The following external activities will be strictly prohibited:

- Outside performances: Any form of performance activities that take place outside.

- Live Amplified Music: Any form of live amplified music unless prior agreement is sought from the Local Authority.
- Musical Instruments: The use of loud musical instruments, particularly those known to generate significant noise such as percussion instruments.
- Fireworks: The use of fireworks or any other pyrotechnic devices.

9.4 Deliveries

Noise from deliveries can present a significant risk of noise impact. In order to reduce the potential for impact, deliveries will take place during daytime operating hours.

9.5 Disposal of Glass Bottles

It must be ensured that glass bottles are emptied into external bins between the hours of 07:00 and 19:00. The bottle bins should be located sympathetically and not in the direct line of sight of any residential windows.

9.6 Dispersal of Patrons

Staff will actively encourage the gradual dispersal of patrons to minimise potential nuisance at closing time.

All patrons loitering externally shall be asked to relocate inside at 23:00 hours to limit external patron noise emissions in the late evening / night-time period.

A member of staff will be positioned in an area close to the main exit to oversee the end of night departure period to ensure that:

- Patrons are encouraged to be considerate upon leaving the premises.
- Patrons do not leave the premises other than by the doors and exits they are guided towards.
- Communication is made with taxi companies regarding the use of horns and slamming of doors.

Further to this, prominent, clear, and legible notices will be displayed at the exits requesting the public to respect residents and to leave the premises and the area quietly.

9.7 Continuous Subjective Noise Monitoring

- All staff will, as part of their induction, be made aware of the surrounding receptors and the effects of noise on residential amenity. It is the responsibility of all staff to be aware of noise on site and to report any potential noise issues to the premises manager at the earliest opportunity.
- All staff will have refresher training on noise issues, prevention, and managements at six-monthly intervals.

The NMP will be reviewed annually or as agreed appropriate to ensure it is streamlined and effective. New and innovative approaches to problem-solving or incidents and any lessons learnt will be incorporated accordingly. This is considered to be a ‘live document’ which evolves by experience in agreement with the Local Authority.

Further to the above, noise emissions from the venue will be assessed at the NSRs identified in the body of the report using the following subjective monitoring record.

Premises: _____ Event: _____

Date: _____ Event start time: _____:_____ Event End time: _____:_____

Pre-start checklist:

- Windows & doors closed: Y/N
- Sound checks and volume set: Y/N
- Agree who will complete objective noise monitoring & when: Y/N
- Check sound limiter is fully operational: Y/N
- Set end-time with performer(s): Y/N
- Complete monitoring form: Y/N

Subjective Noise Monitoring Guide			
Assessment		Description	Guide / Action
A	Not audible at NSRs.	No Entertainment Sound audible.	Okay
B	Just audible at NSRs.	Muffled sound, vocals/music not clear, easily masked by other ambient noise in area.	Okay, but adjust noise level to A.
C	Clearly audible at NSRs.	Clear vocals/music and likely to be heard by neighbours.	Reduce to B immediately, and aim to reduce to A.
D	Loud at NSRs.	Vocals/music are dominant and would be clearly heard by neighbours.	Not acceptable.

Figure 8 – Subjective Noise Monitoring Record

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10. BS4142 Plant Noise Limit Levels

Considering the intended use of the ground floor, it is anticipated that plant equipment may be required to service the development; however, a detailed plant schedule has not yet been confirmed. To protect the amenity of future occupants and nearby noise-sensitive receptors, plant noise limit levels have therefore been established and are presented in the table below.

The stated limit levels are inclusive of any acoustic character corrections (i.e., penalties) that may be applied to account for features likely to increase perceived disturbance, such as tonality, impulsivity, or intermittency, in accordance with BS4142.

To provide a robust assessment, background noise levels measured at MP2 have been used, and limit levels have been defined for both daytime and night-time operational periods to reflect potential variations in plant operating schedules. For example, kitchen extract systems are typically expected to operate during daytime hours only, whereas systems such as air conditioning and mechanical ventilation may operate during both daytime and night-time periods, depending on demand.

Description	Daytime Period (dBA)	Night-time Period (dBA)
Background Sound Level	49	34
Cumulative Plant Noise Limit Level at NSR	44	29
BS4142 Assessment Outcome	'Low Impact'	
NPSE & NPPF Assessment Outcome	'No Observed Effect Level' ('NOEL')	

Table 17 – BS4142 External Plant Noise Limit Levels

Discussion:

As can be seen, provided the plant limit levels are adhered to, all noise emissions from the external plant would not exceed the existing background sound levels. When assessed in accordance with BS4142 this indicates 'low impact', and when assessed with the NPPF and NPSE this is classed as 'No Observed Adverse Effect Level' ('NOAEL'). Once the full plant schedule is finalised, the noise emissions should be calculated by an appropriately qualified person to ensure that the limit levels are achieved.

11. Conclusion and Action Plan

The proposed development has been assessed against the relevant acoustic design criteria, and a sound insulation strategy has been developed to demonstrate compliance with these requirements. The following Action Plan sets out the measures required to ensure that the design considerations and specifications detailed within this report are fully implemented.

1. To achieve appropriate internal levels within the proposed residential rooms, the proposed glazing and background ventilation systems, or appropriate alternatives, should be installed in accordance with the details presented in **Section 3**. Advice regarding overheating mitigation is included in **Section 4**.
2. Noise levels in the external amenity area (rear 1st floor flat roof) are predicted to be within the BS8233 criteria provided 1.5m tall close-board timber fencing is installed across the western boundary. Further detail is included in **Section 5**.
3. An assessment of noise breakout from the ground floor bar has been undertaken in **Section 6**. In order to achieve the required criteria, it is recommended that the glazing to the front of the building is upgraded, and a noise limiter is installed. To minimise the internal sound level required to achieve a uniform and evenly distributed noise environment within the venue, the installation of a multi-speaker public address system is recommended. This would provide improved control over maximum noise levels and allow speakers to be positioned closer to patrons, thereby reducing overall sound levels while maintaining a perceived sense of loudness.
4. To limit noise breaking through from internal commercial sources, partition floor and wall constructions are assessed in **Section 7**. Further design support can be provided by NOVA Acoustics if required.
5. A patron noise assessment has been carried out in **Section 8**. In summary, to ensure that noise levels are appropriate for residents during the night-time period when windows may be opened for ventilation purposes, it is recommended that the beer garden operates **no later than 23:00 hours.**
6. A Noise Management Plan is provided in **Section 9**. All measures outlined within the plan should be adhered to in order to ensure that noise from the commercial unit does not result in adverse impacts on neighbouring residential properties.
7. At this stage, external plant equipment has not been specified. However, given the intended use of the development, it is anticipated that plant may be required in the future. Accordingly, plant noise limit levels have been established and are provided in **Section 10**.

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 18 – 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.

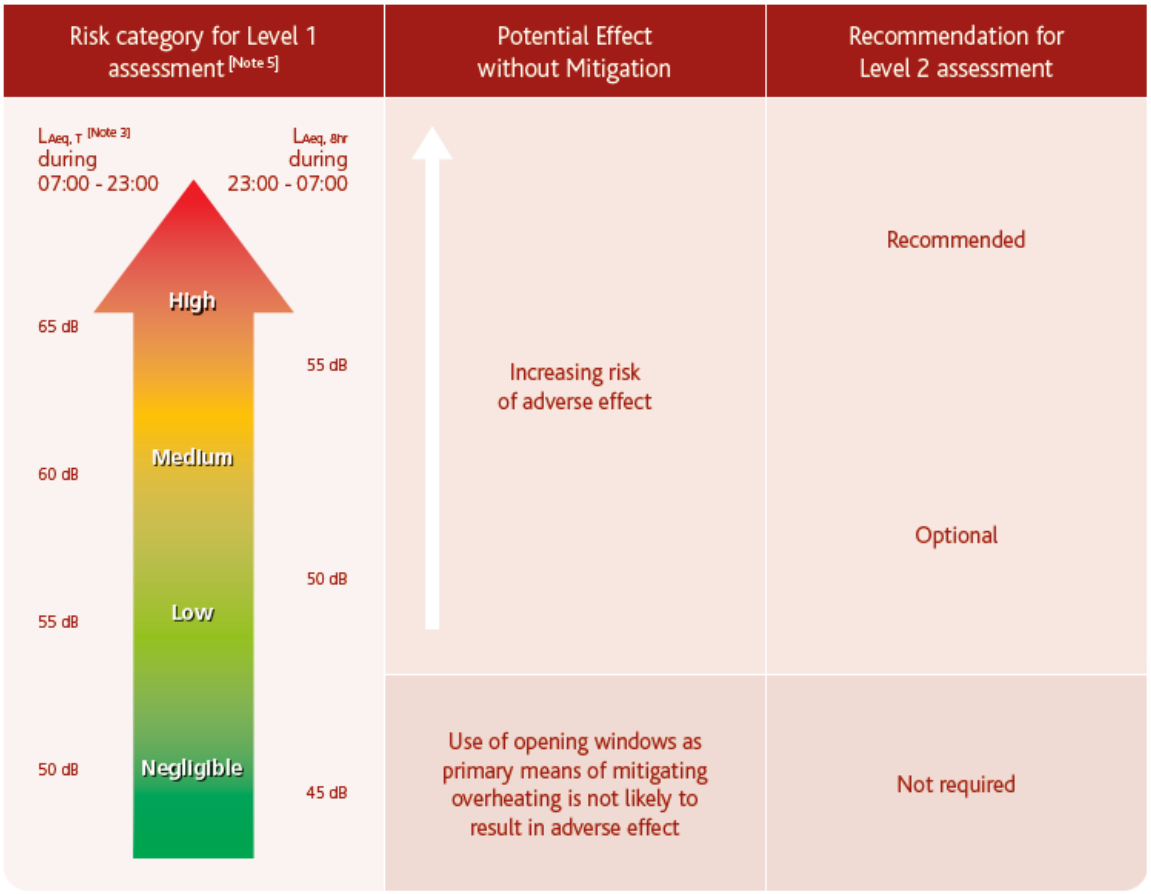


Table 3-2 of AVO Guide (2020)

Figure 9 – 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 19 – 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.

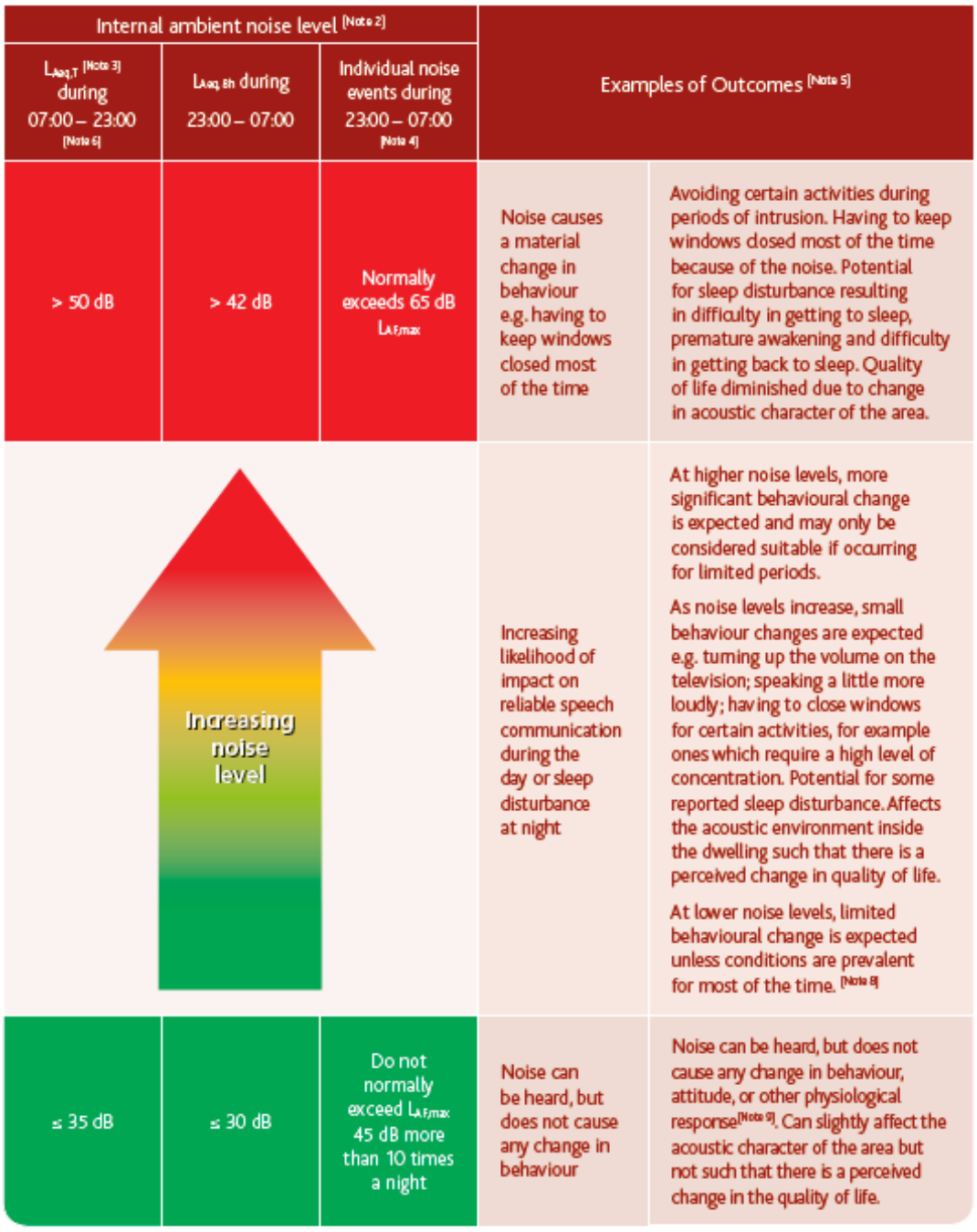


Table 3-3 of AVO Guide (2020)

Figure 10 – AVO Guide Level 2 Internal Ambient Noise Levels

B.6 – BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'

Overview

BS4142:2014 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

a) subjective method.
b) objective method for tonality.
c) reference method."

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely, tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

a) Tonality

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

b) Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

c) Other Sound Characteristics

BS4142:2014 states that where "the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied."

d) Intermittency

BS4142:2014 states that when the "specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time … if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."

Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a 'typical' background sound level for a given period. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.

Assessment of Impact

BS4142:2014 states: "The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs". An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- "Typically, the greater this difference, the greater the magnitude of the impact."
- "A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."
- "A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."
- "The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.

Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact, depending on the context."

Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level.
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level.
- The lower the rating sound level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating sound level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact and would therefore be classified as No Observed Adverse Effect Level.

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

B.7 – Entertainment Noise Legislation

Noise from entertainment venues, e.g., noise from recorded music, live bands or karaoke, ca 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 constructions 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.

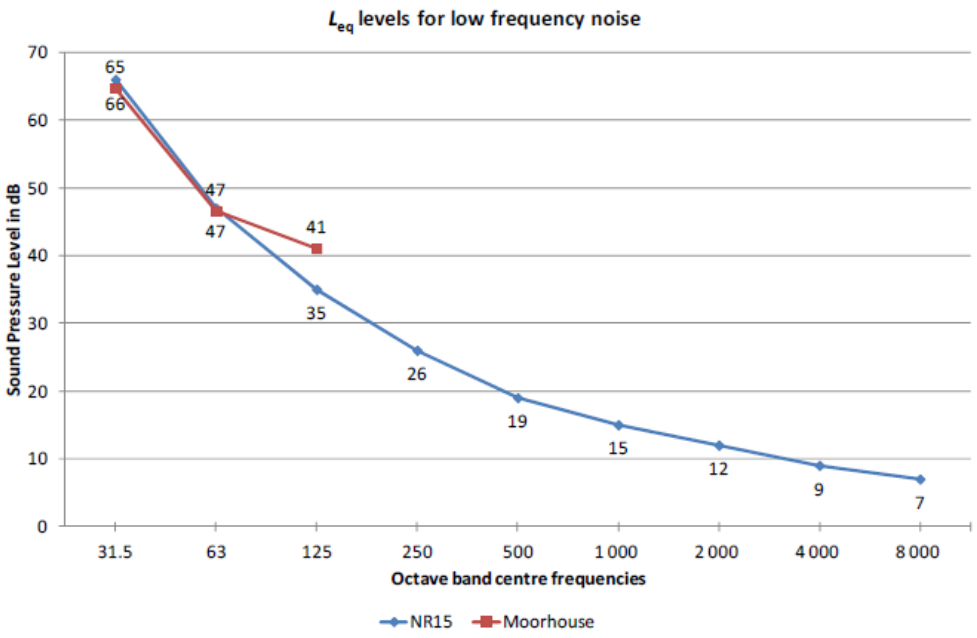


Figure 11 – Moorhouse Low Frequency Noise Rating Curve

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) 47 dB and 41 dB (L_{eq}), respectively'. This criterion may also be applicable for new residential developments that are structurally separate from an existing entertainment venue.

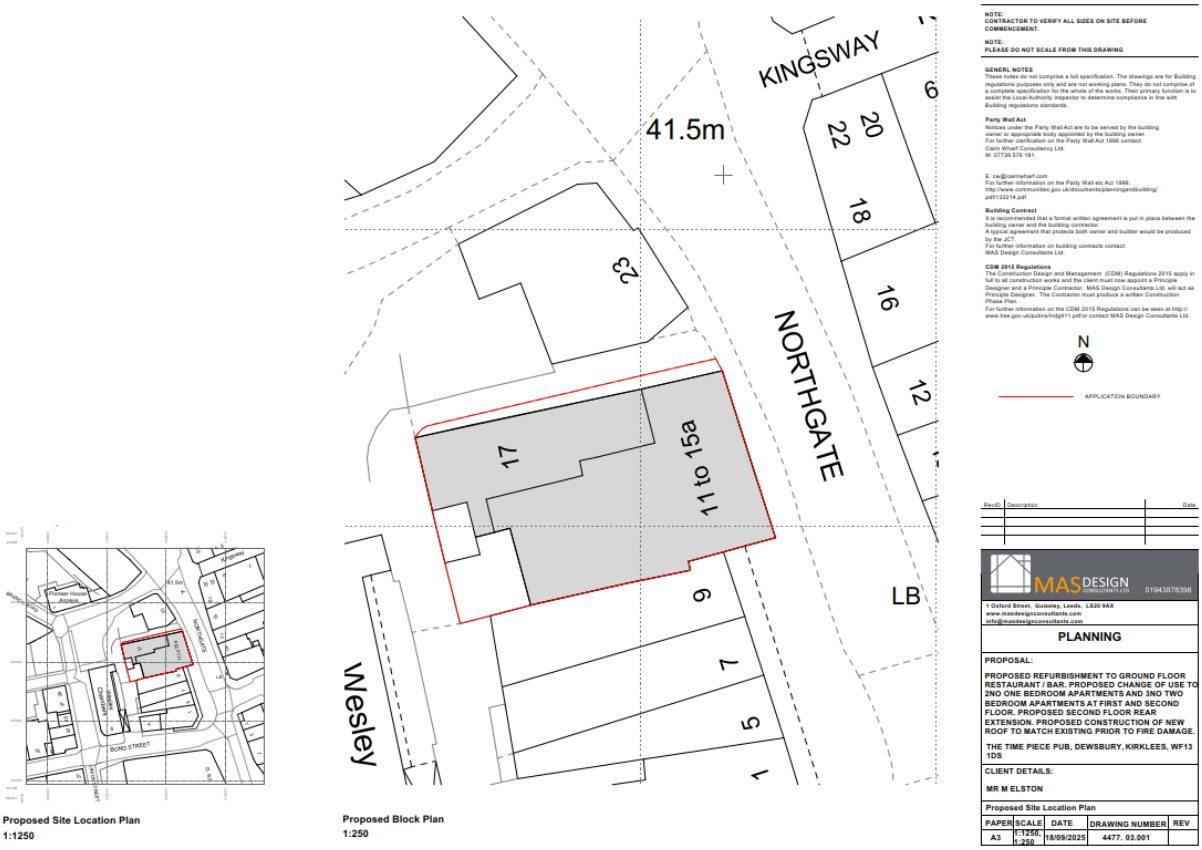
References:

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.

Moorhouse et al (2005) Proposed criteria for the assessment of low frequency noise disturbance, Defra (updated in 2008 and 2011).

Appendix C – Location Plan



Proposed Site Location Plan
1:1250

Proposed Block Plan
1:250

Figure 12 – Location Plans

Appendix D – Environmental Survey

D.1 – Time History Noise Data

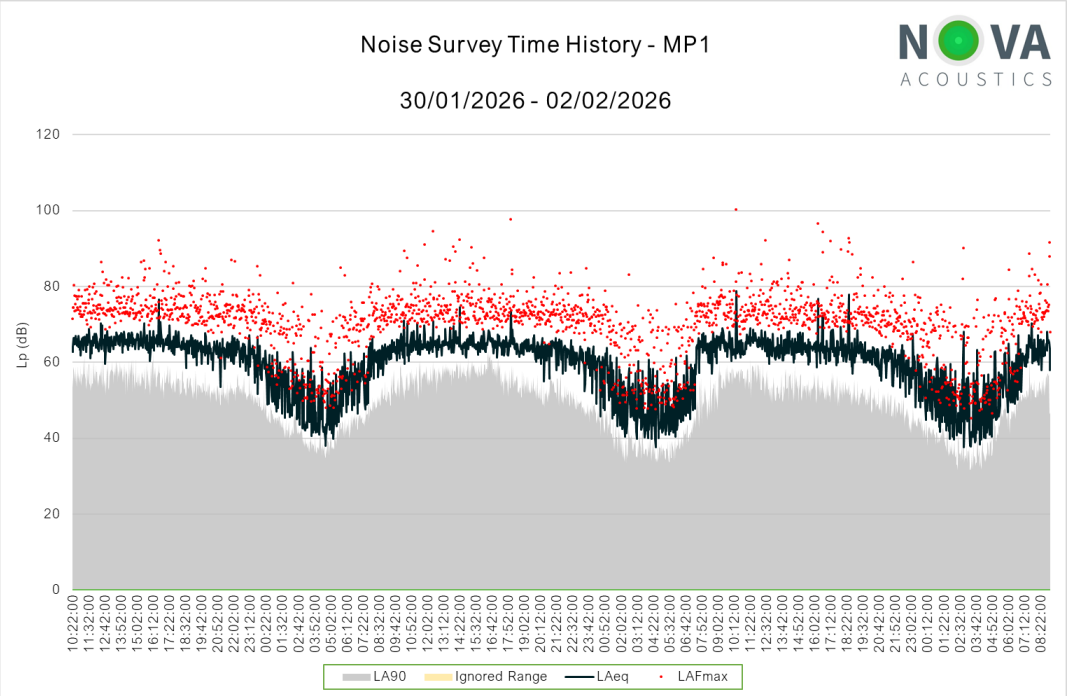


Figure 13 – MP1 Noise Survey Time History

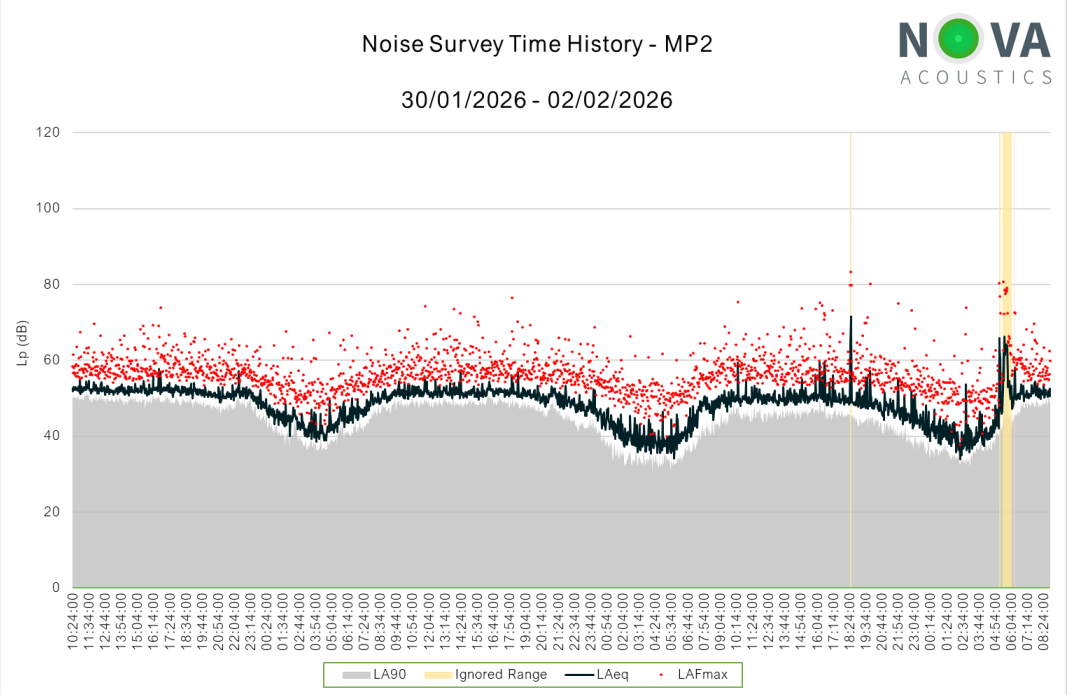


Figure 14 – MP2 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
Svantek SV971A Class 1 Sound Level Meter	141425	≤0.1
Svantek SV971A Class 1 Sound Level Meter	141427	
CESVA CB006 Class 1 Calibrator	902442	

Table 20 – 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 – Ecowitt (Approx. 4.6km NW of Site)				
Time Period	Air Temp (°C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s)
30/01/26 – 00:00 – 23:59	0.2 – 5.5	0.0 – 3.0	SSE	0.0 – 4.4
31/01/26 – 00:00 – 23:59	5.2 – 9.6	0.0 – 3.0	SW	0.0 – 4.1
01/02/26 – 00:00 – 23:59	3.9 – 8.9	0.0 – 0.6	SE	0.0 – 2.5
01/02/26 – 00:00 – 23:59	3.0 – 6.2	0.0 – 1.2	SE	0.0 – 2.8

Table 21 – 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 2-3m^2 and room volumes of 16-22m^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 5-6m^2 and room volume of 42-73m^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).

Living Room (Red Façades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	65	69	63	61	59	61	58	52	46
Glazing Noise Ingress	22	40	34	25	15	6	2	-10	-15
Ventilation Noise Ingress	21	36	20	19	21	13	13	5	-1
Wall Noise Ingress	1	20	9	5	-7	-6	-9	-15	-21
Roof Noise Ingress	24	46	35	25	17	13	10	3	-3
Room Absorption Correction		4	4	4	3	3	3	2	0
Total Noise Ingress	**34**	**54**	**45**	**35**	**29**	**23**	**21**	**11**	**4**
NR30	35	59	48	39	33	30	26	24	22
Exceedance of Criteria	-1	-5	-3	-4	-4	-7	-5	-13	-18

Bedroom (Red Façades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	65	69	63	61	59	61	58	52	46
Glazing Noise Ingress	23	41	35	26	15	7	3	-9	-15
Ventilation Noise Ingress	24	39	23	22	23	16	16	7	2
Wall Noise Ingress	1	19	8	4	-8	-6	-10	-16	-21
Roof Noise Ingress	24	46	36	25	17	13	10	3	-3
Room Absorption Correction		4	4	4	3	3	3	2	0
Total Noise Ingress	**35**	**55**	**45**	**36**	**31**	**24**	**23**	**13**	**6**
NR30	35	59	48	39	33	30	26	24	22
Exceedance of Criteria	0	-4	-3	-3	-2	-6	-3	-11	-16

Bedroom (Red Façades) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	56	60	53	52	50	53	50	44	38
Glazing Noise Ingress	13	32	25	17	7	-2	-5	-17	-22
Ventilation Noise Ingress	15	30	13	13	15	7	8	-1	-6
Wall Noise Ingress	-8	10	-2	-5	-16	-15	-18	-24	-29
Roof Noise Ingress	15	36	26	16	8	5	2	-5	-11
Room Absorption Correction		4	4	4	3	3	3	2	0
Total Noise Ingress	**26**	**46**	**36**	**27**	**22**	**16**	**15**	**5**	**-2**
NR25	30	55	43	35	28	25	21	19	17
Exceedance of Criteria	-4	-9	-7	-8	-6	-9	-6	-14	-19

Bedroom (Red Façades) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Lmax	75	77	74	70	70	72	68	61	56
Glazing Noise Ingress	33	49	46	35	26	17	13	0	-5
Ventilation Noise Ingress	34	47	35	31	34	26	26	16	11
Wall Noise Ingress	11	27	20	13	3	4	0	-7	-12
Roof Noise Ingress	35	53	47	34	28	24	19	12	7
Room Absorption Correction		4	4	4	3	3	3	2	0
Total Noise Ingress	**45**	**63**	**57**	**45**	**42**	**35**	**33**	**22**	**16**
NR40	45	67	56	49	43	40	37	34	33
Exceedance of Criteria	0	-4	1	-4	-1	-5	-4	-12	-17

Living Room (Green Façades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	52	55	50	49	47	48	44	36	29
Glazing Noise Ingress	15	26	20	20	13	1	-2	-12	-19
Ventilation Noise Ingress	10	24	8	10	9	3	1	-9	-17
Wall Noise Ingress	-10	8	-3	-5	-17	-17	-22	-29	-37
Roof Noise Ingress	12	32	23	13	5	0	-4	-13	-20
Room Absorption Correction		4	4	3	3	3	3	2	0
Total Noise Ingress	**24**	**41**	**32**	**28**	**21**	**12**	**9**	**-2**	**-11**
NR30	35	59	48	39	33	30	26	24	22
Exceedance of Criteria	-11	-18	-16	-11	-12	-18	-17	-26	-33

Bedroom (Green Façades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	52	55	50	49	47	48	44	36	29
Glazing Noise Ingress	17	28	22	22	15	3	0	-10	-17
Ventilation Noise Ingress	16	30	15	16	16	9	8	-3	-10
Wall Noise Ingress	-11	6	-4	-7	-18	-19	-23	-31	-38
Roof Noise Ingress	12	32	23	13	5	0	-5	-13	-20
Room Absorption Correction		4	4	3	3	3	2	1	0
Total Noise Ingress	**26**	**42**	**33**	**30**	**24**	**17**	**14**	**3**	**-6**
NR30	35	59	48	39	33	30	26	24	22
Exceedance of Criteria	-9	-17	-15	-9	-9	-13	-12	-21	-28

Bedroom (Green Façades) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	48	48	43	42	40	42	44	39	30
Glazing Noise Ingress	10	21	15	15	7	-3	0	-7	-16
Ventilation Noise Ingress	12	23	8	9	8	3	8	0	-9
Wall Noise Ingress	-16	-1	-11	-14	-26	-25	-23	-28	-37
Roof Noise Ingress	5	25	15	6	-2	-6	-4	-10	-19
Room Absorption Correction		4	4	3	3	3	2	1	0
Total Noise Ingress	**21**	**35**	**25**	**23**	**17**	**10**	**15**	**6**	**-5**
NR25	30	55	43	35	28	25	21	19	17
Exceedance of Criteria	-9	-20	-18	-12	-11	-15	-6	-13	-22

Bedroom (Green Façades) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Lmax	61	64	59	57	56	57	55	47	42
Glazing Noise Ingress	25	37	31	30	23	12	11	1	-4
Ventilation Noise Ingress	26	39	24	24	24	18	19	8	3
Wall Noise Ingress	-2	15	5	1	-10	-10	-12	-20	-25
Roof Noise Ingress	20	41	32	21	14	9	7	-2	-7
Room Absorption Correction		4	4	3	3	3	2	1	0
Total Noise Ingress	**35**	**51**	**42**	**38**	**33**	**26**	**25**	**13**	**7**
NR40	45	67	56	49	43	40	37	34	33
Exceedance of Criteria	-10	-16	-14	-11	-10	-14	-12	-21	-26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