

EATON COURT, OXFORD ROAD,
READING

West Extension - Full Application
Noise Impact Assessment

Document History

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1. INTRODUCTION

MZA Acoustics has been appointed to undertake a noise impact assessment of Eaton Court, Oxford Road, Reading RG1 7NG (the Site) to inform a planning application for the redevelopment of the site to residential use.

It is understood that planning permission is sought for part-extension to add an additional two floors to the western part of the building.

This report presents the results of a baseline environmental noise survey undertaken at the Site, which has been used to inform an assessment of the suitability of the Site for the proposed use.

Recommendations for mitigation measures required to support residential occupation have been provided, including recommendations for the provision of ventilation and mitigation of overheating with respect to the acoustic environment. Measures specifically for the mitigation of noise ingress from a nearby music venue / nightclub are included.

This report occasionally employs technical terminology. To assist the reader, a glossary of terms is presented in Appendix A.

2. THE SITE

2.1 Site Description

The Site is located on Oxford Road, Reading, RG1 7NG, within Reading Borough Council.

The existing building is currently vacant, formerly occupied by office accommodation, with a two-storey west wing and a three-storey east wing. The Site also contains car parking spaces to the front and a two-storey car parking structure to the rear, which is currently closed and disused.

It is directly adjacent to Bond House, a residential building, to the west, and the Royal Meteorological Society building to the east. Mayer House, a block of residential flats, lies across the road to the east.

The Site and its immediate surroundings are labelled in Figure 1.

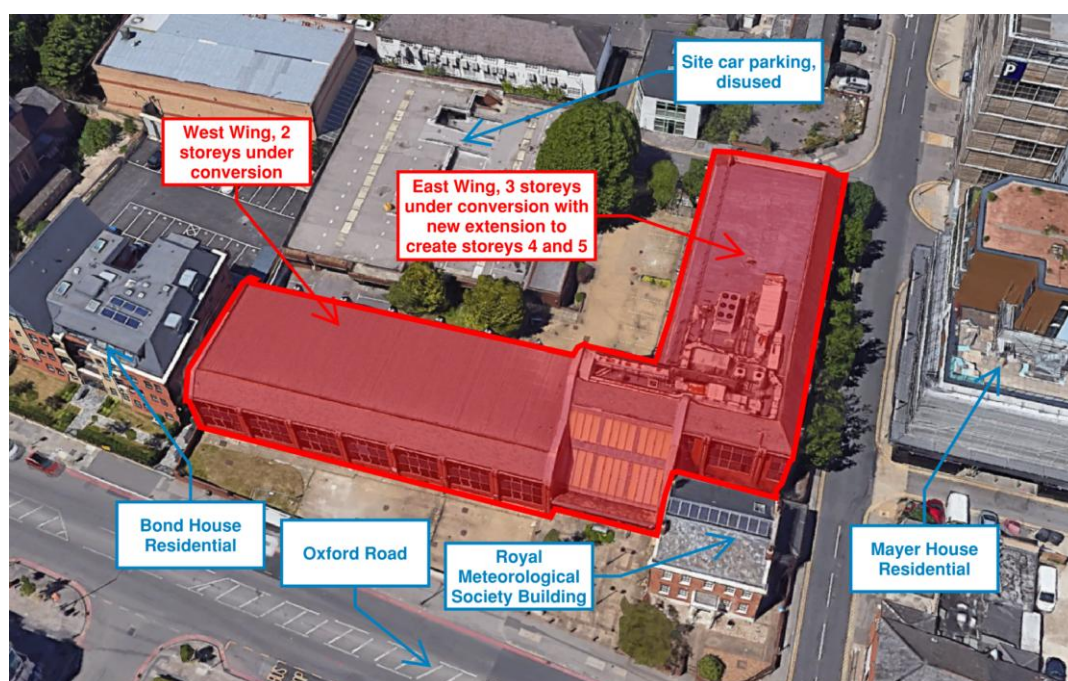


Figure 1: Eaton Court (red) and surrounding local features.

2.2 Surrounding Area

The urban area surrounding the Site is mixed use, containing commercial and residential development.

Nearby residential premises are highlighted in cyan in Figure 2. The noise impact of the extension on these premises, particularly of any associated plant, is discussed in Section 8 of this report.

To the north of the site is Chatham Street and directly to the south is Oxford Road. Both roads are fairly busy and are part of multiple bus routes.

Other commercial noise sources include: The Face Bar, a music venue and nightclub highlighted in blue in Figure 2; the Butler pub (illustrated in green); a tyre garage (yellow); a multi-storey car park (orange); and highstreet shops on Oxford road (cyan).



Figure 2: The Site's (red) proximity to: high street shops and takeaways (cyan), a multi-storey car park (orange), a garage (yellow), a pub (green), and a live music venue and nightclub (The Face Bar, blue). The area in pink is currently under redevelopment to residential flats.

2.3 The Proposed Development

It is proposed to add a two-storey extension to the west wing of the building to provide residential accommodation, following the conversion of the existing building under the General Permitted Development Order (approved under a Class MA application), and the addition of two-storeys to the east wing of the building (under a Class AA application).

The current third (top) floor plan is included in Figure 3.

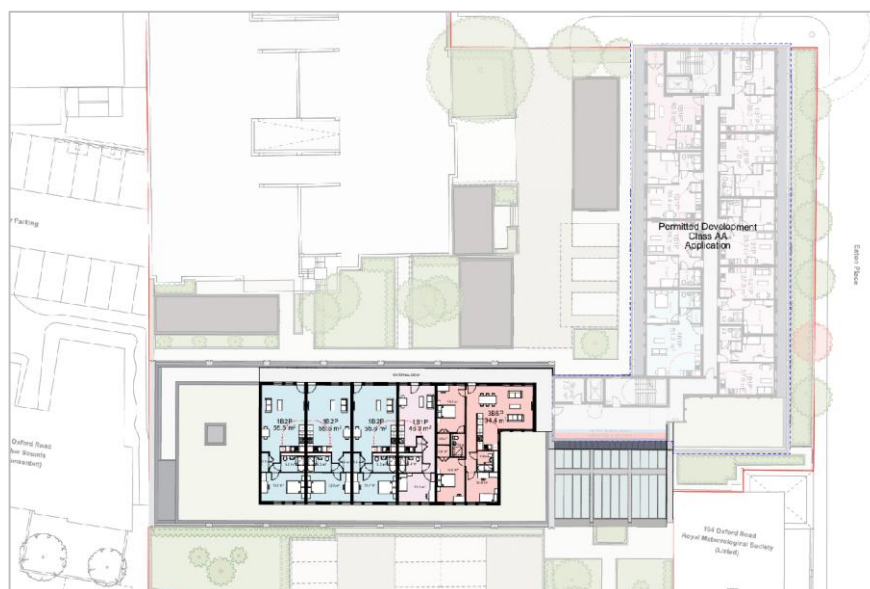


Figure 3: Indicative third (top) floor layout for extension to west wing.

3. ASSESSMENT POLICY AND GUIDANCE

3.1 Introduction

The following section of the report summarises the relevant policy and guidance documents that will inform the noise assessments that follow.

Further information on relevant planning guidance for acoustics is provided in Appendix B.

3.2 Local Policy and Guidance

Reading's Local Plan 2018 references noise impact several times, although does not provide specific, quantitative guidance on the control of noise impacts either on new developments from existing sources of noise, or on existing noise-sensitive receptors from new development.

On the control of noise from noise-generating equipment (taken to be mechanical plant, etc.) **Policy EN17** states:

Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor.

Several correspondence items have also been received from RBC in relation to the other applications undertaken at the site – both Class MA and a Class AA under the General Permitted Development Order.

Comments relate, primarily, to concerns over the mitigation of overheating, especially with respect to nearby sources of entertainment noise, and including the consideration of any plant which would be required to mitigate overheating risks. This is addressed within this report.

3.3 National Planning Policy Framework (NPPF), December 2024

The NPPF determines the government's planning policy for England. The document was first published in March 2012, revised in July 2018, updated in 2019, 2021, 2023 and 2024.

The current version (issued 12/12/24) of the policy document remains largely unchanged with regards to noise which is considered in Chapter 15 – 'Conserving and enhancing the natural environment', specifically in terms of pollution.

Paragraph **187** states that planning policies and decisions should contribute to and enhance the natural and local environment by "...preventing new and existing development from contributing to, being put at 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 that:

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 by doing so they should:

- a) **mitigate and reduce to a minimum** potential adverse impacts 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 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.

Furthermore, Paragraph **200** continues:

Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). 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.

The guidance contained within the NPPF reference the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010).

3.4 National Planning Guidance

In preparation of this assessment, several national and local planning policies are considered, including:

- The National Planning Policy Framework (NPPF), December 2024
- The Noise Policy Statement for England (NPSE), 2010
- Planning Practice Guidance - Noise (PPG-N), 2019

The above documents guide on why the control of noise impact is important for residential development to protect the amenity of future occupants, and provide an approach to the assessment of noise impact on proposed developments. However, they are, primarily, qualitative in their guidance.

As such this report focusses on documents which provide quantitative assessment procedures. Nonetheless, a summary of the above documents is provided in Appendix B.

3.4.1 Professional Practice Guidance on Planning and Noise (ProPG, 2017)

The Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.

The scope of the ProPG is limited to the consideration of new residential development that will be exposed predominantly to airborne noise from transport sources and is implemented in this assessment as it provides a logical approach to the assessment of noise impact on the Proposed Development.

The recommended approach to the ProPG assessment is shown in Appendix B, and is summarised as follows:

Stage 1 - An initial noise risk assessment of the proposed development site, which will inform the level of detail required in the more detailed 'Stage 2' assessment.

Stage 2 - A systematic consideration of four key assessment elements:

1. Demonstrating a "Good Acoustic Design Process"
2. Observing internal "Noise Level Guidelines"
3. Undertaking an "External Amenity Area Noise Assessment"
4. Consideration of "Other Relevant Issues"

The Stage 2 assessment also refers to quantitative guidance for the acoustic design of residential development in the following documents:

- British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings;
- The World Health Organisation Guidelines for community noise; and
- British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound.

Pertinent guidance from ProPG is summarised later in this section and further detail and context is provided in Appendix B.

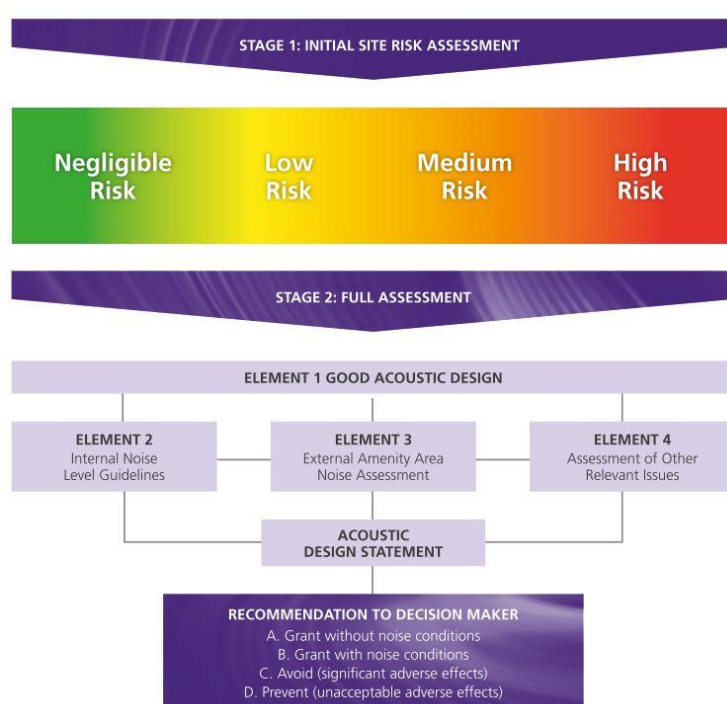


Figure 4: Summary of the ProPG approach.

3.5 **Technical Guidance**

3.5.1 Acoustics, Ventilation and Overheating: Residential Design Guide (The AVO Guide, 2020)

The Association of Noise Consultants' (ANC) AVO Guide collates and appraises guidance on internal target noise levels and seeks to provide a holistic approach to acoustic assessments for new residential development that takes due regard of the interdependence of provisions for acoustics, ventilation and overheating.

The document proposes a very similar two-stage approach to ProPG, with comparable threshold levels for risk grading of the site in relation to noise impact. It then continues to provide guidance on appropriate internal noise standards and schemes of mitigation that may be appropriate to meet these standards.

Application of the AVO Guide is intended to demonstrate good acoustic design as described in the ProPG. However, it is noted that both of these documents were written before the introduction of Approved Document O of the Building Regulations. ADO, discussed in more detail below, sets out statutory criteria for noise exposure in homes, and is considered to take precedent over the guidance provided in either ProPG or the AVO Guide.

Pertinent guidance from the AVO Guide is summarised later in this Report and further detail and context is provided in Appendix B.

3.5.2 British Standard 8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings' provides guidance for the control of noise in and around buildings.

It gives appropriate internal target noise levels for dwellings, which are used to inform the assessment within this report.

It also outlines a method for calculating internal noise levels within buildings due to external noise incident on the façade in Annex G.2. This method is based on that given in BS EN 12354-3 'Building Acoustics - Estimation of acoustic performance of buildings from the performance elements - Part 3; Airborne sound insulation against outdoor sound'.

It is this calculation methodology that has been used to determine mitigation requirements presented in this Report.

3.5.3 BS 4142: 2014 Methods for rating and assessing industrial and commercial sound

BS 4142 provides a methodology for rating and assessing sound associated with both industrial and commercial premises. The purpose of the Standard is clearly outlined in the opening section where it states that the method is appropriate for the consideration of:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train movements on or around an industrial and/or commercial site.

The Standard is based around the premise that the significance of the noise impact of an industrial/commercial facility can be derived from the numerical subtraction of the background noise level (not necessarily the lowest background level measured, but the typical background of the receptor) from the measured/calculated rating level of the specific sound under consideration.

This comparison will enable the impact of the specific sound to be concluded based upon the premise that typically "the greater this difference, the greater the magnitude of the impact". This difference is then considered as follows:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB 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 low impact, depending on the context."

3.6 **Adopted Assessment Criteria**

3.6.1 Internal Noise Criteria – Environmental Sources

Criteria for noise from anonymous sources (road, rail, aircraft, other environmental sources) have been determined, primarily from British Standard 8233 guidelines - as recommended in ProPG and in alignment with the requirements of RBC.

The guidance is summarised in Appendix B, and the adopted assessment criteria for the assessment of existing external sound levels in relation to the residential elements of the Proposed Development are summarised in Table 1.

Table 1: Adopted assessment criteria – normal (background) conditions

Location	Adopted Sound Level Criteria	
	Daytime 07:00 – 23:00 hours	Night-time 23:00 – 07:00 hours
Bedrooms	≤35 dB L _{Aeq,16hr}	≤30 dB L _{Aeq,8hr} ≤45 dB L _{AFmax} ¹
Living Rooms	≤35 dB L _{Aeq,16hr}	N/A
Dining room/areas	≤40 dB L _{Aeq,16hr}	N/A
External amenity areas	≤55 dB L _{Aeq,16hr}	N/A

¹ In line with the quoted guidance from the WHO Guidelines, it is taken that the L_{AFmax} criterion should not be compared to the highest L_{AFmax} level applicable to the assessment location(s), but rather to that more representative of the conditions typically.

BS 8233 states that a 5 dB relaxation in internal L_{Aeq} criteria would still result in 'reasonable' conditions being achieved. However, such relaxations are not generally considered appropriate to apply to the background ventilation condition (which would be continuous at all times) apart from in exceptional circumstances.

The above noise levels would not typically be applied to non-anonymous noise sources, such as noise of a commercial or industrial nature.

3.6.2 Internal Noise Criteria – Music Noise Sources

While there are no formal criteria for internal noise levels from music noise, it is considered that an internal noise level of **NR15 during the night-time** would be appropriate to prevent sleep disturbance to future occupants of the Proposed Development.

This target has been adopted based on a review of industry guidance and other Local Authority policies, which generally recommend either NR20 or NR15 as targets for entertainment noise.

4. **BASELINE ENVIRONMENTAL NOISE SURVEY**

4.1 **Overview**

Detailed noise measurements were obtained at the Site between Friday 9th and Tuesday 13th May 2025, and have been used to evaluate the ambient noise climate and noise from nearby commercial sources.

Two long-term, unattended measurements were taken over a ~96-hour period outside the northeast and northwest façades of the building. Observations were made externally during the installation and collection of equipment, and on additional visits during daytime and evening periods while music events were occurring at the nearby music venue.

Additionally, measurements of road traffic were taken on Friday, 13th June 2025 for the purposes of a Calculation of Road Traffic Noise (CRTN) prediction of the noise level incident on the façades most affected by road traffic noise (east and south).

4.1.1 **Meteorological Conditions**

The weather conditions throughout the surveys were generally conducive to the measurement of environmental sound, i.e. they remained dry, with low wind speeds (measured on-site as < 5 m/s).

A short period of relatively heavy rain was noted on the morning of Monday 12th May, which can be seen on the graphs in Appendix D. However, this has not been considered to have a significant impact on the outcomes of the assessment and, as such the average noise levels included within this report do not exclude this period.

4.1.2 **Equipment**

The sound level meters were calibrated prior to commencement, and upon completion, of the survey. No significant calibration drift was observed in any of the sound level meters.

Details of the equipment used to undertake the survey are included in Appendix C.

4.1.3 **Measurement Positions**

Measurement position LT1 was located out of a first-floor window on the north elevation of the existing building, and was well screened from traffic noise to accurately measure noise levels from The Face Bar during music events. It is used to calculate noise levels from The Face Bar around the Proposed Development.

Measurement position LT2 was located out of a second-floor window in the stairwell in the east wing of the building, and overlooks a number of commercial noise sources and Eaton Place, as well as having line of sight to Chatham Street, a busy main road.

The measurement positions for the two shortened CRTN measurements, CRTN 1 and CRTN 2, overlook their respective roads.

Figure 5 illustrates the noise measurement positions.



Figure 5: Locations of noise survey measurements, including measurements used to inform CRTN calculations.

4.2 Long Term Survey

A summary of the results from the long-term noise survey at both positions are presented in this section.

Low-frequency noise levels impacting the Site from The Face Bar are presented separately and the method used to calculate noise levels around each elevation of the Site is discussed.

4.2.1 Long Term Noise Survey Results

The results of the unattended noise survey measurements are presented in graphical format in Appendix D. The following have been used to determine the presented noise levels in Table 2:

- The daytime and night-time periods are taken to be 07:00 to 23:00 hrs and 23:00 to 07:00 hrs, respectively.
- The daytime and night-time levels presented are the arithmetic average of the 16-hour and 8-hour $L_{Aeq,T}$ measurement periods.
- 'Typical' maximum event noise levels have been established by taking the 10th-15th highest $L_{Amax,1min}$ value.
- The background sound level presented is that which is the lowest typically occurring, by statistically analysing the measured values during the relevant assessment period.

Table 2: Unattended noise survey results, levels rounded to integer decibel values (façade location, no correction applied).

Location	Period	Equivalent Continuous Sound Level dB LAeq,T	Typical Maximum Noise Level dB LAfmax	Typical Background Sound Level dB LAf90,T ¹
LT1 – West Wing	Daytime	52	N/A	47
	Night-time	47	63	41
LT2 – East Wing	Daytime	60	N/A	53
	Night-time	54	71	42

¹ Reference period (T) is 1-hour for the daytime and 15-minutes for the night-time, as per BS 4142. All background levels rounded in accordance with BS 4142.

4.2.2 Observations

At both positions the dominant noise source throughout the day and night-time was generally traffic – including buses, which stop nearby on Chatham Street and Oxford Road.

The noise level was higher at LT2, as it had a direct line-of-sight to the busy Chatham Street to the north. It was also exposed to noise from the multi-storey car park, garage, and from the nearby pub (The Butler, Chatham Street), while LT1 is mostly screened from these sources.

4.3 Commercial Noise

The most notable commercial noise sources affecting the site are:

- The Face Bar, to the north west;
- The Butler Pub (to the north, on the corner of Chatham Street and Eaton Place); and
- A tyre garage, ~30 m north of the site on Eaton Place.

Noise from these sources is appraised below.

4.3.1 The Face Bar

Entertainment noise from The Face Bar was observed and measured during events on both Friday 9th May and Saturday 10th May 2025. Noise level data was extracted during a mixed rock/electronic music event, and the period containing the loudest of the single ‘sets’ measured was analysed as a worst-case example of noise breakout.

It was found that the 63Hz octave band was considerably above the ambient noise levels measured from other sources at LT1.

While observations made on site suggested that noise from The Face Bar could be heard at other locations around the building, this was significantly less prominent, especially in the context of the wider noise environment. Figure 6 illustrates the difference between the two measurement locations during the same time period (22:45 – 23:30) on Saturday 10th May 2025.

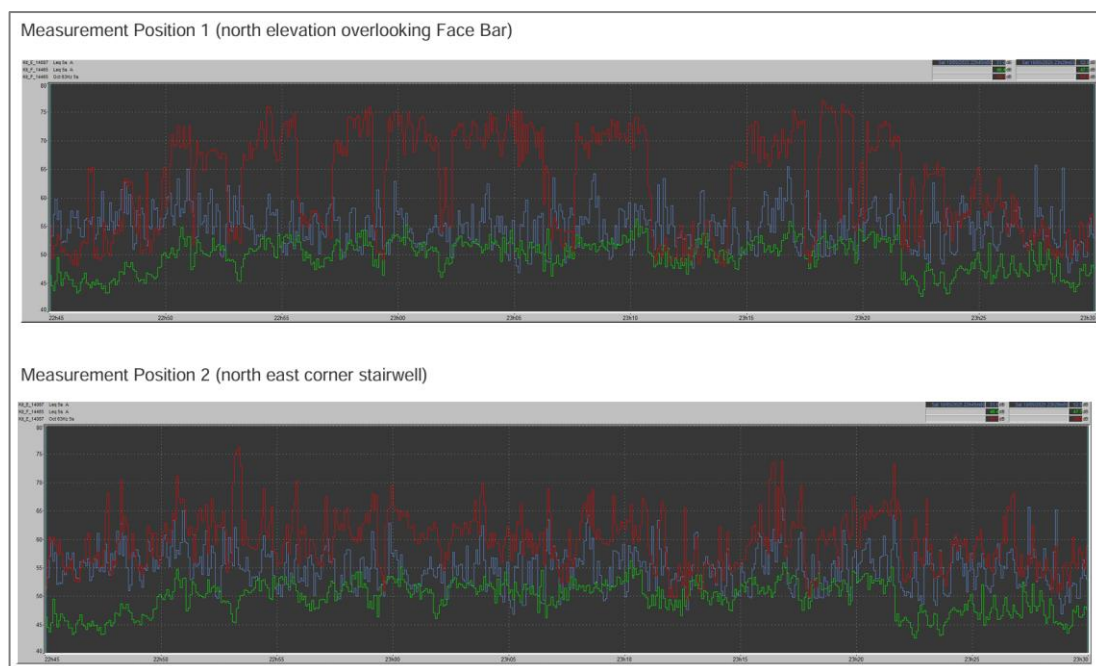


Figure 6: Noise during electronic music set on Saturday 10th May. Red: $L_{eq,63Hz,5sec}$ at measurement position; Green: $L_{Aeq,5s}$ at measurement position LT1; Blue: $L_{Aeq,5s}$ at measurement position LT2

With respect to elevations which do not have line of sight to The Face Bar (south), a reduction in noise level of at least 10 dB at 63 Hz have been predicted to the rear facing rooms – with higher losses at higher frequencies.

On this basis, Table 3 contains the level of the 63Hz octave band at LT1 and when distance corrected to the nearest new façade of the proposed extension.

Table 3: Noise levels from The Face Bar (levels 1 m from the building façade).

Location	Period	63 Hz Octave Band Level, dB
Measured at LT1 (indicative of north elevation of proposed extension)	During electronic set on Saturday 10 th May 2025	75
South elevation of proposed extension (predicted)		< 65

4.3.2 The Butler Pub

LT2 was located approximately 50 m from the Butler Pub, which is licensed as a small music venue, with line of sight to the building.

Noise from The Butler was observed at LT2 during attendance on the evening of Friday 10th May, although was considered relatively insignificant in comparison to that from the Face Bar.

Reviewing the measured data, the 125 Hz and 250 Hz octave bands are noted to be slightly increased at LT2 over the general ambient noise level during the time periods that noise from The Butler was observed – however were not significantly increased at LT1 due to greater distance and reduced line of sight.

It is understood that live music at The Butler does not continue into the night, finishing at 23:00 and, therefore, poses a significantly lower risk to the night-time amenity of the Proposed Development than noise from The Face Bar.

Nonetheless, the noise levels in the 125 Hz and 250Tyre Garage

No obvious noise from the operation of the tyre garage was observed during attendance on site, and there is also no clear evidence of operational noise on the long-term data measured at the site at MP2 – which is significantly closer than the Proposed Development.

The noise from the operation of the tyre garage is generally considered to be indiscernible from the general daytime ambient noise levels from environmental sources (primarily road traffic), and considerably less pervasive than sound from the other commercial noise sources affecting the site (e.g The Face Bar).

4.4 Traffic Noise: Oxford Road and Eaton Place

Surveys to use as part of a Calculation of Road Traffic Noise (CRTN) were undertaken for Oxford Road and Eaton Place. Representative measurements of the two roads' traffic were taken and are presented in Table 4.

Measurements were made in free-field conditions at 3m from the edge of the road

Table 4: Measured results from the concurrent CRTN surveys, free field levels rounded to integer decibel values (dB, free-field)

Location	Period	Equivalent Continuous Sound Level dB L _{A10,1hr} ¹	Typical Maximum Noise Level dB L _{AFmax} ²
CRTN 1 – Oxford Road	13/06/25	66	77
CRTN 2 – Eaton Place	10:46 – 13:46	63	75

¹Average of three consecutive 1-hour L_{A10} measurements

²90th percentile 1minute L_{AFmax}

5. INITIAL SITE SUITABILITY ASSESSMENT

This section presents an initial appraisal of the Site for the proposed use with respect to the noise climate as measured.

5.1 Commercial Noise Sources

Typically, acoustic criteria (as assessed in accordance with national planning guidance, ProPG, the AVO Guide, BS 8233 etc.) are applied to "anonymous" or transport sources (i.e. road, rail, aircraft) and do not apply to noise from industrial or commercial sources which would be assessed under different criteria.

The environmental noise levels across most of the Proposed Development are typical of an urban area. However, the north façade will be affected by noise from the Face Bar and, to a lesser extent, The Butler Pub – which will drive the mitigation requirements in these areas due to the additional low frequency content found in music.

Noise from the tyre shop to the north of the site is considered to be insignificant in the context of the wider ambient noise climate, and mitigation measures which control noise from the other commercial noise sources affecting the site will be appropriate to control noise from this source.

The mitigation requirements for the control of commercial noise sources are discussed in further detail in Sections 6 and 7.

5.2 Establishing Noise Levels from Calculation of Road Traffic Noise Measurements

In accordance with the CRTN Shortened Method, a representative equivalent noise level has been calculated based on measured samples of road traffic on Oxford Road and Eaton Place.

Three consecutive hour-long measurements were used to calculate an $L_{10,18\text{hour}}$, in accordance with the methodology of CRTN. The $L_{10,18\text{hour}}$ has been used to calculate L_{eq} levels for predicted daytime and nighttime traffic flow on the two roads, using a method developed by TRL (Transport Research Laboratory Ltd).

The resulting daytime and nighttime equivalent continuous sound level values are presented in Table 5.

Table 5: Equivalent continuous sound level values of Oxford Road and Eaton Place as calculated via CRTN (free-field noise levels).

Location	Period	Equivalent Continuous Sound Level dB $L_{\text{Aeq,T}}$
CRTN 1 – Oxford Road	Daytime, 07:00 – 23:00	63
	Nighttime, 23:00 – 07:00	55
CRTN 2 – Eaton Place	Daytime, 07:00 – 23:00	60
	Nighttime, 23:00 – 07:00	54

5.3 Initial Appraisal/Risk Assessment

An initial assessment of the Site is presented in Table 6 to provide "an indication of the likely risk of adverse effects from noise, were no subsequent mitigation to be included as part of the development proposal" (from ProPG).

Both the guidance in ProPG (Stage 1 Risk Assessment) and the AVO guide (Level 1 assessment) are referenced.

Noise levels at the north and west elevations are taken from LT1, given this was well screened from most distant environmental noise sources – however it should be noted that the proposed extension may have better line of sight to Chatham Street and, therefore, noise levels may be higher than those measured at LT1. Nonetheless, these are not considered likely to be higher than those measured at LT2 – an appraisal of which is also presented for reference.

Noise levels at the east and south elevations are taken from LT2, and the results of the CRTN. It should be noted that the CRTN measurements were made at ground floor level and, therefore, noise levels are likely to be lower than these at the upper floors.

Table 6: Initial Appraisal / Risk Assessment (façade levels)

Location	Period	Equivalent Continuous Sound Level dB L _{Aeq,T}	ProPG Risk Assessment Outcome	The AVO Guide Risk Category
North and west elevation	Daytime (07:00 – 23:00)	52 ¹	Low/Negligible ²	Low/Negligible ²
	Night-time (23:00 – 07:00)	47 ¹	Low ²	Low/Negligible ²
East and south elevations	Daytime (07:00 – 23:00)	60 - 63	Low	Medium
	Night-time (23:00 – 07:00)	54 - 55	Low	Medium
LT2 (for reference)	Daytime (07:00 – 23:00)	60	Low	Medium
	Night-time (23:00 – 07:00)	54	Low	Medium

¹ It should also be considered that the extension may have better line of sight to Chatham Street than the installed microphone and, therefore, noise levels may be higher than those measured.

² Though the west elevation is screened from most environmental noise, it is highly exposed to noise from The Face Bar. Noise breakout from The Face Bar therefore drives the mitigation requirements for this façade.

ProPG also states that sites which experience regular maximum noise levels of greater than 60 dB L_AF_{max} should also not be considered as negligible risk.

Maximum noise levels of around 77 dB L_AF_{max} were measured at the site due to bus traffic and, on this basis, and considering the influence of the abovementioned commercial

noise sources on the site, it is recommended that further mitigation is explored in accordance with Stage 2 of the ProPG assessment method.

6. VENTILATION AND OVERHEATING

This section discusses the acoustic environment in relation to provision of ventilation and mitigation of overheating.

There are three conditions in which ventilation is required:

- Continuous background ventilation - to provide appropriate air changes to reduce damp etc.;
- Ventilation required for thermal comfort (to prevent overheating); and
- Purge ventilation - required on an ad-hoc basis, for example, to remove smells etc.

The overheating and acoustics assessment considers guidance from the AVO Guide and the Building Regulations Approved Document O (ADO) – although it should be noted that the requirements of ADO do not strictly apply to extension projects.

Both documents consider the overall average (L_{Aeq}) noise levels, with the AVO Guide considering the 16-hour daytime and both documents the 8-hour night-time as well as the typically occurring L_{AFmax} noise levels at the assessment locations.

6.1.1 RBC Correspondence

The Case Officer for the Class MA application at the site provided commentary on that application in relation to the ventilation and overheating strategy for the proposed scheme.

Concerns were raised over the reliance on open windows for the provision of overheating control and the risk of elevated internal noise levels when required.

While, on all sites, a ventilation strategy which can employ openable windows would be preferable for sustainability and occupant comfort reasons, it is the case that almost all urban development would exceed standard internal noise criteria with windows open.

As such, it is almost universally accepted for such development to rely on windows being closed as a means of mitigating external noise ingress (whether that be for background ventilation, or ventilation for mitigating overheating) in order to achieve appropriate internal noise levels.

The provision of alternate means of cooling allows occupants the ability to regulate both their thermal and acoustic environment at their choice, and it should also be borne in mind that the noise from the commercial noise sources affecting the Site is not constant, or even every day.

It should further be noted that the implementation of mechanical ventilation systems with suitable, automated, summer bypass and heat recovery modes can provide sustainability benefits over non-mechanical means.

6.2 Continuous Background Ventilation

Mechanical ventilation is proposed to provide continuous background ventilation to habitable rooms in accordance with Approved Document F.

As such, other passive means of providing background ventilation (e.g open windows or trickle ventilators), which typically reduce the overall sound insulation performance of the building envelope, are not required.

Appropriate attenuation is likely to be required to MVHR units to prevent external noise break-in via ductwork and to control noise levels from the mechanical system itself. This should be developed at the detailed design stages once ventilation system layouts are confirmed.

6.3 Ventilation for Thermal Comfort

The provisions of Approved Document O (relating to overheating) do not apply to extension projects and, therefore, there is no statutory requirement to achieve certain internal noise levels when windows are opened for the control of overheating.

Nonetheless, it is acknowledged that, during warmer months when windows are likely to be required to be opened for additional ventilation (e.g to mitigate overheating), internal noise levels from external noise sources would inevitably increase – and Reading Borough Council have raised this as a concern, especially with respect to noise from The Face Bar.

6.3.1 North Elevation

The proposed layouts feature most of the bedrooms of the Proposed Development located on elevations which face away from The Face Bar, with the exception of one bedroom on the third-floor.

Given the extant nature of the noise from The Face Bar, and considering concerns from Reading Borough Council in relation to noise exposure to future occupants, **comfort cooling should be installed to bedrooms which have a direct line of sight to the venue** (any bedrooms on the north elevation).

It is recommended that this would not be required for the open plan living room/kitchens, which are typically not used for sleeping and, when occupied, internal noise levels arising from the use of the space (e.g watching TV, cooking etc.) will typically be appropriate to mask noise break-in from The Face Bar.

It should be noted that windows would not be sealed closed, remaining openable for purge ventilation or at occupant preference, however the provision of comfort cooling will ensure that occupants have access to cooling during periods when noise from The Face Bar would result in undesirable internal noise levels with an open window (e.g later into the night, when general ambient noise levels are quieter).

6.3.2 South Elevation – Commercial Noise

As discussed earlier in this report, the low frequency noise levels emitted from The Face Bar to the south elevation are predicted to be at least 10 dB quieter than those on the north elevation – with an upper level of around 65 dB $L_{eq,63Hz,5min}$ predicted.

To achieve the internal noise level target of NR15 (47 dB at 63 Hz), a minimum level difference from outside to inside of 18 dB would be required.

A study undertaken by Napier University for DEFRA in 2007 (*NANR116: Open/Closed Window Research*) measured the sound insulation performance of a number of types of open windows in laboratory conditions. Generally, higher levels of sound insulation are seen at lower frequencies – with a tilt-opening window with an open area of 0.2m² achieving a level difference in excess of around 20 dB at 63 Hz.

Extrapolating the sound insulation value for a window of greater open area, it is predicted that the minimum sound insulation performance of 18 dB at 63 Hz would be achieved by

a window with an approximate open area of 0.3 m² – which, for a window of the proposed dimension on the scheme, results in an opening distance of approximately 100 mm.

Noting that it is often considered appropriate to allow relaxations to internal noise levels under overheating conditions (when windows would be required to be opened) on the basis these are relatively uncommon, an open distance of 200 mm would result in a predicted internal noise level of approximately NR20 from noise from The Face Bar when windows are open on the south elevation.

6.3.3 South Elevation – Environmental Noise

With respect to environmental noise and overheating risk, noise levels on the south elevation are driven by road traffic on Oxford Road, with regular bus passes (including a bus stop outside the Proposed Development).

A maximum noise level of ~73 dB L_{Afmax} is predicted at the upper floor extension, based on typical recorded values during the daytime CRTN measurements on Oxford Road.

As discussed above, it is recommended in both the Acoustics, Ventilation and Overheating Guide and Approved Document O that relaxations are typically accepted for internal noise level targets under the overheating condition (when windows would be required to be opened), and typically a relaxation of 10 dB is initially applied (although this may depend on the frequency and duration of the overheating condition).

It is likely that open areas of windows which are sufficient to mitigate overheating would result in exceedance of the relaxed internal targets of Approved Document O/The AVO Guide.

However, the actual requirements would need to be determined through overheating assessment and, should this only occur during the daytime, these may be acceptable.

6.3.4 Summary

It should be acknowledged that it is outside the remit of the acoustic report to comment on the risk of overheating and the requirements for mitigation of this, and it should be reiterated that the provisions of Approved Document O do not apply to the scheme.

However, the above is presented to provide advice on the likely internal noise levels that might be experienced at the Proposed Development should open windows be relied upon for the control of overheating.

It is recommended that any overheating strategy should not necessarily restrict the open areas of windows during the daytime, if this would allow for the use of passive measures over mechanical means on elevations which are not significantly affected by noise from The Face Bar.

6.3.5 East and West Elevations

There are no openable windows on the east or west elevations of the proposed extension.

6.4 Purge Ventilation

Approved Document F Volume 1 (dwellings) of the Building Regulations states that purge ventilation is required to remove high concentrations of pollutants and water vapour. It is used intermittently and required only for pollutants produced by occasional activities (e.g. fumes from painting).

The document suggests that account should be taken of external noise when considering openable windows for purge ventilation.

However, considering the short periods and infrequent nature that the higher ventilation rate would be required, it is usually considered acceptable for windows to be opened. There is a general precedent that external sound levels should not determine the acceptability of opening windows to provide intermittent, occasional and ad-hoc ventilation in cases such as those described above.

7. MITIGATION – BUILDING ENVELOPE

This section provides outline advice on the mitigation requirements of the building envelope to control noise when windows are closed to achieve the adopted assessment criteria outlined in Section 3.6.

Detailed calculations have been undertaken based on the proposed room dimensions and façade areas to provide an acoustic specification for the façade elements. Given the relatively high levels of low frequency noise experienced from The Face Bar, both the glazing and façade must be specified to provide good sound insulation performance at low frequencies for them to achieve the internal noise level target of NR15.

This section provides a recommended acoustic performance of each section of the building envelope and guidance on how this might be achieved within the current design. These recommendations should be reviewed at the detailed design stages to ensure that the acoustic performance requirements are met.

It should be noted that the performance requirements for the glazing and façade elements rely on noise break-in through other means (e.g. via ventilation openings/MVHR ductwork on the façade) to be appropriately controlled – the detailed design of which have not yet been undertaken.

7.1 Non-Glazed Elements of the Building Envelope

This section discusses the performance requirements for the non-glazed elements of the building envelope (walls, roof).

The current proposed external façade construction is for a lightweight cladding, which offers relatively little low frequency sound insulation, and therefore recommendations for the internal elements of this build-up to achieve appropriate levels of attenuation are provided.

The acoustic performance requirements to achieve appropriate internal noise levels are described below and presented on the mark-up in Figure 7. Only the 3rd floor is presented, as predicted internal noise levels on the second floor are generally similar or lower as they do not include a contribution via the roof (discussed below).

Internal noise level predictions are presented for the bedrooms which are worst affected by noise from Face Bar, with the variation in external noise levels across each elevation being relatively small.

It should be noted that the construction recommendations provided are indicative only and should be developed at the design stages with reference to the acoustic performance specifications. It will be important to include both appropriate mass (from internal linings) and cavity depths to achieve the higher levels of low frequency performance required on elevations which are significantly affected by low-frequency noise.

The same mitigation strategy should be employed on the second floor.

It should be noted that the internal lining build-ups are based on the current façade proposals (a Euroclad Vieo standing seam system). Should this system change, then the internal lining requirements may also change. Ultimately, it is the acoustic performance requirement for each element which should be met.

7.1.1 Elevations with Line of Sight to The Face Bar (West, North)

Bedrooms with direct line of sight to The Face Bar require an improved building envelope to prevent low frequency noise ingress.

A sound insulation performance of $\sim 50 \text{ dB } R_w + C_{tr}$ is required for this façade, with a minimum performance of 31 dB in the 63Hz octave band.

Based on the current external façade proposals, for a Euroclad Vieo standing seam façade system, the following upgrades are likely to be required – although it should be noted that there may be other methods to achieve the above performance requirements:

- Internal room lining of 3 layers of 15 mm SoundBloc (or similar dense plasterboard)
- 200mm steel stud mounted on a resilient bar; 150mm mineral wool in the cavity, with a density of at least 40 kgm^{-3}
- 2 x 18 mm cement particle board to slab edge

The above has been developed for the single bedroom on the northern elevation as an example of the most stringent requirement.

It is recommended that the open plan kitchen/living rooms, which would not typically be used for sleeping, may be afforded relaxed criteria (NR25 may be appropriate) and therefore it is likely that a reduced build-up (e.g. by removal/reduction of internal linings) would be appropriate in these locations.

7.1.2 Other Elevations (East, South)

Where rooms/elevations are screened from The Face Bar, they will experience a reduced level of low-frequency noise. Given that improving the low-frequency performance of a lightweight system is relatively difficult, this reduction in low-frequency external noise level allows for significantly reduced construction requirements.

The worst-case bedroom, to the southwest corner on the third floor, with both a side wall and roof in addition to the main elevation, has been assessed.

A sound insulation performance of $45 \text{ dB } R_w + C_{tr}$ is required for these façades, with a minimum sound insulation performance of 26 dB R_w at 63 Hz.

Based on the current external façade proposal for the west and north facades, the internal construction could be reduced to:

- Internal room lining of 2 layers of 12.5 mm SoundBloc (or similar dense plasterboard)
- 200mm steel stud (no resilient bar required); 150mm mineral wool in the cavity, with a density of at least 40 kgm^{-3}
- 2 x 18 mm cement particle board to slab edge

7.1.3 Roof

The roof construction is similarly important for the prevention of low frequency noise ingress and is required to achieve appropriate levels across the whole development.

The roof will require a sound insulation performance of $50 \text{ dB } R_w + C_{tr}$ with a minimum performance of 31 dB in the 63Hz octave band.

Indicatively, and based on initial build-ups provided by the architect, this could be achieved with a build-up consisting of (outside to inside):

- 210mm insulating panel (to achieve thermal requirements)
- 18 mm plywood deck
- 248mm solid joist with rubber isolation clip
- 2 layers of 100mm mineral wool in the cavity, with a density of at least 40kgm^{-3}
- 1 layer of 12.5mm SoundBloc
- Total depth: 548mm.

The final build-up should be reviewed at the detailed design stages to confirm it meets appropriate acoustic performance.

7.2 Glazing

7.2.1 North Elevation (Line of Sight to The Face Bar)

To achieve the internal noise level target of NR15, the north facing bedroom with direct line of sight to The Face Bar will require a relatively high performing window system to prevent low frequency noise ingress.

Windows are likely to be an acoustic laminate system and should achieve a minimum acoustic performance of $31 \text{ dB } R_w + C_{tr}$ with a sound reduction index of at least 26 dB in the 63 Hz octave band.

This requirement is likely to be able to be reduced to living room/kitchen spaces which would carry less onerous internal noise level targets.

7.2.2 Other Elevations

Bedrooms on the elevations with no line of sight to The Face Bar require a reduced performance.

Windows incorporating relatively standard thermal double glazing achieving a minimum acoustic performance of $29 \text{ dB } R_w + C_{tr}$ would be appropriate, with a minimum performance of 23 dB in the 63 Hz octave band.

An indicative build-up for this would be 8 mm glass / 14 mm air / 6 mm glass.

7.3 External Doors

It is noted that there are external doors in the north elevations which open from the living rooms to the External Deck.

Doors would most typically be specified in a similar manner to glazing and, therefore, it is recommended that the performance requirements for these are confirmed when the internal criteria for living rooms is confirmed, and the other construction elements are known.

Indicatively, it is recommended that these should achieve similar ratings to the windows.

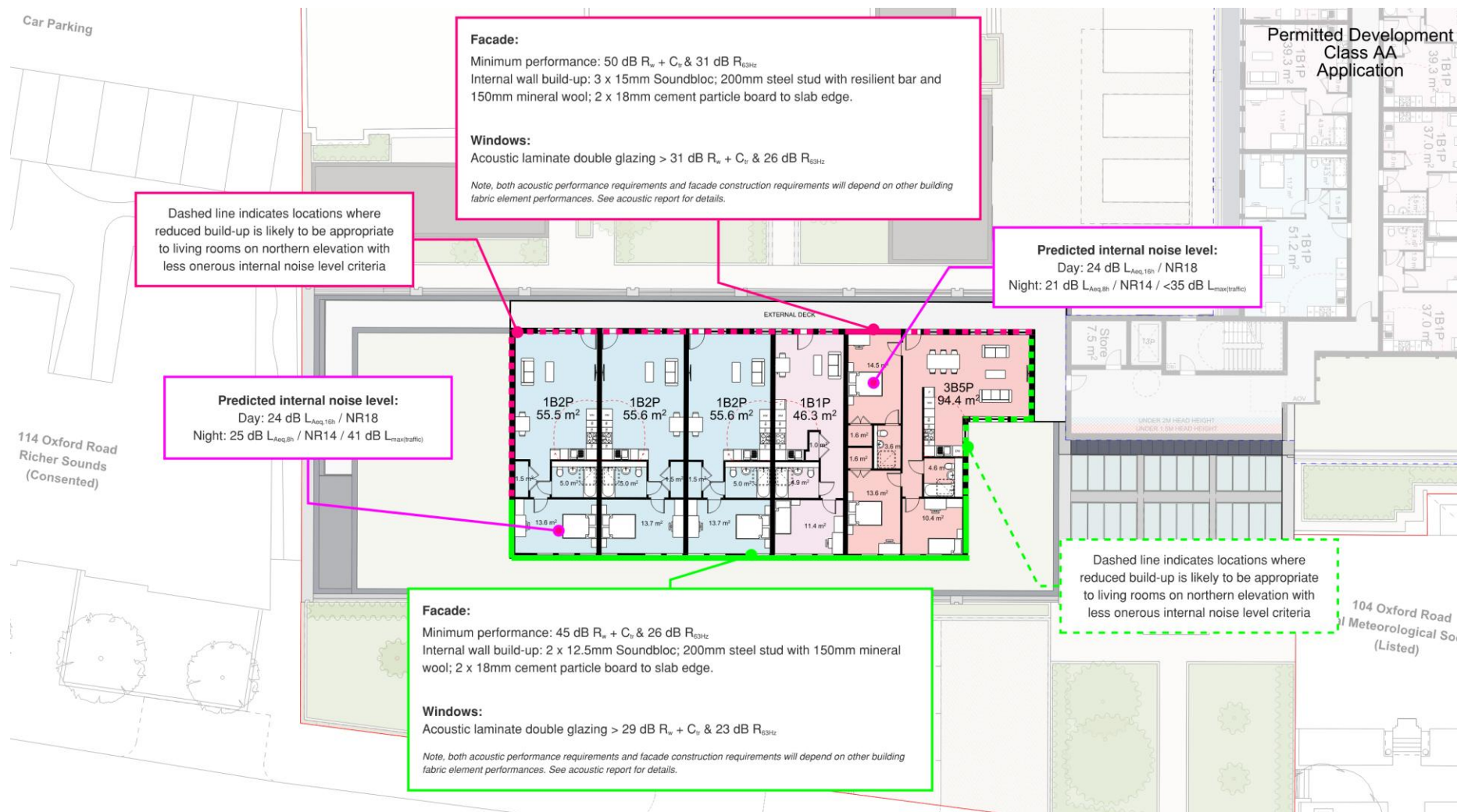


Figure 7: Mitigation requirements

8. PLANT NOISE EMISSIONS

8.1 Overview

Noise emissions limits for building services that serve the development are set to protect the amenity of existing, nearby noise-sensitive receptors (generally considered to be residential properties).

Residential mechanical ventilation systems do not typically generate high levels of noise and are easily attenuated using in-line attenuators/silencers.

Plant used for cooling (e.g Air Source Heat Pumps) typically require good air flow to operate correctly. As such, they can be difficult to acoustically attenuate, as this normally requires an acoustic enclosure or barrier. If not correctly designed, this could restrict air flow and reduce efficiency.

8.2 Background Levels and Plant Noise Emission Limits

As discussed in Section 3.2, Reading Borough's Councils Local Plan Policy EN17 provides guidance on limits for noise emitted from noise-generating equipment.

In addition, for the previous applications at the site, it was recommended that the following condition would likely be imposed on any planning approval:

No mechanical plant shall be installed until a noise assessment of the proposed mechanical plant has been submitted and approved by the Local Planning Authority. The assessment shall be carried out for in accordance with BS4142:2014+A1:2019 methodology. The predicted specific sound level ($L_{Aeq,Tr}$) (with reference to BS:4142) as measured at a point 1 metre external to the nearest noise-sensitive facade shall be at least 10dB below the pre-existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation. The predicted rating level, $L_{Ar,Tr}$ (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to the nearest noise-sensitive facade (habitable window of a dwelling) shall not exceed the pre-existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation. The plant shall thereafter only be installed in accordance with the assessment and shall thereafter be maintained so that it operates to the same standard.

Based on the above, the noise limits set out in Table 7 are established.

Table 7: Proposed plant noise emission limits at nearest noise-sensitive receptors (level 1 m from the building façade)

Receptor Location	Period	Typical Background Noise Level ¹ dB LA90,T	Specific Level Limit dB LAeq,T _r	Rating Level Limit dB LA _r ,T _r
Receptors screened from major roads (e.g rear elevation of Bond House) ²	Daytime (07:00 – 23:00)	47	37	47
	Night-time (23:00 – 07:00)	41	31	41
Receptors with line of sight to major roads ³	Daytime (07:00 – 23:00)	53	43	53
	Night-time (23:00 – 07:00)	42	32	42

¹ Derived using 1-hour periods during the daytime and 15-minute periods during the night-time, as per guidance in BS 4142:2014.

² Measured background noise levels at LT1

³ Measured background noise levels at LT2

8.3 Indicative Assessment

While a full, detailed assessment of proposed equipment cannot be undertaken (as selections and locations are not known) an initial assessment has been undertaken below to establish the likelihood of requiring acoustic mitigation to equipment.

A typical small residential heat pump may have a sound power level of between 60 to 70 dB(A).

On the assumption that equipment would be located on the third-floor roof (as is typically recommended to prevent issues with noise affecting windows that overlook), it is likely that there would be two primary noise-sensitive receptors considered:

- Bond House, immediately to the east (approximately 15 m from the roof of the third-floor extension at closest distance); and
- Windows of the eastern wing of Eaton Court itself.

An indicative BS 4142 style assessment of a single heat pump to Bond House is presented, using an indicative allowance for screening from the edge of the building roof of 10 dB.

Table 8: Indicative residential heat pump assessment to Bond House

Calculation Step	Value
Equipment Sound Power Level	65 dB(A)
Correction to sound pressure level at 15 m	-32
Screening from roof edge	-10

Calculation Step	Value
Façade correction	+3
Specific sound level at Bond House	26 dB(A)

On the above basis, a maximum of three units, or selection of alternative equipment achieving a maximum cumulative sound power level of 70 dB(A), would be allowed while complying with RBC's noise limits.

However, there is likely to be opportunity to increase the distance and/or increase screening (through use of plant enclosures etc.) to reduce the noise level at the receptors and, therefore, increase the maximum number of, or maximum noise levels emitted from, plant items.

8.3.1 Plant Noise to the Development Itself

Additionally, the noise from the units should be considered to the windows of the development itself – particularly those which have direct line of sight to the plant (e.g. the fourth floor of the extension to the east wing).

BS 4142 acknowledges that it should not necessarily be applied in the same fashion to new noise-sensitive receptors, as the BS 4142 noise impact thresholds are more typically associated with the effects on existing receptors which are subject to the introduction of new plant.

Furthermore, RBC's criteria to achieve a specific sound level (L_{Aeq} without the effects of tonality, impulsivity etc. allowed for) of 10 dB below the existing background sound level is considered relatively onerous for typical small-scale residential equipment which does not tend to exhibit significant noise characteristics.

It is therefore recommended that equipment installed as part of the scheme, and assessed to new elements of the scheme, should be considered with respect to the internal noise levels experienced at the dwellings when windows are opened. Internal noise level targets of NR25 are recommended as appropriate to ensure significant impacts are prevented.

Assuming a partially open window would provide at least 10 dB level difference from outside to inside, the above limit would result in an external noise level which coincides approximately with the existing background sound level at the site, and is at least 7 dB below the ambient sound level at the rear of the site, during the night-time.

Therefore it is considered that the introduction of new cooling plant to serve the development should not result in noise levels which are intrusive to future occupiers.

9. CONCLUSION

MZA Acoustics has been appointed to undertake a noise impact assessment at Eaton Court, Oxford Road, Reading RG1 7NG (the Site) to inform a planning application for partial redevelopment, proposing an extension of 2 floors to the existing west wing of the building to provide residential accommodation.

A baseline noise survey has been undertaken at the site, which has been used to predict the potential noise impact for future occupiers of the Proposed Development and set limits for noise emitted from the Development.

9.1 Overheating

Internal noise levels during overheating are discussed, especially with respect to commercial sources which affect the site.

The requirements of Approved Document O do not apply to this project, however given the risk of noise disturbance from The Face Bar, and the concerns raised by Reading Borough Council in relation to noise impact from the venue, it is proposed that bedrooms which are affected by noise from The Face Bar would have comfort cooling provided to allow occupants to control their exposure to this noise. There is only one bedroom on the northern elevation which would require such treatment – with most bedrooms located on the southern elevation.

Other elevations experience lower levels of commercial noise, although are also affected by noise from Oxford Road. Noise levels from Oxford Road are not significantly higher than those experienced in typical urban environments. It is likely that windows open sufficiently to mitigate overheating would result in exceedances of typical internal noise level criteria.

However, the requirements should be informed by overheating assessment and it is recommended that exceedances of internal noise levels during the daytime where windows cannot be opened during the night may be preferred to the implementation of comfort cooling which has cost, sustainability and noise impacts.

9.2 Building Envelope Mitigation

Acoustic performance specifications, and associated indicative constructions, for the façade, roof, and windows have been recommended to achieve the internal noise level targets.

The assessment has been undertaken for bedrooms, which are considered most sensitive to noise, with the most onerous requirement to the bedroom on the north elevation which has direct line of sight to The Face Bar.

A reduced performance requirement, and associated construction, has been determined for bedrooms on the south elevation, which are affected by commercial noise to a lesser extent but also experience moderate levels of road traffic noise.

It is recommended that a less onerous internal noise level target may be adopted for the living room/kitchen spaces (NR25 may be appropriate) which are not used for sleeping, and performance requirements and construction types for these rooms should be established at the later detailed design stages.

It should be noted that the acoustic performance specifications provided have been developed holistically – i.e. allowing for a contribution of sound from each building

element. If the acoustic performance of one element changes, then others may be relaxed or improved.

Ultimately, the intent of the acoustic performance specifications provided is to demonstrate that the internal noise level targets can be achieved. It is therefore recommended that any condition imposed should relate to the achieving of the internal noise level targets, and not the acoustic performance specifications provided within this report.

9.3 **Plant Noise Emissions**

Plant noise emissions limits have been established based on the measured background sound levels at the site and the requirements of Reading Borough Council.

While final plant selections and locations are not known, an indicative assessment is demonstrated for a typical residential heat pump unit which demonstrates that compliance should be achievable at the nearest existing noise-sensitive receptors to the scheme.

Additionally, the impact of the plant on the other elements of the scheme itself have been considered. It is recommended that an internal noise level target of NR25 is targeted to control noise impact to windows on the east wing which would potentially overlook any future equipment. This results in an external level which would be roughly equivalent to the existing background noise level, and at least 7 dB below the existing ambient noise level, at the rear of the Site.

9.4 **Recommendation**

In conclusion, it is recommended that the Site is suitable for the proposed use subject to appropriate mitigation being installed as described in the relevant sections of this report.

This should be ensured through the application of an appropriately worded planning condition which requires the internal noise level targets recommended in this report to be achieved.

The limitations to this report are included in Appendix F.

Appendices

Appendix A – Glossary of Acoustic Terminology

Airborne Sound	Sound that reaches the point of interest by propagation through air.
Ambient Sound:	Sound from all sources at any given time, from both near and far. Usually measured in terms of L_{Aeq} .
A-Weighting	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Background Sound Level	The A-weighted sound pressure level that can be considered the baseline in the absence of any noise from a specific source of sound under assessment. Measured in terms of $L_{A90, T}$.
Calibration	The measurement system/ chain should be periodically calibrated, within a laboratory, against traceable calibration instrumentation, to either National Standards or as UKAS-Accredited, as required. The calibration of the system should also be checked in the field using a portable calibrator before and after each short term measurements, and periodically for longer term monitoring.
Class 1	The Class of a sound level meter describes its accuracy as defined by the relevant international standards – Class 1 is more accurate than Class 2. The older standard IEC 60651 referred to the grade as "Type", whereas the new standard IEC 61672 refers to it as the "Class". The most accurate meters used in the field (as opposed to a laboratory) are Class 1. Class 2 meters can be used in some instances; however MZA Acoustics use Class 1 (or Type 1) meters by default, as required by BS 4142:2014, for example.
Decibel	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds (s_1 and s_2) is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20 Pa.
Fast time Weighting (F)	Averaging time used in sound level meters. Defined in BS EN 61672-2:2013 Electroacoustics. Sound level meters. Pattern evaluation tests.
Free-field / Façade	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 m away.
$L_{AF90, T}$	The A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time fast time-weighting (F). Generally used to describe the 'background' sound conditions.
L_{AFmax}	The maximum A-weighted sound pressure level during a given time period. L_{max} is sometimes used for the assessment of occasional loud sounds, which may have little effect on the overall L_{eq} noise level, but could still affect the sound environment. Unless described otherwise, it is measured using the fast time-weighting (F).
$L_{eq, T}$	A sound level index called the equivalent continuous sound level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded. Where the value is A-weighted, it will be presented ' $L_{Aeq, T}$ ' or ' $dB A L_{eq, T}$ ', otherwise it should be an un-weighted (or linear) value.

L_p	See Sound Pressure Level.
Noise	Related to human response to sound. Unwanted sound, or sound that is considered undesirable or disruptive.
Octave Band	Frequency ranges in which the upper limit of each band is twice the lower limit. Octave bands are identified by their geometric mean frequency, or centre frequency.
Sound Absorption Coefficient	A measure of how effective a material is at absorbing sound incident to its surface. The index range is between 0 and 1, where 1 indicates a perfectly absorbent material and 0 indicates a perfectly reflective one.
Sound Power	In a specified frequency band, the rate at which acoustic energy is radiated from a source. In general, the rate of flow of sound energy, whether from a source, through an area, or into an absorber.
Sound Power Level	Of airborne sound, ten times the common logarithm of the ratio of the sound power under consideration of the standard reference power of 1 pW. Expressed in decibels.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level	The sound level is the sound pressure relative to a standard reference pressure of 20 Pa (20×10^{-6} Pascals) on a decibel scale.
Weighted Sound Reduction Index (R_w)	A single-figure quantity which characterises the airborne sound insulating properties of a material or element over a range of frequencies.

Appendix B – Summary of Guidance Documents and Standards

NATIONAL PLANNING POLICY AND GUIDANCE

NATIONAL PLANNING POLICY FRAMEWORK (NPPF), December 2024

The NPPF determines the government's planning policy for England. The document was first published in March 2012, revised in July 2018, updated in 2019, 2021, 2023 and 2024.

The current version (issued 12/12/24) of the policy document remains largely unchanged with regards to noise which is considered in Chapter 15 – 'Conserving and enhancing the natural environment', specifically in terms of pollution.

Paragraph 187 states that planning policies and decisions should contribute to and enhance the natural and local environment by "...preventing new and existing development from contributing to, being put at 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 that:

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 by doing so they should:

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

Furthermore, Paragraph **200** continues:

Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). 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.

The guidance contained within the NPPF reference the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010).

NOISE POLICY STATEMENT FOR ENGLAND (NPSE), 2010

The NPSE provides more detail than the NPPF setting out the long-term vision of the Government noise policy and applying to all forms of noise excluding occupational noise. The NPSE repeatedly refers to the management and control of noise within the context of Government Policy on sustainable development.

The NPSE also stresses that noise impact should not be treated in isolation from other related factors. At paragraph 2.7 for example it states:

'...the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications.'

The NPSE introduces and describes three categories, or levels, describing the presence or absence of noise effects but does not quantify those categories, stating that the corresponding objective levels are likely to be different for different noise sources, receptors and times of the day or night. These categories are:

- **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
- **LOAEL** – Lowest Observed Adverse Effect Level – This is the level above which adverse effects on health and quality of life can be detected
- **SOAEL** – Significant Observed Adverse Effect Level – This is the level above which significant adverse effects on health and quality of life occur.

The NPSE recognised that, at the time of publication, further research was needed into how these categories might be quantified for different scenarios. There is still no robust, universally accepted method of deriving suitable values and a variety of approaches are adopted in different circumstances. The subjective guidance provided in the Planning Practice Guidance (PPG) for noise can be of assistance in deriving suitable values.

The three aims of the NPSE are:

- Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

PLANNING PRACTICE GUIDANCE – NOISE (PPG-N), 2019

The Government launched the Planning Practice Guidance (PPG) web-based resource in March 2014 and refreshed it in July 2019. The section on noise provides tabulated descriptions of example outcomes of the categories introduced in the NPSE based on the likely average response. It also adds a fourth category termed Unacceptable Adverse Effect (UAE).

The PPG-N describes sound that is not noticeable to be at levels below the NOEL. It describes exposures that are noticeable but not to the extent there is a perceived change in quality of life as below the LOAEL and need no mitigation. With reference to the definition of noise in the NPSE, such emissions are 'sound'; and not 'noise'. On this basis, the audibility of sound from a development is not, in itself, a criterion to judge noise effects that is commensurate with national planning policy.

The PPG-N suggests that noise exposures above the LOAEL cause small changes in behaviour. Examples of noise exposures above the LOAEL provided in the PPG-N is having to turn up the volume on the television; needing to speak more loudly to be heard; where there is no alternative ventilation, closing windows for some time because of the noise; or, a potential for some reported sleep disturbance. In line with the NPPF and NPSE, the PPG-N states that consideration needs to be given to mitigating and minimising effects above the LOAEL but taking account of the economic and social benefits being derived from the activity causing the noise.

The PPG-N suggests that noise exposures above the SOAEL cause material changes in behaviour. Examples of noise exposures above the SOAEL cause material changes in behaviour. Examples of noise exposures above the SOAEL provided in the PPG-N are, where there is no alternative ventilation, keeping windows closed for most of the time or avoiding certain activities during periods when the noise present; and/or there is a potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. In line with the NPPF and NPSE, the PPG-N state that effects above the SOAEL should be avoided and that whilst the economic and social benefits being derived from the activity causing the noise must be taken into account, such exposures are undesirable.

The guidance in the PPG-N, which is based on that provided in the NPSE, is summarised in the following table.

The PPG-N states that there are many factors which should be considered when determining if noise is of concern; one factor is the number of noise events, the frequency and pattern of occurrence of the noise.

The PPG-N provides further information on the adverse effects of noise and how it can be mitigated. For noise sensitive development, mitigation measures can include: avoiding noisy locations; designing the development to reduce the impact of noise from the local environment, including noise barriers; and optimising the sound insulation provided by the building envelope including through noise insulation.

Perception	Examples of Outcomes	Increasing Effect Levels	Action
No Observed Effect Level			
Not present	No effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, 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.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

PROFESSIONAL PRACTICE GUIDANCE ON PLANNING AND NOISE (PROPG)

As discussed in Section 2 of this report, the ProPG is designed to provide practitioners with guidance on a recommended assessment approach to the management of noise within the planning system in England for new residential development.

The guidance is non-statutory and is primarily aimed at the assessment of proposed residential development 'exposed predominantly to noise from existing transport sources'. Despite being non-statutory, it is expected to be widely adopted by planning authorities as best practice when considering noise affecting new residential development.

The ProPG aims to complement Government planning and noise policy and guidance, and in particular it strives to:

- "advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
- encourage the process of good acoustic design in and around new residential developments;
- outline what should be taken into account in deciding planning applications for new noise-sensitive developments;
- improve understanding of how to determine the extent of potential noise impact and effect; and
- assist the delivery of sustainable development."

The assessment approach, as summarised and implemented in the body of this report, is described as follows.

Stage 1 Risk Assessment

The Stage 1 initial noise risk assessment is based on placing the site within ranges of external noise levels, which correspond to varying degrees of risk. The external noise levels refer to the combined free-field noise level from all relevant sources of transport noise that affect the site. The external noise levels may also include industrial/commercial noise where it is present, but where it is "not dominant".

The indicative noise levels are intended to provide a sense of the noise challenge at a potential residential development site and should be interpreted flexibly having regard to the locality, the project and the wider context.

The initial noise risk assessment approach is presented in Figure 1 in the ProPG, which is reproduced in the following figure.

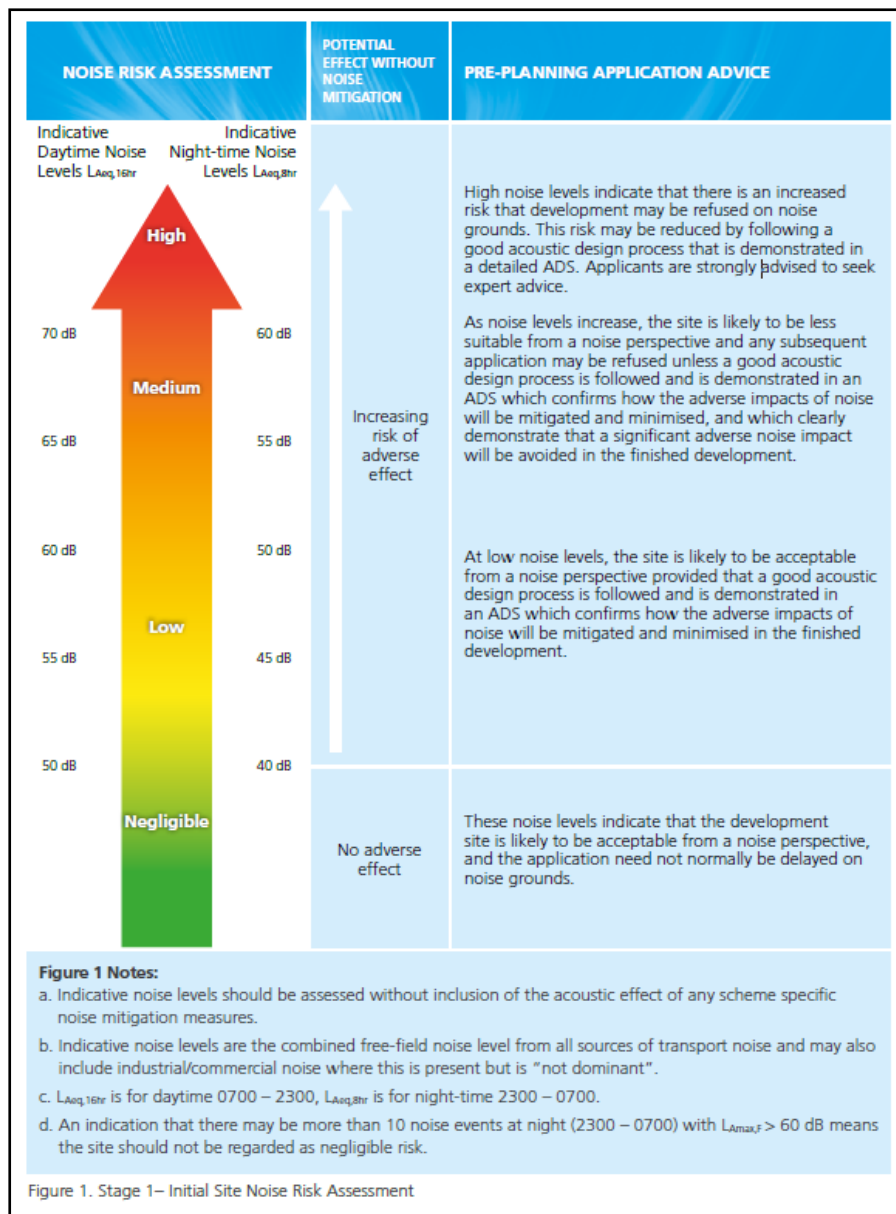


Figure 8: ProPG Stage 1 Risk Assessment

Stage 2 Element 1 – Good Acoustic Design Process

ProPG states that planning applications for new residential development should include evidence that the following have been properly considered:

- Check the feasibility of relocating, or reducing noise levels from relevant sources.
- Consider options for planning the site or building layout.
- Consider the orientation of proposed building(s).
- Select construction types and methods for meeting building performance requirements.
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost CDM (construction design and management) etc.
- Assess the viability of alternative solutions.
- Assess external amenity area noise.

Stage 2 Element 2 – Internal Noise Level Guidelines

The internal noise level guidelines provided under Element 2 within Figure 2 of the ProPG are based upon the guidance in BS 8233:2014. Accompanying notes 4 – 7 from Figure 2 of the ProPG state the following:

“Note 4 – Regular individual noise events (for example, schedules aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or L_{Amax,F} depending on the character and number of events per night. Sporadic noise events could require separate values. 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 45 dB 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 5 – Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the “open” position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

Note 6 – Attention is drawn to the requirements of the Building Regulations.

Note 7 – Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as “unreasonable”. Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as “unacceptable” by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant

rooms experiencing “unacceptable” noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form.”

Stage 2 Element 3 – External Amenity Area Noise Assessment

ProPG refers to the design ranges in BS 8233:2014 with respect to the assessment of external amenity, as well as guidance in the PPG-N. Based on these two documents the following guidance is provided with respect to the assessment of noise in external amenity areas:

3(i) “If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended”

3(ii) “The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB LAeq,16hr.”

3(iii) “These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces.”

3(iv) “Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process.”

3(v) “Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:

- a relatively quiet façade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or
- a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different protected location); and/or
- a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or
- a relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance).”

Stage 2 Element 4 – Other Relevant Issues

ProPG states that the following other relevant issues, should be considered, where appropriate:

- 4(i) compliance with relevant national and local policy
- 4(ii) magnitude and extent of compliance with ProPG
- 4(iii) likely occupants of the development
- 4(iv) acoustic design verses unintended adverse consequences
- 4(v) acoustic design verses wider planning

Planning Recommendations

Following the ProPG assessment approach, will lead the noise practitioner to choose between four possible recommendations to the decision maker. These are as follows:

- planning consent may be granted without any need for noise conditions.
- planning consent may be granted subject to the inclusion of suitable noise conditions.
- planning consent should be refused on noise grounds in order to avoid significant adverse effects (“avoid”); or
- planning consent should be refused on noise grounds in order to prevent unacceptable adverse effects (“prevent”).

Full details of where and when the above recommendations apply are provided in Section 3 of ProPG.

TECHNICAL GUIDANCE

ACOUSTICS VENTILATION AND OVERHEATING RESIDENTIAL DESIGN GUIDE – JANUARY 2020

The Acoustics, Ventilation and Overheating (AVO) Guide recommends an approach to acoustic assessments for new residential development that takes due regard of the interdependence of provisions for acoustics, ventilation and overheating.

The AVO Guide is intended for the consideration of new residential development that will be exposed predominantly to airborne sound from transport sources, and to sound from mechanical services that are serving the dwelling in question.

The AVO Guide provides guidance on all stages of the assessment and design of dwellings. However, of particular use at planning stage, is its guidance on the initial site appraisal – which aligns broadly with that of ProPG. The level 1 site risk assessment from the AVO guide is presented in the following figure.

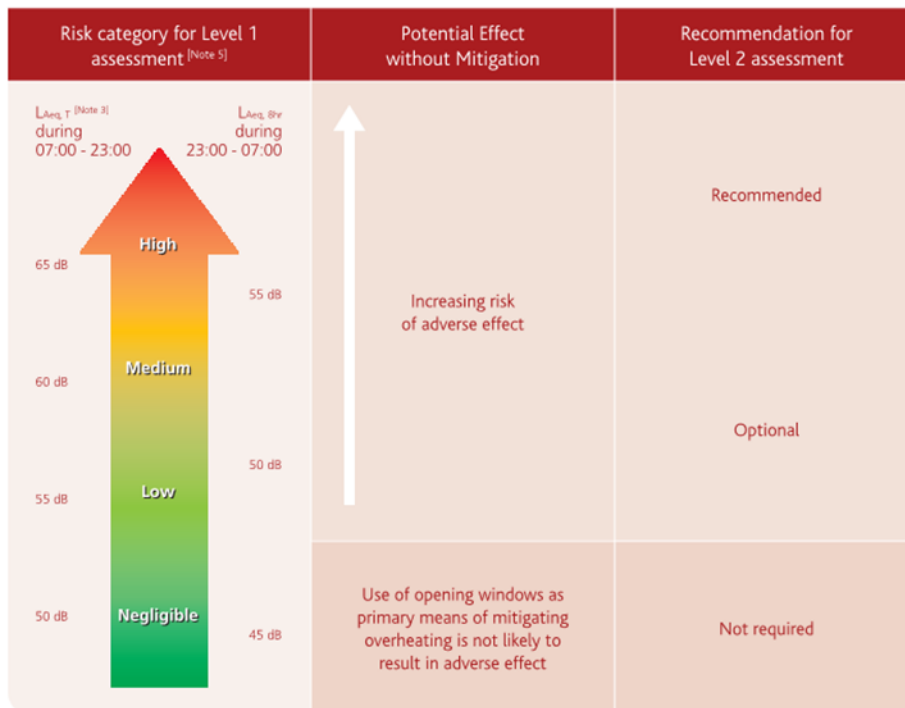


Figure 9: AVO Guide - Level 1 risk assessment

Also of use at the early stages of the design is the AVO Guide's high level recommendations on appropriate glazing and ventilation strategies for schemes depending on their external noise levels.

The following figure presents Table B-2 of The AVO Guide, which provides an initial assessment of appropriate mitigation requirements for dwellings that fall within varying external noise level brackets.

Ventilation System from ADF	Cont. equiv. (L_{Aeq}) or events (L_{AFmax})	Level Difference, external free field level – internal reverberant level, dB	
		Typical windows and vent	Higher acoustic performance windows and vent
1, 2	L_{Aeq}	21	31
	L_{AFmax}	22	35
3 (with trickle vent)	L_{Aeq}	23	33
	L_{AFmax}	24	38
4 (no trickle vent)	L_{Aeq}	27	38
	L_{AFmax}	31	45

Figure 10: The AVO Guide Table B-2: Potential level differences associated with different ventilation systems from ADF

It follows that, depending on their risk categories, developments (or areas of developments) would be subject to more detailed assessments on the risk of occupants being exposed to high levels of noise within dwellings, dependant on the method of controlling overheating and the frequency with which the overheating condition would occur – as informed by the mechanical engineer and, likely, an overheating assessment.

The AVO Guide provides a recognition that the absolute levels within standard documents may be exceeded under overheating conditions and provides a sliding scale on which to assess the impact of an experienced noise level dependant on the frequency with which it is experienced. Figure 11 and Figure 12 presents an example of such a scale during the daytime.

The AVO Guide does not, however, provide a quantitative indication of the duration under which a noise condition may be experienced while still being 'acceptable'.

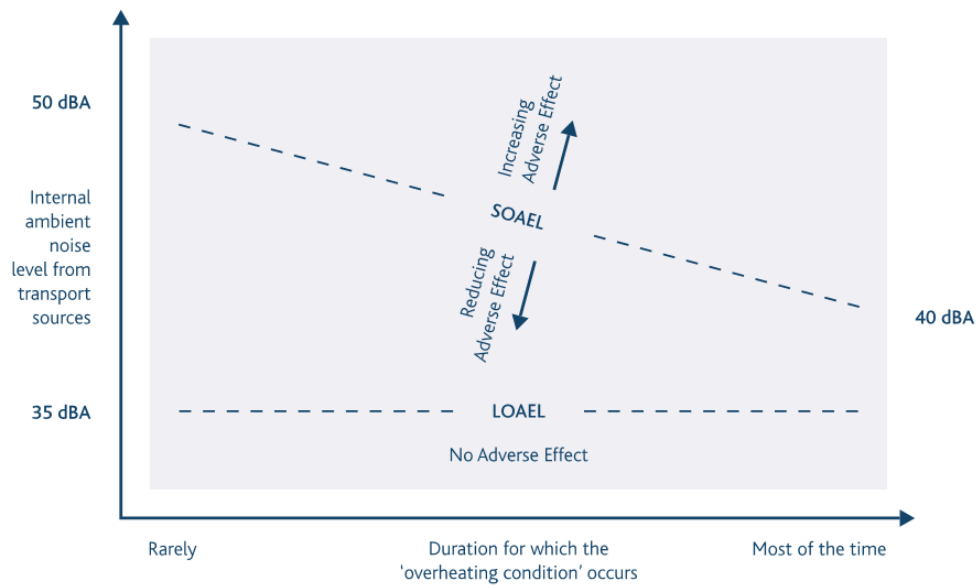


Figure 11: Figure B-2 of the AVO Guide - the 'AVO Diagram' for daytime noise exposure

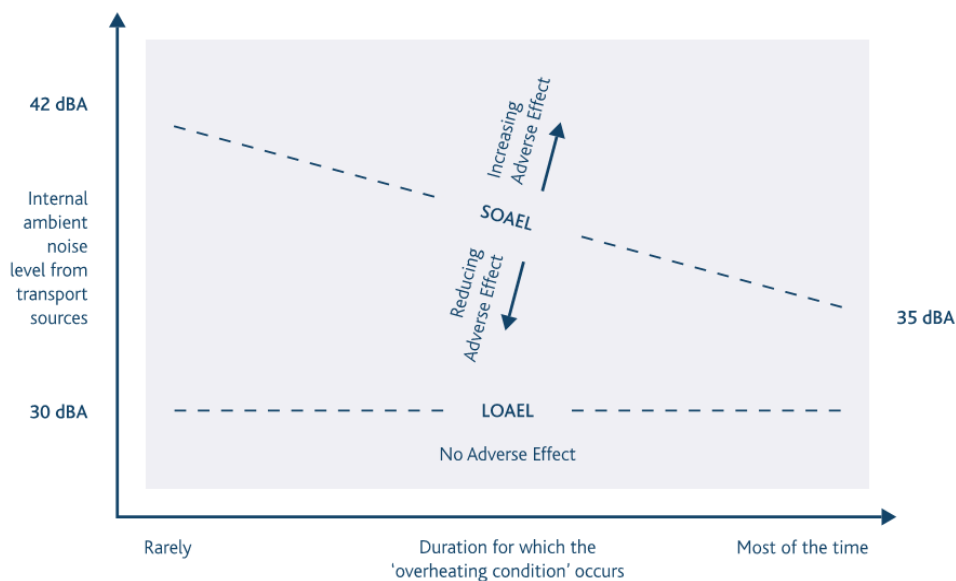


Figure 12: Figure B-3 of the AVO Guide - the 'AVO Diagram' for night-time noise exposure

BS 8233:2014 GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

BS 8233:2014 Guidance on sound insulation and noise reduction for buildings provides guidance for the control of noise in and around buildings. Through providing appropriate criteria and limits for internal and external noise levels it can be used to guide the design of new buildings (or refurbished buildings undergoing a change of use).

Guidance pertaining to indoor noise levels for residential spaces is summarised in the table below. These levels refer to the overall internal noise resulting from steady external environmental noise, such as road traffic, and are not applicable for sources of noise with specific character.

Table 9: BS 8233 – Indoor ambient noise levels in spaces when unoccupied

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 $L_{Aeq,8hour}$

Shorter duration and intermittent noise events can be responsible for sleep disturbance. While BS 8233 does not recommend specific maximum noise limits for controlling these events, Note 4 from Figure 2 of the ProPG states that good acoustic design can be used so that individual noise events do not normally exceed 45 dB L_{AFmax} more than 10 times a night.

BS 8233:2014 states that, *“Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night.”* However, the document does not recommend any specific criterion.

The noise level criteria specified in BS 8233:2014 are broadly in line with those specified by the World Health Organization (WHO) in its Guidelines for Community Noise (1999), as described below.

WHO GUIDELINES FOR COMMUNITY NOISE

The WHO Guidelines consolidate scientific knowledge on the health effects of community noise and provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments. The main sources of community noise are identified as road, rail and air traffic; industries; construction and public work; and neighbours.

The effects of noise in dwellings are, typically, sleep disturbance, speech interference and annoyance. Suggested guideline limitations, and the time periods to which they relate, are presented in the following table.

Table 10 – WHO guideline values for community noise in specific environments

Specific environment	Critical health effect(s)	L _{Aeq,T}	Time base, T (hours) ¹	L _{AFmax}
Outdoor living areas	Serious annoyance, daytime and evening	55 dB	16	-
	Moderate annoyance, daytime and evening	50 dB	16	-
Dwellings indoors	Speech intelligibility and moderate annoyance, daytime and evening	35 dB	16	-
Inside bedrooms	Sleep disturbance, night-time	30 dB	8	45 dB ²
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45 dB	8	60 dB

¹ These periods are usually taken to be 07:00 – 23:00 (16 hour day) and 23:00 – 07:00 (8 hour night)

² The document states that, “For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night...”

In line with the quoted guidance from the WHO Guidelines, it is taken that the L_{AFmax} criterion should not be compared to the highest L_{AFmax} level applicable to the assessment location(s), but rather to that more representative of conditions typically.

It is noted that the WHO guidance relating to night-time maximum noise levels is based on a study of sleep disturbance due to aircraft movements, which are not a prominent feature here. However, in the absence of similar guidance relevant to rail or road traffic, together with aircraft noise typically being considered more annoying than the other two modes of transport, it is considered appropriate to apply the guidance for the purposes of the assessment.

BS 4142:2014+A1:2019 METHODS OF RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND

BS 4142:2014+A1:2019 primarily provides a numerical method by which to determine the significance of sound of an industrial nature (i.e. the ‘specific sound’ from the proposed development and/or existing source) at residential NSRs. The specific sound level may then be corrected for the character of the sound, if appropriate, and this is then termed the ‘rating level’ (denoted as L_{Ar,Tr}), whether or not a rating penalty is applied.

With regard to the rating correction, paragraph 9.2 of BS 4142:2014+A1:2019 suggests the following subjective methods for the determination of the rating penalty for tonal, impulsive and/or intermittent specific sounds:

Tonality

- For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity

- A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

Intermittency

- When the specific sound has identifiable on/off conditions, the specific sound level should 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.

Other sound characteristics

- Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

BS 4142:2014+A1:2019 requires that the background sound levels adopted for the assessment be representative for the period being assessed. The Standard recommends that the background sound level should be derived from continuous measurements of normally not less than 15-minute intervals, which can be contiguous or disaggregated. However, the Standard states that there is no 'single' background sound level that can be derived from such measurements. The accompany not to paragraph 8.1.4 states that:

"A representative level should account for the range of background sound levels and should not automatically be assumed to be either the minimum or modal value."

Estimating Impact

An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level of the specific sound. In the context of the Standard, adverse impacts include, but are not limited to, annoyance and sleep disturbance.

Typically, the greater this difference, the greater the magnitude of the impact, while 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.

BS 4142:2014 recommends the following scale to estimate the impact:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on context.
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Whilst there is a relationship between the significance of impacts determined by the method contained within BS 4142:2014+A1:2019 and the significance of effects described in the PPG-N, there is not a direct link. It is not appropriate to ascribe numerical rating / background level differences to LOAEL and SOAEL because this fails to consider the context of the sound which is a key requirement of the Standard.

The significance of the effect of the noise in question (i.e. whether above or below SOAEL and LOAEL) should be determined on the basis of the initial estimate of impact significance from the

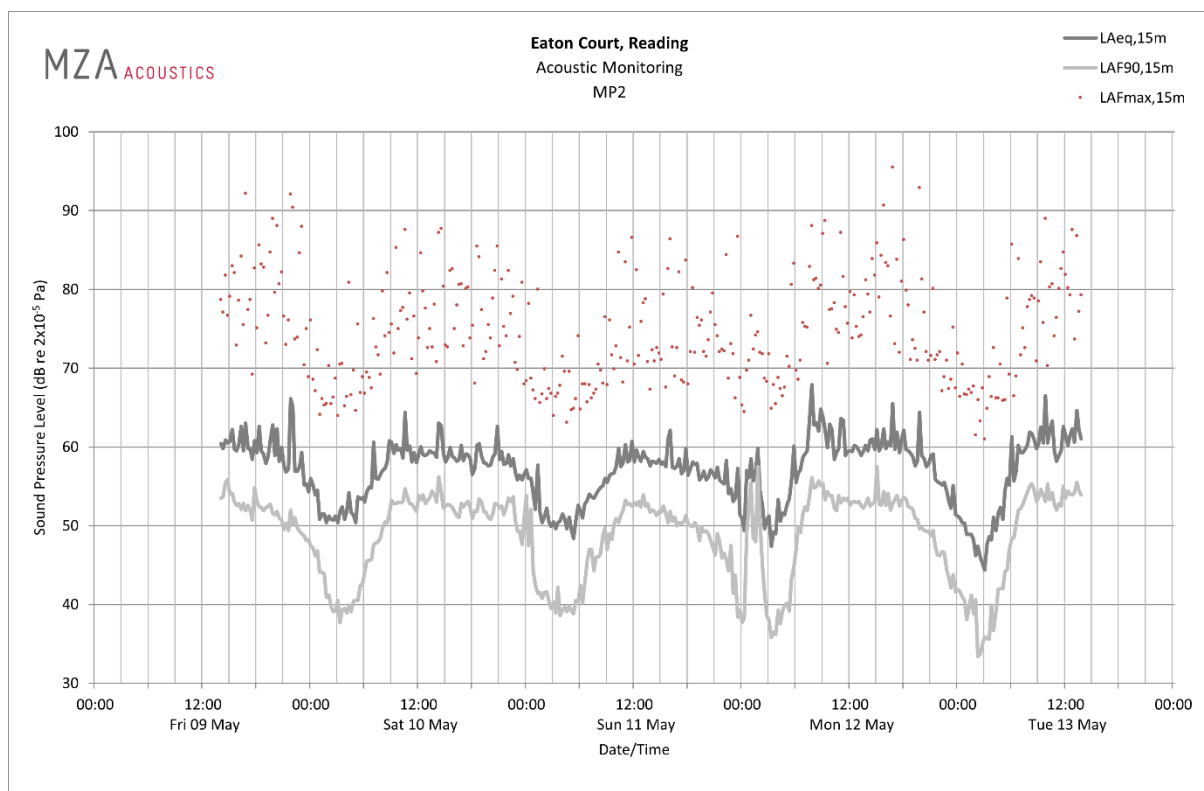
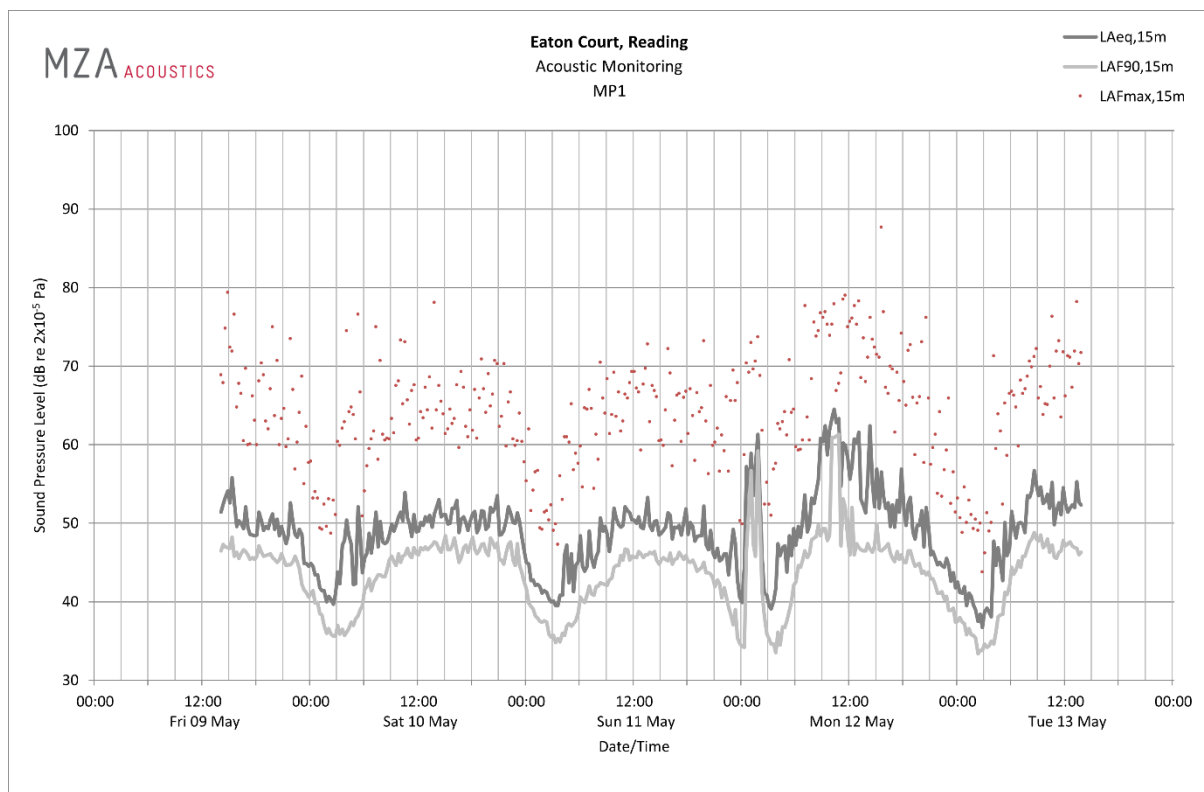
BS 4142:2014 assessment with reference to the examples of outcome described within the PPG-N and after having considered the context of the sound. It is necessary to consider all pertinent factors, including:

- the absolute level of the sound;
- the character and level of the residual sound compared to the character and level of the specific sound; and
- the sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions such as:
 - façade insulation treatment;
 - ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
 - acoustic screening.

Appendix C – Environmental Noise Survey Equipment

Equipment	Type	Serial Number	Calibration Due Date
Unattended Monitoring Location (LT1) and CRTN on Oxford Road			
Sound Level Meter	01dB Metravib FUSION	14465	02/06/2026
Pre-amplifier	01dB Metravib PRE22	2135015	
Microphone	GRAS 40CD 1/2" Pre-polarised free-field	470849	
Calibrator	01dB Metravib CAL31	98855	03/04/2026
Unattended Monitoring Location (LT2)			
Sound Level Meter	01dB Metravib FUSION	14087	19/10/2025
Pre-amplifier	01dB Metravib PRE22	2113049	
Microphone	GRAS 40CD 1/2" Pre-polarised free-field	446548	
Calibrator	01dB Metravib CAL31	87801	29/04/2026
CRTN on Eaton PI			
Sound Level Meter	01dB CUBE	14240	03/06/2026
Pre-amplifier	01dB PRE22	2138129	
Microphone	GRAS 40CD 1/2" Pre-polarised free-field	367230	
Calibrator	Cirrus CR:515	100874	31/03/2026

Appendix D – Noise Survey Results



Appendix E – Limitations to this Report

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

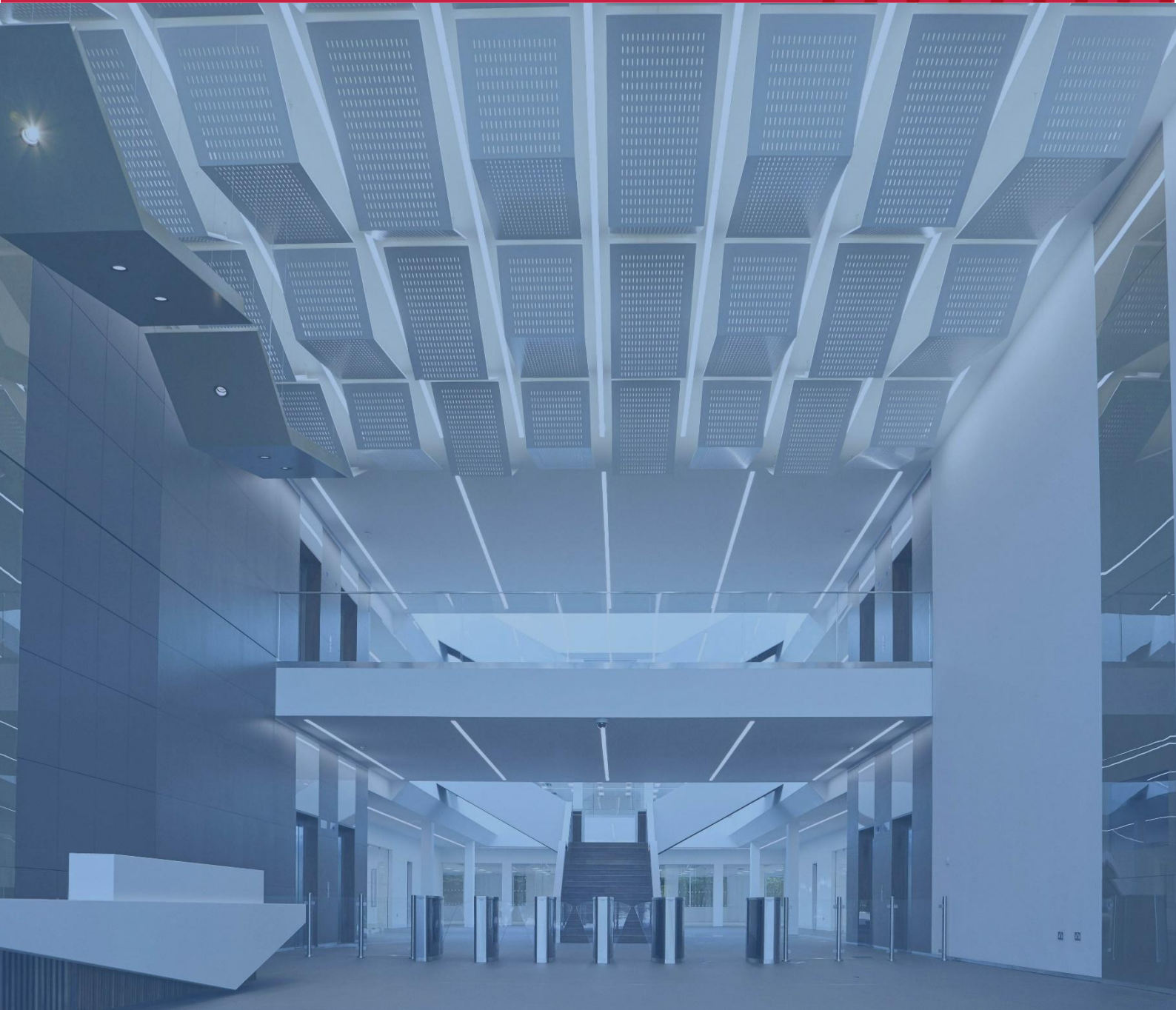
The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and from our experience. If additional information becomes available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

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