15 New Road, Chippenham

Noise Intrusion Assessment

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prepared for

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1.0 Introduction

1.1 It is proposed that an existing office building at 15 New Road, Chippenham be converted for residential use.

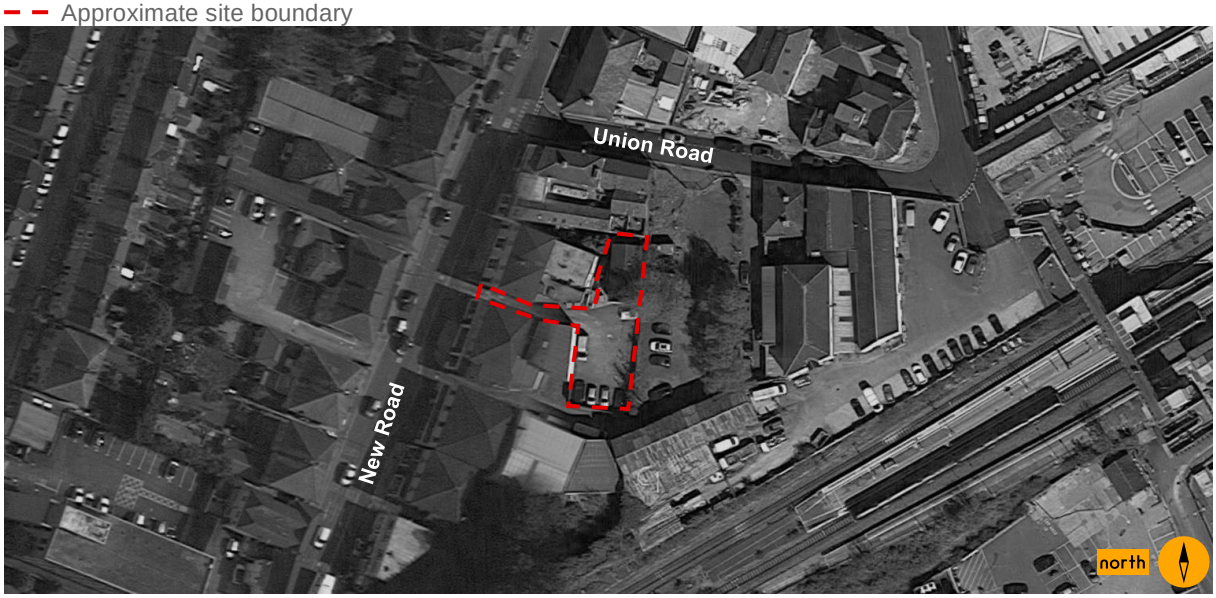
1.2 A noise survey has been undertaken on site by Suono to establish incident noise levels on the existing office building. Internal noise criteria have been set using relevant guidance and any mitigation required to meet these criteria is detailed within this report.

2.0 Site Location

2.1 The site is at 15 New Road, Chippenham situated to the rear of an existing Domino's Pizza outlet at 16-17 New Road. The site and its surrounds can be seen on **Image 1** below, with the approximate site boundary shown as a dashed red line.

Image 1: Site location

Approximate site boundary



Aerial image courtesy of Google Maps

2.2 The existing building is set back from New Road (the A420) which runs to the west of the site. New Road is a busy one-way street with a constant traffic flow. Union Road is a small one-way street with little traffic and is located to the north of the site beyond an existing restaurant.

2.3 It is understood that a site with industrial activity is located immediately to the east of the site and storage units are located to the south of the site.

2.4 Chippenham train station is located to the southeast of the site beyond the industrial property and the rail line runs east to west to the south of the site.

2.5 The site is within the jurisdiction of Wiltshire Council.

3.0 Design Criteria

3.1 The following criteria have been adopted for the assessment of noise to the proposed development based on national planning policy and local authority guidance. The basis for the criteria set is detailed in **Appendix B** attached to this document.

3.2 Industrial and commercial noise is a significant part of the existing noise climate, therefore the rating noise levels of nearby industrial and commercial activity has been used for the assessment of external noise intrusion to the proposed development.

- Daytime noise levels within all habitable rooms[1]: 35 dB $L_{Ar,1hour}$
- Night-time noise levels within habitable rooms: 30 dB $L_{Ar,15minute}$ and 45 dB $L_{Amax,F}$[2]

3.3 For the avoidance of doubt, daytime relates to 07:00 to 23:00 and night-time 23:00 to 07:00.

4.0 Noise Survey

4.1 An unattended noise survey was conducted on site between 16:30 on Monday 22nd May and 13:30 on Wednesday 24th May 2023. The survey works were undertaken to quantify noise levels incident on the façades of the existing building.

4.2 Noise measurements were taken at two positions. Full details of the noise survey are set out in **Appendix A** attached to this document. A summary of the measured noise levels at each position are presented within the tables below. **Image 2** indicates the measurement positions.

Table 1 Summary day and night noise levels at positions MP1 and MP2, dB

Period	**Noise Level, dB(A)**	
	MP1	**MP2**
07:00-23:00 Day, $L_{Aeq,16hours}$	57	49
23:00-07:00 Night, $L_{Aeq,8hours}$	51	48
23:00-07:00 Night, $L_{Amax,F}$[3]	71	70

Table 2 Highest one hour day and 15-minute night noise levels at positions MP1 and MP2, dB

Period	**Measurement Location**	
	MP1	**MP2**
07:00-23:00 Day, $L_{Ar,1hour}$	58	56
23:00-07:00 Night, $L_{Ar,15\ minutes}$	58	52

4.3 The noise climate at MP1 was affected by noise from New Road and the Domino's pizza restaurant including delivery noise and mechanical services noise. The noise climate at MP2 was affected by distant road noise and industrial activity from the property to the rear of the site.

[1] Habitable rooms refer to bedrooms, living rooms and dining rooms.

[2] Not normally exceeded more than 10 times per night.

[3] Based on 10th highest magnitude $L_{Amax,F}$ figure, considering 1-minute data during each of the night times of the survey.

Image 2: Location of noise measurement positions

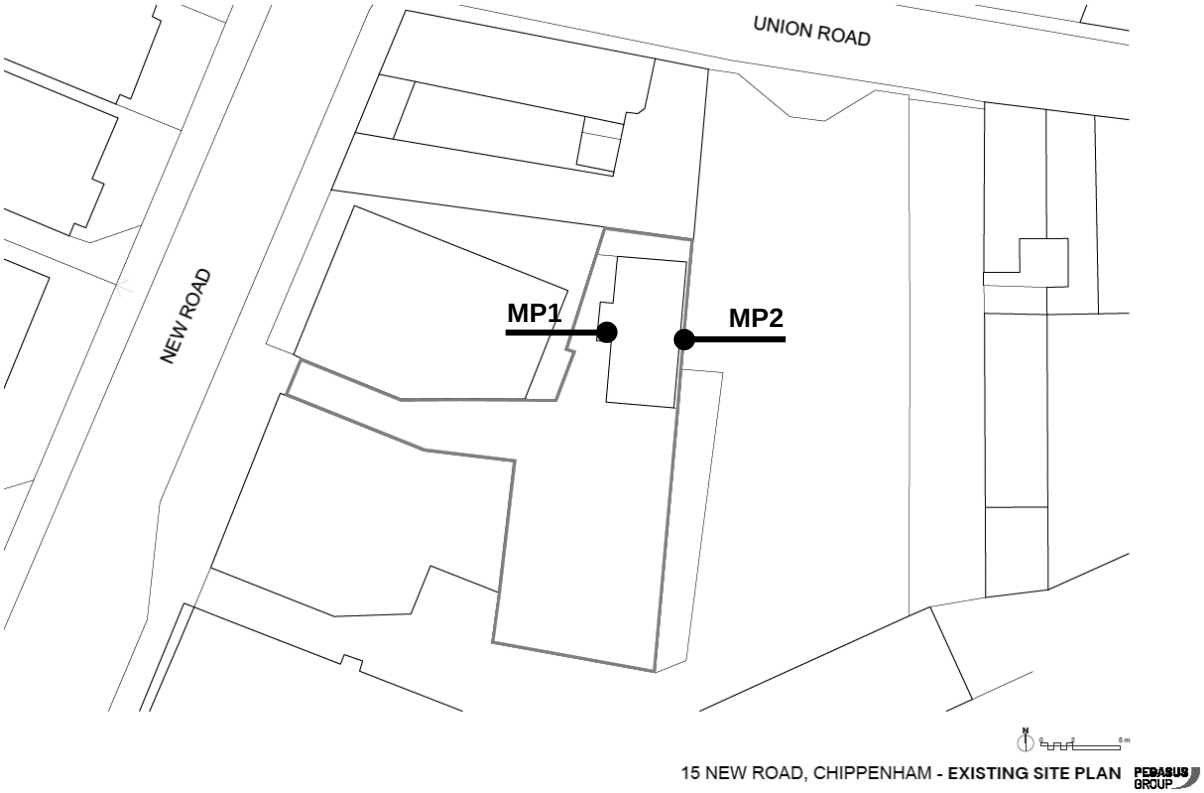


Image taken from *Pegasus Group* existing site plan

5.0 Assessment

Overview

5.1 The assessment has been based on the proposed layout shown in *Pegasus Group* drawing number P23-0244_DE_301 dated April 2023. The provided layout is set out later in this section, along with the proposed noise mitigation strategies for the scheme.

5.2 The octave band noise levels measured at each position were used to calculate internal noise levels within the proposed building.

5.3 It has been assumed that the façades of the existing building consists of two layers of 100 mm blockwork with a cavity of 50 mm and inner plasterboard lining. The roof is assumed to be slated with a suspended plasterboard ceiling below and at least 100 mm glass fibre thermal insulation in the cavity.

5.4 If the existing constructions differ from this or alternatives are preferred, Suono must be consulted to verify that existing or proposed constructions offer the required sound insulation performances.

5.5 To provide a suitably robust mitigation strategy, penalties of +9 dB for the daytime and +12 dB for the night time have been applied for impulsivity and intermittency where relevant in line with BS 4142:2014+A1:2019[4] to noise emissions from the nearby industrial and commercial activity. Details on BS 4142 can be found in **Appendix B**.

[4] BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound

5.6 At the time of writing, a ventilation strategy had not been confirmed. Two mitigation strategies have therefore been presented in the following section; a strategy with a ventilation system incorporating passive through wall trickle ventilators, and a strategy with a fully mechanical ventilation system (MVHR[5]).

5.7 The types of glazing stated in **Table 3** have been used in calculations and are referred to in the following section. Where an indicative configuration or product is suggested, alternatives can be employed, so long as they perform to an equal or better performance than the octave band specification stated.

Table 3 Acoustic performance of glazing elements, dB

Code	**Typical Construction**	**Index**	**Minimum Apparent Sound Reduction Index, dB at Octave Band Centred Frequency, Hz**					
			125	**250**	**500**	**1k**	**2k**	**4k**
Glazing G1	10 mm glass, 16 mm air gap, 9.1 mm acoustically laminate glass	*R*’	29	33	44	46	49	57
Glazing G2	10 mm glass, 12 mm air gap, 6 mm glass	*R*’	25	27	34	40	38	46
Glazing G3	8.8 mm acoustically laminate glass, 16 mm air gap, 12.8 mm acoustically laminate glass	*R*’	26	36	46	50	52	63

5.8 Typical glazing configurations are quoted for guidance only and alternatives may be utilised, in any case the acoustic performance of the system proposed must be demonstrated to the satisfaction of Suono. The sound reduction performances quoted above must be achieved by the glazing systems taken as a whole, in their installed condition.

5.9 The performance specifications therefore apply to the glazing, frames and all seals on any openable parts of the systems and any required ventilation or condensation control mechanisms. This list is not exhaustive: no part of the glazing system shall cause the above figures not to be achieved. The glazing supplier should be expected to prove that the above sound reduction figures can be achieved by the system being proposed.

5.10 Where there is no specific glazing requirement identified in **Image 3** and **Image 4** below, it will be acceptable to use standard thermal double glazing (expected to offer single figure sound reduction performance of circa R'_w 30 dB).

5.11 The passive through wall trickle ventilators detailed in **Table 4** have been used in the calculations and are referred to within the section below.

[5] MVHR – Mechanical Ventilation and Heat Recovery

Table 4 Acoustic performance of trickle ventilator elements, dB

Code	Typical Construction	Index	Minimum Apparent Sound Reduction Index, dB At Octave Band Centred Frequency, Hz					
			125	250	500	1k	2k	4k
Vent V1	*Glidevale* Fresh 80 dB	$D_{n,e}$	29	33	44	46	49	57
Vent V2	*Greenwood* MA3051	$D_{n,e}$	47	46	49	56	66	61

5.12 Noise intrusion calculations have included the effects of up to three trickle ventilators to living rooms and two to bedroom areas (noting that fewer would be acceptable with regards to noise). The ventilation strategy should be confirmed as acceptable by a suitably qualified party, in relation to the requirements of Approved Document F of the Building Regulations.

5.13 The above $D_{n,e}$ values relate to the performance of a single vent in its "open" position, based on its area, standardised to an absorption area of 10 m^2 . Therefore, the figure is higher than the actual insertion loss that will be provided by the ventilator, as it is dependent on the area of the vent. The $D_{n,e}$ figure is only therefore useful in specifying the product against a given $D_{n,e}$ requirement.

5.14 The ventilator examples set out in the table above are through wall products; these are provided as examples only and other through-frame or wall configurations may be acceptable, providing the minimum octave band performance requirements are met. The ventilator product supplier should be expected to demonstrate that the above sound reduction figures can be achieved by the system being proposed (in an open position).

Mitigation Strategies

MVHR ventilation strategy

5.15 The glazing types shown in **Image 3** below are required if an MVHR ventilation system is used.

Image 3: Glazing requirements if MVHR is to be adopted:

Glazing G1: 10 mm glass, 16 mm air gap, 9.1 mm acoustically laminate glass
Glazing G2: 10 mm glass, 12 mm air gap, 6 mm glass



Image taken from *Pegasus Group* drawing P23-0244_DE_301

5.16 If a mechanical ventilation system is to be adopted as part of the ventilation strategy, the mechanical ventilation system should utilise continuously operating fans – with a user operated setting, where possible, to allow an increased ventilation rate when desired.

5.17 External noise emissions from the mechanical ventilation system should ideally be limited to 30 dB $L_{Ar,Tr}$ at 3 m (when running at normal operation duty) from each termination to avoid disturbance to the property they are serving and to immediate neighbours.

5.18 The mechanical ventilation system should be designed to achieve noise levels inside of no more than NR 20 in bedrooms and NR 25 in all other habitable rooms under background ventilation mode. These limits do not apply to kitchen extract equipment.

Ventilation strategy utilising passive trickle ventilators

5.19 The glazing and ventilator types shown in **Image 4** below are required if trickle ventilators are to be used in the ventilation strategy.

Image 4: Glazing and ventilator requirements if trickle vents are to be used

Glazing G2 / Vent V1: 10 mm glass, 12 mm air gap, 6 mm glass / *Glidevale* Fresh 80 dB

Glazing G3 / Vent V2: 8.8 mm acoustically laminate glass, 16 mm air gap, 12.8 mm acoustically laminate glass / *Greenwood* MA3051



Image taken from *Pegasus Group* drawing P23-0244_DE_301

6.0 Conclusions

6.1 It is proposed that an existing office building at 15 New Road, Chippenham be converted for residential use.

6.2 Suono have undertaken a noise survey on site to quantify the noise climate. This has formed the basis of a noise assessment, in which two different mitigation options have been explored to achieve noise criteria set by national planning policy and guidance.

6.3 Within Section 5.0, this report sets out details of the glazing and ventilation related measures required to control noise intrusion for the scheme to ensure suitable internal noise conditions for its future occupants.

Appendix A: Noise Survey

Details of unattended noise survey

Methodology and Equipment

An unattended noise survey was conducted on site between 16:30 on Monday 22nd May and 13:30 on Wednesday 24th May 2023. The survey works were undertaken to quantify noise levels incident on the façades of the existing building.

Noise measurements were taken at two positions which are indicated in **Image A1** below and described in **Table 5**.

Image A1: Location of noise measurement positions

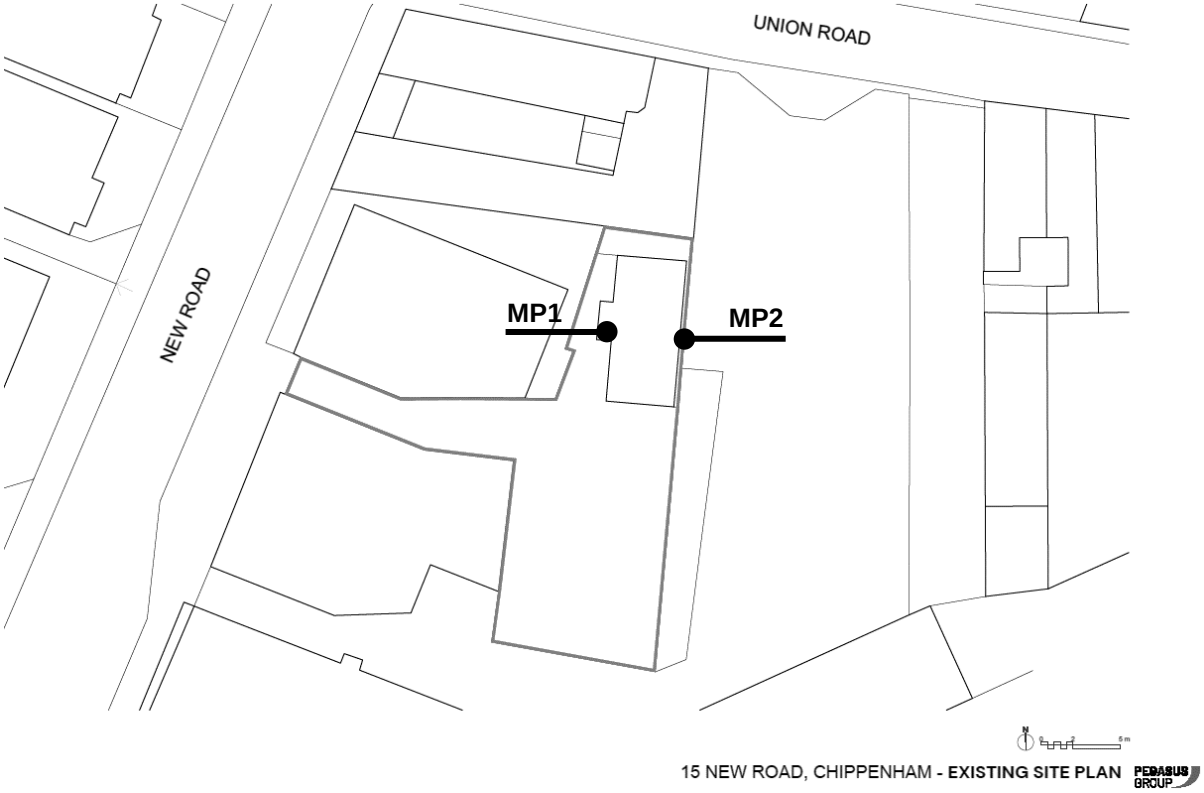


Image taken from *Pegasus Group* existing site plan

Table 5 Measurement locations

Location	Detail
MP1	Microphone at approximately 4 m above local ground level, at 1 m from the existing façade. Measurements were unattended. The noise climate was affected by noise from New Road and the Domino's pizza restaurant including delivery noise and mechanical services noise.
MP2	Microphone at 4 m above local ground level, at 1 m from the existing façade. Measurements were unattended. The noise climate was contributed to by local road traffic noise and industrial activity to the rear of the site.

Noise measurements were made using the equipment set out within the following table. The unattended sound level meters were fitted within weatherproof enclosures, and both meters were calibrated before and after the survey to confirm an acceptable level of accuracy. No significant drift was noted to have occurred.

Table 6 Measurement equipment

Location	Item	Detail
MP1 and MP2	Sound level analyser	Svantek 971A
	Outdoor microphone kit	Svantek SA 271A
	Acoustic calibrator	Svantek SV33B

Measurements of the L_{Aeq}, L_{Amax} and L_{A90} indices were recorded over consecutive 1-minute periods for the duration of the unattended survey.

The weather on setup and collection was clear and warm with a light breeze. Publicly available weather data[6] suggests that conditions were suitable for the duration of the survey works.

Results of the measurements at both positions are summarised in **Table 7** and **Table 8** and are shown in the time history plots below.

Table 7 Summary day and night noise levels at positions MP1 and MP2, dB

Period	Noise Level, dB(A)	
	MP1	MP2
07:00-23:00 Day, $L_{Aeq,16hours}$	57	49
23:00-07:00 Night, $L_{Aeq,8hours}$	51	48
23:00-07:00 Night, $L_{Amax,F}$[7]	71	70

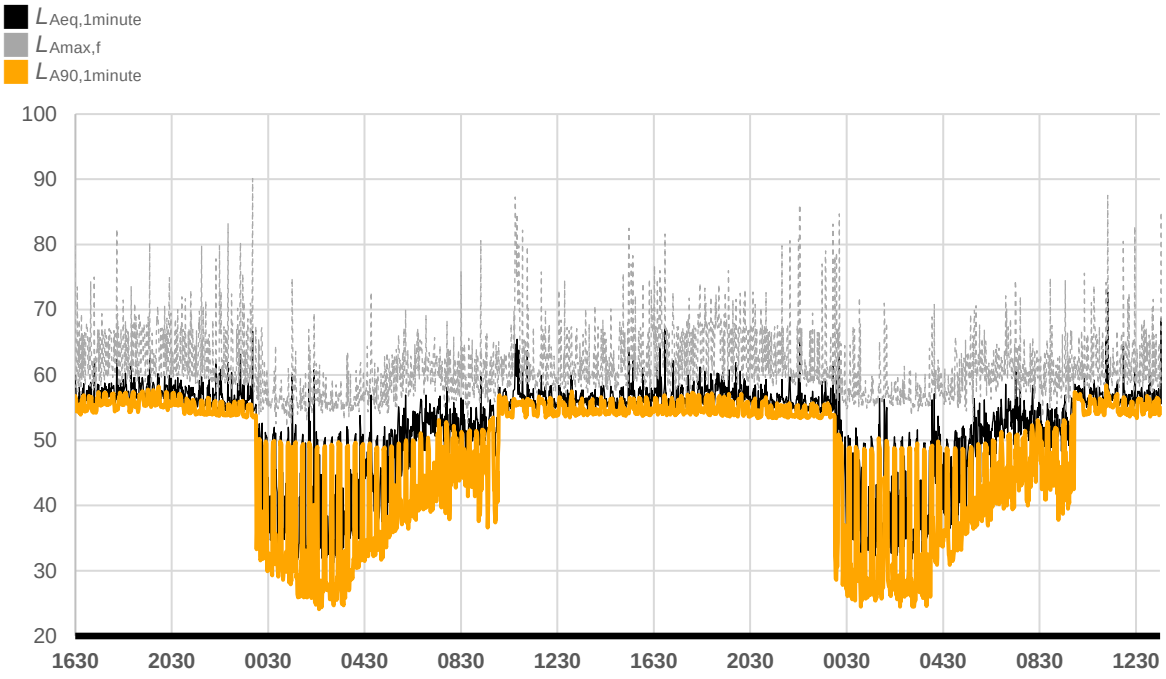
[6] Based on data Weather Underground Station ICHIPPEN21. Suono have no responsibility for the reliability or accuracy of this data.

[7] Based on 10th highest magnitude $L_{Amax,F}$ figure, considering 1-minute data during each of the night times of the survey.

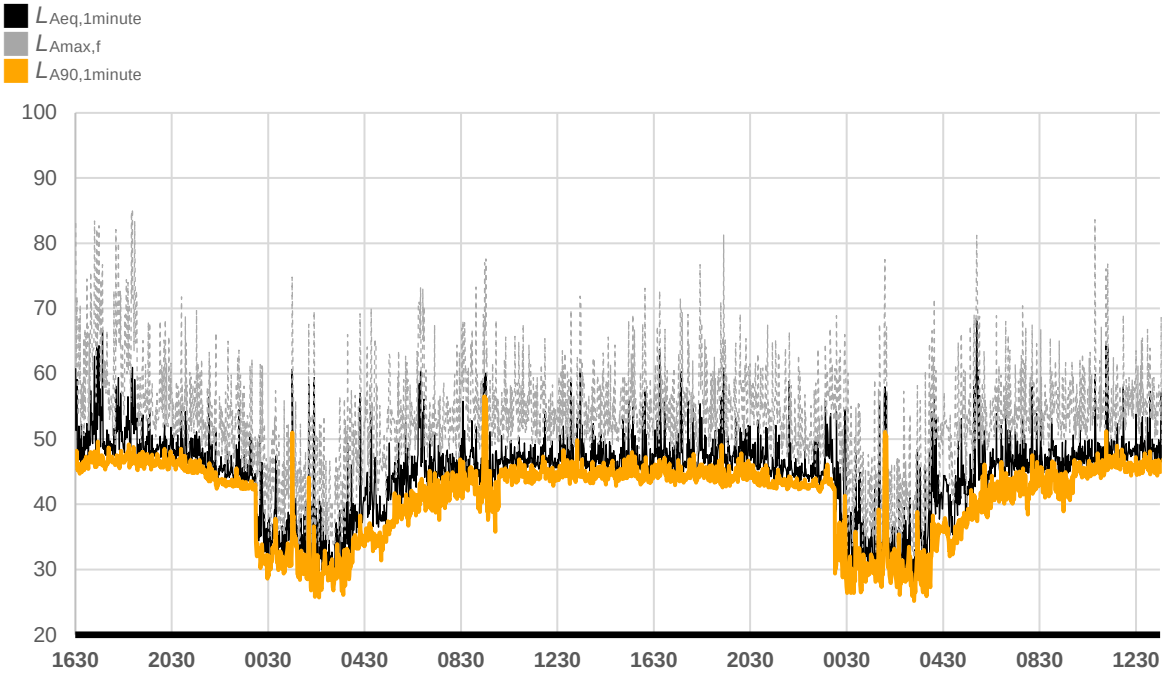
Table 8 Highest one hour day and 15-minute night noise levels at positions MP1 and MP2, dB.

Period	Measurement Location	
	MP1	**MP2**
07:00-23:00 Day, $L_{Ar,1hour}$	58	56
23:00-07:00 Night, $L_{Ar,15\ minutes}$	58	52

Noise Measurement Results at Location MP1



Noise Measurement Results at Location MP1



Appendix B: Planning Policy and Guidance

Local Authority Policy

Wiltshire Council sets policy on noise within their Core Strategy which was adopted in January 2015.

Core Policy 57, Ensuring High Quality design and Place Shaping, of the Cire Strategy document states the following:

> *"A high standard of design is required in all new developments, including extensions, alterations, and changes of use of existing buildings. ... Applications for new development must be accompanied by appropriate information to demonstrate how the proposal will make a positive contribution to the character of Wiltshire through:*
>
> *…*
> *vii. having regard to the compatibility of adjoining buildings and uses, the impact on the amenities of existing occupants, and ensuring that appropriate levels of amenity are achievable within the development itself, including the consideration of privacy, overshadowing, vibration, and pollution (e.g. light intrusion, noise, smoke, fumes, effluent, waste or litter)*
> *…"*

National planning policy and guidance detailed below have been used to set noise limits to achieve a suitable level of amenity within the proposed dwellings.

National Policy

Noise Planning Policy Framework (NPPF)

The NPPF is the relevant document for defining the national policy toward noise sensitive development. The document was originally published in March 2012 and most recently updated in July 2021.

Paragraph 130 states that planning policies and decisions should ensure that developments:

> *"create places that […] promote health and well-being, with a high standard of amenity for existing and future users…"*

Further to this and on the subject of noise, paragraph 174 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 unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution"*

Paragraph 185 of the NPPF states:

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

a) *mitigate and reduce to a minimum potential adverse 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 and amenity value for this reason;"*

Clause "a)" in paragraph 185 makes reference the Noise Policy Statement for England which is discussed in the following section.

The July 2018 edition of NPPF introduced the '*agent of change'* principle in paragraph 187. In terms of noise, this principle requires that those proposing a new noise sensitive development incorporate sufficient mitigation such that the operation of existing premises in the area is not unreasonably restricted in order to control noise impact upon the new development:

"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."

Noise Policy Statement for England (NPSE)

The NPSE (March 2010) also does not set quantitative guidelines for the suitability of noise sensitive development in an area depending on the prevailing levels of noise. Absent, therefore, is reference to specific noise thresholds which determine whether noise sensitive development is suitable and, if so, whether mitigation factors need to be considered.

Instead, the NPSE sets out the principle of "SOAEL, LOAEL and NOEL" which are defined as follows:

Significant Observed Adverse Effect Level (SOAEL): This is the level [of noise exposure[8]] above which significant adverse effects on health and quality of life occur.

Lowest Observed Adverse Effect Level (LOAEL): This is the level [of noise exposure[2]] above which adverse effects on health and quality of life can be detected.

No Observed Effect Level (NOEL): This is the level [of noise exposure[2]] 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.

Given the overall thrust of the NPSE, the SOAEL is an important assessment threshold although the NPSE also comments in section 2.22 that:

"*It is not possible to have a single objective noise based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times.*"

Attention is drawn to the fact that the SOAEL is the level above which significant adverse effects can be observed. Importantly, it should be noted again in respect of the NPPF that the overall

[8] Additional text drawn from the Planning Practice Guidance Definition

objective is to avoid or minimise significant adverse impacts; some degree of impact is acceptable, and it is not necessary or reasonable to seek to achieve no impact at all.

In addition to the principles set out above, the NPSE sets out three key aims:

> The first aim of the Noise Policy Statement for England
>
> *"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."*
>
> The second aim of the Noise Policy Statement for England
>
> *"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."*
>
> The third aim of the Noise Policy Statement for England
>
> *"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."*

Paragraph 2.24 of the NPSE states that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life. It also states that this does not mean that such adverse effects cannot occur.

Each development site must be judged on its ability to deliver on each of these aims, and while rating the prevailing noise against predefined thresholds is no longer necessary, defining the prevailing noise levels is an essential first step in assessing a given site under the current regime.

Planning Practice Guidance (PPG)

In March 2014 the Department for Communities and Local Government (DCLG) launched the national Planning Practice Guidance (PPG) web-based resource. The PPG on Noise (last updated in July 2019) expands upon the NPPF and NPSE and sets out more detailed guidance on noise assessment.

Like the NPPF and NPSE, the guidance does not include any specific noise levels but sets out further principles that should underpin an assessment. The PPG includes a section on noise, paragraph 003 of which states:

> *"Plan-making and decision making need to take account of the acoustic environment and in doing so consider:*
>
> *- whether or not a significant adverse effect is occurring or likely to occur;*
> *- whether or not an adverse effect is occurring or likely to occur; and*
> *- whether or not a good standard of amenity can be achieved."*

It then refers to the NPSE and states that the aim is to identify where the overall effect of the noise exposure falls in relation to the relevant SOAEL, LOAEL and, by inference, the NOEL. Definitions for these thresholds are provided again within the PPG, which differ very slightly in wording to the NPSE, but are taken to be identical in their meaning.

In relation to the SOAEL, LOAEL and NOEL, the PPG makes the following important statement:

“Although the word ‘level’ is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs.”

The guidance then presents a table, which is reproduced in the following table. The implication of the final line of the table is that only the 'present and very disruptive' outcomes are unacceptable and should be prevented. All other outcomes (i.e. all other lines in the table) can be acceptable, depending upon the specific circumstances and factors such as the practicalities of mitigation.

On that basis, noise levels deemed to be below the SOAEL can be considered acceptable providing noise has been mitigated and reduced to a minimum.

Table 9 Planning Practice Guidance summary of noise exposure hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No specific measures required
NOEL - No Observed 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 change in the quality of life.	No Observed Adverse Effect	No specific measures required
LOAEL - 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 or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
SOAEL - 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

It is noteworthy that the PPG states that:

"Noise impacts may be partially offset if residents have access to one or more of:

- a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling;

- a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that result in significant adverse effects;

- 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, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minute walking distance).

Noise Assessment Guidance and Criteria

The ProPG and BS 8233:2014

The Professional Practice Guidance on Planning & Noise – New Residential Development, 2017 (ProPG) was prepared by the Institute of Acoustics, the Chartered Institute of Environmental Health and the Association of Noise Consultants.

In relation to residential development, the ProPG builds on the principles and criteria set out BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings (BS 8233).

While the ProPG is helpful in many ways, it must be noted that the guidance and supplementary documents "*does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy on which users should take their own advice as appropriate*".

Section 2.27 of the ProPG states:

> *"It is considered that suitable guidance on internal noise levels can be found in "BS8233:2014: Guidance on sound insulation and noise reduction for buildings". Table 4 in Section 7.7.2 of the standard suggests indoor ambient noise levels for dwellings (when unoccupied) and states that "in general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values". The standard states (Section 7.7.1) that "occupants are usually more tolerant of noise without a specific character" and only noise without such character is considered in Table 4 of the standard."*

Indeed, ProPG expands on the advice and notes of BS 8233 Table 4, with relevant sections presented in **Table 10** below:

Table 10 BS8233/ProPG internal noise criteria

Activity	**Location**	**Internal Ambient Noise Level**	
		Daytime (0700-2300)	**Night time (2300-0700)**
Resting	Living Room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB $L_{Amax,f}$ (Note 4)

Note 4

> *"… 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

"… 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 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."

With respect to external amenity spaces, ProPG again points to BS 8233 that states:

"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 $L_{Aeq,16hr}$…"

"…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 but should not be prohibited."

The above thresholds (adjust as necessary taking into account the relevant notes) are taken to correspond to LOAELs, when considered in relation to the PPG and NPSE.

The ProPG sets out the principle of the "*Acoustic Design Statement*" (ADS) in which noise is quantified and assessed, and mitigation measures determined in line with the methodology set out therein. The preparation of an ADS is not relevant or appropriate for all sites, however many of the principles are those which would typically be adopted when preparing noise assessment for planning submissions etc.

Features which may be included within an ADS comprise:

- An initial site noise risk assessment;
- A description of external site noise levels before and after mitigation measures;
- Demonstrations of good acoustic design principles;
- Details of how internal noise guidelines will be achieved;
- Assessment of the impact of $L_{Amax,F}$ noise levels where guidelines values are exceeded;

- An aim to achieve internal noise guidelines with windows open where practical, noting this approach will not necessarily be possible. Due consideration should be given to ventilation and thermal comfort with windows closed;

- Acoustic design to achieve good living conditions where internal noise guidelines can only be achieved with windows closed (noting the guidelines are not applicable when windows are open to provide purge ventilation);

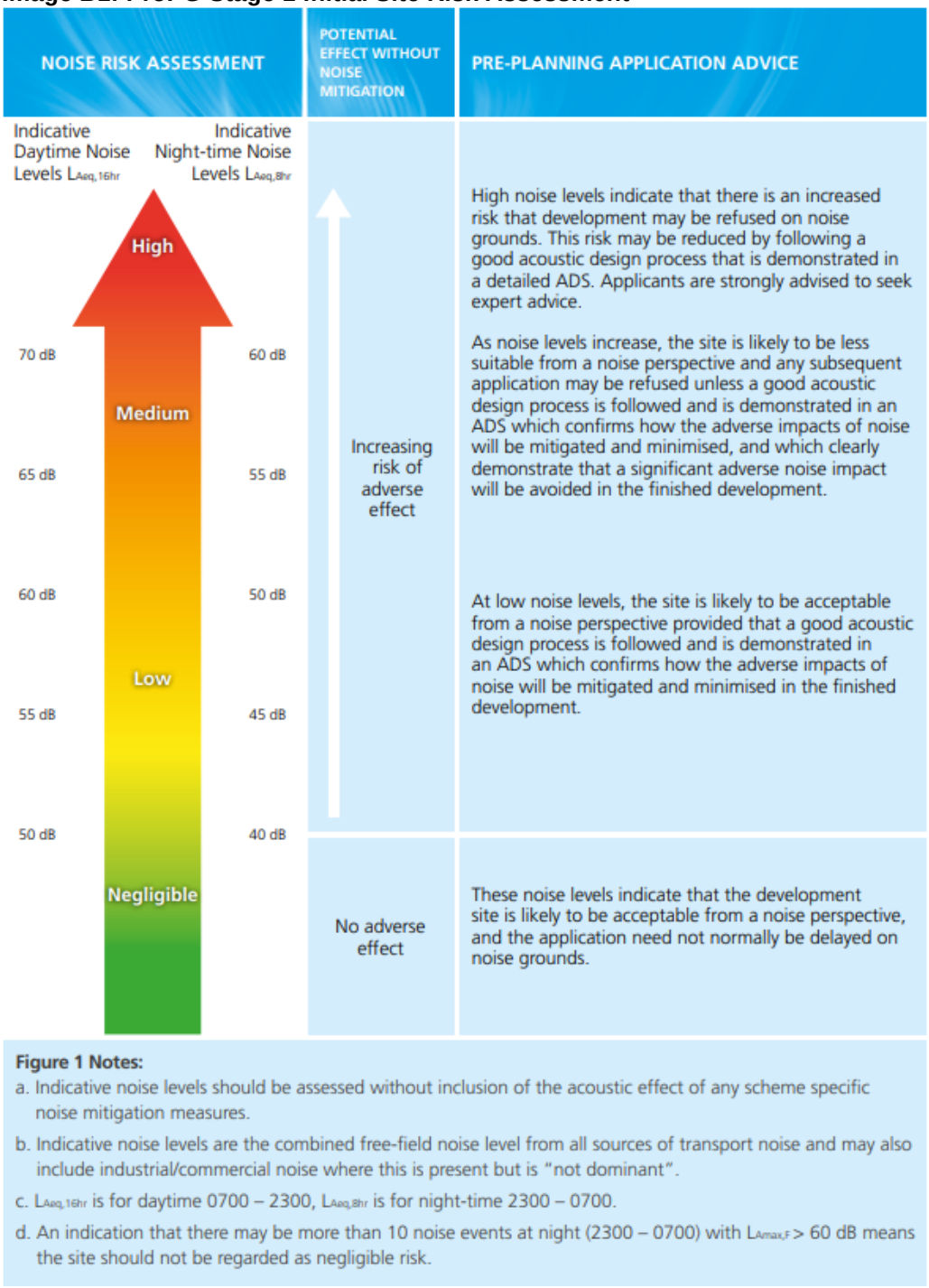
- Information regarding the steps taken to minimise overheating where this is relevant to noise;

- A consideration of noise to external amenity areas;

- A presentation of the findings of the assessment, resulting noise impacts and any mitigation measures that may be required.

With regard to the initial site noise risk assessment, the ProPG sets out the following table. It is important to understand that a site with external noise levels categories as high risk does not mean that site is necessary unsuitable for development. Instead, it means that a good acoustic design process must be followed to ensure suitable conditions are provided to future occupants.

Image B1: ProPG Stage 1 Initial Site Risk Assessment



As neither the ProPG of BS 8233 form statutory guidance or regulations, it falls to the acoustics practitioner (or other similar party) to determine how the documents should be interpreted and how their contents are applied to any given scheme.

Industrial Noise

As there are industrial and commercial noise sources surrounding the site, further guidance on industrial noise should be sought to ensure appropriate criteria are adopted.

British Standard BS 4142

British Standard 4142:2014+A1:2019 (Methods for rating and assessing industrial and commercial sound), an update to BS 4142 and taken to be the correct version to adopt for this assessment, states in section 1.1:

> *"This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:*
>
> *a) sound from industrial and manufacturing processes;*
>
> *b) sound from fixed installations which comprise mechanical and electrical plant and equipment;*
>
> *c)sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and*
>
> *d)sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from fork-lift trucks, or that from train or ship movements on or around an industrial and/or commercial site.*
>
> *The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident."*

The standard states its applications as,

> *"This standard is applicable to the determination of the following levels at outdoor locations:*
>
> *a) rating levels for sources of sound of an industrial and/or commercial nature; and*
> *b) ambient, background and residual sound levels,*
>
> *for the purposes of:*
>
> *1) investigating complaints;*
> *2) assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and*
> *3) assessing sound at proposed new dwellings or premises used for residential purposes."*

BS 4142 sets out a daytime assessment period of 1 hour and night time period of 15 minutes. The assessment methodology requires that a "specific level" from a given noise source is determined considering these time periods.

The rating level of noise, $L_{Ar,\,Tr}$, for the relevant assessment period is the calculated noise level at the nearest receiver location, adjusted to take into account the acoustic characteristic of the noise. Acoustic feature corrections can be made to account for tonality, impulsivity, intermittency and other characteristics present in the resultant sound at the receiver position.

The magnitude or appropriateness of any correction will depend both on the type of noise source and the context in which it is perceived. Similarly, in accordance with BS 4142, the period of time for

which an individual noise source is active during the relevant reference time period will also be considered in establishing the rating level.

It is also necessary to consider the existing noise climate and what sound sources contribute to it. For example, where a noise generating activity is proposed adjacent to an existing similar noise generating site, the impact of the new noise source would be less than if it were to be planned in a location where its character and type is different to and more noticeable than any existing noise source nearby.

Section 9.2 of BS 4142 details the 'Subjective method' of applying character corrections. Corrections to apply are discussed within this section and reproduced below:

> ***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.*
>
> *NOTE 2 If characteristics likely to affect perception and response are present in the specific sound, within the same reference period, then the applicable corrections ought normally to be added arithmetically. However, if any single feature is dominant to the exclusion of the others then it might be appropriate to apply a reduced or even zero correction for the minor characteristics.*
>
> ***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. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. 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, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.*

Once the rating level at each receptor has been calculated, it is then necessary to determine the significance of the industrial/commercial sound source. Reference can be made to the following commentary in BS 4142:

> *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."*

It then goes on to suggest that an initial assessment of the impact can be undertaken as follows:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9), and consider the following."

However, it is also pertinent to note that in the context of building new sensitivities near to an industrial/commercial source, section 8.5 of BS 4142 states that:

"Where a new noise-sensitive receptor is introduced and there is extant industrial and/or commercial sound, it ought to be recognized that the industrial and/or commercial sound forms a component of the acoustic environment. In such circumstances other guidance and criteria in addition to or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of required noise mitigation."

In section 11 of the BS 4142, it states that where the initial estimate of the impact needs to be modified due to the context, all relevant factors should be taken into consideration, including the following:

... 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:

i) Façade treatment;"

Where a given impact affects internal noise conditions it may be appropriate to install mitigation in the form of façade insulation treatment and alternative ventilation. To establish the required performance of this mitigation, it is necessary to consider the absolute internal noise contributions from the industrial source.

In line with section 8.5 of BS 4142, guidance from BS 8233 is appropriate for consideration in the context of this site. It provides the basis for appropriate criteria for absolute noise levels from industrial noise within dwellings. Section 7.71 of BS 8233 (which precedes table 4 of the standard that sets out internal noise criteria for dwellings) states the following:

"This subclause applies to external noise as it affects the internal acoustic environment from sources without a specific character, previously termed "anonymous noise". Occupants are usually more tolerant of noise without a specific character than, for example, that from neighbours which can trigger complex emotional reactions. For simplicity, only noise without character is considered in Table 4 [setting out internal ambient noise levels for dwelling]. For dwellings, the main considerations are:

a) for bedrooms, the acoustic effect on sleep; and

b) for other rooms, the acoustic effect on resting, listening and communicating.

NOTE Noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate."

The guidance above, in particular the last paragraph, makes it clear that noise which has a specific character may require lower noise criteria than proposed for anonymous steady noise sources. Applying the acoustic character corrections set out in BS 4142 to industrial noise when considering its effects to habitable areas within dwellings and treating the criteria set out in BS 4142 as 1-hour and 15-minute rating levels for day and night time periods respectively effectively applies lower noise limits in line with BS 8233.

Paragraph 6.5.2 of BS 8233 states the following for residential developments in areas affected by industrial noise (this principle is also set out in section 2.43 of the ProPG):

> *"Where industrial noise affects residential or mixed residential areas, the methods for rating the noise in BS 4142 should be applied. BS 4142 describes methods for determining, at the outside of a building:*
>
> *a) noise levels from factories, industrial premises or fixed installations, or sources of an industrial nature in commercial premises; and*
>
> *b) background noise level."*

The quote above is explicit in stating that the methods for rating the noise in BS 4142 should be applied (i.e. deriving a rating level, L_{Ar}) and reinforces the approach set out above. It does not state that a full BS 4142 'assessment' should be conducted. The reference to the background noise level relates only to a statement of the scope of BS 4142.

BS 4142 acknowledges the use of façade insulation treatment (and associated appropriate ventilation) as mitigation. In terms of ventilation, it notes that such mechanisms should be provided to reduce the need to have windows open, but it does not state that windows must be kept closed. This principle is in line with BS 8233 guidance where assessment should be considered with windows closed, but background ventilation provided.

BS 8233 directly states that BS 4142 can be used to establish the rating level from a commercial noise source. Through BS 4142, the character of the noise can be taken into account when considering noise from industrial sources to new noise sensitivity and it is not necessary to alter the numerical limits set out within BS 8233. The only change needed is to use a suitable assessment period, taken to be 1 hour during the day time and 15 minutes at night, as referenced in both BS 8233 and BS 4142.

Following on from the above and providing further commentary with regard to how noise from an industrial source should be considered, the ProPG states:

> *"great care should be taken when considering using the noise level guidelines in Figure 2 in circumstances where industrial and/or commercial noise is present but "not dominant". Issues that may arise include:*
>
> *• Are there particular acoustic features (tones, impulses etc.) in the industrial and/or commercial noise that may increase its effect compared to sounds without such features? Are there any non-acoustic features that may also have an effect?*
>
> *• Will the time averaging over the 16 hour day or 8 hour night intervals used in Figure 2 lead to underestimation of the impacts of industrial and/or commercial noise that may occur for shorter but still substantial periods at a higher level?*
>
> *Professional judgement will have to be exercised in addressing these sorts of issues. One possible approach may be to apply BS4142:2014 character corrections to the noise level guideline values in order to derive suitable effect thresholds and/ or mitigation design targets and to use the same reference time periods recommended in the standard.*
>
> *It should also be noted that the presence of industrial and/or commercial noise on the site, even if it is "not dominant", may also raise wider issues that should be addressed under the other elements of Stage 2."*

Taking into account the above, the following assessment criteria apply when considering noise from industrial sources to habitable spaces within **new** noise sensitivities:

Table 11 Internal noise criteria for new dwellings when considering industrial noise sources

Activity	**Location**	**Internal Ambient Noise Level**	
		Daytime (0700-2300)	**Night time (2300-0700)**
Resting	Living Room	35 dB $L_{Ar,1hour}$	-
Dining	Dining room / area	40 dB $L_{Ar,1hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Ar,1hour}$	30 dB $L_{Ar,15minutes}$

Following from the above and drawing on the same assessment basis, in particular that set out in section 6.5.2 of BS 8233, the same approach has also been taken with respect to noise in external amenity areas potential affected by industrial noise. This gives rise to an upper target of 55 dB $L_{Ar,1hour}$ in external amenity spaces.

It is noteworthy that the approach described in the preceding section is in general accordance with recommendations within the '*BS 4142:2014+A1:2019 Technical Note'* (March 2020, Version 1.0) produced by the *Association of Noise Consultants Good Practice Working Group*.