



Defence Infrastructure Organisation

LAND AT SLING ROAD, BULFORD

Environmental Noise Assessment





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CONTENTS

1	INTRODUCTION	1
1.1	SITE LOCATION AND SETTING	1
1.2	PROPOSED DEVELOPMENT	1
2	PLANNING CONDITIONS AND ASSESSMENT CRITERIA	2
2.1	NATIONAL PLANNING POLICY FRAMEWORK (NPPF) (2024)	2
2.2	PROFESSIONAL PLANNING GUIDANCE (PROPG): PLANNING & NOISE (IOA, ANC & CIEH, 2017)	3
2.3	BS 8233:2014 GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS (BS 8233)	5
2.4	WORLD HEALTH ORGANISATION (WHO):1999: GUIDELINES FOR COMMUNITY NOISE	5
2.5	APPROVED DOCUMENT O: OVERHEATING (AD-O), 2021	6
3	BASELINE NOISE MONITORING	7
3.1	OVERVIEW	7
3.2	MEASUREMENT LOCATIONS	7
3.3	METEOROLOGICAL CONDITIONS	8
3.4	MEASUREMENT EQUIPMENT	8
3.5	MEASUREMENT RESULTS	8
4	NOISE ASSESSMENT AND RECOMMENDED MITIGATION	10
4.1	SITE SUITABILITY FOR RESIDENTIAL DEVELOPMENT	10
4.2	EXTERNAL NOISE LEVELS IN OUTDOOR LIVING AREAS	10
4.3	INTERNAL NOISE LEVELS IN HABITABLE ROOMS	10
4.4	ASSESSMENT IN ACCORDANCE WITH AD-O CRITERIA	12
5	CONCLUSIONS	13

TABLES

Table 2-1 - Summary of internal ambient noise levels to be achieved in habitable rooms when assessed in accordance with BS 8233	5
Table 2-2 - Typical threshold levels for simplified and dynamic thermal modelling for AD-O	6
Table 3-1 – Noise measurement equipment	8
Table 3-2 – Summary of unattended continuous noise measurements	8
Table 4-1 - Octave band sound performance values for typical façade components, dB	11
Table 4-2 – Required Improvement to Ventilator Performance	11

APPENDICES

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

APPENDIX B

RED LINE BOUNDARY AND INDICATIVE LAYOUT

APPENDIX C

LIMITATIONS

1 INTRODUCTION

WSP UK Limited has been appointed by Defence Infrastructure Organisation (DIO) to undertake a noise assessment for the proposed residential properties designated as the service families accommodation at a parcel of land to the north of Bulford Camp in Salisbury.

The environmental noise assessment considers the suitability of the proposals in terms of the prevailing local noise environment on the proposed residential properties. To inform the assessment an environmental baseline noise survey has been conducted to establish the prevailing acoustic environment representative of the site. The results of the baseline noise survey have been assessed in accordance with applicable standards and guidance. Where appropriate, consideration has been given to noise mitigation measures to demonstrate how future residents can be protected against the prevailing and future noise environment and to achieve the required standards.

This report is necessarily technical in nature, so to assist the reader a glossary of acoustic terminology is contained in **Appendix A**.

1.1 SITE LOCATION AND SETTING

The site is located just north of Bulford Camp and comprises an open field, situated to the east of Sling Road. Sling Road is accessed via Sheepbridge Road which runs east to west approximately 135 m to the north of the site. The site is bound by existing residential dwellings to the north, and open land to the east, south and west. The desktop review of the satellite imagery has also revealed a number of firing ranges situated over 1 km to the north-east of the site.

1.2 PROPOSED DEVELOPMENT

The proposed development would consist of eight residential dwellings-houses for the military families. The red line boundary and an indicative site layout for the proposed development are presented in **Appendix B**.

2 PLANNING CONDITIONS AND ASSESSMENT CRITERIA

2.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF) (2024)

First published in 2012 and most recently updated in December 2024, the National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. Noise is referenced within the document as follows below.

Paragraph 187 states:

"Planning policies and decisions should contribute to and enhance the natural and local environment by: ...

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

Paragraph 198 states:

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

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development - and avoid noise giving rise to significant adverse impacts on health and the quality of life⁷²;

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".

Paragraph 200 states:

"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".

Reference number 72 within Paragraph 198(a) of the NPPF points to the Explanatory Note to the Noise Policy Statement for England (NPSE).

2.2 PROFESSIONAL PLANNING GUIDANCE (ProPG): PLANNING & NOISE (IOA, ANC & CIEH, 2017)

The joint Institute of Acoustics (IoA) / Acoustics and Noise Consultants (ANC) / Chartered Institute of Environmental Health (CIEH) publication: Professional Practice Guidance (ProPG) on planning & noise was published in May 2017. This document provides guidance and a recommended approach to managing transportation noise effects on proposed new residential developments within the planning system in England.

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."*

As presented in **Figure 2-1**, the ProPG includes a Figure to assist with the undertaking of initial site risk assessments for Proposed Scheme sites. The Figure provides a scale of daytime and night-time noise levels for negligible, low, medium and high risk categories for application sites with guidance as to how noise levels may need to be mitigated.

ProPG contains further guidance on the criteria provided in BS 8233:2014 (see **Section 2.3**). The ProPG also states that:

"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."

The guidance discusses in detail how the 45 dB L_{Amax,F} value was derived and provides a rationale for adopting the 10th highest L_{AFmax} maximum event level during the night-time period as the 'typical' level.

Figure 2-1: Stage 1 – Initial site noise risk assessment (from ProPG, Figure 1, page 09)

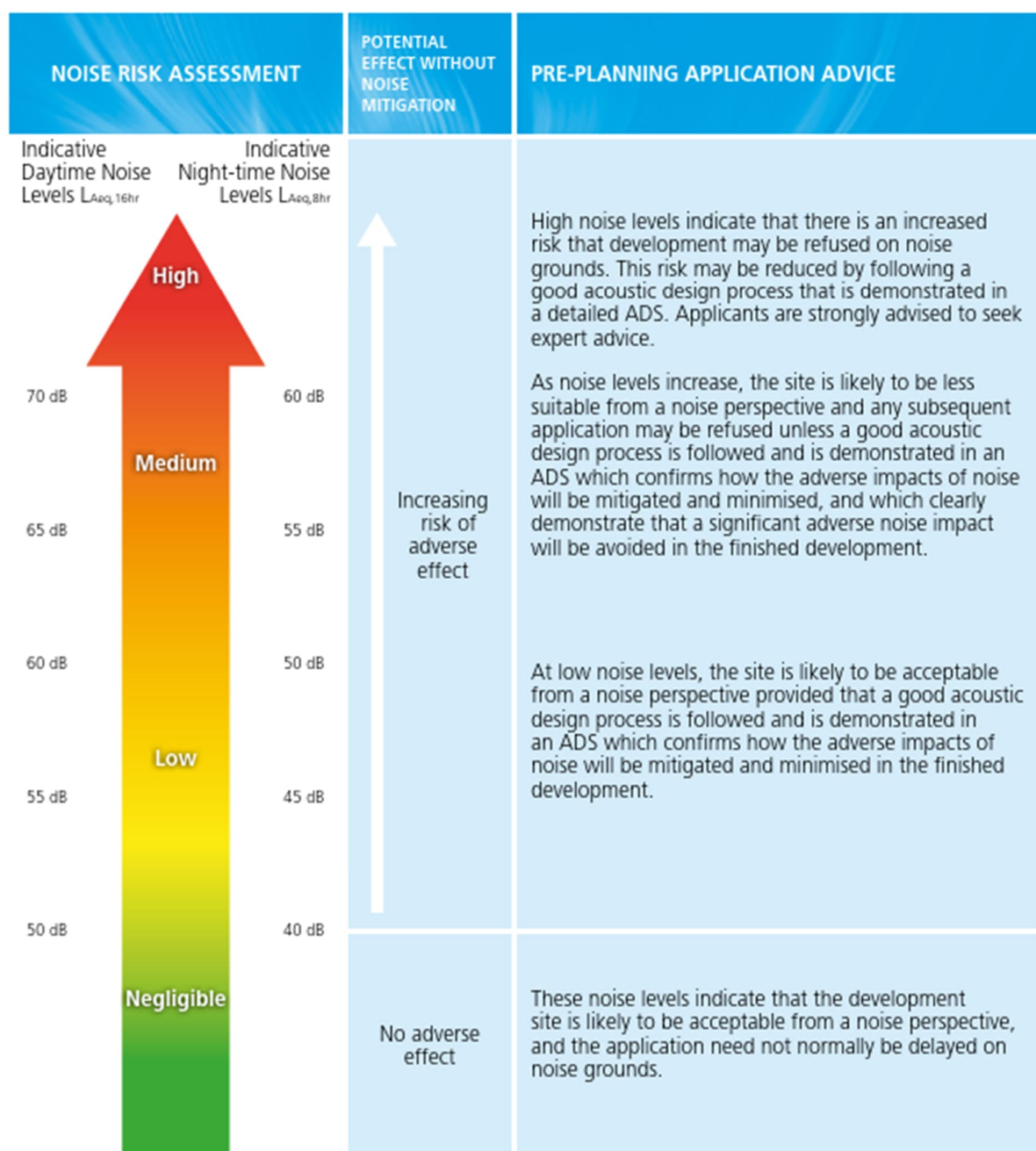


Figure 1 Notes:

- Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.
- Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".
- $L_{Aeq,16hr}$ is for daytime 0700 – 2300, $L_{Aeq,8hr}$ is for night-time 2300 – 0700.
- An indication that there may be more than 10 noise events at night (2300 – 0700) with $L_{Amax,F} > 60$ dB means the site should not be regarded as negligible risk.

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

This standard provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.

The guidance provided includes appropriate internal and external noise level criteria which are applicable to dwellings exposed to steady external noise sources. It is stated that it is desirable that the internal ambient noise level does not exceed the following criteria set out in **Table 2-1**.

Table 2-1 - Summary of internal ambient noise levels to be achieved in habitable rooms when assessed in accordance with BS 8233

Activity	Location	Period	
		Daytime (07:00 to 23:00 Hours)	Night-time (23:00 – 07:00 Hours)
Resting	Living Room	35 dB LAeq, 16 Hour	-
Dining	Dining Room/area	40 dB LAeq, 16 Hour	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq, 16 Hour	30 dB LAeq, 8 Hour

Whilst BS 8233 recognises that a guideline value may also be set in terms of SEL or L_{AFmax} for the assessment of regular individual noise events that can cause sleep disturbance during the night-time, a specific criterion is not stipulated. Notwithstanding the internal guideline values stated within BS 8233, reference has also been made in this assessment to the World Health Organisation (WHO) 1999: *Guidelines for Community Noise*.

With respect to external amenity space such as gardens and patios it is stated that it is desirable that the noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55dB LAeq,T which would be acceptable in noisier environments. It is then confirmed that higher external noise criteria may be appropriate under certain circumstances such as within city centres urban areas, and locations adjoining the strategic network, where it may be necessary to compromise between elevated noise levels and other factors such as convenience of living, and efficient use of land resource.

2.4 WORLD HEALTH ORGANISATION (WHO):1999: GUIDELINES FOR COMMUNITY NOISE

The internal ambient LAeq noise level criteria in BS 8233 is concordant with the guidance contained within the World Health Organisation (WHO) 1999: *Guidelines for Community Noise*. The WHO guidelines also provide guidance on suitable LAmax noise levels during the night-time period. Specifically, it is stated that:

"Indoor guideline values for bedrooms are 30 dB L_{Aeq} for continuous noise and 45 dB L_{Amax} for single sound events."

The L_{AFmax} criteria detailed within this document draws upon guidance from Vallet and Vernet, which states:

"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".

2.5 APPROVED DOCUMENT O: OVERHEATING (AD-O), 2021

AD-O aims to protect the health and welfare of residents from high indoor temperatures. To ensure that any mitigation to avoid overheating is usable, AD-O instructs the overheating designer that *"windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits:*

- a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
- b. 55dB L_{AFmax} , more than 10 times a night (between 11pm and 7am)."

In doing so, AD-O essentially sets these indoor sound levels as the maximum permissible sound levels for noise ingress when the overheating mitigation solution is in use. For example, if the design relies on windows to be open by a certain amount to avoid overheating, the above noise limits would apply with the windows open by that same amount.

The *Approved Document O Noise Guide*¹ recommends following threshold levels above which the simplified AD-O assessment method cannot be used.

Table 2-2 - Typical threshold levels for simplified and dynamic thermal modelling for AD-O

Parameter	Maximum outside sound level
$L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am)	50 dB
L_{AFmax} , more than 10 times a night (between 11pm and 7am)	65 dB

¹ Approved Document O Noise Guide v1.1, November 2024

3 BASELINE NOISE MONITORING

3.1 OVERVIEW

To inform the assessment and determine the current prevailing noise climate across the site, an unattended baseline noise survey has been undertaken between approximately 14:00 hours on the 25th of November and approximately 13:00 hours on the 27th of November 2025.

The noise monitoring has been unattended, however based on the subjective observations of the attending WSP personnel during the deployment and collection of the equipment, the noise environment has been noted to be dominated by the traffic noise from the Sheepbridge Road to the north, as well as the occasional helicopter noise from the military aircrafts and distant shooting from the firing ranges to the north-east of the site. Additional noise sources noted in the area, include birdsong, heavy vehicle noise from the Bulford Camp to the south and animal activity from farm field to the west.

3.2 MEASUREMENT LOCATIONS

The unattended measurement location adopted throughout the survey is shown in **Figure 3-1** and is referred to as UML1. It was located in the green forestry area, approximately 12 m from the northern corner of the field. The microphone was positioned at a height of approximately 1.5 m above ground level and in free-field conditions. This location is considered to be representative of the noise environment at the site and likely to be experienced at the proposed residential development.

Figure 3-2: Noise measurement Location



3.3 METEOROLOGICAL CONDITIONS

Based on our review of the historical weather data (Weather station ID ITIDWO8²), the survey period was generally considered suitable for obtaining representative noise measurements, remaining predominantly dry with light winds. A few hours of rainfall have been noted on the evening of the 26th November 2025. These periods have been reviewed, and any abnormal measurement levels have been excluded from the following assessment.

3.4 MEASUREMENT EQUIPMENT

The baseline noise survey measurements were undertaken using the following equipment set out in **Table 3-1**.

Table 3-1 – Noise measurement equipment

Measurement Location	Equipment	Make and Model	Serial Number
UML1	Sound level meter	01dB-METRAVIB Blue Solo 'Datalogging Integrating Sound Level Meter'	61331
	Pre-amplifier	01dB-METRAVIB PRE 21 S	14575
	Microphone	01dB Metravib MCE 212 Microphone	92344
	Calibrator	Norsonic type 1251 Sound Calibrator	31460

The Type 1 sound level meters has been calibrated to traceable standards within the preceding two years and the portable calibrator within the preceding twelve months. The sound level meter was calibrated both, prior to, and upon completion of the survey and no significant drift was observed.

3.5 MEASUREMENT RESULTS

A summary of the continuous noise levels has been provided in **Table 3-2**.

Table 3-2 – Summary of unattended continuous noise measurements

Date	Period	L _{Aeq,T}	Typical L _{AFmax} ¹
25/11/2025	Daytime (07:00-23:00)	48	-
	Night-time (23:00-07:00)	40	59
26/11/2025	Daytime (07:00-23:00)	57	-
	Night-time (23:00-07:00)	40	61

² The Weather Company. *Weather Underground*. [online] Available at: www.wunderground.com [Accessed: 5 December 2025]

Date	Period	L _{Aeq,T}	Typical L _{AFmax} ¹
27/11/2025	Daytime (07:00-23:00)	48	-

¹ Typical L_{AFmax} noise levels taken as the 10th highest L_{AFmax} during the night-time in accordance with guidance referenced by the WHO.

4 NOISE ASSESSMENT AND RECOMMENDED MITIGATION

4.1 SITE SUITABILITY FOR RESIDENTIAL DEVELOPMENT

Drawing on the results of the baseline noise survey set out in **Table 3-2**, it is considered that the proposed residential properties would be exposed to levels of up to 57 dB $L_{Aeq,16hr}$ during the daytime and up to 40 dB $L_{Aeq,8hr}$ and 70 dB L_{AFmax} during the night-time.

When considered against the Initial Site Noise Risk Assessment from the ProPG Stage 1 assessment it can be seen that the daytime and night-time noise levels at the site lie within the 'low' noise risk category. This indicates the site is likely to be acceptable from a noise perspective provided that a good acoustic design strategy is followed.

4.2 EXTERNAL NOISE LEVELS IN OUTDOOR LIVING AREAS

The worst-case measured daytime noise levels of 57 of dB $L_{Aeq,16hr}$ is only 2 dBA above the criterion of 55 dB $L_{Aeq,16hr}$ for the outdoor living areas of the proposed residential development and doesn't take into account any screening which is expected to be provided by the future buildings of the proposed residential development and/or localised barriers. As such, the criterion of 55 dB $L_{Aeq,16hr}$ for the outdoor living areas should be comfortably met in all of outdoor living areas of the proposed residential development, following the construction of the dwellings.

4.3 INTERNAL NOISE LEVELS IN HABITABLE ROOMS

This section of the assessment identifies the acoustic performance requirements of the building façade components to ensure the adopted criteria are achieved during daytime and night-time periods. These include an internal noise guideline value of 35 dB $L_{Aeq,16hr}$ for living rooms during the daytime and 30 dB $L_{Aeq,8hr}$ for bedrooms during the night. In addition, in accordance with the WHO Guidelines a criterion of 45 dB L_{AFmax} should not normally be exceeded in bedrooms during the night-time period.

A partially open window is assumed to provide up to 13 dB attenuation of external noise. Therefore, to meet the target internal noise levels in habitable rooms, external free-field noise levels should not exceed 48 dB $L_{Aeq,16hr}$ during the day and, 43 dB $L_{Aeq,8hr}$ and 56dB L_{AFmax} at night. Comparison with the results in **Table 3-2** shows that the worst-case anticipated noise levels are above these criteria, therefore further consideration has been given to the mitigation measures to demonstrate that acceptable internal noise criteria for habitable rooms can be achieved in principle.

An initial assessment of external noise ingress and façade sound insulation performance required to achieve the adopted criteria has been carried out adopting the methodology set out in BS 12354-1:2000 *Building acoustics. Estimation of acoustic performance in buildings from the performance of elements. Airborne sound insulation against outdoor sound* (BS 12354). The calculations are based on the following assumptions:

- Typical room dimensions of developments of a similar type, i.e. 3 m width, 4 m depth and 2.5 m in height;
- Maximum glazed area of 40 % of the total façade area (i.e. 3 m²);
- Octave band data based on the measurements undertaken during the baseline noise survey;

- Non-glazed areas of façade to be masonry (brick/block cavity walls) with a minimum sound insulation performance of $R_w + C_{tr}$ 47 dB;
- Reverberation time of 0.5 seconds; and
- Two standard trickle / façade vents are provided to each room to provide background ventilation. Where more than two vents are required the performance of each individual vent increases by 10 Log N, where N is the number of vents. **Table 4-2** provides guidance on the performance of each vent should 1, 2, 3 or 4 be provided.

The assessment indicates that standard thermal double glazing 27 dB $R_w + C_{tr}$ is acceptable in all locations along with acoustically rated façade vents. **Table 4-1** provides a summary of the required vent performances.

Table 4-1 - Octave band sound performance values for typical façade components, dB

Façade Component	Octave Band Centre Frequency Façade Component (Hz)								Single Figure $R_w + C_{tr}$ ¹
	63	125	250	500	1k	2k	4k	8k	
Glazing (R)	16	22	20	26	36	39	31	25	27
Ventilation (D_{ne})	32	32	32	31	33	31	31	31	32

¹ The sound insulation performance of the ventilator is provided in terms of $D_{ne,w} + C_{tr}$

It should be noted that the above glazing construction is provided as an indicative example to demonstrate that the internal noise level criteria can be achieved with due consideration to the specification of appropriate glazing and ventilation. Detailed noise break-in calculations should be undertaken at the detailed design stage to further inform any specification and tender documents, taking into account final room layouts, glazing dimensions, ventilation proposals and final proposed ground levels for the site etc.

The provided window mounted ventilator performances assume the minimum equivalent open area required to meet background ventilation rates in habitable rooms can be achieved with a single window mounted ventilator provided to each window, with a maximum of two ventilators per habitable room. A minimum equivalent area of 2500 mm² is to be provided by the ventilator. Should more ventilators be required to achieve this minimum equivalent area, the stated ventilation performances will need to be increased by the values identified in **Table 4-2** within each octave band.

Table 4-2 – Required Improvement to ventilator performance

Number of vents (n)	n x 1	n x 2	n x 3	n x 4
Required improvement to ventilator performance, dB	+0	+3	+5	+6

For the provision of purge ventilation in accordance with AD-F of the Building Regulations, it is considered acceptable for occupants of the buildings to have the ability to open windows should

they wish to allow a rapid control of temperature during the hottest hours of the day during summer months.

4.4 ASSESSMENT IN ACCORDANCE WITH AD-O CRITERIA

The results of the baseline noise survey have been assessed in accordance with the night-time noise level criteria of AD-O set out in **Table 2-2**. The results indicate that the AD-O criteria for internal first-floor night-time noise levels are likely to be met.

5 CONCLUSIONS

WSP UK Limited has been appointed by Defence Infrastructure Organisation (DIO) to undertake a noise assessment for the proposed residential properties designated as the service families accommodation at the parcel to the north of Bulford Camp in Salisbury.

The assessment has been based upon the results of an unattended, baseline noise monitoring undertaken over two consecutive days. The results of the baseline noise survey have been considered in accordance with the external and internal noise level criteria to ascertain the need for, and degree of, mitigation measures required to protect future occupants of the proposed residential dwellings from the prevailing noise environment.

Outdoor living areas will be protected from the external noise by the proposed residential buildings themselves, and/or screened by localised barriers, as appropriate. The results of the noise monitoring demonstrates that the worst-case measured daytime noise levels are just marginally above the target criterion; thus, with localised mitigation measures in place, the external noise level criterion of 55 dB $L_{Aeq,16hour}$ will be met for all outdoor living areas across the proposed development.

With regard to noise levels within internal habitable spaces, the assessment has demonstrated that appropriate internal noise levels can be achieved at the sensitive areas of the proposed development with standard thermal double glazing and trickle vents.

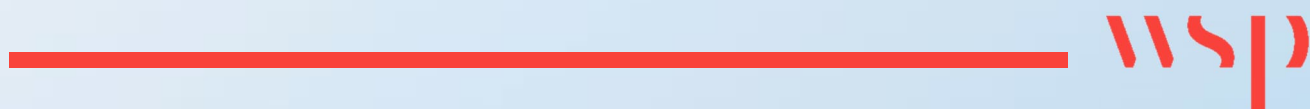
In summary, it has been identified how the amenity of the future residents of the development can be appropriately protected, by means of achieving both internal and external noise level criteria across the development, which are appropriate for residential occupation

The results of the noise monitoring and assessment indicate that the AD-O criteria for internal first-floor night-time noise levels are also likely to be met.

Limitations to this report are presented in **Appendix C**.

Appendix A

GLOSSARY OF ACOUSTIC TERMINOLOGY



NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc, according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels commonly found in the environment is given in the following table.

Table A.1 - Range of sound levels commonly found in the environment

Sound levels	Location
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside factory

Sound levels	Location
100 to 110 dB(A)	Burglar alarm at 1m away
110 to 130 dB(A)	Jet aircraft on take off
140 dB(A)	Threshold of pain

ACOUSTIC TERMINOLOGY

Table A.2 - Acoustic terminology

Terminology	Meaning
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2 \times 10^{-5} \text{Pa}$).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' - weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} and L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time, and the L_{90} is the level exceeded for 90% of the time.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.

Façade Level	A sound field determined at a distance of 1m in front of a large sound reflecting object such as a building façade.
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Appendix B

RED LINE BOUNDARY AND
INDICATIVE LAYOUT





Appendix C

LIMITATIONS





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 WSP UK Limited. WSP UK 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 WSP UK Limited and agree to indemnify WSP UK Limited for any and all loss or damage resulting therefrom. WSP UK 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 WSP UK Limited reserve the right to review the information, reassess any new potential concerns and modify our opinions accordingly.



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