



Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited

29th May 2025

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Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

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This report has been prepared by Hawkins Environmental Limited for the sole purpose of assisting in gaining planning consent for the proposed development described in the introduction of this report.

This report has been prepared by Hawkins Environmental Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This assessment takes into account the prevailing conditions at the time of the report and assesses the impact of the development (if applicable) using data provided to Hawkins Environmental Limited by third parties. The report is designed to assist the developer in refining the designs for the proposed development and to demonstrate to agents of the Local Planning Authority that the proposed development is suited to its location. This should be viewed as a risk assessment and does not infer any guarantee that the site will remain suitable in future, nor that there will not be any complaints either from users of the development or from impacts emanating from the development site itself.

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Table of Contents

1.	INTRODUCTION	6
1.1.	Overview	6
1.2.	The Nature, Measurement and Effect of Noise	7
1.3.	Site Description	8
2.	NATIONAL & LOCAL PLANNING POLICY	10
2.1.	National Planning Policy Framework (2024).....	10
2.2.	Noise Policy Statement for England (2010).....	11
2.3.	Planning Practice Guidance	11
3.	ASSESSMENT METHODOLOGY & GUIDANCE.....	15
3.1.	BS 8233: 2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'	15
3.2.	World Health Organisation Guidelines for Community Noise (1999).....	16
3.3.	WHO Night Noise Guidelines for Europe (2009)	17
3.4.	BS 4142:2014+A1:2019 'Methods for Rating and Assessing Industrial and Commercial Sound'	17
3.5.	BS 4142:2014+A1:2019 Technical Note (2020)	18
3.6.	BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites'	21
3.7.	The Little Red Book of Acoustics (4th ed.) (2024)	23
3.8.	Possible Options for the Identification of SOAELs and LOAELs in Support of the NPSE (2014)	24
3.9.	ProPG: Planning & Noise Professional Practice Guidance (2017)	25
3.10.	Acoustics, Ventilation and Overheating Residential Design Guide (2020)	27
3.11.	Approved Document O: Overheating (2021)	30
3.12.	Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O (2022)	31
4.	ENVIRONMENTAL NOISE SURVEY	32
4.1.	Survey Overview	32
4.2.	Noise Survey Results	33
4.3.	Background Sound Levels.....	34
5.	PROPG STAGE 1: INITIAL SITE NOISE RISK ASSESSMENT	38
5.1.	Site Classification - ProPG	38
6.	PROPG STAGE 2: ACOUSTIC DESIGN STATEMENT	39
6.1.	Element #1: Good Acoustic Design Process	39
6.2.	Element #2: Internal Noise Levels	39
6.3.	Element #3: External Amenity Areas	43

6.4.	Element #4: Other Relevant Issues	44
7.	IMPACT OF THE PLANT	45
7.1.	Overview	45
7.2.	Proposed Plant.....	45
7.3.	Specific and Rating Sound Level.....	45
7.4.	Adherence to Sound Criteria	47
8.	CONSTRUCTION NOISE.....	49
8.1.	Construction Plant & Machinery	49
8.2.	Construction Traffic	54
8.3.	Construction Vibration	55
8.4.	Complaints and Incident Procedures.....	56
8.5.	Training	57
9.	OVERALL CONCLUSIONS AND RECOMMENDATIONS	58

List of Appendices

Appendix 1 Glossary of Acoustic Terms	60
Appendix 2 Schedule of Equipment	62
Appendix 3 Summary of Noise Measurements	70
Appendix 4 Manufacturer Fan Data	72
Appendix 5 Full Construction Programme	75

List of Tables

Table 1.1: Typical Noise Levels	8
Table 2.1: Noise Exposure Hierarchy	14
Table 3.1: Summary of Noise Criteria: BS 8233: 2014	15
Table 3.2: Summary of Noise Criteria: WHO	17
Table 3.3: BS 5228 Annex E – The ABC Method Threshold Values	22
Table 3.4: Threshold for Significant Construction Noise Effect at Dwellings.....	22
Table 3.5: Distance at which vibration from typical construction activities may be perceptible	23
Table 3.6: Magnitude of Change in Vibration Levels – Construction Impacts	23
Table 3.3: Possible Value & Ranges of Values for LOAEL & SOAEL.....	25
Table 3.4: Initial Site Risk Assessment and Subsequent Guidance in Relation to the Overheating Condition	29

Table 3.5: External Noise Levels Above Which The Simplified Method Cannot Be Used	31
Table 4.1: Summary of Weather Conditions during the Noise Measurements.....	32
Table 4.2: Summary of the Noise Level Measurements	34
Table 5.1: Initial Site Noise Risk Assessment	38
Table 6.1: Summary of Noise Criteria: BS8233:2014 and ProPG.....	40
Table 6.2: The Simple Calculation Procedure from Annex G of BS 8233: 2014	40
Table 6.3: Internal Noise Levels Assuming a Partially Opened Window.....	42
Table 7.1: Receptor Specific Sound Levels	45
Table 7.2: Subjective Character Corrections.....	46
Table 7.3: Receptor Rating Sound Levels	47
Table 7.4: BS 4142 Assessment - Daytime.....	48
Table 7.5: BS 4142 Assessment - Nighttime.....	48
Table 8.1: Construction Programme	49
Table 8.2: Annex C BS 5228 Construction Noise Source Data – Typical Plant.....	50
Table 8.3: Summary of Cumulative Receptor Noise Levels Based on Plant Noise Calculations	52
Table 9.1: Summary of Recommendations to Achieve Suitable Internal Noise Levels.....	59

List of Figures

Figure 3.1: Initial Site Risk Assessment (from the ProPG).....	26
Figure 4.1: Noise Measurement Location & Proposed Site Plan with Trees to be Removed	33
Figure 4.2: Noise Measurements	35
Figure 4.3: Distribution of Day Time $L_{A90,1\text{hour}}$ Sound Levels	36
Figure 4.4: Distribution of Night Time $L_{A90,15\text{mins}}$ Sound Levels	37
Figure 7.1: Locations of the Sensitive Receptors and Plant.....	46
Figure 8.1: Noise Sensitive Premises Locations.....	51

1. INTRODUCTION

1.1. Overview

Hawkins Environmental Limited has been instructed by Barchester Healthcare Limited to undertake a noise assessment for the redevelopment of land at Oakdale, Lower Wokingham Road, Crowthorne.

On the 26th September 2024, an appeal for the “*Demolition of the existing house and erection of a care home development with en-suite wet rooms in a single block on three levels (use class C2) with associated communal facilities, access, parking and landscaping works.*” was made under section 78 of the Town and Country Planning Act 1990 (as amended) against a refusal to grant planning permission. The decision of the appeal was allowed and planning permission was granted.

As part of the appeal decision (LPA ref. APP/X0360/W/23/3336000), a number of conditions are outlined. This includes Condition 9 that states “*Prior to the commencement of the development, a noise impact assessment together with a timetable for its implementation, shall be submitted to and approved in writing by the local planning authority.*”

The assessment should be suitable to inform the design of the development hereby permitted and will need to address noise impact in terms of:

- i. Existing noise sources and how they may affect the amenity of the occupiers of the site once construction is complete, this is to take into consideration the character of the site and the nearby roads etc, and the impact on the amenity of nearby noise sensitive receptors as a results of the new development, both internal and external spaces, taking into consideration any mechanical noise arising from the use of the proposed development including, but not limited to, kitchen extractor fans.*
- ii. The impact on nearby noise sensitive receptors during the construction phase, to include vehicle movement and plant and machinery being used, as well as construction noise and any mitigation measures.*
- iii. Details of good design to protect occupiers of the proposed development from noise from existing noise sources, glazing and ventilation of the proposed properties will need to be designed to meet acceptable internal and external noise levels.*

The noise assessment should identify a scheme of recommended works, or such other steps as may be necessary to minimise the effects of noise on nearby receptors and on future occupants of the development. The approved noise scheme resulting from the assessment shall be implemented according to the approved timetable, and approved measures, other than those addressing the construction phase shall be retained thereafter.”

Consequently, this assessment considers three areas:

1. The impact of plant noise on surrounding existing properties;
2. The impact of construction noise on surrounding existing properties; and
3. Mitigation requirements to ensure suitable internal noise levels are experienced by the inhabitants of the care home.

The assessment adheres to the principles of Government planning policy in relation to noise, specifically enacted by the *National Planning Policy Framework (NPPF)*, the *National Planning Practice Guidance (NNPPG)* on Noise and the *Noise Policy Statement for England (NPSE)*.

The recommended approach for assessing noise in relation to residential development has been adopted, which is currently the *Professional Practice Guidance on Planning and Noise: New Residential Development* (the “ProPG”), which adopts the criteria contained within *BS 8233: 2014 ‘Guidance on sound insulation and noise reduction for buildings’*. Consideration has also been given to the Association of Noise Consultants’ *Acoustics, Ventilation and Overheating (AVO) Guide*.

All noise measurements were conducted in accordance with *BS 7445-2: 1991 ‘Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use’*.

1.2. The Nature, Measurement and Effect of Noise

Noise is often defined as sound that is undesired by the recipient. Whilst it is impossible to measure nuisance caused by noise directly, it is possible to measure the loudness of that noise. ‘Loudness’ is related to both sound pressure and frequency, both of which can be measured. The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitudes of the numbers involved, a logarithmic scale of decibels (dB) is normally used, based on a reference level of the lowest audible sound.

The response of the human ear is not constant over all frequencies. It is therefore usual to weight the measured frequencies to approximate the human response. The resulting ‘A’ weighted decibel, dB(A), has been shown to correlate closely to the subjective human response.

When related to changes in noise, a change of ten decibels from say 60 dB(A) to 70 dB(A) would represent a doubling in ‘loudness’. Similarly, a decrease in noise from 70 dB(A) to 60 dB(A) would represent a halving in ‘loudness’. A change of 3 dB(A) is generally considered to be just perceptible. **Table 1.1** details typical noise levels. A glossary of acoustic terms can be found in **Appendix 1**.

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Table 1.1: Typical Noise Levels

Approximate Noise Level (dB(A))	Example
0	Limit of hearing
30	Rural area at night
40	Library
50	Quiet office
60	Normal conversation at 1 m
70	In car noise without radio
80	Household vacuum cleaner at 1 m
100	Pneumatic drill at 1 m
120	Threshold of pain

1.3. Site Description

The development site is situated along Lower Wokingham Road in Crowthorne, Wokingham RG45 6BX. The site currently comprises of planted land, hardstanding and a single use-Class C3 dwellinghouse. The proposed scheme will see the demolition of the existing dwellinghouse and the erection of a three storey dwellinghouse (use Class C2) with associated communal facilities, access, parking and landscaping works. A location plan of the proposed site can be seen in **Figure 1.1**.

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Figure 1.1: Site Location Plan

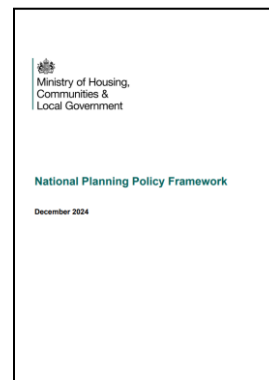


2. NATIONAL & LOCAL PLANNING POLICY

2.1. National Planning Policy Framework (2024)

The National Planning Policy Framework (NPPF) was first published on the 27th March 2012 and revised July 2018, February 2019, July 2021, September 2023, December 2023 with the latest version published in December 2024.

The NPPF outlines the Government's planning policies for England and determines how they should be applied. It provides a framework within which Local Planning Authorities are required to prepare their own locally-prepared plans, where both the policies within the NPPF and the local plan are material planning considerations against which planning decisions are determined. These distinctive local and neighbourhood plans should be interpreted and applied in order to meet the needs and priorities of their communities.



The NPPF notes *"The purpose of the planning system is to contribute to the achievement of sustainable development, including the provision of homes, commercial development, and supporting infrastructure in a sustainable manner"* (Paragraph 7). The NPPF notes sustainable development should be delivered with three main dimensions: economic; social and environmental (Paragraph 8).

The NPPF supports a presumption in favour of development, unless the adverse impacts of that development outweighs the benefits it notes *"that sustainable development is pursued in a positive way, at the heart of the Framework is a presumption in favour of sustainable development"* (Paragraph 10).

The NPPF states that in the planning system *"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 187).

Paragraph 198 of the NPPF talks specifically about noise stating 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 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..."*

Specifically in relation to noise from existing commercial premises, Paragraph 200 of the NPPF notes: *"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".

2.2. Noise Policy Statement for England (2010)

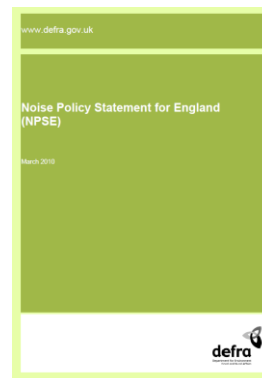
The Noise Policy Statement for England (NPSE) provides further guidance which is relevant to the policies set out in the NPPF and states that: *"Within the context of sustainable development:*

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible contribute to the improvement of health and quality of life."*

NPSE introduces established concepts originally from the field of toxicology that are now being applied to noise impacts. They are:

- **NOEL – No Observed Effect Level** - This is the level of noise 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 of noise 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.

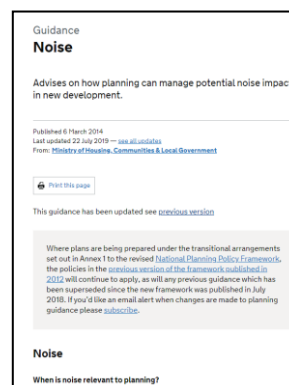
NPSE goes on to state that *"it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*



2.3. Planning Practice Guidance

The Noise Planning Practice Guidance (NPPG) was launched on 6th March 2014 and has undergone regular revision, with the most recent changes to Noise Guidance published in July 2019. NPPG provides additional guidance and interpretation to the Government's strategic policies, outlined within the NPPF, in a web-based resource.

The NNPPG provides more guidance on the assessment of noise for planning purposes and builds on the concepts of NOEL, LOAEL and SOAEL introduced in NPSE to establish whether noise is a factor that needs to be taken into account. It states: *"Local planning authorities' plan-making and decision taking should 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.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation."

However, it goes into more detail about the subjective nature of noise and how the results of any assessment must be treated flexibly and pragmatically. The guidance states: *"The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation. These factors include:*

- *the source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day – this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night;*
- *for a new noise making source, how the noise from it relates to the existing sound environment;*
- *for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise;*
- *the spectral content of the noise (i.e. whether or not the noise contains particular high or low frequency content) and the general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features), and;*
- *the local arrangement of buildings, surfaces and green infrastructure, and the extent to which it reflects or absorbs noise.*

More specific factors to consider when relevant include:

- *the cumulative impacts of more than one source of noise;*
- *whether any adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time (and the effect this may have on living conditions). In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations.*
- *In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur.*
- *Noise Action Plans (where these exist), and, in particular the Important Areas identified through the process associated with the Environmental Noise Directive and corresponding regulations should be taken into account. Defra's website has information on Noise Action Plans and Important Areas. Local*

authority environmental health departments will also be able to provide information about Important Areas.

- the effect of noise on wildlife. Noise can adversely affect wildlife and ecosystems. Particular consideration needs to be given to the potential effects of noisy development on international, national and locally designated sites of importance for biodiversity;*
- where 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.*
- some commercial developments including restaurants, hot food takeaways, night clubs and public houses can have particular impacts, not least because activities are often at their peak in the evening and late at night. Local planning authorities will wish to bear in mind not only the noise that is generated within the premises but also the noise that may be made by customers in the vicinity”.*

Table 2.1 shows examples of the noise hierarchy (adapted from the NPPG) and shows that the aim is to identify where the overall effect of the noise exposure falls in relation to SOAEL, LOAEL and NOEL. The implication of the advice is only noise that is ‘noticeable and very disruptive’ would be considered unacceptable and therefore, should be prevented. The inference, therefore, is that all other outcomes can be acceptable, depending upon the specific circumstances and level of mitigation.

Regarding noise from existing commercial premises, the NPPG provides additional guidance on the “Agent of Change” principle, introduced in the NPPF. The NPPG notes that where existing commercial premises could have a significant adverse effect on residents or users of the proposed scheme “*the applicant (or ‘agent of change’) will need to clearly identify the effects of existing businesses that may cause a nuisance (including noise, but also dust, odours, vibration and other sources of pollution) and the likelihood that they could have a significant adverse effect on new residents/users. In doing so, the agent of change will need to take into account not only the current activities that may cause a nuisance, but also those activities that businesses or other facilities are permitted to carry out, even if they are not occurring at the time of the application being made*”. Consequently, it is important to consider not just what noise the commercial premises currently make, but what they could make.

The NPPG goes on to note that “*The agent of change will also need to define clearly the mitigation being proposed to address any potential significant adverse effects that are identified. Adopting this approach may not prevent all complaints from the new residents/users about noise or other effects, but can help to achieve a satisfactory living or working environment, and help to mitigate the risk of a statutory nuisance being found if the new development is used as designed (for example, keeping windows closed and using alternative ventilation systems when the noise or other effects are occurring).*

It can be helpful for developers to provide information to prospective purchasers or occupants about mitigation measures that have been put in place, to raise awareness and reduce the risk of post-purchase/occupancy complaints”.

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Table 2.1: Noise Exposure Hierarchy

Perception	Examples of outcomes	Increasing effect level	Action		
No Observed Effect Level - NOEL				Low Noise Level	
Not Present	No Effect	No Observed Effect	No specific measures required		
No Observed Adverse Effect Level - NOAEL				Increasing Noise Levels 	
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		
Lowest Observed Adverse Effect Level - LOAEL					
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		
Significant Observed Adverse Effect Level - SOAEL					
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		High Noise Level

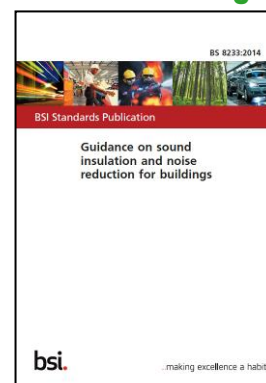
3. ASSESSMENT METHODOLOGY & GUIDANCE

3.1. BS 8233: 2014 ‘Guidance on Sound Insulation and Noise Reduction for Buildings’

Originally published in 1999, the 2014 edition of BS 8233, significantly updates the guidance in light of the policy changes as a result of the advent of the NPPF and the withdrawal of NPPG 24. The 2014 edition of BS 8233 sees a change in the title of the Standard, moving from a ‘Code of Practice’ to ‘Guidance’, as the text ‘largely comprises guidance that does not support claims of compliance’.

BS 8233:2014 indicates that to control external noise ingress into a proposed development, a number of planning stages should occur as follows:

- “Assess the site, identify significant existing and potential noise sources, measure or estimate noise levels, and evaluate layout options.
- Determine design noise levels for spaces in and around the building(s).
- Determine sound insulation of the building envelope, including the ventilation strategy”.



BS 8233:2014 suggests design noise levels for various types of building. The recommended noise levels for dwelling houses, flats and rooms in residential use (when unoccupied) can be seen in **Table 3.1** below. This is replicated from Table 4 of Section 7.7.2 of BS 8233:2014. The guidance suggests that “In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values”. The noise levels in **Table 3.1** are marginally different to those published in BS 8233:1999 ‘Sound insulation and noise reduction for buildings – Code of practice’, but are based on the existing guidance from the current World Health Organisation (WHO) “Guidelines on Community Noise”.

Table 3.1: Summary of Noise Criteria: BS 8233: 2014

Activity	Location	07:00 To 23:00	23:00 To 07:00
Resting	Living room	35 dB L _{Aeq,16hour}	-
Dining	Dining room/area	40 dB L _{Aeq,16hour}	-
Sleeping	Bedroom	35 dB L _{Aeq,16hour}	30 dB L _{Aeq,8hour}

When considering the noise level criteria considered in **Table 3.1**, the following points should be noted:

- BS 8233: 2014 suggests that the above criteria should be adopted flexibly and that “where development is considered necessary or desirable... the internal target level may be relaxed by up to 5 dB and reasonable internal conditions still achieved”.
- The noise levels quoted above are annual averages and “do not need to be achieved in all circumstances” e.g. New Year’s Eve or fireworks night.

- The noise levels in **Table 3.1** are “for steady external noise sources” such as traffic noise or plant noise. This is a departure from the 1999 version of BS 8233, where the recommended internal noise levels were irrespective of the external noise source and therefore included the suggestion that in order to achieve “reasonable” noise levels within bedrooms at night, L_{AFmax} noise levels should not exceed 45 dB. Whilst this has been omitted from the 2014 version of BS 8233, it does state 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. Sporadic noise events could require separate values.” Therefore, at sites which may be affected by individual noise events, it is more appropriate to use the guidance contained within the WHO “Guidelines on Community Noise” which suggest that good sleep will not generally be affected if internal levels of L_{AFmax} 45 dB are not exceeded more than 10-15 times per night.
- BS 8233:2014 notes that if the design of the building is “relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the facade insulation or resulting noise level”.
- BS 8233 provides guidance for noise in gardens and outdoor amenity space. It suggests that “it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments.” The guidance does go on to say that these guideline values are not achievable in all circumstances and in some areas, “such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.”

3.2. World Health Organisation Guidelines for Community Noise (1999)

The 1999 World Health Organisation (WHO) guidance “Guidelines for Community Noise”, provides recommendations on maximum internal and external noise levels in a range of situations. The WHO guidelines are a consequence of a comprehensive review of the scientific evidence in relation to community noise exposure and the health and social aspects of such exposure. Whilst not adopted policy, the recommendations within the WHO Guidelines are often quoted and form the basis of the recommendations within BS 8233 and other similar guidance. A summary of the noise criteria can be seen in **Table 3.2**.

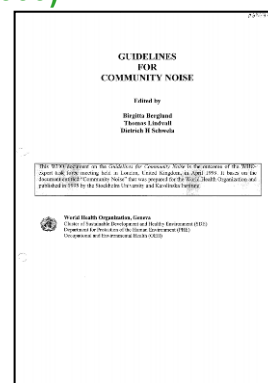
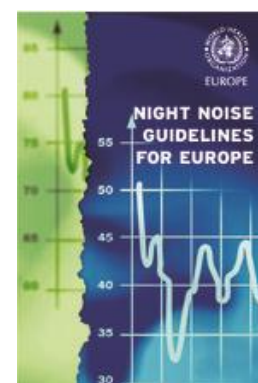


Table 3.2: Summary of Noise Criteria: WHO

Residential Environment	Critical Health Effect	L_{Aeq}	L_{AFmax}	Time Base
Outdoor living area	Serious annoyance, daytime and evening	55	-	07:00-23:00
	Moderate annoyance, daytime and evening	50	-	07:00-23:00
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	-	07:00-23:00
Inside bedrooms	Sleep disturbance, night-time	30	45	23:00-07:00
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	60	23:00-07:00

3.3. WHO Night Noise Guidelines for Europe (2009)

In 2009, the World Health Organisation published the “Night Noise Guidelines for Europe” as a partial update and extension to the “Guidelines for Community Noise”, specifically in relation to development on the scientific evidence of night noise exposure. The 2009 guidance suggests that a “ $L_{night,outside}$ of 40 dB should be the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly”. However, since that target would be impossible to achieve in many situations, a “ $L_{night,outside}$ value of 55 dB is recommended as an interim target for the countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach”.

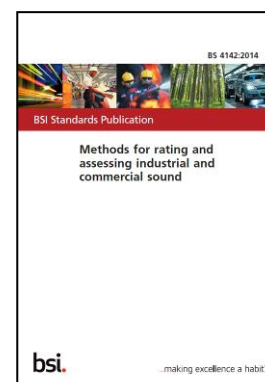


3.4. BS 4142:2014+A1:2019 ‘Methods for Rating and Assessing Industrial and Commercial Sound’

British Standard BS 4142: 2014 +A1:2019 “Methods for rating and assessing industrial and commercial sound” provides a method for the measurement and rating of industrial noise or noise of an industrial nature and background noise levels outside dwellings in mixed residential and industrial areas. The rating level (defined in the BS) is used to rate the industrial noise source outside residential dwellings (this is defined as the “specific noise source”).

The procedure defined in BS 4142 for predicting the likelihood of complaints is based on establishing the difference between the rating level and the background level outside the residential property of interest. The greater the difference the greater the likelihood of complaints and more specifically:

- “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.
- Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.”

The guidance goes on to state that “where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.” Consequently, when considering the impact of a BS 4142 assessment, it is often also necessary to consider the absolute noise levels experienced at the receptor location in relation to BS 8233 and World Health Organisation guidelines.

3.5. BS 4142:2014+A1:2019 Technical Note (2020)

In March 2020, Acoustic and Noise Consultants (the ANC) published a guidance note to accompany BS 4142.

The Technical Note states “remain concerns for some users of BS 4142 and this guidance is designed to assist readers with a reasonable interpretation and application of BS 4142 as a whole”. It notes “In the production of this guidance, the ANC Working Group (WG) has reviewed BS 4142 and attempted to address any content regarded as ambiguous”. Consequently, whilst not an official guidance document, the Technical Note provides advice of the interpretation of BS 4142 and provides examples of best practice with regards to the application of the BS.

The following sub-sections contain clarifications from the Technical Note that are particularly pertinent to this assessment.



3.5.1. Internal Noise Levels

The Technical Note notes “BS 4142 ‘is not intended to be applied to the assessment of indoor sound levels’ (Subclause 1.3) and cannot, therefore, be used for façade design. Whilst BS 4142 can be used to assist in the determination of the likelihood of an adverse or significant adverse impact, guidance on internal design criteria and mitigation is provided elsewhere”. The Technical Note goes on to state that in conjunction with BS 4142, the use of BS 8233 may be appropriate to determine internal noise levels “although recognition should be given to the associated scope and/or limitations”.

3.5.2. Introduction of a New Noise-Sensitive Receptors

One of the major short-comings of BS 4142 is the lack of differentiation between the assessment of new noise sources verses the assessment of new noise-sensitive receptors. Subclause 8.5 of BS 4142 states “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”.

The Technical Note clarifies this position by noting “where BS 4142 is used in this situation, its fundamental principles, in terms of what constitutes the residual, background and specific sources, should not be compromised. Where other standards or guidance document are used, care should be taken with regard to their own stated scope or limitations. Examples of such guidance might include:

- *BS8233: 2014 where an industrial/commercial sound source is constant and new residential development is proposed nearby;*
- *Elements of ProPG where the impact of regular night time maximum sound events is the critical consideration;*
- *DMRB where impacts relate solely to changes to vehicular movements within or around a site; or*
- *BS 5228 where activities are temporary and of a similar nature to the construction activities considered by that Standard.*

These documents, or others, may help to inform the contextual elements of a BS 4142 assessment or help where a numerical assessment fully in accordance with BS 4142 may not be possible”.

In this regard the Technical Note that when assessing new noise-sensitive receptors close to commercial noise sources, it may not be possible to use BS 4142 as difficulties in disaggregating “*legitimate commercial residual sources to the background sound level could potentially lead to unrepresentatively adverse outcomes*”. Consequently, “*alternative guidance and standards should be referenced, although care should be taken not to apply them beyond their own stated scope or limitations*”. It goes on to note that “*different approaches might be adopted depending on whether the industrial/commercial source is continuous or intermittent, whether there are ancillary sources present, or where one particular industrial/commercial premises dominates*”.

3.5.3. Background Sound Levels

BS 4142 does not provide a definitive method for calculating or determining a background sound level. The Technical Note does not a definitive method either, but does provide more clarification. It notes “*it was the view of the WG that it is not always appropriate to define a singular background sound level for use in an assessment. In such cases, a range of values over one or more time periods may be more appropriate. An assessment should generally focus on the sound levels measured during the period of greatest interest, which may be the quietest part of the night, or the time period relating to a complaint. Determining the period of greatest interest should be judged on a case-by-case basis*”.

The Note points out that “*it is important that the established background sound level is representative of typical conditions*”. It goes on to provide a number of examples whereby time history, histogram and cumulative distribution data is presented, along with the range of values selected by the WG as being representative. “*These examples are included to illustrate the range of views in the WG as to how best to identify representative background sound levels for particular datasets and serve to highlight the sensitivity of the outcome to individual interpretations of measurement data. It must be remembered that there are no ‘correct’ answers, only judgement and justification. In many instances, additional information beyond that presented in these examples would be required to inform the judgement of representative levels*”.

3.5.4. Context

The criteria used to determine the acceptability of an impact with BS 4142 talks about the requirement to consider “context”. However, BS 4142 does not provide much detail as to what one might consider in relation to context.

BS 4142 notes that absolute levels of sound can be of significance, where residual values are both high and low. In particular, BS 4142 notes that absolute levels may be as, or more, important than relative outcomes where background and rating levels are low, but does not provide further commentary.

The Technical Note points out that “BS 4142 does not indicate how the initial estimate of impact should be adjusted when background and rating levels are low, only that the absolute levels may be more important than the difference between the two values. It is likely that where the background and rating levels are low, the absolute levels might suggest a more acceptable outcome than would otherwise be suggested by the difference between the values. For example a situation might be considered acceptable where a rating level of 30dB is 10dB above a background sound level of 20dB, i.e. an initial estimate of a significant adverse impact is modified by the low rating and background sound levels.

There may be situations where the opposite is true, and it is for the assessor to justify any modifications to the initial estimate of impact.

BS 4142 does not define ‘low’ in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB L_{A90} , and low rating levels as being less than about 35 dB $L_{A,T,r}$.

The WG suggest that similar values would not be unreasonable in the context of BS 4142, but that the assessor should make a judgement and justify it where appropriate”.

The Technical Note suggests other areas one might consider when looking at context:

- “character of a particular neighbourhood;
- former uses at or close to a site;
- legitimacy of the industrial use, e.g. planning permissions or environmental permits;
- implementation of best practicable means for a given process or activity; or
- local convention or perceptions”.

It goes on to provide two examples:

“For example; a former industrial use may be less relevant if it ceased 10 years previously, than a use that ceased within the previous six months. Setting out the context in this way is important so that the reader is fully aware of the point being made”.

“For example; a coffee shop with drive thru facility located adjacent to a fairly busy road with traffic lights and constant stop/start traffic, with residential properties nearby. In these circumstances the noise climate is unlikely to change in any perceptible way due to the addition of vehicles moving and idling in the drive thru area. However, during the evening, the gaps in the general traffic could reduce the background sound level sufficiently that an adverse or significant adverse impact is suggested. An intermittency correction could also be

considered appropriate. In this example, the assessor might legitimately take the view that the context is at odds with the initial (numerical) assessment, and substantially adjust the conclusions of the assessment on the basis of the context”.

3.6. BS 5228:2009+A1:2014 ‘Code of practice for noise and vibration control on construction and open sites’

British standard BS 5228:2009+A1:2014 ‘Code of practice for noise and vibration control on construction and open sites – Noise’ (“BS 5228”) provides recommendations for basic methods of noise and vibration control relating to construction sites, including sites where demolition, remediation, ground treatment or related civil engineering works are being carried out, and open sites, where work activities/operations generate significant noise levels, including industry-specific guidance. BS 5228 also provides guidance concerning methods of prediction and measuring noise and assessing its impact on those exposed to it.

Annex E of the British standard considers the methodology to determine the significance of noise effects. Specifically, Annex E.3.2 introduces ‘The ABC Method’. This method considers the pre-existing onsite ambient noise levels during the daytime, evening, night-time and weekend periods. For each of these periods, BS 5228 presents three sets of thresholds which determine a potential significant effect at dwellings once exceeded. **Table 3.3** and **Table 3.4** presents a replication of Table E.1 from BS 5228 which demonstrates the assessment categories and threshold values BS 5228 sets a maximum threshold value for construction noise based on the existing ambient noise levels. For example, if the ambient daytime noise level was recorded to be 64 dB(A), this would indicate that the receptor would be a Category B receptor and therefore the maximum noise level would be 70 dB. This threshold level represents the sum of the pre-construction (ambient) noise and the construction noise at the receptor. If the construction noise exceeds this threshold, the effects of construction noise could be considered significant.

Part 2 of BS 5228 (BS 5228-2:2009+A1:2014 ‘Code of practice for noise and vibration control on construction and open sites – Vibration’) provides recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels, including industry-specific guidance. Annex B of BS 5228-2 concerns the significance of vibration effects where it is identified that the appropriate methods to identify the likely significance of vibration levels from construction and demolition activities and refers to British standard BS 6472-1 ‘Guide to evaluation of human exposure to vibration in buildings’ regarding further advice in relation to significance effects of vibration.

BS 5228-2 suggests that for the majority of people, the threshold of vibration perceptibility is between 0.14 and 0.3 mms^{-1} Peak Particle Velocity PPV. Based on historical field measurements, BS 5228 provides distances from typical construction activities at which the onset of perceptibility could occur. **Table 3.5** summarises these distances. Receptors located at distances greater than those described below in **Table 3.5** are unlikely to experience an impact since they will be located outside the range of perceptibility.

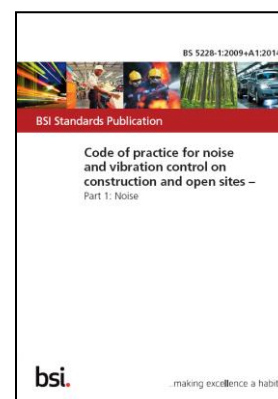


Table 3.3: BS 5228 Annex E – The ABC Method Threshold Values

Assessment category and threshold value period	Threshold values, in decibels, dB $L_{Aeq,T}$		
	Category A	Category B	Category C
Night-time (11pm to 7am)	45	50	55
Evenings and weekends ^{NOTE 4}	55	60	65
Daytime (7am to 7pm) and Saturdays (7am to 1pm)	65	70	75

NOTE 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.

NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.

NOTE 3: Applied to residential receptors only

NOTE 4: weekday evenings (7pm to 11pm); Saturdays (1pm to 11pm) and Sundays (7am to 11pm)

Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values.

Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than Category A values.

Table 3.4: Threshold for Significant Construction Noise Effect at Dwellings

Time	Parameter	Category A	Category B	Category C
Weekday Daytime (0700 to 1900)	Threshold Value: (max construction noise level)	65 dB	70 dB	75 dB
	Ambient Noise	< 62.5 dB	62.5 – 67.4 dB	> 67.4 dB
Evenings (1900 to 2300)	Threshold Value: (max construction noise level)	55 dB	60 dB	65 dB
	Ambient Noise	< 52.5 dB	52.5 – 57.4 dB	> 57.4 dB
Night-time (2300 to 0700)	Threshold Value: (max construction noise level)	45 dB	50 dB	55 dB
	Ambient Noise	< 42.5 dB	42.5 – 47.4 dB	> 47.4 dB

Table 3.5: Distance at which vibration from typical construction activities may be perceptible

Construction Activity	Distance from Activity when Vibration May be Perceptible
Heavy Goods Vehicles	5-10m
Excavation	10-15m
Hydraulic Breaker	15-20m
Driven Piling	50-100m

Although there is a lower threshold of perceptibility, BS 5228 assigns 1mm/s PPV as the maximum target value for control of the impact of construction vibration. This target criterion is based on the guidance contained within BS 5228, experience from previous sites and accepted vibration policy criteria across a range of enforcing authorities elsewhere in the UK. The limits are presented in terms of PPV as it is the simplest indicator for both perceptibility and potential complaints. It should be noted that this threshold relates only to perceptibility and the likelihood of complaints. The threshold of potential damage to buildings from construction vibration is considerably higher at 15mm/s PPV. **Table 3.6** summarises the magnitude of change descriptors for construction vibration.

Table 3.6: Magnitude of Change in Vibration Levels – Construction Impacts

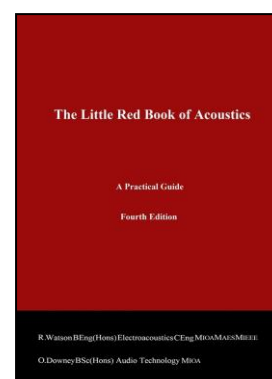
Short-Term Impact Magnitude	Vibration Level – mm/s PPV
Negligible	<0.15
Minor	0.15 – 0.30
Moderate	0.30 – 1.0
Major	>1.0

3.7. The Little Red Book of Acoustics (4th ed.) (2024)

First published in 2007, *'The Little Red Book of Acoustics: A Practical Guide'* remains an industry-standard textbook. Appreciated by professionals and beginners alike for being clear and straightforward, the book has also been included in recommended reading lists for Institute of Acoustics accredited courses.

The 4th edition of the book was published in September 2004 and includes recent updates to standards such as BS 8233 and BS 4142, in addition to presenting a new method to assess and determine the representative background sound levels as part of a BS 4142 assessment.

The book recognises that BS 4142 does not give a single fixed method for assessing the representative background sound level and proposes the 'LRB



Method’ which considers a modal approach with a distribution threshold criterion.

The LRB Method requires each of the background sound level integer values to be counted. The analysis of the candidate values for the background sound level first starts with the candidate with the highest number of occurrences. If there are multiple values with the same number of occurrences, then the analysis will first consider the lowest of these candidate values.

Each candidate value is tested based on whether or not there is less than or equal to 45% of the data below the candidate value. If the candidate value features more than 45% of the data below the candidate value, then it should be rejected. Once the candidate value features less than or equal to 45% of the data below the candidate value, then it should be accepted as the representative background sound level.

3.8. Possible Options for the Identification of SOAELs and LOAELs in Support of the NPSE (2014)

Published by Defra, based on a Research Project prepared by AECOM, “*Possible Options for the Identification of SOAELs and NOAELs in Support of the NPSE*” attempts to give values to the concepts of SOAELs and NOAELs, introduced by the Noise Policy Statement for England (NPSE). After the withdrawal of NPPG24: Planning and Noise in 2012, which included Noise Exposure Categories, with specific numerical boundaries, the NPSE was heavily criticised for having no specific numerical guidance. Whilst the NPSE and NPPF encourage the development of location-specific criteria, in the context of the specific environment, the absence of guidance meant the implementation of the NPSE was difficult. Consequently, the project identifies both specific possible values and possible ranges of values for SOAELs and NOAELs for different noise sources. These values can be seen in **Table 3.3**.

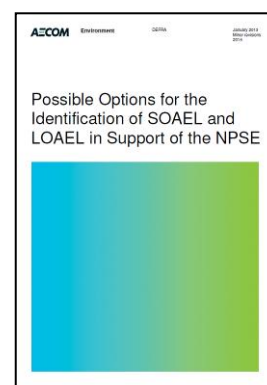


Table 3.7: Possible Value & Ranges of Values for LOAEL & SOAEL

Source	Effect	LOAEL	SOAEL
Road	Annoyance (Daytime)	56 (53-59)	66 (64-68)
	Sleep (Night-time)	46 (43-52)	56 (51-64)
Rail	Annoyance (Daytime)	63 (61-66)	72 (70-74)
	Sleep (Night-time)	55 (52-63)	68 (61-77)
Air	Annoyance (Daytime)	52 (50-54)	60 (58-62)
	Sleep (Night-time)	41 (40-49)	53 (47-60)

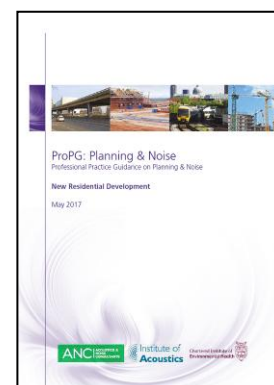
3.9. ProPG: Planning & Noise Professional Practice Guidance (2017)

Planning & Noise: Professional Practice Guidance on Planning and Noise: New Residential Development (the “ProPG”), published May 2017, provides a recommended approach for dealing with noise within the planning process, specifically in relation to new residential developments.

The ProPG follows a systematic, proportionate, risk-based, 2-stage approach. The two stages of the approach are:

- Stage 1 – an initial assessment where external noise is rated against the risk of adverse effect; and
- Stage 2 – a systematic consideration of four key elements to determine the suitability of the site for housing.

The results of the initial Site noise risk assessment will determine the appropriate risk of developing the Site from a noise perspective. This approach is intended to give the developer, the noise practitioner, and the decision maker an indication only of the likely suitability of the site for new residential development from a noise perspective. Thus, a site with a higher risk will be recognised as presenting more acoustic challenges than a site with a low or negligible risk.



Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Figure 3.1 outlines the initial site risk assessment. Stage 2 of the approach looks to determine whether a site is suitable for housing based on the noise risk of the site. Stage 2 essentially attempts to determine that good acoustic design principles have been incorporated into the design from the outset, that suitable internal noise levels can be achieved in habitable rooms and that suitable external noise levels can be achieved in gardens and outdoor amenity space.

Figure 3.1: Initial Site Risk Assessment (from the ProPG)

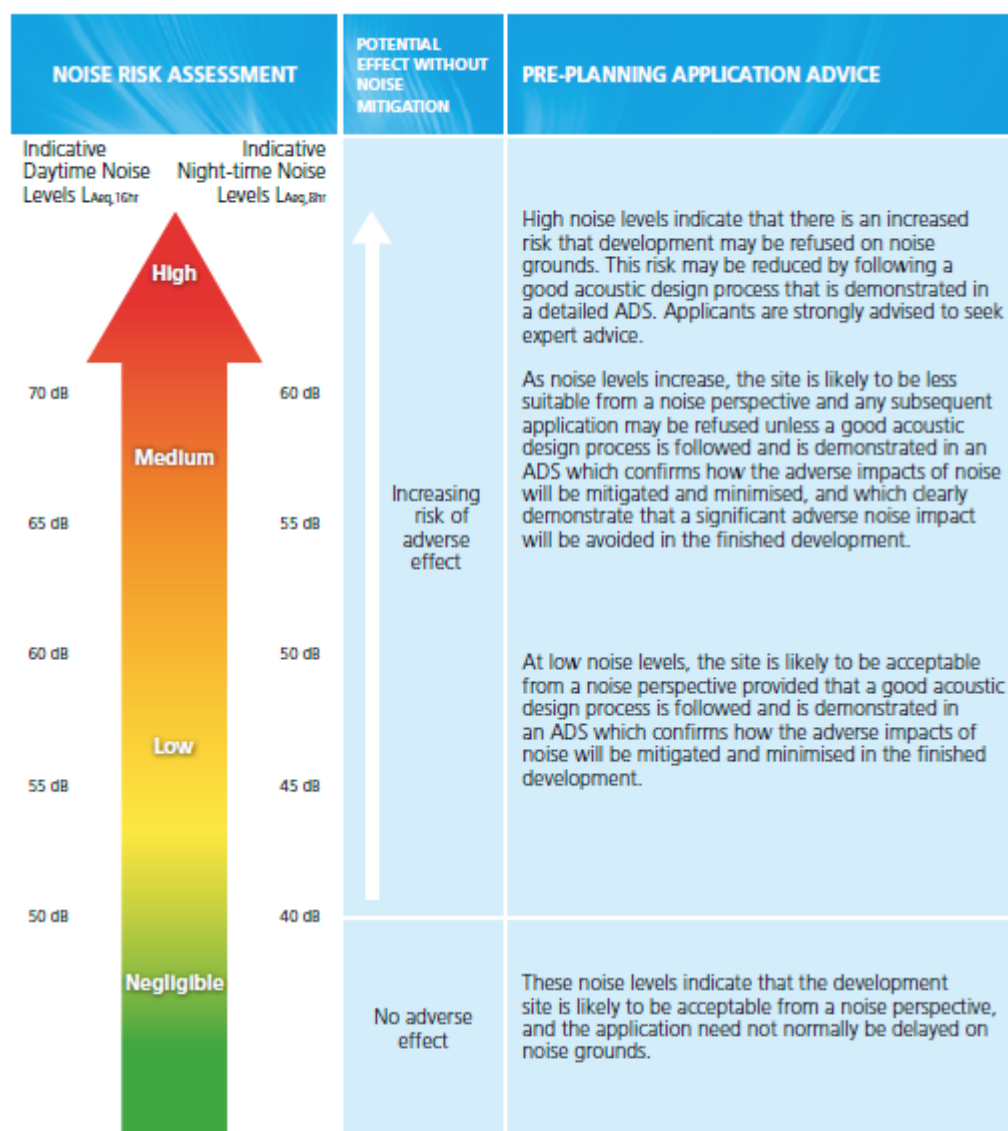


Figure 1 Notes:

- 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.

The ProPG encourages good acoustic design for all developments with the aim of protecting future residents from the effects of noise. Para 2.21 of the ProPG notes that in the first instance, it would be necessary to try to achieve suitable internal noise levels with windows open:

“Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided; occupants generally prefer the ability to have control over the internal environment using openable windows, even if the acoustic conditions would be considered unsatisfactory when open. Solely relying on sound insulation of the building envelope to achieve acceptable acoustic conditions in new residential development, when other methods could reduce the need for this approach, is not regarded as good acoustic design.”

However, the ProPG notes that in some instances it is not possible to achieve suitable internal noise levels when windows are open. The notes to Figure 2 of the ProPG note *“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 target internal levels with windows open, internal noise levels can be assessed with windows closed...”*. In these instances, one must consider the impacts of ventilation and overheating, with the need to provide a good acoustic environment. The ProPG notes in Para 2.36 that where a *“scheme is reliant on open windows to mitigate overheating, it is also necessary to consider the potential noise impact during the overheating condition. In this case a more detailed assessment of the potential impact on occupants should be provided”*.

3.10. Acoustics, Ventilation and Overheating Residential Design Guide (2020)

Published by the Association of Noise Consultants; the *Acoustics, Ventilation and Overheating (AVO) Guide* recommends an approach for acoustic assessments to take due regard of the interdependence of acoustics, ventilation and overheating. The approach ensures that the ventilation strategy of a building becomes an integral part of the acoustic design process.

The AVO Guide notes that *“The starting position when considering mitigation of noise impact on new residential development is to apply good acoustic design, site-wide, as described in the ProPG”*. Since the ProPG advocates the importance of at least attempting to achieve suitable internal noise levels with windows open, the starting point of the AVO Guide is to first see whether windows can be opened; therefore, it is clear that the AVO Guide should be applied after good acoustic design principles have been applied.

The AVO Guide makes it clear that as part of the acoustic design process, one needs to consider both whole house ventilation (which the AVO calls the *“ADF ventilation condition”*) and provisions for ventilation cooling to mitigate overheating (the *“overheating condition”*). The Guide notes that *“In terms of noise effect, the important distinction between these two situations is that the ADF ventilation condition applies for the entire time whereas the overheating condition applies only for part of the time”*.

Regarding the overheating condition, the AVO Guide notes *“it is considered reasonable to allow higher levels of internal ambient noise from transport sources when higher rates of ventilation are required in relation to the overheating condition. The basis for this is that the overheating condition occurs for only part of the time. During*



this period, occupants may accept a trade-off between acoustic and thermal conditions, given that they have some control over their environment. In other words, occupants may, at their own discretion, be more willing to accept higher short-term noise levels in order to achieve better thermal comfort. The importance of control is relevant to daytime exposure, but not to night time exposure where the consideration is sleep disturbance”.

To estimate the potential impact in the overheating condition, a two-stage approach has been taken. The two levels of the approach are:

- Level 1 - an initial assessment where external noise is rated against the risk of adverse effect based on the assumption that opening windows are the primary means of mitigating overheating; and
- Level 2 – a systematic consideration of the potential for adverse effect on occupants based on internal ambient noise levels.

A Level 1 assessment looks at the external noise levels to determine whether a partially open window can be used to manage overheating, assuming a 13 dB attenuation for an open window. For “negligible” sites, no further action is required and open windows will be sufficient to manage overheating. For “high” risk sites, a Level 2 assessment is required. This is also recommended for “medium” risk sites. For a Level 2 assessment, the internal noise levels are calculated with windows open to determine the likely impact when windows are open to satisfy the overheating condition. **Table 3.4** summarises the approach and guidance from the AVO Guide. Essentially the guidance is used to determine whether or not windows can or cannot be opened. This guidance should be read in conjunction with Approved Document O of the Building Regulations.

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Table 3.8: Initial Site Risk Assessment and Subsequent Guidance in Relation to the Overheating Condition

Daytime $L_{Aeq,16hour}$	Night-time $L_{Aeq,8hour}$	Night-time L_{AFmax}	Level 1 Risk	Level 2 Assessment	Outcome	Openable Windows?
≤ 48 dB(A)	≤ 43 dB(A)	-	Negligible	Not Required	Noise can be heard, but does not cause any change in behaviour or attitude	Yes
> 48 dB(A) to ≤ 53 dB(A)	> 43 dB(A) to ≤ 48 dB(A)	-	Low	Optional	Limited behavioural change is expected unless conditions are prevalent for most of the time.	Yes
> 53 dB(A) to ≤ 63 dB(A)	> 48 dB(A) to ≤ 55 dB(A)	Normally Exceeds > 74 dB(A) to ≤ 78 dB(A)	Medium	Recommended	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods.	Yes, Depending on Duration
> 63 dB(A)	> 55 dB(A)	Normally Exceeds 78 dB(A) at night	High	Recommended	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.	No

3.11. Approved Document O: Overheating (2021)

Approved Document O of the Building Regulations 'Overheating' (AD-O) was released in December 2021 and came into effect in England on 15th June 2022. It aims to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures

AD-O requires the residential premises to:

- *limit unwanted solar gains in summer; and*
- *provide an adequate means to remove heat from the indoor environment.*

In meeting these requirements:

- *account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and*
- *mechanical cooling may only be used where insufficient heat is capable of being removed.*

Whilst this is a standard in relation to the Building Regulations and not planning (i.e. compliance does not need to be demonstrated in order to obtain planning consent), consideration of the amenity of future residents (and therefore the overheating management strategy) is a material planning consideration and consequently it is recommended that AD-O is considered as part of the overall glazing, ventilation and overheating strategy of the development.

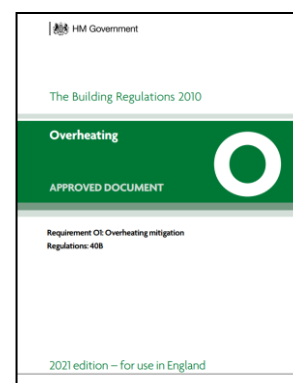
AD-O includes two methods for demonstrating compliance – the “Simplified Method”, which relies on limiting the glazed area of a room based on the location and orientation of the rooms, as well as whether the dwelling is cross ventilated, and the “Dynamic Thermal Modelling Method”. The “Dynamic Thermal Modelling Method” should be used for dwellings that do not satisfy the “Simplified Method” and relies on detailed modelling of the building and may require additional mechanisms to remove excess heat. These include:

- Opening windows;
- Ventilation louvres in external walls;
- A mechanical ventilation system; and
- A mechanical cooling system.

It is noted in paragraph 3.2 of AD-O that “*In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am)*”.

It is noted in paragraph 3.3 of AD-O that windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits:

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



3.12. Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O (2022)

Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O was published jointly by the Institute of Acoustics and Acoustics and Noise Consultants in July 2022. The guide was compiled to aid acoustic professionals in demonstrating compliance with Approved Document O (AD-O) of the Building Regulations.

As noted above, AD-O provides guidance on when an open window cannot be used to deal with overheating. Whilst AD-O provides internal noise levels, the IOA/ANC Guidance translates this into external noise levels.

Table 3.5 shows the external noise levels above which it will not be possible to use the “Simplified Method” to demonstrate compliance with AD-O. The IOA/ANC Guidance notes that “It may be possible to increase these values and still satisfy the requirements of the simplified method using acoustically specified balconies”.

The Guidance goes on to note that “Based on the external noise levels presented in (Table 3.5), it is likely that external noise will be an issue for many sites exposed to only modest levels of noise”.

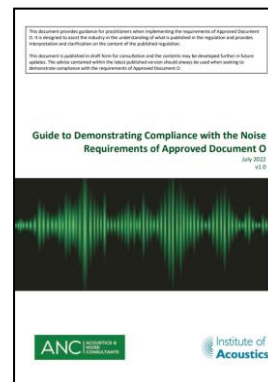


Table 3.9: External Noise Levels Above Which The Simplified Method Cannot Be Used

Parameter	High Risk Location ¹	Medium Risk Location ²
$L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am)	44 dB	49 dB
L_{AFmax} , more than 10 times per night (between 11pm and 7am)	59 dB	64 dB

Note 1: High Risk Locations have been identified in Appendix C of AD-O as certain postcodes in London and select postcodes in Central Manchester.

Note 2: Medium Risk Locations are all other locations in England not previously identified as High Risk Locations.

If noise levels exceed the levels identified in **Table 3.5**, it will be necessary to use the “Dynamic Thermal Modelling Method” to demonstrate compliance with AD-O. It should be noted that exceedances of the above noise thresholds do not necessarily mean that windows cannot be opened or that mechanical ventilation is required. For example, it may be possible to remove adequate heat from the rooms using a combination of smaller openable windows areas (through either smaller openable glazed panels or by fitting window restrictors) and ventilation louvres in external walls. The AVO Guide provides more definitive guidance on when windows can and cannot be opened in relation to noise.

4. ENVIRONMENTAL NOISE SURVEY

4.1. Survey Overview

In order to determine the extent to which the site is affected by noise, a detailed noise measurement study has been carried out on the proposed development site. Noise measurements have been carried out in order to determine the overall $L_{Aeq,16hrs}$ and $L_{Aeq,8hrs}$ for the day and night time periods. In addition, the L_{Amax} , L_{A10} , L_{A50} , and L_{A90} noise levels have also been measured.

All noise monitoring was conducted using a Norsonic 140 sound level meter, which conforms to BS EN IEC 61672-1: 2003 as a Class 1 precision measurement system. A Norsonic 1251 field calibrator was used before and after the measurement periods in order to ensure that the equipment had remained within reasonable calibration limits (± 0.5 dB).

All of the equipment used has been calibrated in accordance with the procedures set out in BS EN IEC 61672-2: 2003 and for the electrical testing of frequency filters as set out in BS EN IEC 61260. The equipment was calibrated at Campbell Associates Limited, in Great Dunmow, Essex. Campbell Associates Limited meets the laboratory accreditation requirements of the United Kingdom Accreditation Service (UKAS Lab No. 0789). Sound level meters are laboratory calibrated every two years, with field calibrators laboratory calibrated every twelve months. **Appendix 2** summarises the equipment used including serial numbers and calibration certificates.

All noise monitoring has been conducted in accordance with the guidance set out in BS 7445-2: 1991 'Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use'. This standard details information that should be recorded in addition to the actual measured levels such as meteorological data, and a description of the noise source itself.

The survey was conducted on the 4th and 5th February 2025. The noise monitoring was conducted by Mathew Vaughan of Hawkins Environmental Limited. Mathew is a Member of the Institute of Acoustics and holds a Masters of Science in Applied Acoustics from Solent University.

Weather conditions were conducive to successful monitoring. **Table 4.1** summarises the weather conditions during the measurement period.

Table 4.1: Summary of Weather Conditions during the Noise Measurements

General Description	The measurement periods were cool for the time of year, with some sunshine during the day with light winds.
Windspeed	Average wind speeds were low, typically less than 0.5 m/s.
Temperature	The temperature went down to around -1°C at night, with daytime temperatures up to 10°C.
Precipitation	The measurement period remained dry.

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Noise measurements were conducted at ground floor level. The measurement location is considered representative of the worst affected façade of the proposed development. The measurement location is considered to be a freefield position. A map showing the measurement location in relation to the new site layout can be seen in **Figure 4.1**.

Figure 4.1: Noise Measurement Location & Proposed Site Plan with Trees to be Removed



4.2. Noise Survey Results

The noise measurement study has identified that the primary noise source is road traffic noise attributable to Lower Wokingham Road, which passes adjacent to the eastern boundary of the proposed development site. Rail noise was not audible, despite the North Downs Line being situated ~160m to the east of the eastern boundary of the development site. Aircraft noise is occasionally audible.

The noise measurement data is detailed in **Appendix 3** and **Figure 4.2** and summarised in **Table 4.2** below.

Table 4.2: Summary of the Noise Level Measurements

Period (hours)	Measured Noise Level, dB			
	$L_{Aeq,T}$	Range $L_{Aeq,5mins}$	Range $L_{Amax,5mins}$	Range $L_{A90,5mins}$
7am to 11pm	56.0	47.3 – 60.0	58.6 – 83.3	29.5 – 56.5
11pm to 7am	48.4	23.8 – 57.3	28.8 – 69.4	22.6 – 45.4

4.3. Background Sound Levels

The background sound levels have been calculated in accordance with BS 4142:2014, which represents the most up-to-date guidance on the subject. Prior to the publication of the 2014 version of BS 4142, acousticians would use the lowest measured background sound levels; however, BS 4142: 2014 provides substantially more guidance on the determination of background sound levels. Section 8.1 of BS 4142: 2014 states that “*for this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods. Among other considerations, diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes*”. The guidance goes on to say that “*a representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value*”.

In order to determine the background sound levels for the day and night-time periods, the background sound levels have been analysed over the appropriate time periods, i.e. 15 minutes for night-time (11 pm to 7 am) and 1 hour for the daytime periods. **Figure 4.3** and **Figure 4.4** detail the distribution of the background sound levels as described in BS 4142: 2014 for the day and night-time periods respectively.

It can be seen from **Figure 4.3** that during the daytime, the $L_{A90,1hour}$ ranged from 35 to 54 dB(A). The value with the highest number of occurrences is 48 dB(A). Less than 45% of the data is below this value. Therefore, 48 dB(A) would be considered representative of the background sound level during the daytime.

It can be seen from **Figure 4.4** that during the nighttime, the $L_{A90,15mins}$ ranged from 23 to 45 dB(A). The value with the highest number of occurrences is 25 dB(A). Less than 45% of the data is below this value. Therefore, 25 dB(A) would be considered representative of the background sound level during the nighttime.

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

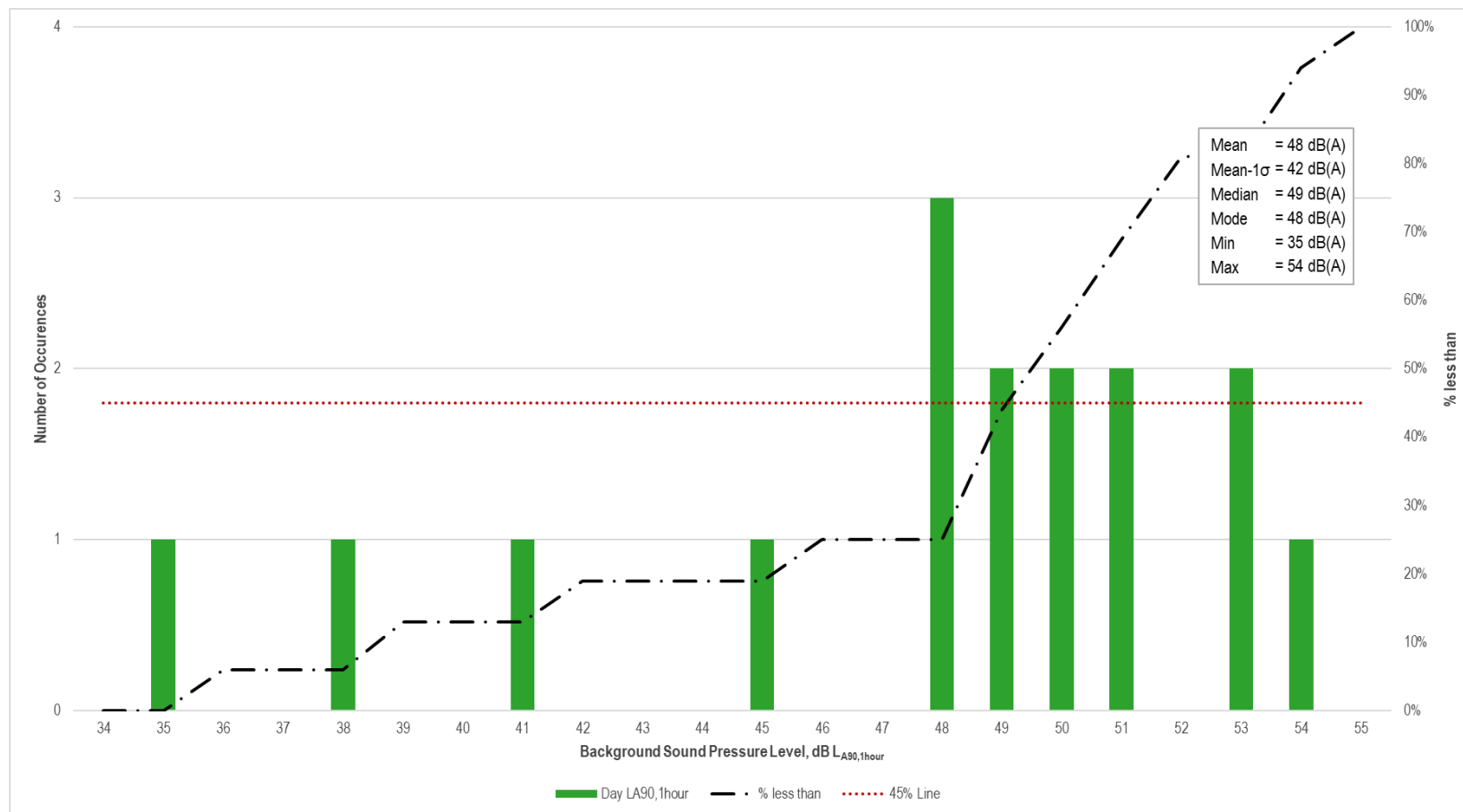
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Figure 4.2: Noise Measurements



Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1Figure 4.3: Distribution of Day Time $L_{A90,1\text{hour}}$ Sound Levels

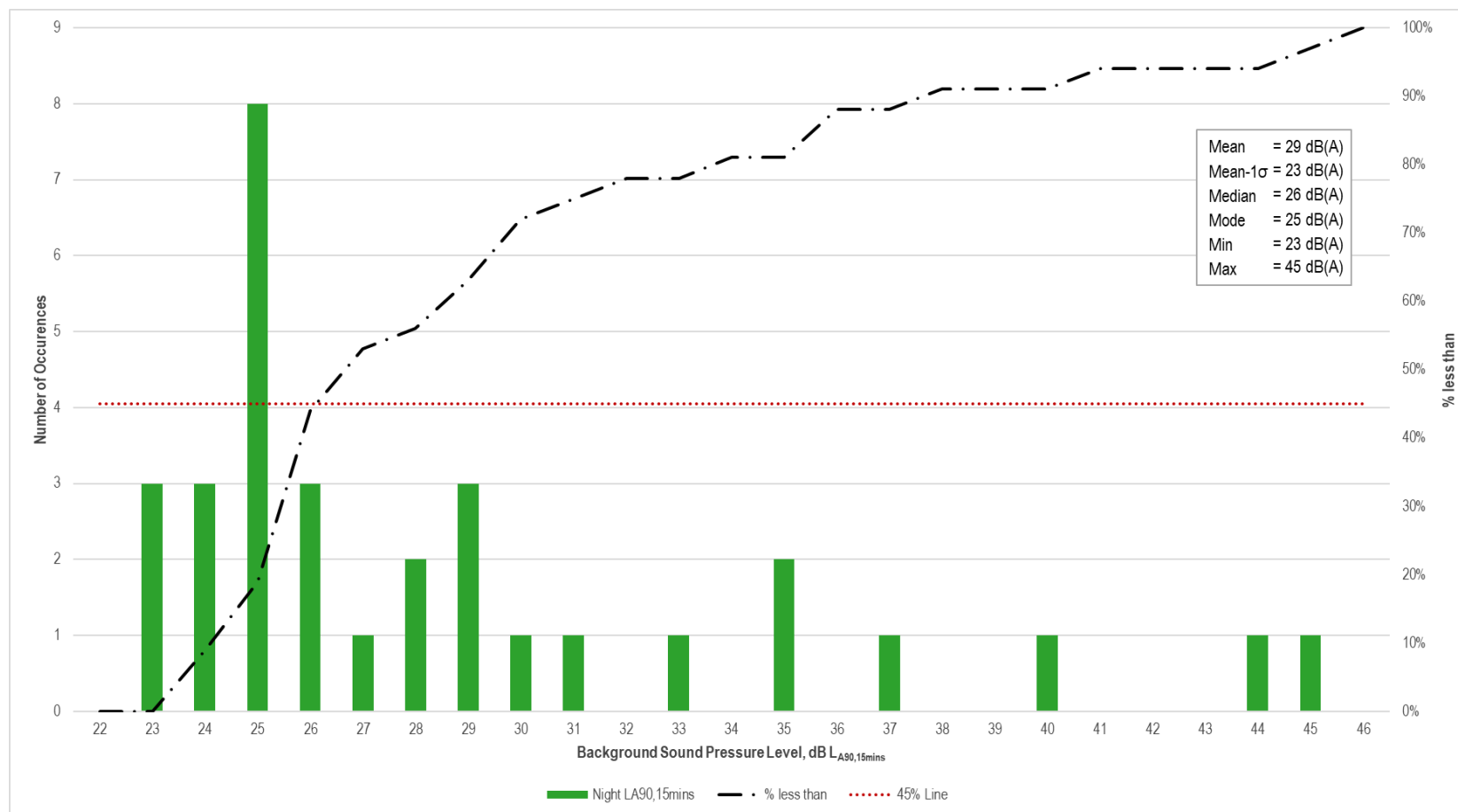
Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

37

Figure 4.4: Distribution of Night Time L_{A90,15mins} Sound Levels



5. PROPG STAGE 1: INITIAL SITE NOISE RISK ASSESSMENT

5.1. Site Classification - ProPG

The noise measurement survey determined the on-site noise levels. For the purposes of the assessment, the LOAEL and SOAEL levels have been determined from the Defra/AECOM research on LOAEL and SOAEL levels for road traffic sources. The Defra/AECOM research indicates that the typical average LOAEL would be around 56 dB(A) for the onset of daytime annoyance, with the SOAEL around 66 dB(A). For the onset of night time sleep disturbance, the LOAEL would be around 46 dB(A) and the SOAEL around 56 dB(A).

Table 5.1: Initial Site Noise Risk Assessment

Criteria	Daytime $L_{Aeq,16hr}$	Night time $L_{Aeq,8hr}$
Result	55 dB	47 dB
ProPG Noise Risk	Low	Low
Effect Level	Between LOAEL and SOAEL	Between LOAEL and SOAEL
Action	Mitigate and reduce to a minimum	Mitigate and reduce to a minimum

Based on the results shown in **Table 5.1**, the noise risk of the site is “Low”, with the effect level in between the LOAEL and the SOAEL. This suggests that there could be an observed effect of noise on the proposed development site and as a consequence, it will be necessary to mitigate and reduce noise for the future residents to a minimum. For a “Low” risk site, a Stage 2 assessment with Acoustic Design Statement will be required, demonstrating a good acoustic design process has been followed, demonstrating how the adverse impacts of noise have been mitigated and minimised.

It should be noted that the above sound levels feature a 1.4 dB line-source distance correction where the measurement position is situated approximately 43m from the centre line of Lower Wokingham Road and the façade of the proposed building is situated approximately 59m from the centre line of Lower Wokingham Road.

6. PROPG STAGE 2: ACOUSTIC DESIGN STATEMENT

The Stage 1 Initial Site Risk Assessment has identified that the noise risk is “Low” and therefore, a Stage 2 assessment will be required, demonstrating a good acoustic design process has been followed, demonstrating how the adverse impacts of noise have been mitigated and minimised.

6.1. Element #1: Good Acoustic Design Process

Following a good acoustic design process is an implicit part of Government planning and noise policy and it is imperative that acoustic design is considered at an early stage of the development control process.

The ProPG requires the consideration of acoustic design and requires considerations such as checking the feasibility of relocating, or reducing noise levels from, relevant sources; considering options for planning the site or building layout; considering the options for screening buildings or sources; and considering the orientation of proposed buildings. These considerations will then inform how best to deal with excessive noise by either:

- Quietening or removing the source of noise;
- Attenuating the sound on its path to the receiver;
- Obstructing the sound path between the source and receiver; or
- Improving the sound insulation of the building envelope.

The orientation and layout of the proposed development has been designed with noise in mind, in combination with a number of other considerations as required by planning. The proposed building is conceptually a rectangular building. Alternative approaches to the layout were explored as part of a rigorous design process. The proposed scheme has been designed to deliver high quality accommodation that appropriately considers functionality, amenity, privacy, daylight and outlook as well as the ability to obstruct the sound path from external sources. Therefore, the optimum layout has been achieved in terms of acoustic design.

6.2. Element #2: Internal Noise Levels

6.2.1. Criteria

The Initial Site Risk Assessment and good acoustic design process indicates that the sound insulation of the building envelope requires improvement and noise does need to be taken into account in the design of the building in order to meet the internal noise criteria contained within BS 8233 and the ProPG, and to comply with the guidance contained within the NPPF. The appropriate design noise levels at this site are those identified in **Table 6.1** below.

Table 6.1: Summary of Noise Criteria: BS8233:2014 and ProPG

Activity	Location	07:00 to 23:00	23:00 to 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} NOTE

Note: For a reasonable standard in noise-sensitive rooms at night (e.g. bedrooms) individual noise events should not normally exceed 45dB L_{Amax} more than 10 times a night.

Annex G of BS 8233 provides a rigorous calculation method for determining the internal noise levels within a proposed development.

6.2.2. Glazing Specification

The Sound Reduction Index (R_w sometimes noted as SRI) is the level of sound attenuation afforded by a particular material. It is possible to calculate the R_w of a particular facade to determine the internal noise level based on the noise survey results. It is widely known that a masonry wall will have a R_w of at least 50 dB, sometimes as high as 55 to 60 dB. The R_w of individual glazing solutions will vary considerably. However, BS 8233 notes that good quality insulating double glazed window units will typically have an R_w of 33 dB.

Using the equation in Annex G of BS 8233, it is possible to calculate the internal noise levels based on typical construction details. However, Annex G first suggests conducting simple calculations, to determine whether more detailed calculations are required. The simple calculation procedure in Annex G notes that:

“The windows, and any trickle ventilators, are normally the weakest part of a brick and block facade. Insulating glass units have an insulation of approximately 33 dB R_w ... assuming suitable sound attenuating trickle ventilators are used...”. Consequently, it is possible to arithmetically subtract 33 dB from the external (freefield) noise levels to determine internal noise levels. The results of these calculations can be seen in **Table 6.2** below.

Table 6.2: The Simple Calculation Procedure from Annex G of BS 8233: 2014

Criteria	Daytime $L_{Aeq,16hr}$	Night time $L_{Aeq,8hr}$
External (freefield)	55 dB	47 dB
Criteria	35 dB	30 dB
Internal Noise Level (assuming R_w of 33)	22 dB	14 dB
Comparison to Criteria	-13 dB	-16 dB
Action	More detailed calculation will not be required. Suitable internal noise levels can be achieved with a standard double glazed window system with a R_w of 33.	

The above approximation includes a certain margin of error, since the R_w is based on insulation values relating to a pink noise spectrum - actual values achieved are lower for traffic noise. In addition, the above simple calculations do not take account of absorption, such as furnishings in the room. Consequently, the above is only a rough calculation which could underestimate noise levels by as much as 5 dB. Therefore, more detailed calculations may be required if the predicted internal noise levels higher are than 30 dB daytime and 25 dB night-time.

The results of the calculations in **Table 6.2** show that the internal noise levels will be more than 5 dB lower than the criteria; consequently, suitable internal noise levels can be achieved with standard double-glazed windows, which would typically have an R_w of 33 dB.

It should be noted that the acoustic performance of the façade is dependent upon the relative performance of each element. For example, it may be possible to have a lower acoustic rated glazing system if the acoustic performance of the ventilation system is improved. Similarly, it may be necessary to have an improved glazing and ventilation package, if the walls of the proposed development are not typical brick and blockwork. It is also important to note that acoustic performance is frequency dependent and other window specifications may be suitable providing that they perform well in the frequencies pertinent to the noise levels measured at this particular site.

The R_w is the rating sound insulation of a building element. BS 8233: 2014 notes that “these single-figure ratings are generally good predictors of subjective assessments of insulation of similar constructions. However, this is not always the case for different constructions, for example the low-frequency performance of a lightweight partition might be significantly different from that of a masonry partition with the same single-number rating, so it is prudent to examine the full measurement data in critical situations”. One way that can be used to check for variations in frequency performance is to consider the C_{tr} correction quoted for glazing. The $R_w + C_{tr}$ is the dB insulation value against a standardised road traffic noise spectrum. For example, where a window is quoted as $R_w (C_{tr}) = 33 (-3)$, this will perform better in the frequencies pertinent to traffic noise, when compared to a window quoted $R_w (C_{tr}) = 33 (-7)$, despite the same R_w .

As a consequence of the above, it is always strongly recommended that any glazing solution is tested within the parameters of BS 8233: 2014, using full octave band data to determine suitability.

6.2.3. Ventilation, Overheating & the Opening of Windows

The ProPG notes that in the first instance, it would be necessary to try to achieve suitable internal noise levels with windows open. However, the ProPG notes that in some instances it is not possible to achieve suitable internal noise levels when windows are open.

The ProPG recommends a conservative estimate of 13 dB attenuation for a partially opened window. **Table 6.3** determines the internal noise levels with windows open. **Table 6.3** notes that suitable internal noise levels cannot be achieved with windows open. Therefore, one must consider the impacts of ventilation and overheating, with the need to provide a good acoustic environment.

Table 6.3: Internal Noise Levels Assuming a Partially Opened Window

Criteria	Daytime $L_{Aeq,16hr}$	Night time $L_{Aeq,8hr}$
External (freefield)	56 dB	48 dB
Criteria	35 dB	30 dB
Internal Noise Level Assuming a Partially Opened Window	43 dB	36 dB

The AVO Guide makes it clear that one needs to consider both whole house ventilation (which the AVO calls the “ADF ventilation condition”) and provisions for ventilation cooling to mitigate overheating (the “overheating condition”). The Guide notes that “In terms of noise effect, the important distinction between these two situations is that the ADF ventilation condition applies for the entire time whereas the overheating condition applies only for part of the time”.

The site cannot rely on the windows being opened for ventilation. Therefore, an alternative source of ventilation is required. The AVO Guide provides comprehensive guidance in relation to appropriate ventilation strategies.

It should be noted that if it is proposed to install trickle vents or any other acoustic ventilator that connects directly through the wall or window, it will be necessary to ensure that the acoustic performance of the ventilator is appropriate for the location. The performance of the acoustic ventilator will be presented as a $D_{n,e,w}$ rating, which is not directly comparable to a R_w rating used for windows. The $D_{n,e,w}$ is the weighted average composite loss of a typical wall with the vent installed; therefore, the R_w of the vent on its own will be less. Therefore, when selecting a vent, the $D_{n,e,w}$ value needs to be higher than the minimum R_w needed for the window, otherwise this could lessen the sound reduction performance of the window. As a rough guide, the R_w is generally between 5 and 10 dB lower than the equivalent $D_{n,e,w}$ and it is therefore recommended that the $D_{n,e,w}$ of the vent is at least 7 dB higher than the R_w recommended for the window. For example, if a R_w of 30 dB is recommended for the window, the $D_{n,e,w}$ of the vent should be at least 37 dB.

With regards to overheating, the AVO Guide has determined that the site is a “Medium” risk site based on the criteria contained within **Table 3.4** of this report and the measured noise levels.

For a “Medium” risk site, windows can be opened to deal with overheating. However, the duration that the windows are expected to be opened is a factor when considering whether it is acceptable to rely on openable windows to deal with overheating. The guidance indicates that if the windows were “rarely” opened to deal with overheating, for example during the hottest nights of the year, this would be considered acceptable. However, if the windows were opened “most of the time” to deal with overheating, for example continuously from the end of May to the end of September, this may be considered unacceptable.

6.2.4. Consideration of Approved Document O of the Building Regulations

Under the guidance contained within Appendix C of AD-O, the site is located within a “Medium Risk Location”. It can be seen that the measured onsite noise levels are in excess of the maximum recommended levels displayed in **Table 3.5** pertinent to the Risk Location.

As the noise levels exceed the levels identified in **Table 3.5**, it will be necessary to use the “*Dynamic Thermal Modelling Method*” to demonstrate compliance with AD-O. It should be noted that exceedances of the above noise thresholds do not necessarily mean that windows cannot be opened or that mechanical ventilation is required. For example, it may be possible to remove adequate heat from the rooms using a combination of smaller openable windows areas (through either smaller openable glazed panels or by fitting window restrictors) and ventilation louvres in external walls. It should be noted that consideration of AD-O is only in relation to night time noise in bedrooms.

6.2.5. Variation Across the Development Site

Section 6.2.2 and **Section 6.2.3** of this report outline the glazing, ventilation and overheating requirements for the front of the site facing Lower Wokingham Road, where the measurements were undertaken. This is considered to be the worst affected façade. However, accommodation to the rear of the development, without a direct view of Lower Wokingham Road, is likely to benefit from lower noise levels.

Regarding glazing requirements, **Section 6.2.2** of this report notes that standard double glazed windows will be adequate on the front façade; as noise levels will be lower to the rear, it is possible to conclude that standard double glazed windows will be also be suitable for windows without a direct view of Lower Wokingham Road.

Regarding overheating and whether windows can be opened, **Section 6.2.3** notes that windows cannot be opened to deal with overheating. Since noise levels will be lower at accommodation to the rear of the development, without a direct view of Lower Wokingham Road, it is anticipated that noise levels would result in a “medium” risk under the AVO Guide and therefore the opening of windows where internal noise levels exceed the recommended levels within BS 8233 may be acceptable to address overheating, depending on the duration that windows need to be opened.

6.3. Element #3: External Amenity Areas

BS 8233 provides guidance for noise in gardens and outdoor amenity space. It suggests that “*it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments.*” The guidance does go on to say that these guideline values are not achievable in all circumstances and in some areas, “*such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.*”

The location of the two courtyards within the development is likely to be the optimal design in terms of reducing noise in outdoor amenity areas and is likely to be effective particularly in terms of reducing road noise from Ifield Avenue and Ifield Green, as well as reducing airport noise. The $L_{Aeq,16hours}$ is expected to be in the region of 55 dB, which is equivalent to the “upper guideline value” of 55 dB. The proposed building is likely to offer some screening which could see the majority of the external amenity space see noise levels that are less than 55 dB $L_{Aeq,16hours}$.

6.4. Element #4: Other Relevant Issues

Good acoustic design principles which have been followed mean that the proposed development is in general compliance of the ProPG.

The proposed façade sound insulation performances mean that internal noise levels when windows are closed will be in line with ProPG internal noise criteria. When windows are open, for example to manage overheating, internal noise levels might be slightly higher than the desired levels.

Steps should be taken through effective architectural and ventilation design to minimise the regularity and duration that windows are required to be open. This, in conjunction with the good acoustic design principles adopted, would be considered to minimise any potential adverse effects of noise on occupants.

7. IMPACT OF THE PLANT

7.1. Overview

The assessment is carried out in accordance with BS 4142: 2014 +A1:2019 'Methods for rating and assessing industrial and commercial sound'.

7.2. Proposed Plant

At the proposed development, it is proposed to install 4no. CAHV-P500YB-HPB(-BS) hot water heat pumps manufactured by Mitsubishi Electric. As per the manufacturers' data presented in **Appendix 4**, the Mitsubishi Electric CAHV-P500YB-HPB(-BS) generates a sound pressure level of 63 dB(A) at 1m when operating at maximum capacity.

It is also proposed to install 1no. EJ741474 kitchen extract fan manufactured by Fläkt Group. As per the manufacturers' data presented in **Appendix 4**, the proposed kitchen extract fan is anticipated to generate a sound pressure level of 69 dB(A) at 3m when operating at its maximum capacity.

7.3. Specific and Rating Sound Level

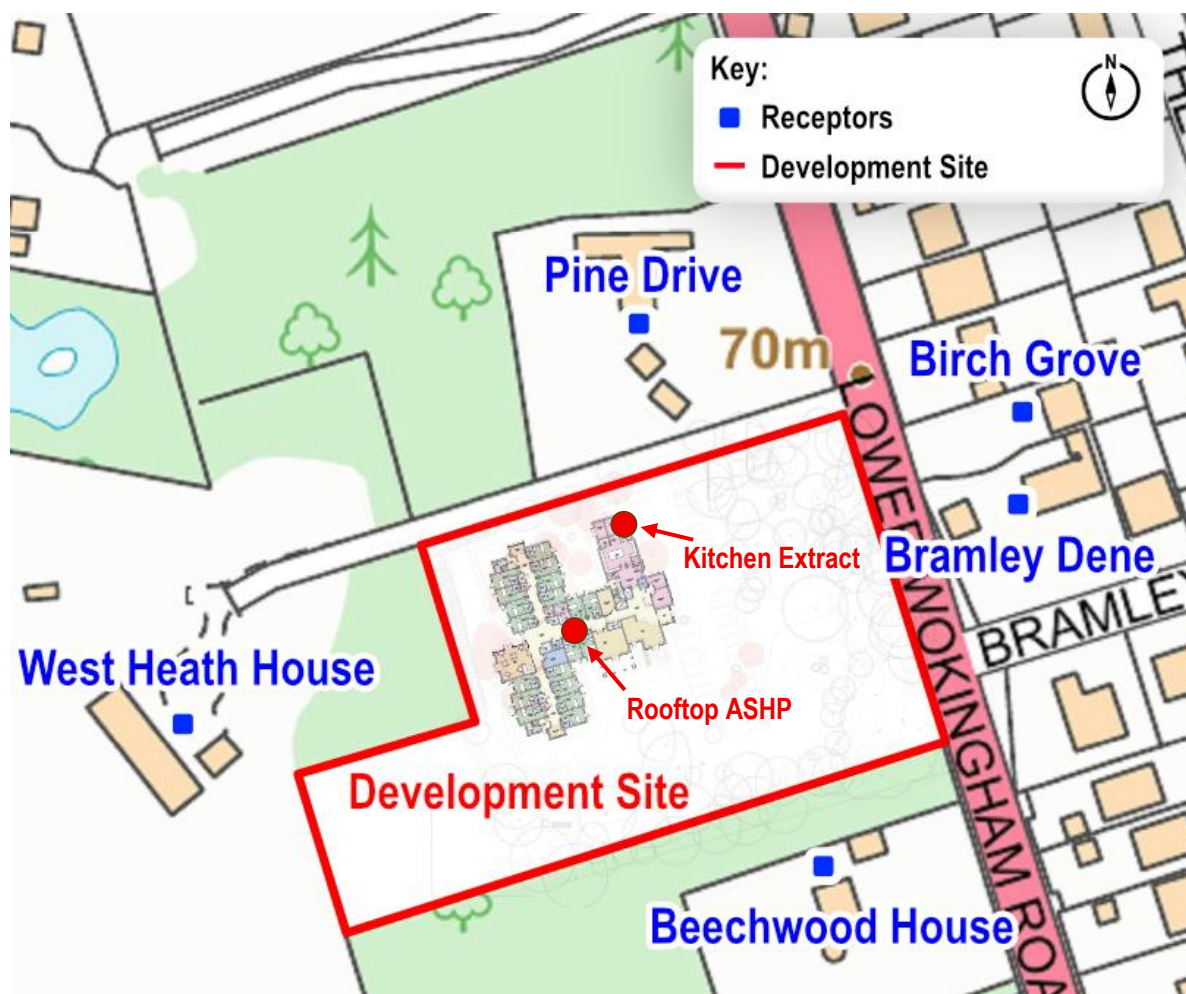
Using the location of the proposed CAHV units and kitchen extract fan and based on the published noise levels, the cumulative noise level from the plant has been calculated for the nearest five dwellings. **Figure 7.1** shows the location of the closest receptors in addition to the locations of the plant.

It should be noted that since the kitchen extract fan is not expected to operate at night between 11pm and 7am, the specific and rating sound levels for both the daytime and nighttime periods have been considered. **Table 7.1** shows the calculated sound levels for the nearest noise sensitive receptors based on standard point source distance attenuation.

Table 7.1: Receptor Specific Sound Levels

Location	Freefield Specific Sound Level in dB(A)	
	Day	Night
Pine Drive	36	21
West Heath House	28	19
Beechwood house	29	21
Bramley Dene	33	18
Birch Grove	33	17

Figure 7.1: Locations of the Sensitive Receptors and Plant



In accordance with Section 9 of BS 4142, the rating sound level is calculated by applying a character correction to the calculated receiver sound level. For this assessment, the character correction was specified using the “Subjective Method”, where it is necessary to “consider the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention.” BS 4142 goes on to highlight the subjective correction that one could apply; these corrections are summarised in **Table 7.2** below:

Table 7.2: Subjective Character Corrections

Category	Comments
Tonality	“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 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”

Category	Comments
Other sound characteristics	<i>"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."</i>
Intermittency	<i>"If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."</i>

It would be anticipated that the kitchen extract fan would be used during the operation of the kitchen which would be anticipated to be during the daytime between 7am and 11pm. The proposed CAHV ASHP units may operate at any time in any 24-hour period. It is typical that the kitchen extract and ASHP units may generate a just perceptible tone at the nearest noise sensitive receptors. Whilst the CAHV ASHP units may operate intermittently, the intermittency is unlikely to be readily distinctive against the residual acoustic environment at the nearest noise sensitive receptors. Consequently, a 2 dB tonality rating penalty should be applied to all specific sound levels to determine the rating sound levels during the daytime and nighttime. **Table 7.3** presents the rating sound levels during the day and night at each receptor.

Table 7.3: Receptor Rating Sound Levels

Location	Freefield Specific Sound Level in dB(A)	
	Day	Night
Pine Drive	38	23
West Heath House	30	21
Beechwood house	31	23
Bramley Dene	35	20
Birch Grove	35	19

7.4. Adherence to Sound Criteria

To assess the impact of the proposed plant, the predicted sound levels have been compared to the criteria in BS 4142. **Table 7.4** and **Table 7.5** below considers the sound levels in a BS 4142 assessment during the daytime and nighttime respectively. In a BS 4142 assessment, the 'industrial' sound is rated by comparison against the background sound level. The difference between the rating sound level and lowest background sound level gives an indication of the likelihood of complaint.

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Table 7.4: BS 4142 Assessment - Daytime

	Background Sound Level L_{A90}	Specific Sound Level L_{Aeq}	Rating Sound Level L_{Aeq}	Rating and Background Sound Level Difference
Pine Drive	48	36	38	-10
West Heath House	48	28	30	-18
Beechwood house	48	29	31	-17
Bramley Dene	48	33	35	-13
Birch Grove	48	33	35	-13

Note: All sound levels are freefield sound measurements.

Table 7.5: BS 4142 Assessment - Nighttime

	Background Sound Level L_{A90}	Specific Sound Level L_{Aeq}	Rating Sound Level L_{Aeq}	Rating and Background Sound Level Difference
Pine Drive	25	21	23	-2
West Heath House	25	19	21	-4
Beechwood house	25	21	23	-2
Bramley Dene	25	18	20	-5
Birch Grove	25	17	19	-6

Note: All sound levels are freefield sound measurements.

BS 4142: 2014 suggests that “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”. Consequently, it is possible to conclude that unmitigated, the proposed CAHV and kitchen extract fans are unlikely to have an adverse impact on the nearest noise sensitive receptors. BS 4142 states that this is indicative of a low impact and that this is a positive indication that complaints would be unlikely.

8. CONSTRUCTION NOISE

8.1. Construction Plant & Machinery

Construction works in connection with the proposed development has the potential to cause impacts in relation to excessive levels of noise at the closest dwellings and other sensitive properties.

A noise measurement study has identified that the site is a Category A site under BS 5228 and therefore, construction noise limits have been set. The cumulative noise level from all plant operating for each phase of the construction programme has been calculated in accordance with the methodology of BS 5228. Without mitigation, the cumulative noise from all construction activities is predicted to be below the Category A site thresholds of BS 5228.

To ensure that the levels of construction noise do not exceed the Category A threshold of BS 5228, three areas of primary mitigation are proposed:

1. Selection of quiet plant
2. Smart scheduling
3. Noise monitoring

In addition, secondary mitigation measures are proposed to ensure that Best Practicable Means (BPM) are employed at all times and for all stages of set up, operation, and decommissioning of the site.

Table 8.1 presents a simplified construction programme of the site with the full construction programme presented in **Appendix 5**.

Table 8.1: Construction Programme

Phase	Activity	2025							2026												'27	
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
1	Demolition/Groundworks																					
2	Substructure																					
3	Superstructure																					
4	Landscaping & Fitout																					

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Table 8.2: Annex C BS 5228 Construction Noise Source Data – Typical Plant

Plant	BS 5228 Reference	SPL dB $L_{Aeq,T}$ at 10m	% Working Time	Time Corrected SPL, dB $L_{Aeq,T}$ at 10m	Plant Included in Construction Phase			
					1	2	3	4
20t Excavator	Table C.2 Ref. 21	71	80%	70	Y	Y	N	N
12t Excavator	Table C.2 Ref. 25	69	80%	68	Y	N	N	N
8t Excavator	Table C.4 Ref. 17	71	80%	70	N	Y	N	N
5t Excavator					N	Y	N	N
Tracked Crusher	Table C.1 Ref. 14	82	50%	79	Y			
8t Dumper	Table C.2 Ref. 8	68	80%	67	Y	N	N	N
7t Dumper	Table C.4 Ref. 5	63	80%	63	N	Y	N	N
1.5t Dumper	Table C.4 Ref. 8	56	80%	55	N	Y	N	N
3.5t Telehandler	Table C.4 Ref. 55	70	25%	64	N	Y	N	N
4t Telehandler	Table C.2 Ref. 35	71	50%	68	N	N	Y	N
120t Mobile Crane	Table C.4 Ref. 42	64	25%	64	N	N	Y	N
Stihl Saws	Table C.4 Ref. 72	79	30%	74	N	N	Y	N
Circular Saws	Table C.4 Ref. 72	79	30%	74	N	N	Y	N
Angle Grinder	Table C.4 Ref. 93	80	30%	75	N	N	Y	N
Hammer Drills	Table D.6 Ref. 54	76	30%	71	N	N	Y	N
Impact Drills	Table D.7 Ref. 7	80	30%	75	N	N	Y	N

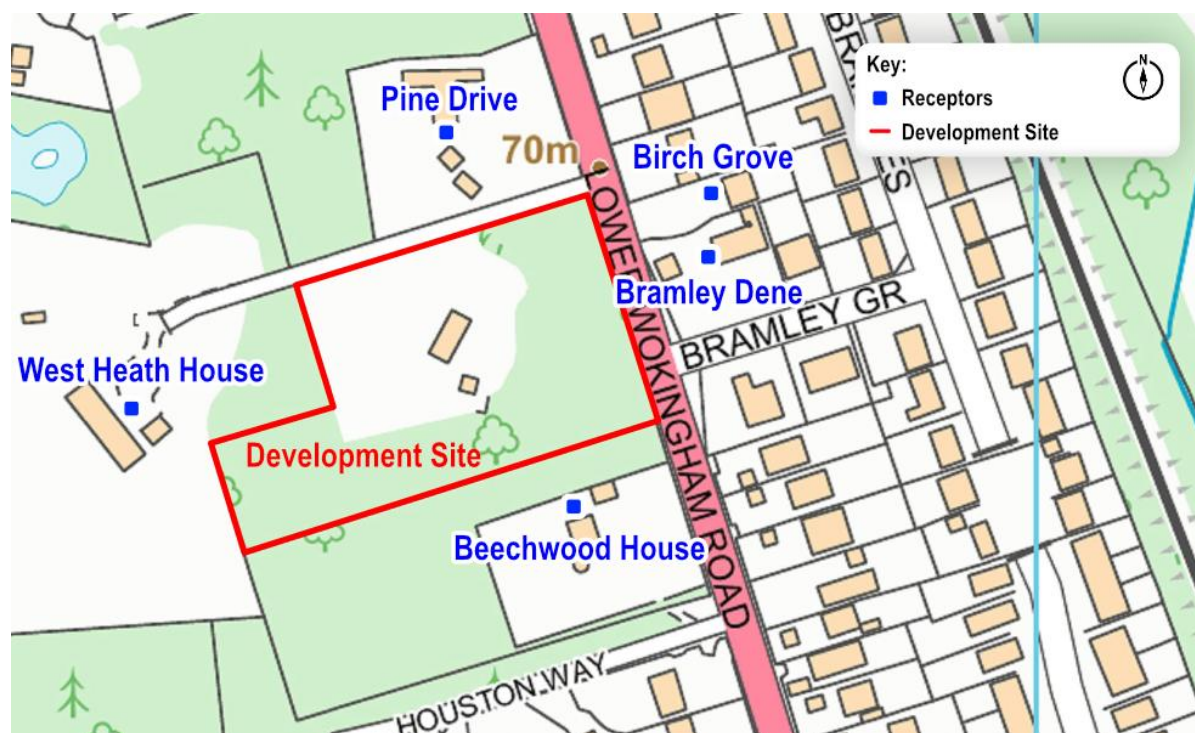
8.1.1. Noise Sensitive Receptors

Construction works of the proposed development has the potential to cause impacts of excessive levels of noise and vibration; particularly to the nearest noise-sensitive premises (NSPs) which are in close proximity to the development site. 5 NSPs have been considered:

- 1 – West Heath House
- 2 – Pine Drive
- 3 – Birch Grove
- 4 – Bramley Dene
- 5 – Beechwood House

Figure 8.1 presents the nearest noise sensitive receptor locations.

Figure 8.1: Noise Sensitive Premises Locations



8.1.2. Initial Assessment

The cumulative noise level from all plant operating for each phase of the construction programme has been calculated in accordance with the methodology of BS 5228. **Table 8.3** presents a summary of the cumulative noise levels at the NSPs, based on the construction activities occurring at the closest point to each respective noise sensitive receptor.

Table 8.3: Summary of Cumulative Receptor Noise Levels Based on Plant Noise Calculations

Receptor	Cumulative Receptor Sound Pressure Levels, dB $L_{Aeq,T}$ (Months)				
	1-3	4-5	6	7-16	16-20
1 – West Heath House	58	55	62	59	-
2 – Pine Drive	62	58	65	64	-
3 – Birch Grove	60	54	61	60	-
4 – Bramley Dene	63	55	61	61	-
5 – Beechwood House	63	57	63	64	-

As noted in **Section 3.4** of this report, the maximum $L_{Aeq,T}$ noise level for daytime construction noise at a Category A site is 65 dB. **Table 8.3** notes that this threshold is not exceeded when considering the predicted sound pressure level values of the construction activities for each respective phase. Months 16-20 are in relation to landscaping and fitout where it is expected that there will not be a notable impact of noise.

8.1.3. Primary Noise Mitigation Measures

It is clear from the initial assessment that the level of construction noise meets the Category A criteria of BS 5228 of 65 dB(A). However, it should be noted that these noise levels would be unlikely, as this assumes the construction noise activities would occur at the closest point within the development site and the proposed building to each respective receptor. Therefore, the actual noise levels from the proposed construction activities are likely to be marginally lower than as estimated. Consequently, this assessment is a consideration of a 'worst-case' scenario.

However, since this worst-case scenario identifies the levels of construction noise are close to the Category A threshold of BS 5228 of 65 dB, it would be necessary to consider mitigation to ensure that the threshold value is not exceeded.

It is recommended that when particularly noisy activities occur, especially when they occur close to the nearest noise sensitive premises (NSPs), the following mitigation measures are implemented:

- **Smart scheduling**, ensuring that when noisy activities occur close to NSPs, ensure that other concurrent activities are either located as far from the NSPs as possible, or are quiet activities; and
- **Noise levels are monitored** to ensure that if noise levels are exceeded at any of the NSPs, noisy works are stopped or noise levels are reduced. The noise threshold in BS 5228 is normally considered

to be a $L_{Aeq,12hours}$ from 7am to 7pm. Since this is effectively an “average” noise levels or a dose of noise, rather than a maximum noise level, one can make noise in excess of the threshold value for a shorter period of time, providing that the rest of the period consists of lower noise levels.

8.1.4. Secondary Noise Mitigation Measures

Whilst selecting quieter plant, smart scheduling and noise level monitoring will be essential in ensuring that the levels of construction noise do not exceed the Category A threshold of BS 5228, a number of design and management measures can be incorporated into proposed working practices to further reduce the potential impact to the surrounding properties.

Best Practicable Means (BPM) shall be employed at all times and for all stages of set up, operation, and decommissioning of the site. The following general measures will be included;

- Operating hours should be adhered to, with local residents being notified of any changes to the operating hours of the site;
- All plant used on site should be in compliance with the noise limits quoted in the ‘*Noise Emission in the Environment by Equipment for use Outdoors Regulations 2001: Great Britain*’;
- Where practicable, design and use of site hoardings and screens to provide acoustic screening of noise emitting equipment. Temporary noise barriers must have at least 15 kg/m² surface density (or manufacturer provide evidence to confirm minimum of 10dB(A) reduction at 500Hz), where possible higher than the line of sight to neighbours;
- Proper use of plant with respect to minimising noise emissions and regular maintenance. All vehicles and mechanical plant used for the purpose of the works should be fitted with effective exhaust silencers and should be maintained in good efficient working order. All planned repairs and maintenance of plant shall be undertaken during normal working hours. Activities outside normal working hours that could give rise to disturbance will be kept to a practicable minimum. Such maintenance activities shall only be undertaken within the site compound and behind the site hoarding;
- Selection of inherently quiet plant where suitable. Any major items of plant such as generators or compressors should be ‘sound reduced’ models fitted with properly lined and sealed acoustic covers which should be kept closed whenever the machines are in use and all ancillary pneumatic percussive tools should be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Machines in intermittent use should be shut down in the intervening periods between work or throttled down to a minimum;
- Plant and equipment such as flat-bed lorries, skips and chutes should be lined with noise attenuating materials. Materials should be handled with care and be placed, not dropped. Materials should be delivered during normal site operation hours.
- All ancillary plant such as generators, compressors and pumps should be positioned so as to cause minimum noise disturbance, i.e. furthest from receptors or behind close boarded noise barriers. If necessary, acoustic enclosures should be provided and/or acoustic shielding;

- Use of screws and drills rather than nails for fixing hoardings etc;
- Careful handling of materials & waste such as lowering rather than dropping items;
- The site layout should be designed to minimise potential effects on neighbours. A competent banksman should be employed to provide assistance to vehicles accessing and leaving the site, thereby ensuring minimal traffic disturbance and pedestrian safety.
- Vehicle movements should be planned to ensure that lorries do not arrive or depart outside standard hours. No daytime or night-time parking of lorries will be permitted outside agreed areas;
- Avoiding excessive shouting, loud radios or excessive revving of engines;
- Construction contractors should be obliged to adhere to the codes of practice for construction working given in BS 5228-1:2009+A1:2014 and the guidance given therein regarding minimising noise emissions from the site.

8.1.5. Neighbour Liaison

The most important secondary mitigation measure is forging a proactive relationship with neighbours. Early interaction with neighbours via a direct, named neighbour liaison officer can help foster positive relationships between neighbours and contractors and reduce the likelihood of complaints.

It is recommended that the following neighbour notification procedures will be followed during the operational works, the Contractor should appoint a responsible person to liaise with stakeholders in order to keep them informed of matters likely to affect them.

Prior to site work commencing (at least one week before the works or a change in works), neighbours will be informed of:

- The start date;
- the duration and nature of the project;
- the principal stages of the project;
- possible impacts; and
- details of contact names and numbers of appropriate site personnel.

The names and contact details of appropriate site personnel should be forwarded to the Local Environmental Health Officer and should be posted on the site hoarding at the entrance.

8.2. Construction Traffic

At this stage, details of construction traffic have not been provided. It is understood that Lower Wokingham Road (A321) features a traffic count of 12,666 AADT with 1.3% of traffic classified as HGV traffic.

An increase of 3 dB (the onset of an adverse impact and onset of perceptibility) is analogous to a doubling of road traffic. Therefore, the construction programme would need to see an increase in AADT by more than 12,000 vehicle movements with more than 160 HGV movements per day for construction traffic noise to be considered a measurable impact. It is unlikely that the construction programme would see such levels of trip

generation and therefore it is likely that the construction programme would only see a negligible increase in traffic with equally a negligible impact to residents along the A321.

With the consideration of Best Practicable Means and a traffic management plan, absolute noise levels can be effectively managed such that potential impacts arising from construction traffic noise can be minimised as far as reasonably practicable. This may be inclusive of:

- Scheduling HGV deliveries to occur during off-peak hours to minimise congestion and to avoid weekends;
- Consider 'just-in-time' ("JIT") logistics strategies in addition to consolidation in order to minimise and stagger deliveries;
- Communication and co-ordination with suppliers to emphasise necessity of noise reduction measures during deliveries;
- Use of clear signage and route planning;
- Provide incentives for the use of public transportation and carpooling to reduce the number of workers' vehicles entering and exiting the site;
- Avoiding deliveries on weekends;
- Avoid idling vehicles;

By using a Best Practicable Means approach and with an implementation of a Traffic Management Plan, construction traffic can be effectively managed which would reduce noise from construction traffic as far as reasonably practicable.

8.3. Construction Vibration

8.3.1. Prediction of Vibration

Vibration is very difficult to predict, as the propagation of vibration depends on a number of factors that are not always easy to quantify. However, BS 5228-2 provides guidance on determining whether impacts are likely to be considered an impact by providing distances from typical construction activities at which the onset of perceptibility could occur. BS 5228-2 suggests that for the majority of people, the threshold of vibration perceptibility is between 0.14 and 0.3 mms⁻¹ PPV which is likely to occur from 15-20 metres to vibratory activities such as piling, concrete breaking and excavation.

Based on the outline construction schedule, it is known that the use of heavy goods vehicles, excavators and piling will all take place during the construction of the development. It has been noted that construction activities will occur more than 40m to the nearest noise sensitive receptors. Therefore, it is considered unlikely that vibration from these activities would be perceived at these receptors and exceed 0.14 mms⁻¹ PPV.

8.3.2. Control of Vibration

BS 5228 provides several methods of mitigating construction vibration. This includes the use of:

- Alternative piling and ground engineering methods and processes;

- Removal of obstructions (e.g. old basement floors, foundations, timbers etc...);
- Provision of cut-off trenches;
- Reduction of energy input per blow (for hammer-driven piling methods);
- Reduction of resistance to penetration, such as:
 - Pre-boring for driven piles.
 - Mudding in for rotary bored piles.
 - Adding water to the bore hole for impact bored piles.
- Avoidance of shear leg contact with sensitive structures;
- Removal of the plug when using casing vibrators;
- Bottom-driving; and,
- Use of variable moment vibrators.

8.4. Complaints and Incident Procedures

The Environmental Coordinator will keep records of the results of the regular monitoring undertaken. Additionally, a record of all environmental incidents that result in air pollution and remedial action taken will be recorded in an environmental incident log book.

Complaints received will be recorded and investigated by the Site Manager.

In the event that exceedances are identified and complaints are raised, appropriate mitigation measures will be installed to reduce noise levels to within the specified limit. Where safe and practical, works will be stopped immediately following a verified complaint and exceedance and will not be commenced until adequate noise control measures are developed and installed. Furthermore, noise measurements will be undertaken once additional mitigation is in place, in order to check the effectiveness of those mitigation measures and the compliance with the noise limits.

The Local Authority's Environmental Health Department will be informed in writing in the event of any noise exceedance and the measures undertaken to reduce noise levels. In the event that noise complainants are raised, the veracity of such complaints will be investigated. Part of the investigation will be based on construction site logs (identifying the works and plant used at the time of the complaints) with the rest reliant on the undertaking of noise monitoring at the complainant receptor or at a representative location.

Complaints will be logged by the project team, and complainants contacted within 48 hours of the complaint to talk through the investigation process. Where monitoring is considered to be a necessity, noise monitoring will be undertaken within 72 hours of receipt of the complaint. The project team will keep the complainant updated throughout the investigation process.

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

8.5. Training

- All site personnel should be made aware of the noise management procedures covered in this plan during site induction.
- Regular Toolbox talks should be given to remind all site personnel of the requirements of noise management.
- All training should be recorded.
- Method statements and risk assessments should also be written (and briefed to all site personnel) before any works that may impact noise are carried out on site.
- Integrated into these documents should be the specific control and risk mitigation methods relating to the noise and vibration issues detailed in this document.

9. OVERALL CONCLUSIONS AND RECOMMENDATIONS

A detailed noise measurement study has been carried out at the site in order to determine whether as a result of noise, there are any significant constraints on developing the site for use as a care home. As part of the appeal decision (LPA ref. APP/X0360/W/23/3336000), a number of conditions are outlined. This includes condition 9 that states *“Prior to the commencement of the development, a noise impact assessment together with a timetable for its implementation, shall be submitted to and approved in writing by the local planning authority.*

The assessment should be suitable to inform the design of the development hereby permitted and will need to address noise impact in terms of:

- i. *Existing noise sources and how they may affect the amenity of the occupiers of the site once construction is complete, this is to take into consideration the character of the site and the nearby roads etc, and the impact on the amenity of nearby noise sensitive receptors as a results of the new development, both internal and external spaces, taking into consideration any mechanical noise arising from the use of the proposed development including, but not limited to, kitchen extractor fans.*
- ii. *The impact on nearby noise sensitive receptors during the construction phase, to include vehicle movement and plant and machinery being used, as well as construction noise and any mitigation measures.*
- iii. *Details of good design to protect occupiers of the proposed development from noise from existing noise sources, glazing and ventilation of the proposed properties will need to be designed to meet acceptable internal and external noise levels.*

The noise assessment should identify a scheme of recommended works, or such other steps as may be necessary to minimise the effects of noise on nearby receptors an don future occupants of the development. The approved noise scheme resulting from the assessment shall be implemented according to the approved timetable, and approved measures, other than those addressing the construction phase shall be retained thereafter.”

The study has shown that due to noise from surrounding roads and the wider environment, the site is considered a “low risk” site under the Pro-PG, with noise levels between the Lowest Observed Adverse Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (SOAEL); therefore, if the site is to come forward for residential development, noise must be considered and it must be mitigated and reduced to a minimum.

Using the guidance and calculation methods contained within BS 8233: 2014 ‘Guidance on sound insulation and noise reduction for buildings’, it has been shown that the recommended maximum internal noise levels for each room use under BS 8233 can be achieved through the provision of suitable glazing and ventilation. A summary of the recommendations can be seen in **Table 9.1** below.

Table 9.1: Summary of Recommendations to Achieve Suitable Internal Noise Levels

	All facades	
	Bedrooms	Living Rooms
Minimum Sound Reduction of the Glazing in Relation to Noise	Standard doubling glazing, which would typically have a R_w of 33 dB or more.	
Ventilation Recommendations in Relation to Noise	Based on the onsite noise level, any ventilation system should be appropriate.	
Overheating Recommendations in Relation to Noise	Based on the onsite noise levels, windows can be opened to deal with overheating, depending on duration.	

A plant noise assessment in accordance with BS 4142:2014+A1:2019 has identified that the proposed CAHV and kitchen extract fans are unlikely to have an adverse impact on the nearest noise sensitive receptors. This is indicative of a low impact and that this is a positive indication that complaints would be unlikely.

A construction noise impact assessment has been conducted in consideration of BS 5228:2009+A1:2014 and has identified that the nearest noise sensitive premises would not be adversely affected by the demolition and construction activities of the development.

Since it has been shown that the proposed development meets the guidance contained within BS 8233: 2014, BS 4142:2014+A1:2019 and BS 5228:2009+A1:2014, it is considered that the proposed development would be in compliance with the requirements as set out in Condition * of the Decision Notice (LPA ref. APP/X0360/W/23/3336000).

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Appendix 1

Glossary of Acoustic Terms

Appendix 1: Glossary of Acoustic Terms

Decibel (dB)	This is a tenth (deci) of a bel. Decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of the ratio between two quantities expressed in logarithmic form.
dB(A)	A-weighted decibels, i.e. decibel level incorporating a frequency weighting (A-weighting), which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness.
Freefield	A situation in which the radiation from a sound source is completely unaffected by the presence of any reflecting boundaries.
Hertz (Hz)	Unit of frequency, equal to one cycle per second. The frequency of sound waves refers to the number of pressure fluctuations per second. Frequency is related to the pitch of a sound.
$L_{Aeq,T}$	The equivalent steady sound level in dB(A) containing the same acoustic energy as the actual fluctuating sound level over the given period, T. For example, daytime noise is generally measured over a 16 hour period, so T is 16 hours. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.
L_{A10}	The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 percent of a given time and is the $L_{A10,T}$. The L_{A10} is used to describe the levels of road traffic noise at a particular location.
L_{A50}	The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 50 percent of a given time and is the $L_{A50,T}$.
L_{A90}	The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 percent of a given time and is the $L_{A90,T}$. The L_{A90} is used to describe the background noise levels at a particular location.
L_{Amax}	The 'A'-weighted maximum sound pressure level measured over a measurement period.
R_w (or SRI)	The weighted sound reduction index as a single number laboratory measured rating used to describe the sound insulation of building elements.

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Appendix 2

Schedule of Equipment

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Appendix 2: Schedule of Equipment

Hawkins Noise Kit 3 - Equipment Set 2918:

Equipment Type	Manufacturer	Serial Number	Calibration Certification Number	Calibration Type	Date of Last Calibration Check	Date of Next Calibration Check
Nor-140 Type 1 Sound Level Meter	Norsonic	1402918	U47824	UKAS Calibration: 0789	16 th May 2024	May 2026
Nor-1211-C Weather protected measurement microphone	Norsonic	8706	48196	Traceable Calibration – Campbell Associates	26 th June 2024	June 2026
Nor-1251 Sound Calibrator	Norsonic	31233	U47822	UKAS Calibration: 0789	16 th May 2024	May 2025
Nor1408A/10 Extension Cable	Norsonic/Lemo	Not Applicable				

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Laboratory Location

Campbell Associates Ltd

5b Chelmsford Road Industrial Estate
 GREAT DUNMOW, Essex, GB-CM6 1HD
 Phone 01371 871030

**Certificate of Calibration**Certificate number: **U47824**Test Object: **Sound Level Meter, BS EN IEC 61672-1:2003 Class 1**

Producer: **Norsonic AS.**
 Type: **140**
 Serial number: **1402918**
 Customer: **Hawkins Environmental Ltd**
 Address: **The Square, Basing View,
 Basingstoke, Hampshire. RG21 4EB.**
 Contact Person: **Nick Hawkins**
 Order No: **PO-0376**

Introduction:

Calibration has been performed as set out in CA Technical Procedures which are based on the procedures for periodic verification of sound level meters as per the Test Object listed above. Results and conformance statement are overleaf and detailed results, where appropriate, are provided in the attached Measurement Report.

Tested:	Producer	Type	Serial No	Certificate No
Microphone	CEL	192/2F	28241	U47823
Calibrator*	Norsonic	1251	31233	U47822
Preamplifier	Norsonic	1209	12207	Included

* The calibrator was complete with any required coupler for the microphone specified.

Additional items that have also been submitted for verification:

Wind shield Norsonic Nor1451 (ø 60mm)
 Attenuator N/A
 Extension cable N/A

These items have been taken into account wherever appropriate.

Instruction Manual: Im140_1Ed8R0En Firmware Version: v2.1.670 The test object is a single channel instrument.

Conditions	Pressure kPa	Temperature °C	Humidity %RH
Reference conditions	101.325	23	50
Measurement conditions	99.89 ±0.01	23.05 ±0.85	55.25 ±2.55

Calibration Dates:

Received date: 10/05/2024 Reviewed date: 16/05/2024
 Calibration date: 16/05/2024 Issued date: 16/05/2024

Technicians: (Electronic certificate)

Calibrated by: *Martyna Silva*

Reviewed by: *Jenny Crawford*

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Doc ref: Slim-Cert-Master-V3-07

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1**Certificate of Calibration**

Continuation of Certificate number: U47824

The statements of conformance and observation notes detailed in this certificate are made with reference to the following standards in respect of the calibration of the test object.

Manufactured:	BS EN IEC 61672-1:2003
Periodic Tests:	BS EN IEC 61672-3:2006
Pattern Evaluation:	Not Applicable

Conformance:

From markings on the sound level meter or by reference to the manufacturer's published literature it has been determined that the instrument submitted for verification was originally manufactured to the listed standard and similarly that the associated sound calibrator conforms to the BS EN IEC 60942 standard.

Measurement Summary:

Indication at the calibration check frequency - IEC 61672-3 Ed.1 #9	Passed
Self-generated noise - IEC 61672-3 Ed.1 #10.2	Passed
Acoustical signal tests of a frequency weighting - IEC 61672-3 Ed.1 #11	Passed
Electrical signal tests of frequency weightings - IEC 61672-3 Ed.1 #12	Passed
Frequency weightings: A Network - IEC 61672-3 Ed.1 #12.3	Passed
Frequency weightings: C Network - IEC 61672-3 Ed.1 #12.3	Passed
Frequency weightings: Z Network - IEC 61672-3 Ed.1 #12.3	Passed
Frequency and time weightings at 1 kHz IEC 61672-3 Ed.1 #13	Passed
Level linearity on the reference level range - IEC 61672-3 Ed.1 #14	Passed
Toneburst response - IEC 61672-3 Ed.1 #16	Passed
Peak C sound level - IEC 61672-3 Ed.1 #17	Passed
Overload indication - IEC 61672-3 Ed.1 #18	Passed

Comments

Correct level with associated calibrator is 113.9dB(A).

Statement of Conformance

The sound level meter submitted for testing has successfully completed the periodic tests for the environmental conditions under which the tests were performed. However, no general statement of conclusion can be made about conformance of the sound level meter to the full requirements of the manufactured standard because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in the manufacturer's standard and because the periodic tests completed cover only a limited subset of the specifications in the relevant standard

Observations

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a coverage probability of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS requirements. Details of the uncertainty for each measurement are available from the Calibration Laboratory upon request. Details of the sources of corrections and their associated uncertainties that relate to this verification are contained within the test report accompanying this certificate.

Decision Rule

Basic Meter Function - The decision rules will be applied in accordance with the procedure as described in BS EN 61672-3:2006.

This certificate relates only to the items tested above.

** End of Certificate **

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1**Certificate of Conformance**

Certificate Number 48196

Date of verification June 26, 2024

Laboratory Location

Campbell Associates Ltd

5b Chelmsford Road Industrial Estate

GREAT DUNMOW, Essex, GB-CM6 1HD

Phone 01371 871030

**Weather protected measurement microphone**

Manufacturer Norsonic

Type 1211

Variant C

Serial number 8706

Issued to

Hawkins Environmental Ltd
70 Wentworth Crescent
Basingstoke

Hampshire RG22 4WX

These weather protected measurement microphones comprise a microphone capsule and an associated preamplifier, the types and serial numbers fitted to this unit are noted below. Each of these elements have been tested separately and then the overall acoustic performance of the system verified.

Calibration Report & Certificate Number 48195 for the microphone are attached and form part of this certificate.

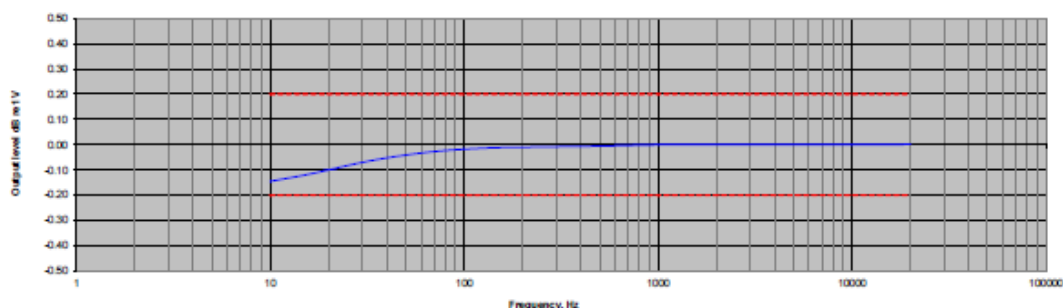
Microphone type	GRAS-40AS	Serial number	9466	Sensitivity	-27.63 dB
Preamplifier type	NOR-1201	Serial number	23667		

Comments: Electrical self noise and acoustic tests carried out using Nor-140.1406335.

Preamplifier conformance

Relative gain test. An input signal was connected via a 18pF line input adaptor. The signal source was a Stanford Research DS360 Signal Synthesizer serial number 88732 and the output levels were read on an Agilent (HP) 34401. Precision Digital Voltmeter serial number MY41015704. Power supplies for the preamplifier were supplied by a Norsoni Nor-483B SMS unit serial number 31072. Valid traceable calibration certificates are held for all this equipment. Verification was performed to the procedure TP 08. The relative gain with frequency of the preamplifier is given in the graph below with the absolute gain at 1kHz given in the table.

Relative gain at 1V input



Continued overleaf

DOCR: CERT-M001

Page 1 of 2

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Absolute gain at 1k Hz

Absolute gain test		
Frequency	Gain	Result
Hz	dB	
1k	-0.24	Pass

Electrical self noise tests

Self noise in dB, at -26dB re 1V/Pa with 18pF load		Result
dB(A)		
	9.5	Pass
dB(C)	13.4	Pass

Acoustic tests

The weather protected measurement microphone was coupled to the Reference Calibrator Nor-1253 serial number 27765 using the supplied coupler Gras-RA0010 s/n 599 and the correct SPL was set on the laboratory analyser. The acoustic cover was then placed over the microphone and the acoustic noise floor checked and the level expressed in dB(A).

The system was then calibrated with Nor-1251 serial number 30873 and the insertion loss of the coupler determined.

Acoustic coupler Gras-RA0010 serial number 599

Acoustic tests	Reference	Measured	Result
	dB	dB	
Acoustic calibration @ 250 Hz	124	124.0	Pass

Acoustic noise floor	Lab ambient	Measured	Result
	dB	dB	
A weighting	35.9	17.2	Pass

Acoustic coupler verification with 1kHz test calibrator	Nominal Level	Measured	k factor
	dB	dB	
	124	114.7	0.71

When using the specified acoustic coupler with the test calibrator given above the correct calibration level for this weather protected measurement microphone is given below.

$$\begin{aligned}
 \text{Calibration level} &= \text{Calibrator nominal level} + \text{Coupler k factor} \\
 &= 113.99 + 0.71 \\
 &= 114.7 \text{ dB}
 \end{aligned}$$

The correct reference angle for this measurement microphone is 90 degrees, when mounted vertically it is correct for measurement of sources co-planar to the horizon.

Environmental conditions at time of tests

Temperature 23.9 °C Humidity 50.3 % RH Pressure 1004.91 mBar

These test indicate that the subject device complies with the requirements of the manufacturer's specification at the time of its manufacture. Repeat verification is recommended within 24 months

Technician: (Electronic certificate)

Verification performed by: *Martyna Silva*

Date of verification: 26 June 2024

Certificate Number: 48196

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Laboratory Location

Campbell Associates Ltd

5b Chelmsford Road Industrial Estate

GREAT DUNMOW, Essex, GB-CM6 1HD

Phone 01371 871030

**Certificate of Calibration**Certificate number: **U47822**Test Object: **Sound Calibrator**Producer: **Norsonic AS.**Type: **1251**Serial number: **31233**Customer: **Hawkins Environmental Ltd**Address: **The Square, Basing View,
Basingstoke, Hampshire. RG21 4EB.**Contact Person: **Nick Hawkins**Order No: **PO-0376**

Measurement Results	Level dB	Level Stability dB	Frequency Hz	Distortion %
Measurement 1	114.10	0.05	1000.56	0.43
Measurement 2	114.09	0.04	1000.57	0.43
Measurement 3	114.09	0.05	1000.57	0.44
Result (Average):	114.09	0.05	1000.56	0.43
Expanded Uncertainty:	0.1	0.02	1	0.1
Degree of Freedom:	>100	>100	>100	>100
Coverage Factor:	2	2	2	2

The stated level is relative to 20µPa. The level is traceable to National Standards. The stated level is valid at reference conditions. The following correction factors have been applied during the measurement

Pres:0.0005 dB/kPa Temp:0.003 dB/°C Humi:0 dB/%RH Load volume: 0.0003 dB/mm³

Conditions	Pressure kPa	Temperature °C	Humidity %RH
Reference conditions	101.325	23	50
Measurement conditions	99.88 ±0.040	21.4 ±0.1	59.3 ±0.7

The reported expanded uncertainty of measurements is based on a standard uncertainty multiplied by the coverage factor of k=2, providing a level of confidence of approximately 95%. Where the degrees of freedom are insufficient to maintain this confidence level, the coverage factor is increased to maintain this confidence level. The uncertainty has been determined in accordance with UKAS requirements.

Records: K:\C A\Calibration\Nor-1504\Nor-1018 CalCal\Current Year\NOR1251_31233_M1.nmf

Preconditioning

The equipment was preconditioned for more than 4 hours in the specified calibration environment.

Method

Calibration has been performed as set out in the current version of CA Technical procedure TP01

Calibration Dates:

Received date: 10/05/2024 Reviewed date: 16/05/2024

Calibration date: 16/05/2024 Issued date: 16/05/2024

Technicians: (Electronic certificate)

Calibrated by: *Palanivel Marappan B.Eng(Hons), M.Sc*

Reviewed by: *Jenny Crawford*

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Doc ref: Calb-Cert-Master-V3-07

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Certificate of Calibration

Continuation of Certificate number: U47822

Reference Microphone: WSM11 (C) - GRAS40AG-291442

Measurements

The calibrator has been tested as described in the following annexes to BS EN IEC60942:2003 Sound Calibrators; B3.4 for sound pressure level, B3.5 for frequency, B3.6 for total distortion and A4.4 for short term stability of the pressure level.

Instruments and Program

A complete list of instruments, hardware and software that have been used for this calibration is available from the calibration laboratory

Comments

Statement of Calibration

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in annex B of BS EN IEC 60942:2003 for the sound pressure levels and frequencies stated, for the environmental conditions under which the tests were performed. However, as public evidence was not available, from a testing organisation responsible for pattern approval, to demonstrate that the model of sound calibrator conformed to the requirements for pattern evaluation described in annex A of BS EN IEC 60942:2003, no general statement of conclusion can be made about conformance of the sound calibrator to the requirements of BS EN IEC 60942:2003.

Notes:

The sound pressure level generated by the calibrator in its ½ inch configuration was measured five times and averaged by a WS2P working standard microphone for class 1 or 2 devices or a LS2P reference microphone for class 0 or LS devices as specified in the International Standard BS EN 61094-4. The results of three replications and the mean of the measurements obtained are given in the measurement results table of this certificate. The frequency and distortion were measured in a similar manner. The figures in BOLD are the final results; a small correction factor may need to be added to the sound pressure level quoted here if the device is used to calibrate a sound level meter that is fitted with a free field response microphone. See manufacturer's handbooks for full details of this and other corrections that may be applicable.

Observations:

Decision Rule:

The decision rules have been applied in accordance with the procedure as described in BS EN 60942:2003

This certificate relates only to the items tested above.

**** End of Certificate ****

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Appendix 3

Summary of Noise Measurements

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Appendix 3: Summary of Noise Measurements

Time	L _{Aeq}	L _{Amax}	L _{A10}	L _{A50}	L _{A90}
07:00	58.6	67.0	61.1	58.2	52.6
08:00	58.7	77.5	61.0	58.3	53.8
09:00	58.0	75.1	60.5	57.2	52.6
10:00	56.0	83.3	58.8	55.0	48.8
11:00	55.5	71.4	58.3	54.9	47.8
12:00	55.4	63.1	58.2	54.8	48.4
13:00	55.1	65.0	58.1	54.3	48.0
14:00	55.5	66.6	58.2	54.9	49.8
15:00	58.2	86.4	58.0	55.4	50.4
16:00	56.4	69.8	58.8	55.9	50.9
17:00	56.1	62.9	58.4	55.8	51.1
18:00	56.0	67.1	58.9	55.3	49.3
19:00	55.0	70.5	58.3	53.7	45.0
20:00	53.6	63.7	57.5	51.4	41.3
21:00	52.8	63.2	56.8	49.4	38.4
22:00	51.3	66.7	55.7	44.4	34.5
23:00	47.5	64.6	51.7	35.4	30.3
00:00	43.0	66.2	39.4	28.4	25.8
01:00	40.1	59.9	35.6	25.7	23.7
02:00	42.3	69.4	31.7	25.9	24.0
03:00	41.8	63.0	38.5	29.2	26.9
04:00	42.0	64.0	37.8	27.9	25.0
05:00	50.1	67.8	53.7	37.8	32.0
06:00	55.0	66.3	58.6	50.9	41.3
Day	56.2	86.4	58.5	54.3	47.7
Night	48.4	69.4	43.4	32.7	28.6

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Appendix 4 Manufacturer Fan Data

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Appendix 4: Manufacturer Fan Data

Mitsubishi Electronic CAHV ASHPs

Model		CAHV-P500YB-HPB	
Power Source		3-phase 4-wire 380-400-415V 50Hz	
Capacity *1		kW	45.0
		kcal/h	38700
		BTU/h	153540
	Power input	kW	12.9
	Current input	A	21.8-20.7-19.9
Capacity *2		kW	3.49
		kcal/h	45.0
		BTU/h	38700
	Power input	kW	153540
	Current input	A	25.6
Capacity *3		kW	43.2-41.0-39.5
		kcal/h	1.76
		BTU/h	57.8-54.9-52.9
	Power input	kW	12.9kPa (1.87psi)
	Current input	A	25-70°C
Temp range	Outlet water temp *4		77-158°F
	Outdoor temp *4	D.B	-20-40°C
Circulating water volume range			-4-104°F
Sound Pressure level (measured in anechoic room) *1			7.5 m ³ /h-15.0m ³ /h
Sound Pressure level (measured in anechoic room) *3			59
Diameter of water pipe			63
	Inlet	mm (in.)	38.1 (Rc 1 1/2") screw
	Outlet	mm (in.)	38.1 (Rc 1 1/2") screw
External finish			Acrylic painted steel plate <MUNSELL 5Y 8/1 or similar>
External dimension H × W × D			1710 (without legs 1650) × 1978 × 759
Net weight			67.3 (without legs 65.0) × 77.9 × 29.9
Accessories			511 (1127)
Design Pressure			Y strainer Rc 1 1/2
	R407C	MPa	3.85
	Water	MPa	1.0
Drawing	Wiring		KC94R746
	External		KC94R745
Heat exchanger	Water side		stainless steel plate and copper brazing
	Air side		Plate fin and copper tube
Compressor	Type		Inverter scroll hermetic compressor
	Maker		MITSUBISHI ELECTRIC CORPORATION
	Starting method		Inverter
	Motor output	kW	7.5 × 2
	Case heater	kW	0.045 × 2
FAN	Lubricant		MEI32
	Air flow rate	m ³ /min	185 × 2
		L/s	3083 × 2
		cfm	6532 × 2
	External static press *5		0Pa, 60Pa (0mmH ₂ O, 1mmH ₂ O)
Type × Quantity			Propeller fan × 2
Control, Driving mechanism			Inverter-control, Direct-driven by motor
Motor output		kW	0.46 × 2
HIC circuit (HIC:Heat Inter-Changer)			Copper pipe
Protection	High pressure protection		High pres.Sensor & High pres.Switch at 3.85MPa (643psi)
	Inverter circuit		Over-heat protection, Over current protection
	Compressor		Over-heat protection
	Fan motor		Thermal switch
Defrosting method			Auto-defrost mode (Reversed refrigerant circle)
Refrigerant	Type × original charge		R407C × 5.5(kg) × 2
	Control		LEV and HIC circuit

*1 Under Nominal heating conditions at outdoor temp, 7°C DB/6°C WB(44.6°F DB/42.8°F WB) outlet water temp 45°C(113°F), inlet water temp 40°C(104°F)

*2 Under Heating conditions at outdoor temp, 7°C DB/6°C WB(44.6°F DB/42.8°F WB), outlet water temp 70°C (158°F)

*3 Under Heating conditions at outdoor temp, 7°C DB/6°C WB(44.6°F DB/42.8°F WB) when this unit is set to capacity priority mode by non-voltage B contact

*4 Due to continuing improvement, the above specifications may be subject to change without notice.

*5 Please don't use the steel material for the water piping material.

*6 Please always make water circulate or pull out the circulation water completely when not using it.

*7 Please do not use groundwater and well water.

*8 Install the unit in an environment where the wet bulb temp will not exceed 32°C (89.6°F).

*9 The water circuit must use the closed circuit.

*10 There is possibility that the unit may abnormally stop when it operates outside its operating range. Provide backup (ex. boiler start with Error display output signal (blue CN511 1-3)) for abnormal stop.

Unit converter

kcal/h = kW × 860

BTU/h = kW × 3,412

cfm = m³/min × 35.31

lbs = kg0.4536

Outdoor temp -30°C DB/ Outlet water temp 40-45°C
 (Outdoor temp -4°F DB/ Outlet water temp 104°F-113°F)
 Outdoor temp -10°C DB/ Outlet water temp 32°C-35°C
 (Outdoor temp 10°F DB/ Outlet water temp 81°F-95°F)
 Outdoor temp 0°C DB/ Outlet water temp 25°C-30°C
 (Outdoor temp 32°F DB/ Outlet water temp 77°F-86°F)

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Kitchen Extract Fan

Fan Code	71JM/20/4/6/36 [Express]
Fan Diameter / Size	710 Size / mm
Blades	6
Fan Speed	1440 rpm
Velocity	15.2 m/s
Blade Angle	36°
Installation Type / Form of Running	D / B (Horizontal)
Fan Casing	Long
Requested Duty	6m ³ /s @ 330 Pa (static)
Outlet Dynamic Pressure	138 Pa
Duty Shaft Power	4.26 kW
Max Shaft Power	4.35 kW
Total Efficiency	66.1 %
Motor Frame	112M [Class F]
Motor Rating	4.80 kW [IE2]
Full Load Current	9.69 A
Starting Current	49.42 A
Motor Mounting	Pad
Electrical Supply	380-420 Volts 50 Hz 3 Phase
Start Type	DOL
Motor Winding	Standard
Enclosure	Standard All
ErP [FMEG] Rating	N 69 (ErP Compliant)
ErP [FMEG] Target	N 58
FMEG Blade Angle [Range]	24° [20° - 36°]
Measurement Category	D (Total)
VSD	N
Fan + Motor Efficiency	66.4% (4.91 m ³ /s @ 393 Pa)
Motor Input Power (ErP)	2.91 kW
SFP value	0.82 W/(l/s) @ Requested Duty
Power from mains	4.93 kW
Energy Consumption	14795 kWh (3000 h/year)
Running Cost / Year	£1775
Air Density	1.2 kg/m ³ / 20 °C / 0 m / 40% RH
Smoke Venting	Non Smoke Venting
Product Number	EJ741474

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA @ 3 m**
Inlet*	86	89	88	86	83	82	77	73	94	68
Outlet*	87	90	88	87	83	82	79	75	95	69
Breakout*	77	69	62	62	58	54	59	52	78	45
* Lw dB re 10 ⁻¹² W						** dBA re 2x10 ⁻³ Pa				
Sound data at requested duty.										

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

Appendix 5

Full Construction Programme

Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

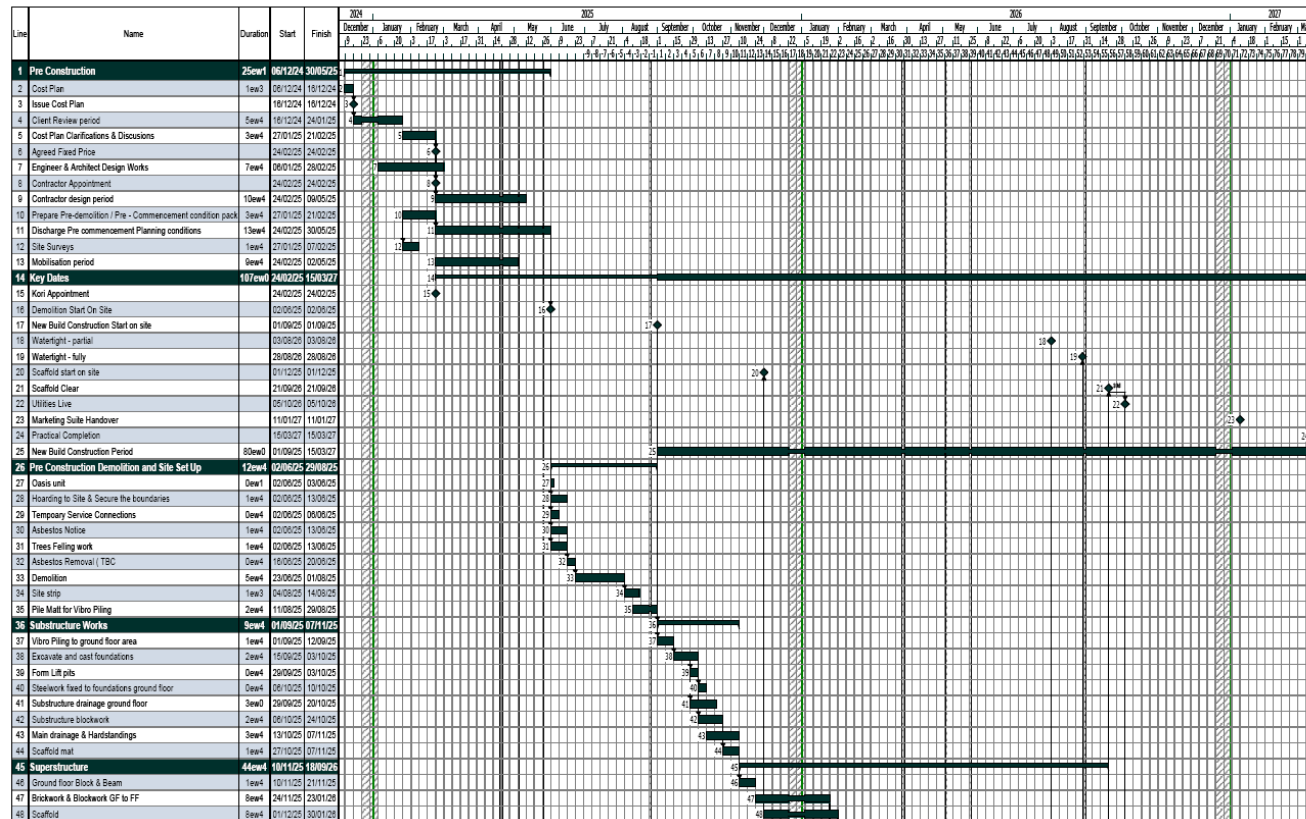
Appendix 5: Full Construction Programme

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Noise Assessment:

Oakdale, Lower Wokingham Road, Crowthorne

Barchester Healthcare Limited • 29th May 2025 • H4379 – NV – v1

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