



Noise Assessment:

Land at Cowplain Community School, Hart Plain Avenue,
Waterlooville

Frontier Estates Limited

18th May 2022

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Frontier Estates Limited • 18th May 2022 • H3331 – NV – v2

Report Details:

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V2	18 th May 2022	Minor Amendments	Nick Hawkins MSc MIOA MIAQM	Nick Hawkins MSc MIOA MIAQM

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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1. INTRODUCTION

1.1. Overview

Hawkins Environmental Limited has been instructed by Frontier Estates Limited to undertake a noise assessment for the redevelopment of land at Cowplain Community School, Hart Plain Avenue, Waterloooville.

During the planning process, it has been identified that the site may require a noise assessment to determine whether the site is suitable for residential use and use as a care home. Consequently, a noise survey was conducted to characterise the noise climate of the site with the proposed layout. By measuring both the ambient and maximum noise levels it has been possible to determine whether mitigation is necessary to achieve reasonable internal and external noise levels.

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 (NPPG) 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**.

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. Statement of Competency

The assessment has been carried out by Nick Hawkins MSc MIOA MIAQM MEnvSc PIEMA, the managing director of Hawkins Environmental Limited. Nick is an environmental consultant with over 15 years of experience working in the field of noise/acoustics and environmental impact assessment.

Nick is an alumnus of the University of East Anglia and the University of Southampton. Nick holds the Institute of Acoustics' Certificate of Competence in Environmental Noise Measurement and became a full Member of the Institute of Acoustics in 2010, having previously been an Associate Member. Nick is also a Member of the Institution of Environmental Sciences and a Member of the Institute of Air Quality Management.

Nick has worked on a range of projects, including a number of prestigious projects, including the noise impact assessments of the Thameslink railway scheme through central London, the construction of lines BXD of the Luas Light Rail System in Dublin, the expansion of Bournemouth Airport and the M25 widening between junctions 1b to 3 and 5 to 7. Nick was one of the first acoustic consultants to be given access to the Crossrail tunnels to conduct vibration compliance monitoring. In addition, Nick regularly conducts acoustic assessments for housing developments, wind turbines, air conditioning units, kitchen extract fans, supermarkets, public houses and other commercial developments.

1.4. Site Description

The development site is situated on Hart Plan Avenue, located in a residential area located close to the village centre of Cowplain. The proposed development will see the construction of a 64-bed care home on part of the playing field currently used by Cowplain Community School. In addition, six dwellings are proposed on what is currently a disused playground, adjacent to the school. A location plan of the proposed site can be seen in **Figure 1.1**.

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Frontier Estates Limited • 18th May 2022 • H3331 – NV – v2**Figure 1.1: Site Location Plan**

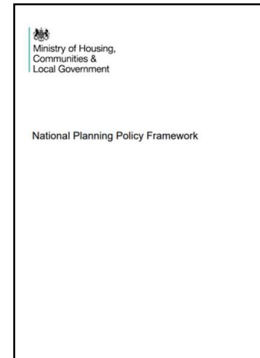
2. PLANNING POLICY & GUIDANCE

2.1. National Planning Policy Framework (2021)

The National Planning Policy Framework (NPPF) was first published on the 27th March 2012 and revised July 2018, February 2019 and again in July 2021. The NPPF outlines the Government's environmental, economic and social policies for England. The NPPF sets out a presumption in favour of sustainable development which should be delivered with three main dimensions: economic; social and environmental (Paragraphs 7, 8, 10 and 11). The NPPF aims to enable local people and their councils to produce their own distinctive local and neighbourhood plans, which should be interpreted and applied in order to meet the needs and priorities of their communities.

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 174).

Paragraph 185 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..."*

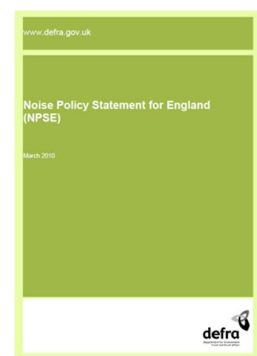


2.2. Noise Policy Statement for England (2010)

The Noise Policy Statement for England (NPSE) provides further guidance on the interpretation of Section 123 of 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 Planning Practice Guidance was launched on 6th March 2014 and provides additional guidance and interpretation to the Government's strategic policies, outlined within the NPPF, in a web-based resource. This is updated regularly.

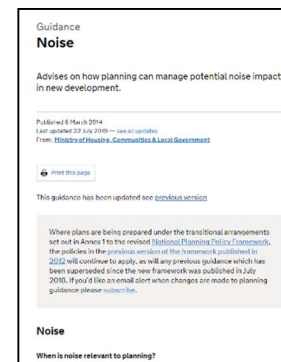
The NPPG provides more guidance on the assessment of noise for planning purposes and builds on the concepts of NOEL, LOAEL and SOAEL introduced in NPSE to establish whether noise is a factor that needs to be taken into account. It states: *“Local planning authorities’ plan-making and decision taking 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 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 (ie whether or not the noise contains particular high or low-frequency content) and the general character of the noise (ie whether or not the noise contains particular tonal characteristics or other particular features). The local topology and topography should also be taken into account along with the existing and, where appropriate, the planned character of the area.*

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 PPG) 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 that 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.

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Table 2.1: Noise Exposure Hierarchy

Perception	Examples of outcomes	Increasing effect level	Action	
Not noticeable	No Effect	No Observed Effect	No specific measures required	Low Noise Level
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required	
Lowest Observed Adverse Effect Level				
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, eg turning up the 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. The potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum	
Significant Observed Adverse Effect Level				
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, eg 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. The potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep.	Significant Observed Adverse Effect	Avoid	
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise leading to psychological stress or physiological effects, eg regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, eg auditory and non-auditory	Unacceptable Adverse Effect	Prevent	High Noise Level

Increasing Noise Levels
↓

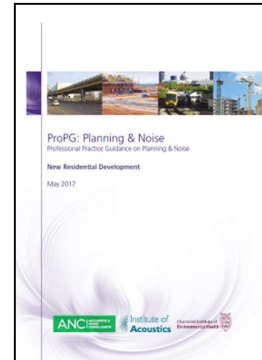
3. ASSESSMENT METHODOLOGY & GUIDANCE

3.1. 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.

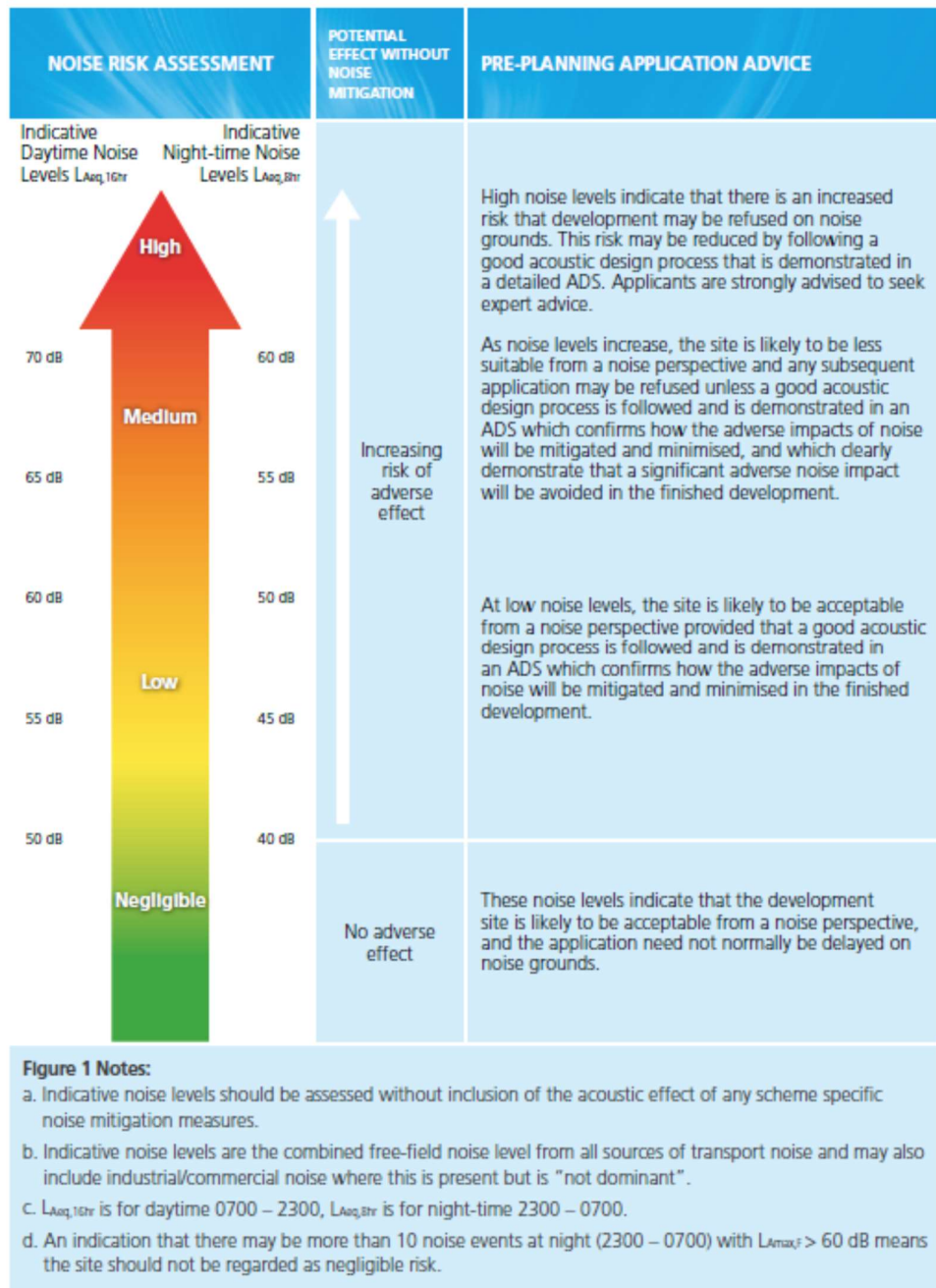
Figure 3.1 outlines the initial site risk assessment. Stage 2 of the approach looks to determine whether a site is suitable for housing based on the noise risk of the site. Stage 2 essentially attempts to determine that good acoustic design principles have been incorporated into the design from the outset, 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.

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

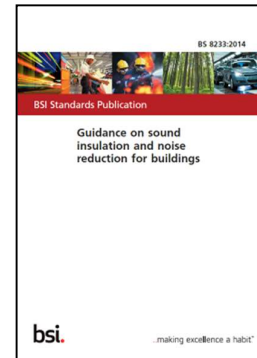


3.2. BS 8233: 2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'

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 PPG 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.”

3.3. 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**.

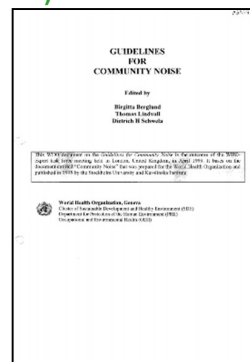


Table 3.2: Summary of Noise Criteria: WHO

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

Residential Environment	Critical Health Effect	L _{Aeq}	L _{AFmax}	Time Base
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

3.4. 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”.



3.5. Possible Options for the Identification of SOAELs and NOAELs 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 PPG24: 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**.

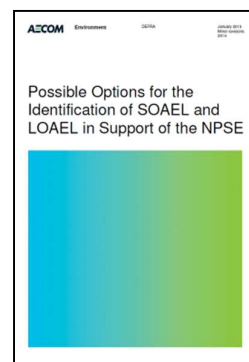


Table 3.3: Possible Value & Ranges of Values for LOAEL & SOAEL

Source	Effect	LOAEL	SOAEL
Road	Annoyance (Daytime)	56 (53-59)	66 (64-68)
	Sleep (Night-time)	46	56

Source	Effect	LOAEL	SOAEL
		(43-52)	(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)

3.6. 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 ProPG suggests that good acoustic design is essential – AVO suggests that the consideration of ventilation and overheating is essential in good acoustic design.

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”*.



The AVO Guide suggests it is a three-step process when considering noise for residential developments:

1. Quantify external noise levels – as one would in a standard noise assessment in accordance with the ProPG.
2. Access noise & ventilation - consider the effect of the proposed or potential ventilation strategies on the acoustic conditions in living rooms and bedrooms.
3. Assess noise & overheating. - Rooms may be grouped by Negligible, Low, Medium and High-risk categories to determine the extent of further analysis or mitigation required. Consider noise from mechanical systems associated with controlling overheating.

Regarding Step 2, the ventilation condition, suitable internal noise levels must be achievable when providing adequate ventilation. **Figure 3.2** and **Figure 3.3** provides guidance on suitable ventilation strategies based on the external noise level.

It should be noted that the AVO Guide describes ventilation systems in line with those described in Approved Document F of the Building Regulations which state:

- System 1 – Background ventilators and intermittent extract fans
- System 2 – Passive stack ventilation
- System 3 – Continuous mechanical extract (MEV)
- System 4 – Continuously mechanical supply and extract with heat recovery (MVHR)

It should be noted that in **Figure 3.2** and **Figure 3.3** ADF Systems 1/2 would have 2 trickle vents, System 3 would have 1 trickle vent and System 4 would not have any trickle vents.

Regarding Step 3, the overheating condition, *“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 of occupants 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. **Figure 3.4** outlines the initial site risk assessment stage. 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 “low” and especially “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. **Figure 3.5** replicates the guidance with regards to the overheating condition.

It is important to also consider noise from mechanical services, both for ventilation and to manage overheating. **Table 3.4** and **Table 3.5** provides desirable noise levels for the ventilation and overheating conditions respectively.

Table 3.4: Indoor ambient noise levels from mechanical services - ADF ventilation condition

Ventilation condition	Possible system or design solution	Desirable internal ambient noise levels from mechanical services
ADF – Whole House Ventilation	System 3: Continuous mechanical extract (MEV), minimum low ventilation rates System 4: Continuous mechanical supply and extract with heat recovery (MVHR), minimum low ventilation rates	Bedrooms $\leq L_{Aeq}$ 26 or 30 dB* Living Rooms $\leq L_{Aeq}$ 30 dB
ADF – Extract Ventilation	System 1: Intermittent extract fans System 3: Continuous mechanical extract (MEV), minimum high ventilation rates System 4: Continuous mechanical supply and extract with heat recovery (MVHR), minimum high ventilation rates	Bedrooms $\leq L_{Aeq}$ 26 or 30 dB* Living / Dining Rooms $\leq L_{Aeq}$ 35 dB Bathroom / WC / Kitchen $\leq L_{Aeq}$ 45 dB
ADF – Purge Ventilation	Manually controlled fan exchanging a minimum 4 air changes per hour	No desirable noise levels are currently proposed based on the lack of evidence of acceptable noise levels when providing purge ventilation for the purpose of rapidly diluting indoor pollutants.

* = AVO notes that “a more prudent limit for mechanical services noise around 24 – 26 dB(A) is likely to be required to prevent an adverse reaction from most occupants while falling asleep.”

Table 3.5: Indoor ambient noise levels from mechanical services - Overheating condition

Possible system or design solution	Desirable internal ambient noise levels from mechanical services
Ventilative cooling or Comfort cooling	Bedrooms L_{Aeq} 30 ($\pm$ 5) dB Living / Dining Rooms L_{Aeq} 35 ($\pm$ 5) dB

Figure 3.2: Guideline Values for Ventilation Strategies Described in Approved Document F – External L_{Aeq} Values

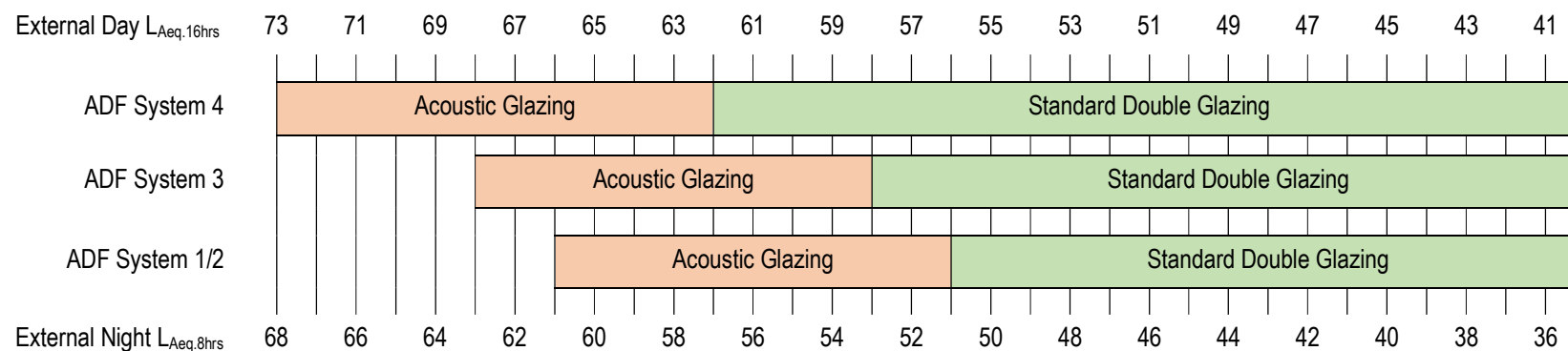
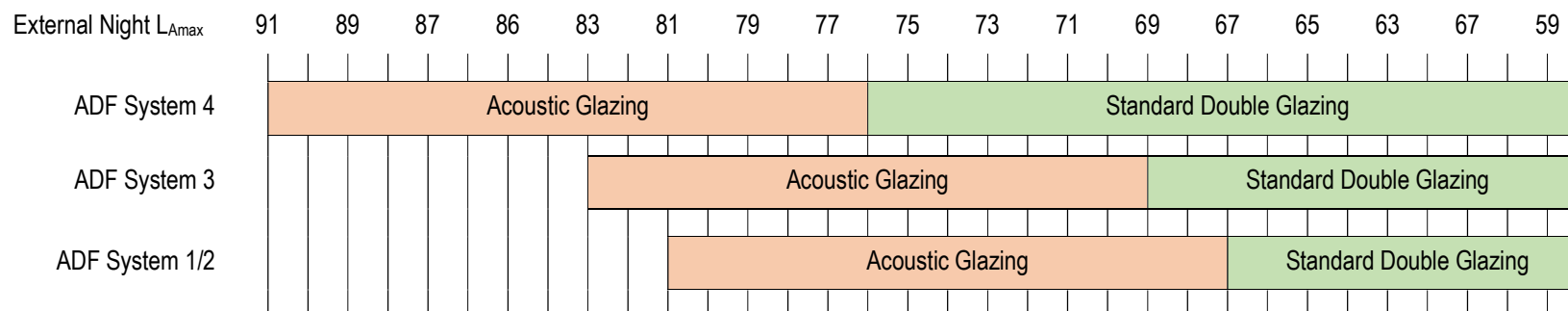


Figure 3.3: Guideline Values for Ventilation Strategies Described in Approved Document F – External L_{Amax} Values



Note: The above external L_{Amax} values should not be exceeded more than 10 times per day.

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Figure 3.4: Initial Site Risk Assessment (from the AVO Guide)

Risk category for Level 1 assessment ^[Note 5]	Potential Effect without Mitigation	Recommendation for Level 2 assessment
$L_{Aeq,T}$ during 07:00 – 23:00 $L_{Aeq,shr}$ during 23:00 – 07:00 65 dB High 55 dB 60 dB Medium 50 dB 55 dB Low 50 dB Negligible 45 dB	Increasing risk of adverse effect	Recommended Optional
	Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect	Not required

Note 1 The noise levels suggested assume a steady road traffic noise source but may be adapted for other types of transport. All levels are external free-field noise levels.

Note 2 The values presented in this table should not be regarded as fixed thresholds and reference can also be made to relevant dose-response relationships, ^[15, 17].

Note 3 A decision must be made regarding the appropriate averaging period to use. The averaging period should reflect the nature of the noise source, the occupancy profile and times at which overheating might be likely to occur. Further guidance can be found within the 2014 IEMA Guidelines ^[23].

Note 4 Refer also to references ^[1, 17, 18, 22] for further guidance regarding individual noise events. Where 78dB LA_{Fmax} is normally exceeded during the night-time period (23:00-07:00), a Level 2 assessment is recommended.

Note 5 The risk of an adverse effect occurring will also depend on how frequently and for what duration the overheating condition occurs. Refer to Figure 3-2.

Note 6 To evaluate the risk category for a dwelling, all three aspects of external noise exposure (i.e. daytime, night-time and individual noise events) should be evaluated. The highest risk category for any of the three aspects applies.

Figure 3.5: Guidance for Level 2 Assessment Relating to the Overheating Condition (from the AVO Guide)

Internal ambient noise level ^[Note 2]			Examples of Outcomes ^[Note 5]	
$L_{Aeq,T}$ ^[Note 3] during 07:00 – 23:00 ^[Note 6]	$L_{Aeq,th}$ during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 ^[Note 4]		
> 50 dB	> 42 dB	Normally exceeds 65 dB $L_{A, fmax}$	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time	Avoiding certain activities during periods of intrusion. 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.
			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods. As noise levels increase, small behaviour changes are expected e.g. turning up the volume on the television; speaking a little more loudly; having to close windows for certain activities, for example ones which require a high level of concentration. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in quality of life. At lower noise levels, limited behavioural change is expected unless conditions are prevalent for most of the time. ^[Note 8]
≤ 35 dB	≤ 30 dB	Do not normally exceed $L_{A, fmax}$ 45 dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response ^[Note 7] . Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

Note 1 The noise levels suggested in Tables 3-2 and 3-3 assume a steady road traffic noise source but may be adapted for other types of transport.

3.7. Joint Guidance on the Impact of COVID-19 on the Practicality and Reliability of Baseline Sound Level Surveying and the Provision of Sound & Noise Impact Assessments (2021)

This joint guidance, published by the Association of Noise Consultants (ANC) and the Institute of Acoustics (IOA), provides a unified approach to conducting noise assessments during the Covid-19 pandemic.

The guidance suggests that “*site survey measurements of the existing noise climate continue to be the default position for obtaining baseline sound level data*”. However, “*the prevailing sound environment must be reasonably representative and not affected by local restrictions*”. Consequently, “*where necessary, the measured data should be supplemented by other sources*”. The guidance notes that “*there remain some instances where the manner in which acoustic assessment and reporting is carried out needs to be adapted. We have, therefore, reiterated below some changes in working practices in the production of such reports, where these may be necessary. In so doing, it is still important to minimise uncertainties when determining baseline conditions, in a clear and transparent way*”.

The guidance notes that road, rail and air traffic has been reduced by the pandemic. Other noise sources may also be different, for example “*local factories may not be working at full output, shift patterns may have changed to allow for social distancing, and places of entertainment may be closed*”. However, the guidance states that “*data from other sources can be used such as existing data (for example, from previous local surveys and noise maps) or undertaking baseline sound predictions to establish an appropriate robust estimate of baseline conditions*”.

The guidance goes on to note that “*the safety of staff is paramount and it must be safe to undertake such measurements*”. Any “*site visits must comply with any restrictions on movement and ensure that social distancing is embedded within the site visit methodology*”.



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 22nd September 2021. The noise monitoring was conducted by Nick Hawkins of Hawkins Environmental Limited. Nick is a Member of the Institute of Acoustics and holds the Institute of Acoustic's Certificate of Competence in Environmental Noise Measurement.

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 warm 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 12°C at night, with daytime temperatures up to 18°C.
Precipitation	The measurement period remained dry.

BS 8233:2014 requires the assessment of both the daytime and nighttime noise levels. Ideally noise measurement equipment is left onsite for twenty-four hours to characterise the noise environment; however, at many sites, this is not possible and an alternative measurement regime must be employed. Typically, when an existing structure exists onsite, a sound level meter is attached to the building at first-floor level or above, so that the equipment cannot be tampered with or stolen. At this site, the site is open, consisting of a playing field and disused playground, both of which the public can access. Therefore, it was necessary to conduct attended noise measurements at a location representative of the closest part of the proposed buildings to Hart Plain Avenue. A map showing the measurement location in relation to the new site layout can be seen in **Figure 4.1**.

The Calculation of Road Traffic Noise (CRTN) describes a shortened measurement procedure for road traffic dominated sites, which is an acceptable alternative for a full 16-hour daytime monitoring survey. The shortened measurement procedure requires L_{A10} noise levels to be measured during three consecutive hours between 10:00 and 17:00. The shortened measurement procedure requires that the measured L_{A10} noise levels to be arithmetically averaged to provide an assumed $L_{A10,3hr}$ noise level, from which the $L_{A10,18hr}$ can then be estimated, using the approximation:

$$L_{A10,18hr} \approx L_{A10,3hr} - 1\text{dB}$$

The $L_{A10,18hr}$ can then be used to calculate the $L_{Aeq,16hr}$ using the conversion factor given in PPG 24:

$$L_{Aeq,16hr} \approx L_{A10,18hr} - 2\text{dB}$$

However, the conversion factor given in PPG 24 should only be utilised when the noise levels are within NECs C or D, as it may otherwise underpredict the noise levels in this noise assessment. Consequently, in certain circumstances it is more appropriate to convert from $L_{A10,18hr}$ to a $L_{Aeq,16hr}$ using the conversion formula in the TRL document “*Converting the UK traffic noise index $L_{A10,18hr}$ to EU noise indices for noise mapping*”.

In order to characterise night time noise, the Hawkins Approximation of night time noise measurement has been utilised (Hawkins, NC. (2015) ‘*The use of short duration night-time noise measurements to estimate $L_{Aeq,8hour}$* .’ Proceedings of Acoustics 2015, Harrogate, UK. The Institute of Acoustics. Vol. 37. Pt. 2.). The Hawkins Approximation determines that for sites where noise is primarily attributed to road traffic noise, the $L_{Aeq,11pm-12am}$ is a very accurate approximation to determine the nighttime $L_{Aeq,8hour}$. Comparisons show that on average this approximation over predicts $L_{Aeq,8hour}$ by just 1.1 dB, yet the instances of underprediction are reduced to less than 10% of noise measurements, ensuring that this Approximation is a valid alternative when full unattended night time noise measurements are not possible.

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Figure 4.1: Noise Measurement Location & Proposed Site Plan



4.2. Noise Survey Results

The noise measurement study has identified that the primary noise source is road traffic noise on Hart Plain Avenue. Noise from Hart Plain Infant and Junior Schools was audible during the daytime, as was Cowplain Community School to a lesser extent.

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

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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}
10am to 1pm	50.3	47.1 – 54.2	59.5 – 71.2	40.2 – 44.5
11pm to 12am	43.0	34.2 – 47.6	42.6 – 64.3	29.8 – 33.6

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	50 dB	43 dB
ProPG Noise Risk	Negligible	Negligible to Low
Effect Level	Below LOAEL	Below LOAEL
Action	No specific measures required	No specific measures required

Based on the results shown in **Table 5.1**, the noise risk of the site is consider to be “Low”, with the effect level in less than the LOAEL. This suggests that noise is unlikely to be an issue on site. For a “Low” risk site, a Stage 2 assessment with Acoustic Design Statement is not required.

6. ProPG STAGE 2: ACOUSTIC DESIGN STATEMENT

The Stage 1 Initial Site Risk Assessment has identified that the noise risk is “Low” with noise levels less than the LOAEL, indicating that noise is unlikely to be an issue on this site; therefore, a Stage 2 assessment is not required.

7. CONSTRUCTION NOISE

Due to the size of the development and early outline stage of the proposals, a quantitative construction noise and vibration assessment has not been carried out. Instead, a qualitative assessment focussing on best practicable means has been completed. In general, the construction works with the greatest potential to generate noise are initial earthworks to level out the site, demolition and the piling of foundations. Building construction itself generally results in lower noise levels.

It is proposed that to minimise construction noise impacts, all construction work should take place in standard construction hours, which are:

Monday – Friday: 08:00 – 18:00

Saturdays: 08:00 - 13:00; and

Sundays and Public Holidays: No construction

It is recommended that the contractor would be required to follow Best Practicable Means to reduce the noise impact upon the local community including the following:

- Operating hours should be adhered to, with local residents being notified of any changes to the operating hours of the site;
- All construction plant and equipment should comply with EU noise emission limits;
- Where practicable, design and use of site hoardings and screens to provide acoustic screening of noise emitting equipment;
- 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;
- Selection of inherently quiet plant where appropriate. All major 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 flatbed 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 working 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;

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- Making positive contact with local residents and providing information on the construction can be the most effective method of reducing the impact of construction noise on sensitive receptors. If appropriate, the above measures can be incorporated into a construction environmental management plan;
- Construction contractors should be obliged to adhere to the codes of practice for construction working given in BS 5228 and the guidance given therein regarding minimising noise emissions from the site; and
- Reference should be made to the Building Research Establishment, BRE 'Pollution Control' guidelines, Parts 1-57.Noise Monitoring.

8. 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 residential purposes.

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 below the Lowest Observed Adverse Effect Level (LOAEL). This indicates that noise is unlikely to be a constraint upon the development of the site for residential or care home use.

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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.

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Appendix 2

Schedule of Equipment

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Appendix 2: Schedule of Equipment

Equipment Set 5199:

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	1405199	U35957	UKAS Calibration: 0789	8 th October 2020	October 2022
Nor-1209 Pre-amplifier	Norsonic	15117	U35957	UKAS Calibration: 0789	8 th October 2020	October 2022
Nor-1225 Microphone	Norsonic	151240	U35957	UKAS Calibration: 0789	8 th October 2020	October 2022
Nor-1255 Sound Calibrator	Norsonic	25262	U35955	UKAS Calibration: 0789	8 th October 2020	October 2021
Nor-1284 Dehumidifier	Norsonic	222	Not Applicable			
Nor- 1212 Weather Protection Kit	Norsonic	Not Applicable				
Nor1408A/5 Extension Cable	Norsonic/Lemo	Not Applicable				

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Campbell Associates Ltd
 5b Chelmsford Road Industrial Estate
 GREAT DUNMOW, Essex, GB-CM6 1HD
www.campbell-associates.co.uk
 Phone 01371 871030 Facsimile 01371879106



CALIBRATION



0789

Certificate of Calibration and Conformance

Certificate number: U35957

Test object: Sound Level Meter, BS EN IEC 61672-1:2003 Class 1 (Precision)
Producer : Norsonic
Type : 140
Serial No.: 1405199
Customer: Hawkins Environmental
Address: The Square, Basing View,
 Basingstoke. RG21 4EB.
Contact Person: Nick Hawkins.

Method :

Calibration has been performed as set out in CA Technical Procedures TP01 & 02 as appropriate. These are based on the procedures for periodic verification of sound level meters as set out in BS EN IEC 61672-3:2006. Results and conformance statement are overleaf and detailed results are in the attached Test Report.

Tested

	Producer:	Type:	Serial No:	Certificate number
Microphone	Norsonic	1225	151240	35956
Calibrator*	Norsonic	1255	125525262	U35955
Preamplifier	Norsonic	1209	15117	Included

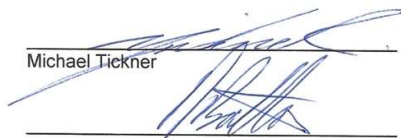
Additional items that also have been submitted for verification
 Wind shield Norsonic Nor1451 (ø 60mm)
 Attenuator -
 Extension cable -
 These items have been taken into account wherever appropriate.

Instruction manual: Im140_1Ed6R3En Firmware version: 3.0.1866 The test object is a single channel instrument.

Conditions	Pressure	Temperature	Humidity
Reference conditions:	101.325 kPa	23.0 °C	50 %RH
Measurement conditions:	100.10 ±0.06 kPa	22.7 ±0.3 °C	43.5 ±0.7 %RH

Date received for calibration: 28/09/2020
 Date of calibration: 08/10/2020
 Date of issue: 08/10/2020
 Engineer

Supervisor


 Michael Tickner


 Darren Batten TechIOA

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

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UKAS Laboratory Number 0789

Certificate number: U35957

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 BS EN IEC 61672-1:2002 and similarly that the associated sound calibrator conforms to BS EN IEC 60942.

Statement of conformance

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of BS EN IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with BS EN IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in BS EN IEC 61672-1:2002, and that the sound level meter submitted for testing conforms to the class 1 requirements of BS EN IEC 61672-1:2003.

¹ This evidence is held on file at the calibration laboratory

Summary of Measurement Results

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

Comment

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

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.

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Measurements performed at:-

Campbell Associates Ltd
 5b Chelmsford Road Industrial Estate
 GREAT DUNMOW, CM6 1HD, England
www.campbell-associates.co.uk
info@campbell-associates.co.uk
 Phone 01371 871030 Facsimile 01371879106



Certificate number: U35955

Certificate of Calibration and Conformance

Test object: Sound Calibrator
Manufacturer: Norsonic
Type: 1255
Serial no: 125525262

Customer: Hawkins Environmental
Address: The Square, Basing View,
 Basingstoke. RG21 4EB.
Contact Person: Nick Hawkins.

Measurement Results:	Level	Level Stability	Frequency	Frequency Stability	Distortion
1:	114.07 dB	0.02 dB	1000.00 Hz	0.00 %	0.35 %
2:	114.07 dB	0.02 dB	1000.00 Hz	0.00 %	0.35 %
3:	114.07 dB	0.02 dB	1000.00 Hz	0.00 %	0.35 %
Result (Average):	114.07 dB	0.02 dB	1000.00 Hz	0.00 %	0.35 %
Expanded Uncertainty:	0.10 dB	0.02 dB	1.00 Hz	0.01 %	0.10 %
Degree of Freedom:	>100	>100	>100	>100	>100
Coverage Factor:	2.00	2.00	2.00	2.00	2.00

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: Pressure: 0.000 dB/kPa Temperature: 0.000 dB/°C Relative humidity: 0.000 dB/%RH Load volume: 0.00015 dB/mm³

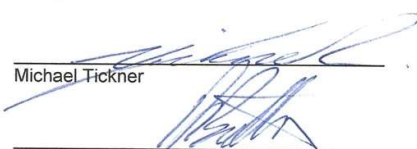
The reported expanded uncertainty of measurements is based on a standard uncertainty multiplied by the coverage factor of k=2, providing a level of confidence of approximately 95%. Where the degrees of freedom are insufficient to maintain this confidence level, the coverage factor is increased to maintain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

Records: K:\C A\Calibration\Nor-1504\Nor-1018 CalCal2020\NOR1255_125525262_M1.nmf

Environmental conditions: Pressure: 101.325 kPa Temperature: 23.0 °C Relative humidity: 50 %RH
 Reference conditions: 101.325 kPa 23.0 °C 50 %RH
 Measurement conditions: 100.068 ± 0.042 kPa 22.3 ± 0.2 °C 44.9 ± 1.2 %RH

Date received for calibration: 28/09/2020
 Date of calibration: 08/10/2020
 Date of issue: 08/10/2020
 Engineer

Supervisor


 Michael Tickner


 Darren Batten TechIOA

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.

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Noise Assessment:

Land at Cowplain Community School, Hart Plain Avenue, Waterlooville

Frontier Estates Limited • 18th May 2022 • H3331 – NV – v2

Certificate number: U35955

Preconditioning

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

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.

Method

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

Instruments and program

A complete list of equipment, hardware and software that has been used in this calibration is available from the calibration laboratory on request.

Comment

Calibrated as received, no adjustments made.

Statement of conformance

As public evidence was available¹, from a testing organisation responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in annex A of BS EN IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of that BS EN IEC 60942:2003.

¹ This evidence is held on file at the calibration laboratory.

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.

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

Measurements performed at

Campbell
Associates

Sonitus House, 5b Chelmsford Road Industrial Estate, Great Dunmow, GB-CM6 1HD

Tel (+44) 01371 871030 Fax (+44) 01371 879106

Email: hotline@campbell-associates.co.uk

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Noise Assessment:

Land at Cowplain Community School, Hart Plain Avenue, Waterloooville

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Appendix 3

Summary of Noise Measurements

Noise Assessment:

Land at Cowplain Community School, Hart Plain Avenue, Waterloooville

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Appendix 3: Summary of Noise Measurements

Time	L _{Aeq}	L _{Amax}	L _{A10}	L _{A50}	L _{A90}
10:00	50.9	71.2	53.4	45.5	41.8
12:00	49.2	70.7	51.8	45.0	42.4
12:00	50.6	70.8	53.5	46.8	43.7
Day	50.3	71.2	52.9	45.8	42.6
23:00	43.0	64.3	40.4	34.7	31.9
Night	43.0	64.3	40.4	34.7	31.9
L _{A10.3hr}	52.9				
L _{A10.18hr}	51.9				
L _{Aeq.16hr}	50.2				
L _{Aeq.8hr}	43.0				