

Hawkins environmental

Noise Assessment:

Welling United FC

Woolwich Road Limited

21st November 2023

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Woolwich Road Limited • 21st November 2023 • H3848 – NV – v3



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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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1. INTRODUCTION

1.1. Overview

Hawkins Environmental Limited has been instructed by Woolwich Road Limited to undertake a noise assessment for the redevelopment of the Welling United FC Park View Road football ground.

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, due to its proximity to a number of busy roads in addition to the Park View Road football ground. 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

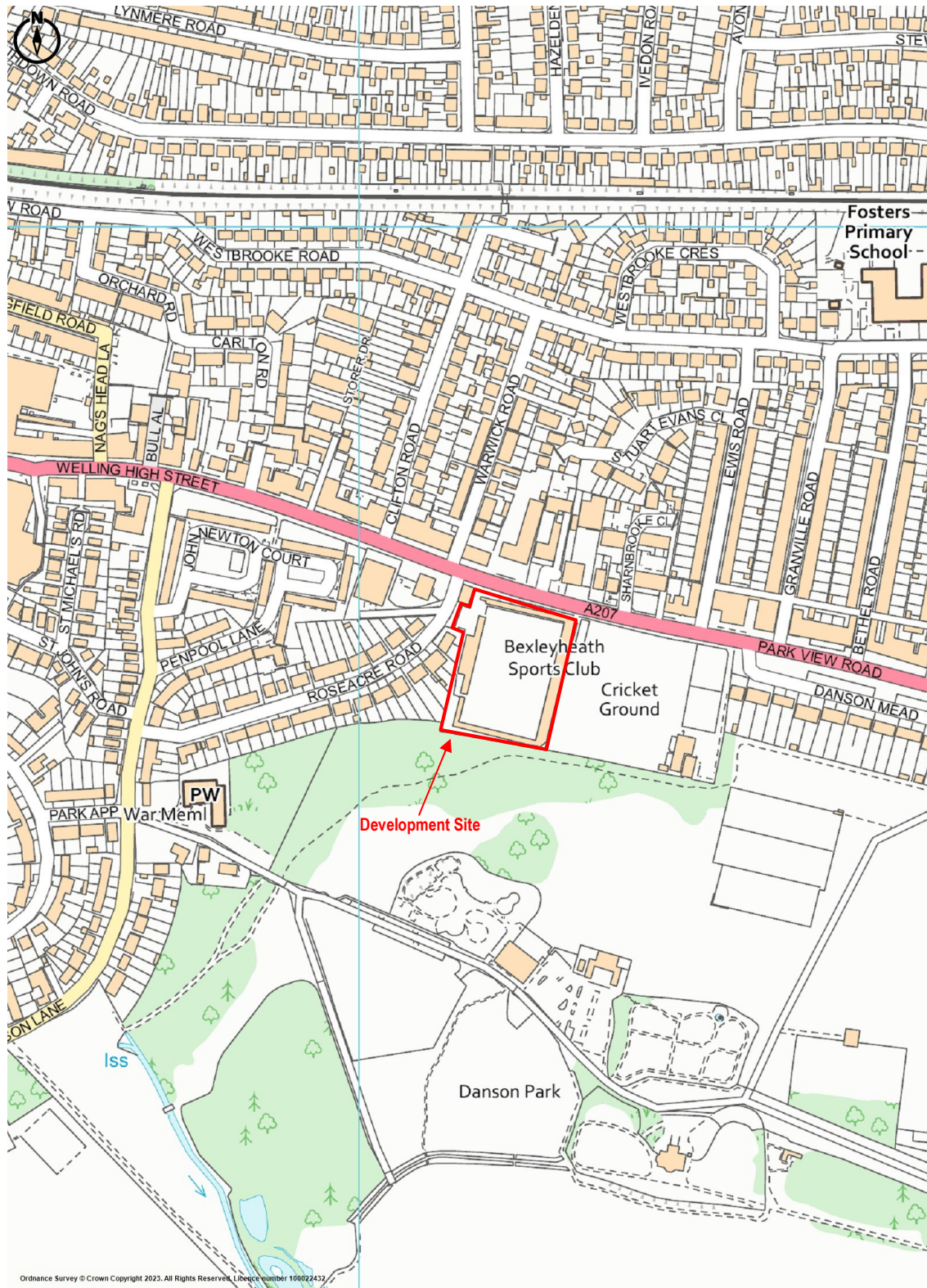
Approximate Noise Level (dB(A))	Example
0	Limit of hearing
30	Rural area at night
40	Library
50	Quiet office
60	Normal conversation at 1 m
70	In car noise without radio
80	Household vacuum cleaner at 1 m
100	Pneumatic drill at 1 m
120	Threshold of pain

1.3. Site Description

The development site is located at the Park View Road football grounds which is situated in Welling, a neighbourhood within the London Borough of Bexley, Outer London. The site currently comprises of the existing football grounds, inclusive of spectator stands and ancillary structures.

The proposed scheme will see the redevelopment of the existing football grounds and the erection of a eight-storey mixed-use building, situated towards the north side of the development site. A location plan of the proposed site can be seen in **Figure 1.1**.

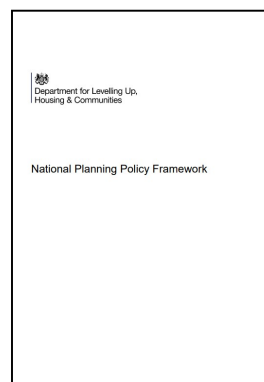
Figure 1.1: Site Location Plan



2. PLANNING POLICY & GUIDANCE

2.1. National Planning Policy Framework (2023)

The National Planning Policy Framework (NPPF) was first published on the 27th March 2012 and revised July 2018, February 2019, July 2021 and September 2023. 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..."*

Specifically in relation to noise from existing commercial premises, Paragraph 187 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)

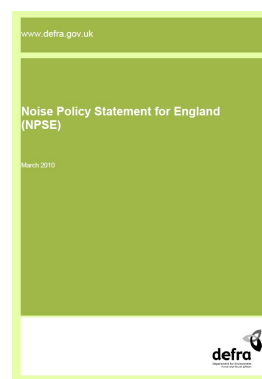
The Noise Policy Statement for England (NPSE) provides further guidance which is relevant to the policy set out in Paragraph 185 of the NPPF and states that: *“Within the context of sustainable development:*

- *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.”*

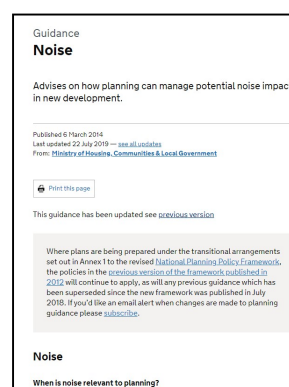


2.3. Planning Practice Guidance

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

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 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 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 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..

Noise Assessment:

Welling United FC

Woolwich Road Limited • 21st November 2023 • H3848 – NV – v3**Table 2.1: Noise Exposure Hierarchy**

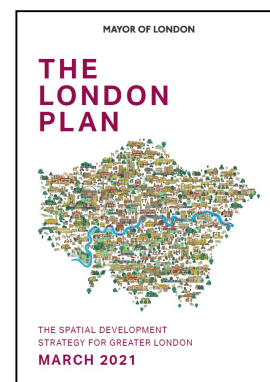
Perception	Examples of outcomes	Increasing effect level	Action	
Not noticeable	No Effect	No Observed Effect	No specific measures required	Low Noise Level
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character 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
↓

2.4. The London Plan (2021)

The New London Plan was formally published on the 2nd of March 2021 and replaces the previous London Plan.

The London Plan notes that noise is an integral part of development planning. When designing developments, it notes that *“measures to design out exposure to poor air quality and noise from both external and internal sources should be integral to development proposals and be considered early in the design process. Characteristics that increase pollutant or noise levels, such as poorly-located emission sources, street canyons and noise sources should also be designed out wherever possible. Optimising site layout and building design can also reduce the risk of overheating as well as minimising carbon emissions by reducing energy demand”* (para 3.3.9).



Policy D13 *Agent of Change* formalises the Agent of Change principle in London's planning policy in relation to noise. The policy notes:

“For a long time, the responsibility for managing and mitigating the impact of noise and other nuisances on neighbouring residents and businesses has been placed on the business or activity making the noise or other nuisance, regardless of how long the business or activity has been operating in the area. In many cases, this has led to newly-arrived residents complaining about noise and other nuisances from existing businesses or activities, sometimes forcing the businesses or other activities to close” (para 3.13.1).

“The Agent of Change principle places the responsibility for mitigating the impact of noise and other nuisances firmly on the new development. This means that where new developments are proposed close to existing noise-generating uses, for example, applicants will need to design them in a more sensitive way to protect the new occupiers, such as residents, businesses, schools and religious institutions, from noise and other impacts. This could include paying for soundproofing for an existing use, such as a music venue. The Agent of Change principle works both ways. For example, if a new noise-generating use is proposed close to existing noise-sensitive uses, such as residential development or businesses, the onus is on the new use to ensure its building or activity is designed to protect existing users or residents from noise impacts” (para 3.13.2).

Policy D13 states:

- A. *“The Agent of Change principle places the responsibility for mitigating impacts from existing noise and other nuisance-generating activities or uses on the proposed new noise-sensitive development. Boroughs should ensure that Development Plans and planning decisions reflect the Agent of Change principle and take account of existing noise and other nuisance-generating uses in a sensitive manner when new development is proposed nearby.*
- B. *Development should be designed to ensure that established noise and other nuisance-generating uses remain viable and can continue or grow without unreasonable restrictions being placed on them.*
- C. *New noise and other nuisance-generating development proposed close to residential and other noise-sensitive uses should put in place measures to mitigate and manage any noise impacts for neighbouring residents and businesses.*

D. Development proposals should manage noise and other potential nuisances by:

- 1) ensuring good design mitigates and minimises existing and potential nuisances generated by existing uses and activities located in the area*
- 2) exploring mitigation measures early in the design stage, with necessary and appropriate provisions including ongoing and future management of mitigation measures secured through planning obligations*
- 3) separating new noise-sensitive development where possible from existing noise-generating businesses and uses through distance, screening, internal layout, sound-proofing, insulation and other acoustic design measures.*

E. Boroughs should not normally permit development proposals that have not clearly demonstrated how noise and other nuisances will be mitigated and managed”.

Policy D14 Noise goes on to state:

A. “In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

- 1) avoiding significant adverse noise impacts on health and quality of life*
- 2) reflecting the Agent of Change principle as set out in Policy D13 Agent of Change*
- 3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses*
- 4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)*
- 5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation*
- 6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles*
- 7) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.*

B. Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra’s Noise Action Plan for Agglomerations”.

Policy D14 notes that “the management of noise should be an integral part of development proposals and considered as early as possible” (para 3.14.1).

It notes that “The management of noise also includes promoting good acoustic design of the inside of buildings. Section 5 of BS 8223:2014 provides guidance on how best to achieve this. The Institute of Acoustics has

produced advice, Pro:PG Planning and Noise (May 2017), that may assist with the implementation of residential developments. BS4214 provides guidance on monitoring noise issues in mixed residential/industrial areas” (para 3.14.3).

2.5. London Plan – Housing Supplementary Planning Guidance (2016)

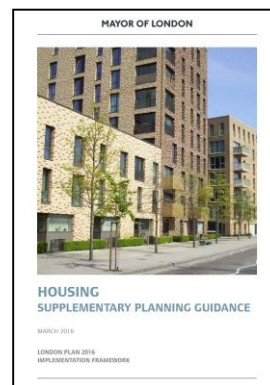
The Housing SPG, published in March 2016 highlights the elements of the London Plan that are relevant to housing development, and where applicable, provides more detail. The SPG states:

“Noise

Standard 30 (and Policy 7.15) – The layout of adjacent dwellings and the location of lifts and circulation spaces should seek to limit the transmission of noise to sound sensitive rooms within dwellings.

2.3.42 - Policy 7.15 Reducing and Managing Noise, Improving and Enhancing the Acoustic Environment and Promoting Appropriate Soundscapes requires development proposals to seek to reduce noise and manage the effects of noise to improve health and quality of life. It is another important aspect of retreat and privacy in a dwelling. Noise from the street and adjoining properties can cause stress, sleep disturbance and friction between neighbours as recognised in the NPPF.

2.3.43 - All dwellings should be built with acoustic insulation and tested to current Building Regulations standards. However, acoustic insulation should not be relied upon as the only means of limiting noise and the layout and placement of rooms within the building should be considered at an early stage in the design process to limit the impact of external noise on bedrooms and living rooms. The impact of noise should also be considered in the placement of private external spaces.”



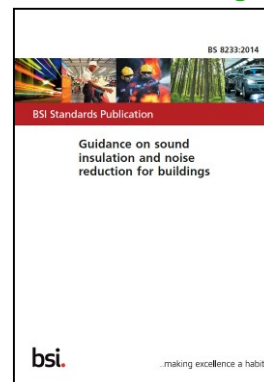
3. ASSESSMENT METHODOLOGY & GUIDANCE

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 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.”

3.2. 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**.

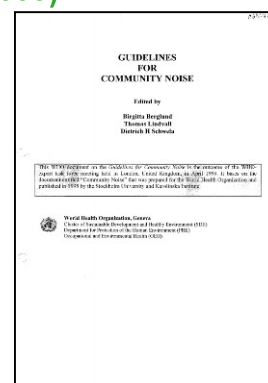


Table 3.2: Summary of Noise Criteria: WHO

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”.

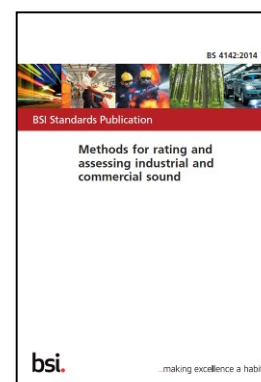


3.4. BS 4142: 2014 +A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

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. 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 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**.

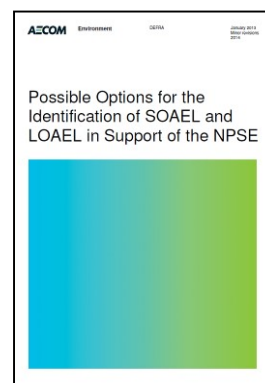


Table 3.3: Possible Value & Ranges of Values for LOAEL & SOAEL

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

3.6. 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.

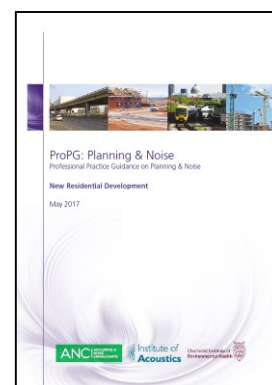


Figure 3.1 outlines the initial site risk assessment. Stage 2 of the approach looks to determine whether a site is suitable for housing based on the noise risk of the site. Stage 2 essentially attempts to determine that good acoustic design principles have been incorporated into the design from the outset,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

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

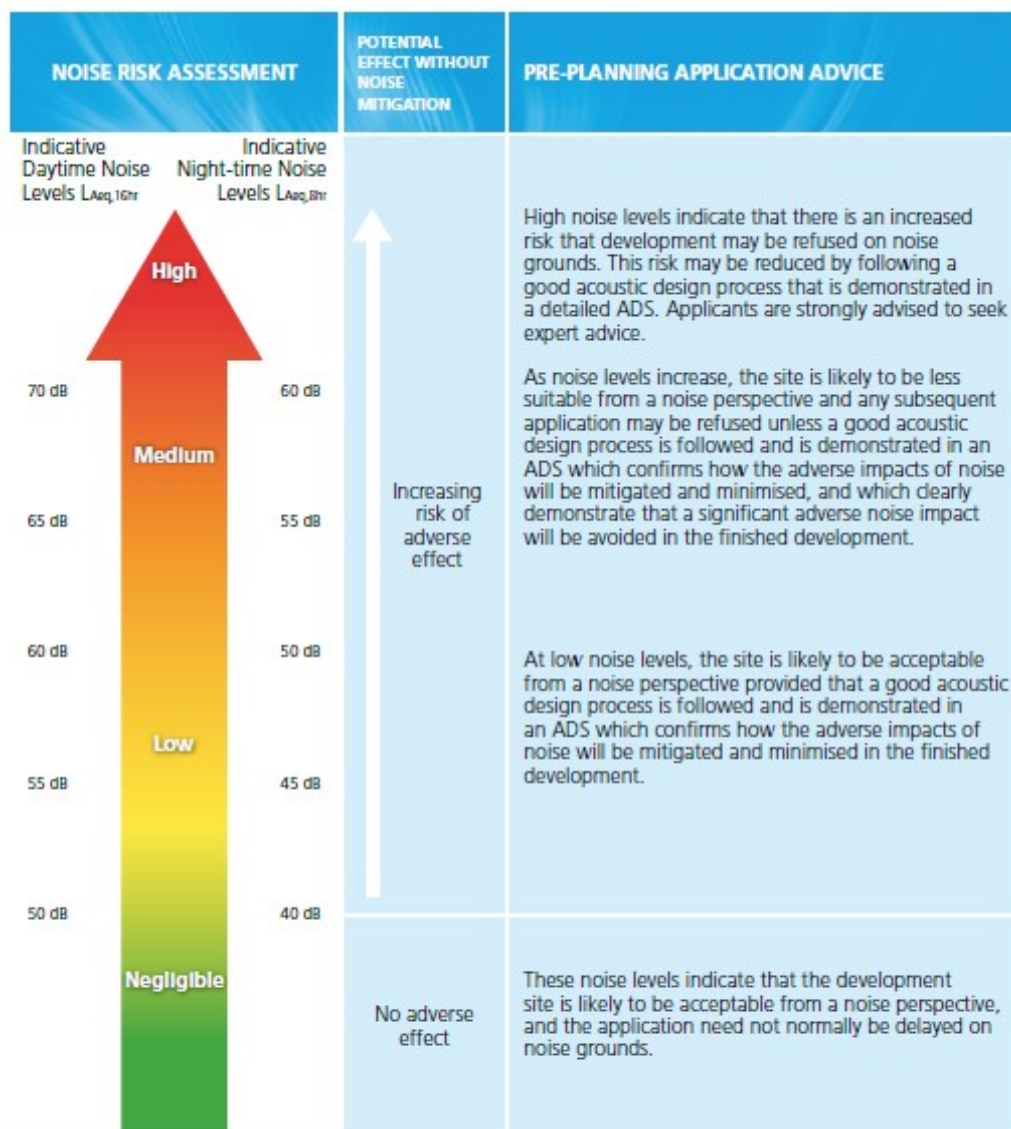


Figure 1 Notes:

- a. Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.
- b. 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".
- c. $L_{Aeq,16hr}$ is for daytime 0700 – 2300, $L_{Aeq,8hr}$ is for night-time 2300 – 0700.
- d. 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:

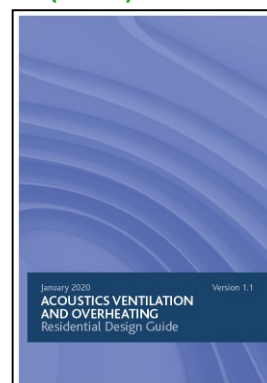
“Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided; occupants generally prefer the ability to have control over the internal environment using openable windows, even if the acoustic conditions would be considered unsatisfactory when open. Solely 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”*.

3.7. 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.

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Table 3.4: 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

3.8. 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.

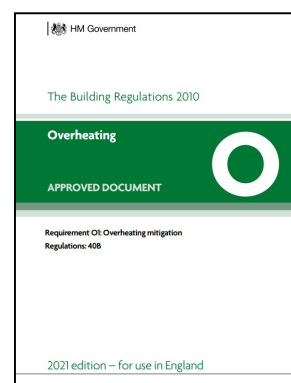
AD-O includes two methods for demonstrating compliance – the “Simplified Method”, which relies on limiting the glazed area of a room based on the location and orientation of the rooms, as well as whether the dwelling is cross ventilated, and the “Dynamic Thermal Modelling Method”. The “Dynamic Thermal 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).



3.9. 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*”.

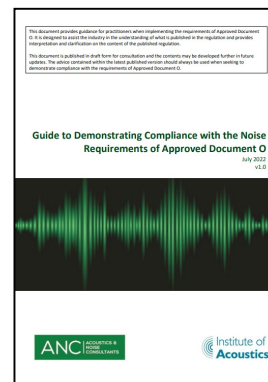
Table 3.5: External Noise Levels Above Which The Simplified Method Cannot Be Used

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.



3.10. IEMA Guidelines for Environmental Noise Assessment (2014)

The 2014 IEMA “Guidelines for Environmental Noise Assessment” address the key principles of noise impact assessment and are applicable to all development proposals where noise effects may occur. The guidance provides advice with regards to the collection of baseline noise data, prediction of noise levels and how noise should be assessed.

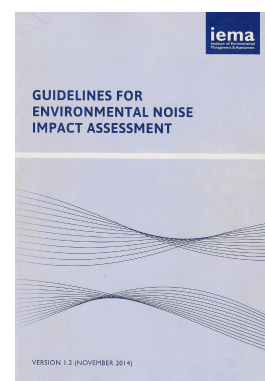
Whilst the guidance contains a great deal of technical guidance for the noise practitioner, it also provides guidance on the assessment of significance, which is replicated later in this chapter.

The IEMA Guidelines provides guidance on how to assess the effects and significance of developments, but it stops short of providing specific assessment criteria which developments should achieve. The guidance instead suggests that the methodology adopted should be selected on a site by site basis with reference to relevant national and local standards, since the guidance recognises that the effect associated with a particular noise impact will be dependent on a number of factors including but not limited to the sensitivity of the receptor, frequency and duration of the noise source and time of day.

When describing the magnitude of the noise effect, the IEMA guide does not suggest a definitive method but does give a number of examples of ways of describing and determining the magnitude. One such example, which has been used in this assessment, is set out in **Table 3.6** below.

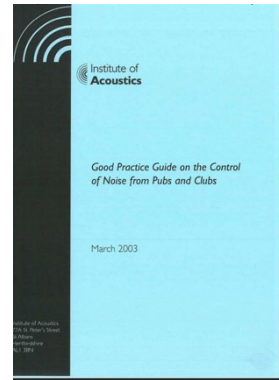
Table 3.6: Magnitude of Change in Noise Levels

Long Term Impact Magnitude	Sound Level Change dB L _{Aeq,T} (positive or negative) T= 16 hour day or 8 hour night
Negligible	≥ 0 dB and < 3 dB
Minor	≥ 3 dB and < 5 dB
Moderate	≥ 5 dB and < 10 dB
Major	≥ 10 dB



3.11. Good Practice Guide on the Control of Noise from Pubs and Clubs (2003)

In 1996, the Institute of Acoustics established a working group to produce a guidance document containing criteria on the control of noise from pubs and clubs. Unfortunately, the working group was unable to produce a formal Code of Practice as a number of industry representatives withdrew from the working party. Consequently, a Code of Practice was not published, rather a Good Practice Guide, which did not contain any objective noise criteria. The Code of Practice only provided guidance on noise control and complaint investigation.

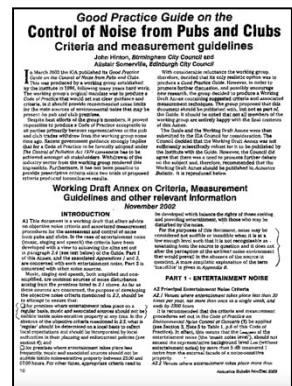


The Guide noted “it has not been possible to subject the new criteria that have been developed and proposed by the working party to a satisfactory validation process. It is hoped that future research will lead to the publication of criteria that have been fully validated in terms of human response and have been subject to trials which confirm their practicability in terms of measurement, enforcement and use within the planning process. Until such criteria are developed, it is recommended that local authorities and others should devise and apply policies having regard to this Guide and taking into account local circumstances and existing licensing and planning policies”.

The Guide did however note that “Music, singing and speech, both amplified and non-amplified, are common sources of noise disturbance... (it) should be to attempt(ed) to ensure that for premises where entertainment takes place on a regular basis, music and associated sources should not be audible inside noise-sensitive property at any time...and for premises where entertainment takes place less frequently, music and associated sources should not be audible inside noise-sensitive property between 23:00 and 07:00 hours”.

3.12. Institute of Acoustics Working Group Annex – Control of Noise from Pubs and Clubs (2003)

During the writing of the Good Practice Guide on the Control of Noise from Pubs and Clubs, John Hinton and Alistair Somerville prepared an Annex containing proposed criteria which published in draft form in September 2002. However, the Annex was omitted from the final version of the Code of Practice but was published in the November/December 2003 edition of the Acoustics Bulletin, designed to stimulate discussion.



Although never officially adopted, the criteria is widely adopted by Local Authorities when both investigating complaints and for setting noise limits.

The Annex suggested that for “venues where entertainment takes place more than once per week or continues beyond 2300 hrs”, the following criteria applies:

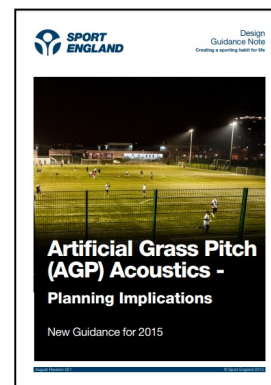
- “The L_{Aeq} of the entertainment noise should not exceed the representative background noise level L_{A90} (without entertainment noise), and
- The L_{10} of the entertainment noise should not exceed the representative background noise level L_{90} (without entertainment noise) in any 1/3 octave band between 40 Hz and 160 Hz”.

The Annex indicates that if the criteria is met, “entertainment noise will be virtually inaudible inside noise-sensitive property”. It also notes that the criteria is applicable for both internal and external assessments. The

Annex indicates that where the entertainment noise takes place no more than once a week and finishes before 2300 hours, the above criteria can be relaxed by 5 dB.

3.13. Artificial Grass Pitch (AGP) Acoustics Guidance Note (2015)

AGP is a guidance note created by Sport England and published in 2015. The guidance note offers a simplified explanation for those wishing to develop artificial grass pitches and provides a more consistent approach for noise assessment and subsequent planning applications. The guidance note highlights that the potential for disturbance to pre-existing and future neighbours should be considered early within the planning stage. The guidance note states that: *“details of acoustics implications associated with such facilities and follows on from an acoustics research programme involving detailed analysis of relevant noise guidance documents and site testing in a range of locations. It proposes appropriate noise criteria and assessment methods and outlines practical measures that can be applied to reduce noise in particularly sensitive areas”*.



The guidance note states on page five that: *“when considering development of an AGP, address the issues of noise criteria set out by:*

- *The National Planning Policy Framework, and;*
- *Local planning authority planning policies”*.

When comparing the AGP noise against the existing noise climate, the guidance note states: *“In some circumstances, an alternative assessment methodology may be appropriate such as where there are changes to an existing natural turf of AGP pitch, or where existing noise levels in the area are high”*.

The document determines that the most significant noise levels on-pitch were derived from the voices of the players themselves, with a typical free-field noise level from an AGP (10m from the side-line halfway marking) equating to 58 dB $L_{Aeq,1hour}$. The guidance document states that: *“The determining noise criteria for AGPs proximity to residential properties, to avoid moderate annoyance in the daytime and evenings as set by The World Health Organisation’s ‘Guidelines for Community Noise’: = 50 dB $L_{Aeq,1hour}$ upper noise limits external to residential properties and within external living areas”*.

The document summarises that *“With suitable noise mitigation measures, it is considered that acceptable noise levels can be achieved for the majority of AGP sites and will operate without adversely affecting neighbouring residential properties”*. The guidance note also recommends that good practice should be applied to the day-to-day running and maintenance of the AGPs and maintaining long-term relationships with pre-existing and future residences.

4. ENVIRONMENTAL NOISE SURVEY

4.1. Baseline Noise Survey

4.1.1. Survey Overview

In order to determine the extent to which the site is affected by road traffic 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 3rd and 4th of October 2023. The noise monitoring was conducted by Mathew Vaughan of Hawkins Environmental Limited. Mathew is an Associate 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 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 11°C at night, with daytime temperatures up to 18°C.
Precipitation	The measurement period remained dry.

Noise measurements were conducted along the site hoarding; abutting Park View Road (A207). 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 Ground Floor Plan



4.1.2. Noise Survey Results

The 24-hour noise measurement study has identified that the primary noise source is road traffic noise attributed to Park View Road (A207), which passes approximately 8 metres to the north (front) of the property. Aircraft noise is also occasionally audible. The noise measurement data is detailed in **Appendix 3** and **Figure 4.3** and summarised in **Table 4.2** below.

Table 4.2: Summary of the Noise Level Measurements

Period (hours)	Measured Noise Levels, dB			
	$L_{Aeq,T}$	Range $L_{Aeq,5mins}$	Range $L_{Amax,5mins}$	Range $L_{A90,5mins}$
7am to 11pm	68.8	64.9 – 72.2	77.7 – 103.7	45.6 – 64.1
11pm to 7am	63.8	56.1 – 70.6	75.3 – 95.8	37.1 – 58.6

4.1.3. 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: 2104 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 day, the $L_{A90,1hour}$ ranged from 51 dB to 62 dB. It can be seen from **Figure 4.3** that most $L_{A90,1hour}$ noise levels were in the region of 58 to 62 dB and therefore, 58 dB is considered to be representative of the daytime background noise level.

It can be seen from **Figure 4.4** that during the night, the $L_{A90,15mins}$ ranged from 37 dB to 59 dB, with the largest number at 38 dB. To characterise a worst-case scenario in terms of night-time background noise levels, it is considered that 38 dB is the night-time background noise level.

Figure 4.2: Noise Measurements

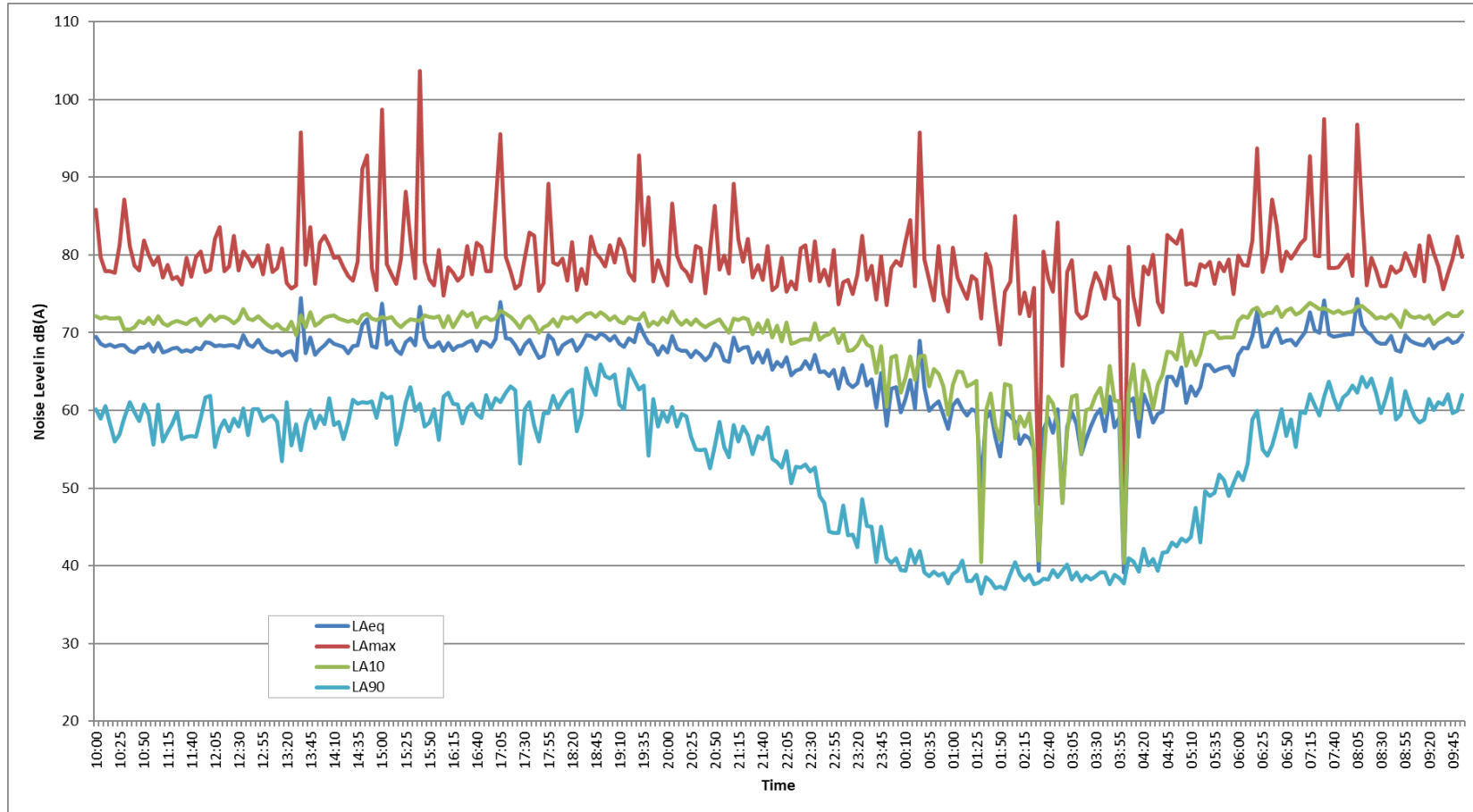


Figure 4.3: Distribution of Day Time L_{A90,1hour} Sound Levels

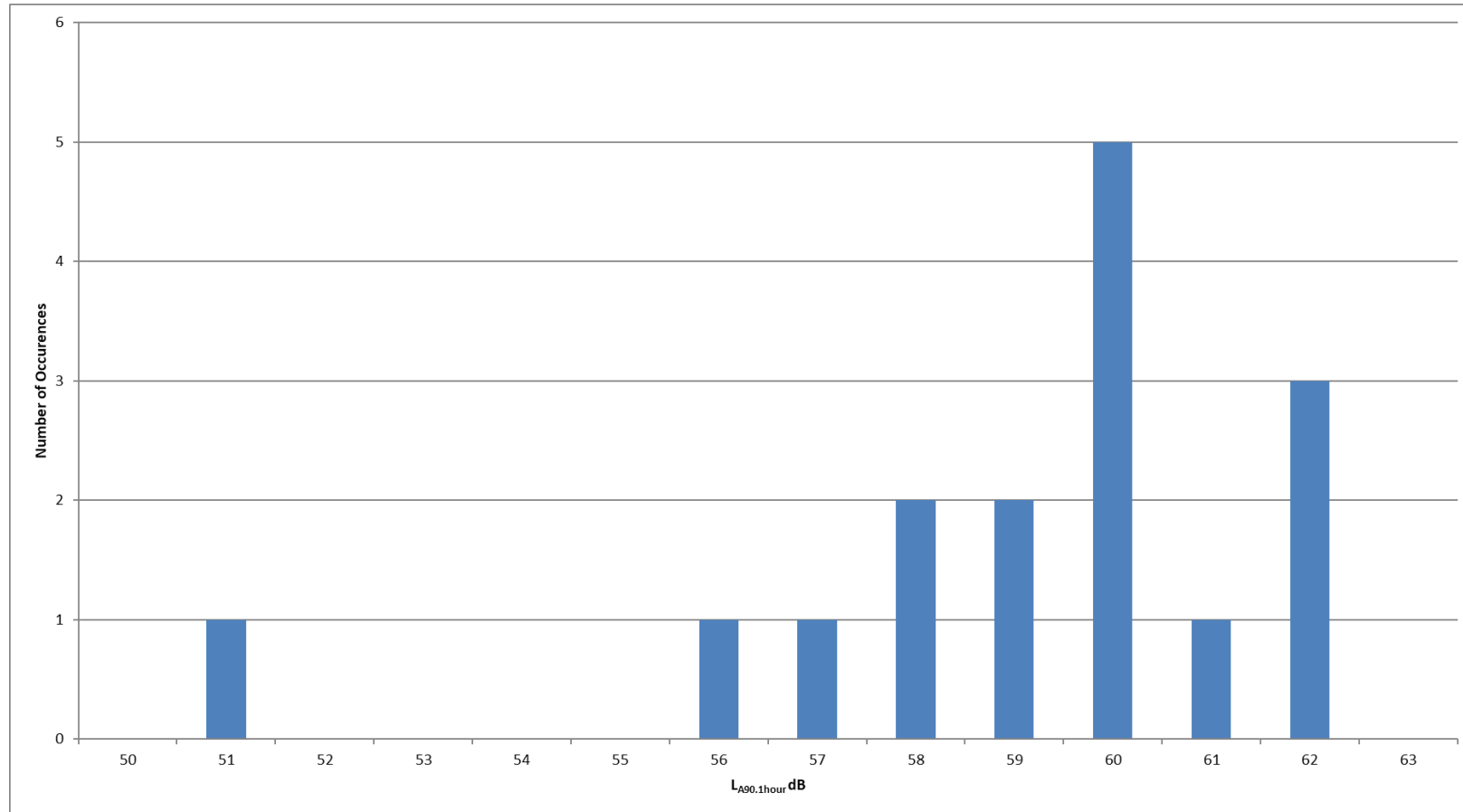
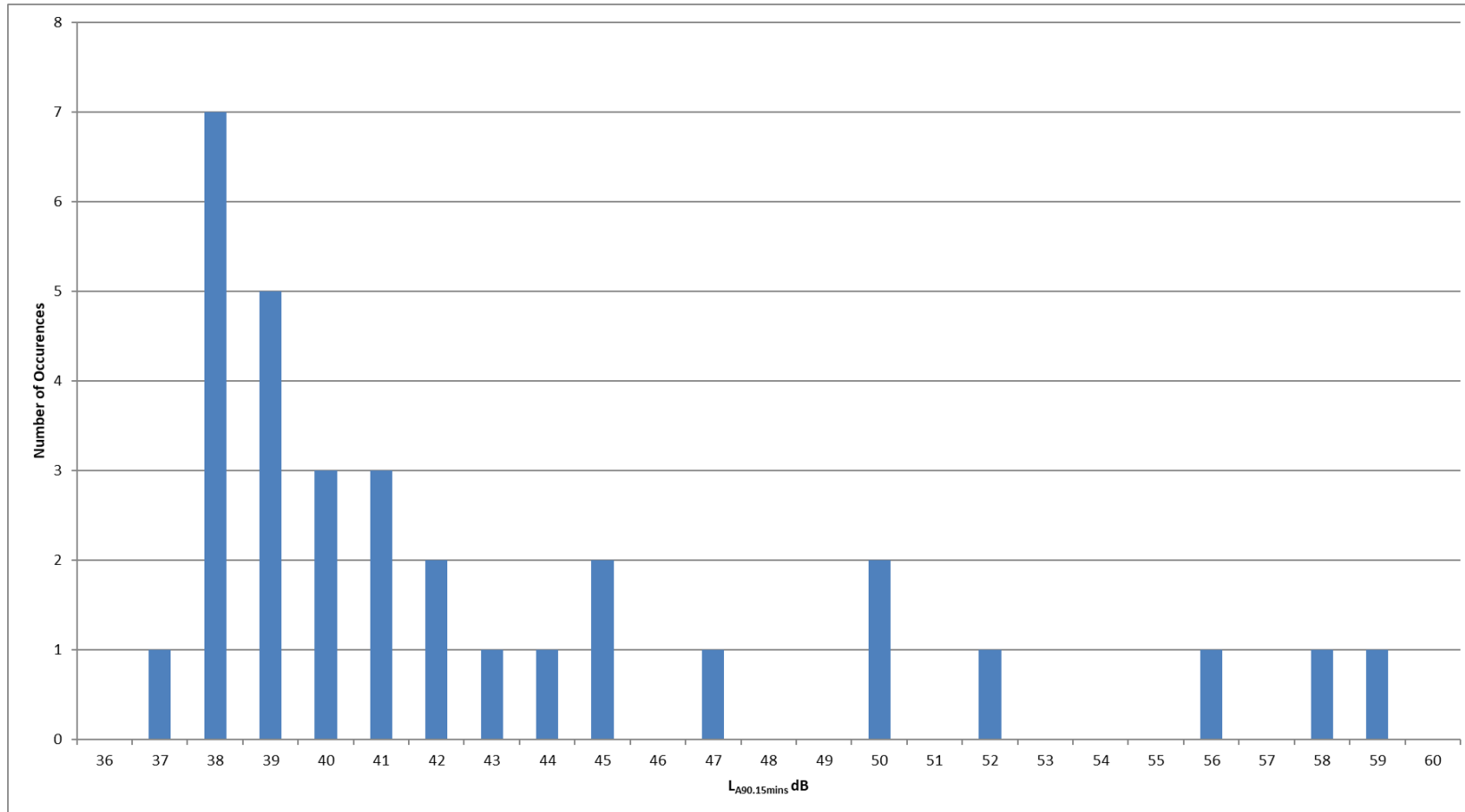


Figure 4.4: Distribution of Night Time L_{A90.15mins} Sound Levels



4.2. Stadium Noise

4.2.1. Survey Overview

In order to determine the extent to which the site is affected by noise during football matches, a detailed noise measurement study has been carried out during a football match at the Park View Road football grounds. Noise measurements have been carried out in order to determine the $L_{Aeq,T}$ for a variety of noise sources during a match. 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.

On the 7th October 2023, an attended noise survey was conducted by Mathew Vaughan of Hawkins Environmental Limited at the existing Park View Road football grounds during a football match. It is understood that the noise measurements were conducted during:

- Welling United FC v Farnborough FC, Vanarama National League South, Park View Road, Welling (stadium capacity: 4000, attendance: 599)

Weather conditions were conducive to successful monitoring. **Table 4.3** summarises the weather conditions during the measurement period.

Table 4.3: Summary of Weather Conditions during the Noise Measurements

General Description	The measurement periods were warm, with some sunshine during the day with light winds.
Windspeed	Average wind speeds were low, typically less than 0.5 m/s.
Temperature	Temperatures up to 18°C.
Precipitation	The measurement period remained dry.

Noise measurements were conducted at a variety of locations in order to capture noise generated by the spectators before, during and at the end of the match, in addition to during half-time. The measurement locations are considered freefield positions. **Figure 4.5.** presents the approximate noise measurement locations during the football match. The noise measurements had characterised noise from the following sources:

- General crowd noise (such as chatter and conversation);
- Loud crowd noise (such as during intense moments of the match and when a goal was scored);
- Public address system (single loudspeaker during both announcements and music playback);
- Burger van and kiosk bar; and,
- Spectators entering/leaving the stadium.

It should be noted that on-pitch noise was insignificant in comparison to the noise of the crowd. Based on the Artificial Grass Pitch (AGP) Acoustics Guidance Note (2015), it is anticipated that noise levels would equate to approximately 58 dB $L_{Aeq,1hour}$ at 10m from the side-line halfway marking such as during training sessions, without spectators or amplified music from the public address system.

Figure 4.5: Noise Measurement Location & Proposed Ground Floor Plan

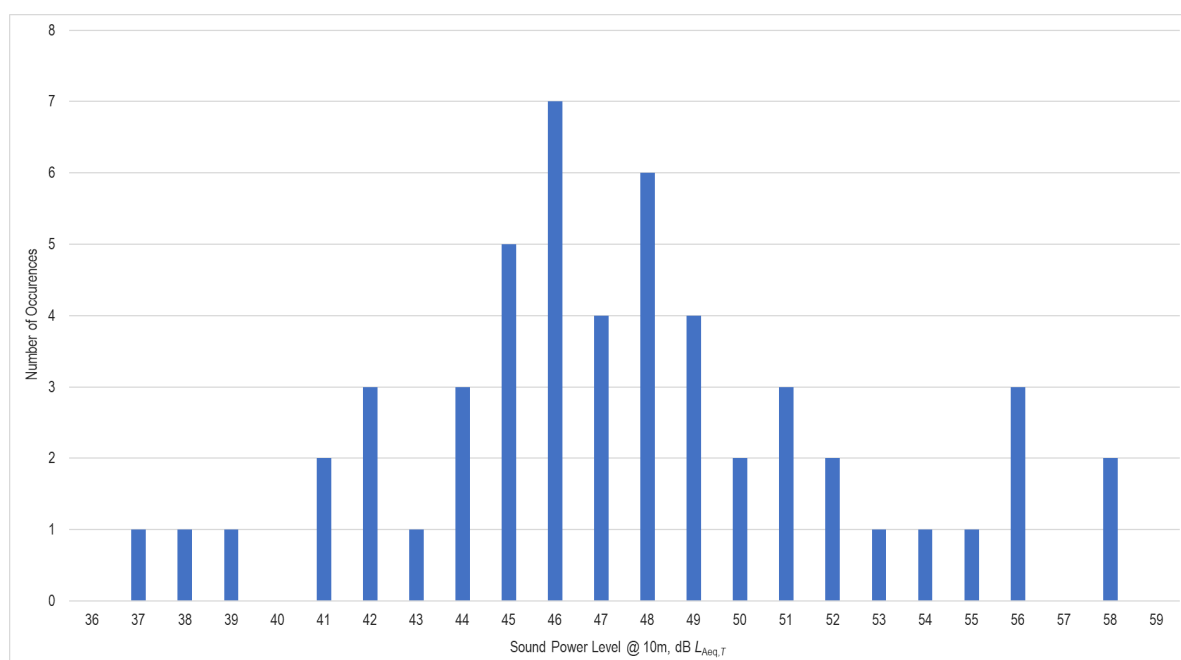


4.2.2. Noise Survey Results – Football Match

Based on the acoustic data of the survey and using an approximate number of spectators within each stand, a sound pressure level has been determined for a single spectator at a normalised distance of 10m. Using this dataset, a histogram has been created to determine the typical sound pressure levels of a single spectator.

The histogram of **Figure 4.6** demonstrates a modal value of 46.0 dB $L_{Aeq,T}$ with the sample determining a mean value of 47.2 dB $L_{Aeq,T}$ and a single standard deviation of 5.2 dB. Based on this, can be determined that during a football match, and based on the sample, a single spectator is likely to generate a sound pressure level of 47.8 dB(A) \pm 10.4 dB at 10 metres with a confidence level of 95% where most of the time, the spectator is likely to generate a sound pressure level of 46.0 dB(A) at 10 metres. During high intensity moments, such as upon a team scoring goal, a single spectator is likely to generate a sound pressure level of 58.0 dB(A) at 10 metres.

Figure 4.6: Histogram of Attended Noise Measurements – Football Match



4.2.3. Crowd Dispersion

Once a football match has finished, spectators disperse to the east and west of Park View Road. Given the low attendance of ~600 spectators in comparison to the existing and proposed capacity of ~4000 spectators, it was observed that noise from spectators leaving the match was not significant and did not result in an audible change in the acoustic environment since the noise climate to the front of the site was dominated by road traffic noise. With larger crowds, such as towards 4000 spectators, it is possible for spectators arriving or leaving the stadium to generate more noise than experienced at present, although it would be anticipated that this would likely be less than the noise generated by Park View Road.

As a consequence, it isn't anticipated that the dispersion of spectators upon arrival and departure to the stadium would be a constraint on the proposed development. However, it may be necessary to implement additional crowd management measures, as required, through monitoring of crowd dispersion when in operation.

4.2.4. Food and Beverage Outlets

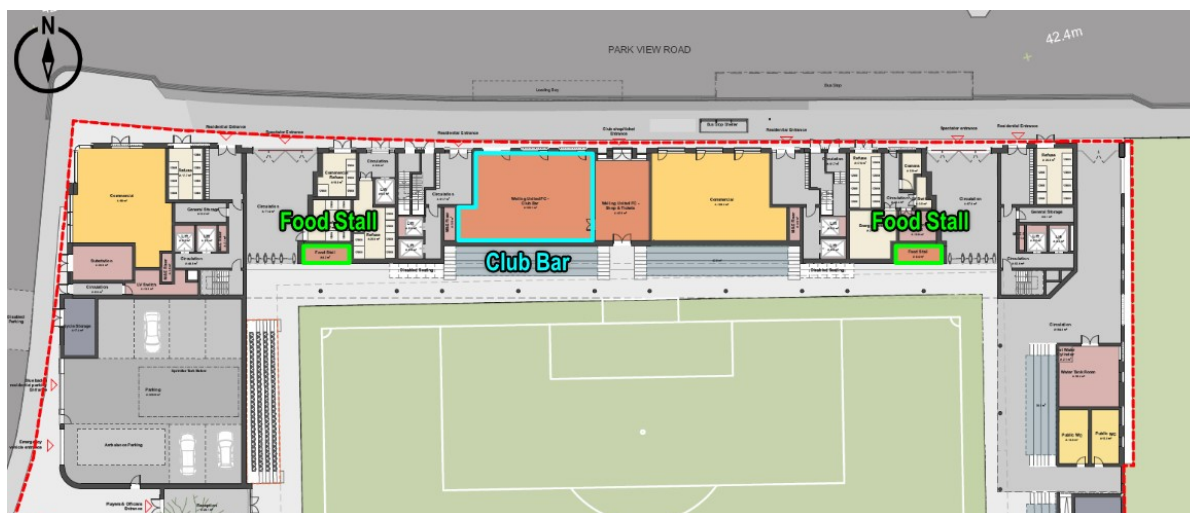
At present, there are two food and beverage outlets comprising of an individual external bar and a burger van. It was also noted that within the existing onsite buildings, there was a sports bar, however this was not audible owing to the lack of noise generating equipment/activities associated with serving mostly cold beverages.

An hour before the match and during half-time is when these outlets are typically in use. During football matches, it was observed that the outlets had not generated any level of audible noise at approximately 3 metres from both outlets. When in use before the match and during half-time, it was observed that the only audible source of noise was the "sizzling" emanating from the griddle of the burger van/food outlet.

The food outlet on average measured between 71-74 dB(A) with a mean $L_{Aeq,T}$ of 72.7 dB(A), at 3 metres. When considering a normalised distance of 10 metres, in addition to the subtraction of noise from patrons in the immediate vicinity, the food outlet is understood to have an $L_{Aeq,T}$ of approximately 51.9 dB(A) at 10 metres.

The existing club bar, situated to the rear of the western stands, was observed to not be audible and therefore was not measurable. As marked on **Figure 4.7**, two food outlets and a new club bar will be included within the proposed scheme.

Figure 4.7: Noise Measurement Location & Proposed Ground Floor Plan



5. PROPG STAGE 1: INITIAL SITE NOISE RISK ASSESSMENT

5.1. Site Classification – ProPG – Typical Noise Levels

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	69 dB	64 dB
ProPG Noise Risk	Medium	High
Effect Level	Above SOAEL	Above SOAEL
Action	Avoid, mitigate and reduce to a minimum	Avoid, mitigate and reduce to a minimum

Based on the results shown in **Table 5.1**, the noise risk of the site is “*High*”, with the effect level in excess of 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 “*High*” 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.

5.2. Establishment of Onsite Noise Levels – During a Football Match

Based on the noise measurements, a noise model has been constructed to determine how noise levels vary across the proposed development site during a football match and in a worst-case scenario with an attendance of 5000. The noise model was constructed using the NoiseMap 5 noise modelling software. NoiseMap 5 utilises the prediction methodology contained within BS 5228-1:2009+A1:2014. The propagation model takes into account the effect of any intervening noise barriers and buildings and the effect of reflecting surfaces.

Figure 5.1 shows the location of the receptors at which the freefield noise levels were predicted during the day and night-time. **Table 5.2** summarises these results at each location. **Figure 5.2** show the predicted noise contours for the proposed development site, for a worst-case hour during a football match..

Noise Assessment:

Welling United FC

Woolwich Road Limited • 21st November 2023 • H3848 – NV – v3**Table 5.2: Predicted Noise Levels Using the NoiseMap Noise Model**

ID	Receptor	Sound pressure Level $L_{Aeq,T}$							MAX
		1 st Floor	2 nd Floor	3 rd Floor	4 th Floor	5 th Floor	6 th Floor	7 th Floor	
1	West Wing – South Façade	-	64.3	65.3	66.2	66.5	-	-	66.5
2	West Wing – East Façade 1	73.2	70.7	69.4	68.7	68	-	-	73.2
3	West Wing – East Façade 2	72.4	70.2	69.5	69.1	68.5	-	-	72.4
4	West Wing – East Façade 3	70.4	66.8	66.0	66.0	65.7	-	-	70.4
5	Centre Block – South Façade 1	-	73.3	71.7	70.8	70.0	69.4	69	73.3
6	Centre Block – South Façade 2	-	69.4	69.4	69.4	69	68.7	68.4	69.4
7	Centre Block – South Façade 3	-	68.3	68.6	68.8	68.7	68.6	68.4	68.8
8	Centre Block – South Façade 4	-	67.5	67.9	68.4	68.3	68.2	68.1	68.4
9	Centre Block – South Façade 5	-	67.4	67.9	68.4	68.3	68.2	68.1	68.4
10	Centre Block – South Façade 6	-	67.6	68.0	68.5	68.4	68.3	68.2	68.5
11	East Wing – West Façade 1	61.4	62.0	62.6	63.2	63.2	-	-	63.2
12	East Wing – West Façade 2	61.8	62.3	62.9	63.5	63.5	-	-	63.5
13	East Wing – West Façade 3	69.0	69.2	69.4	69.7	69.7	-	-	69.7
14	East Wing – South Façade	76.6	73.1	71.1	70.1	69.4	-	-	76.6

Figure 5.1: Location of Noise Receptors

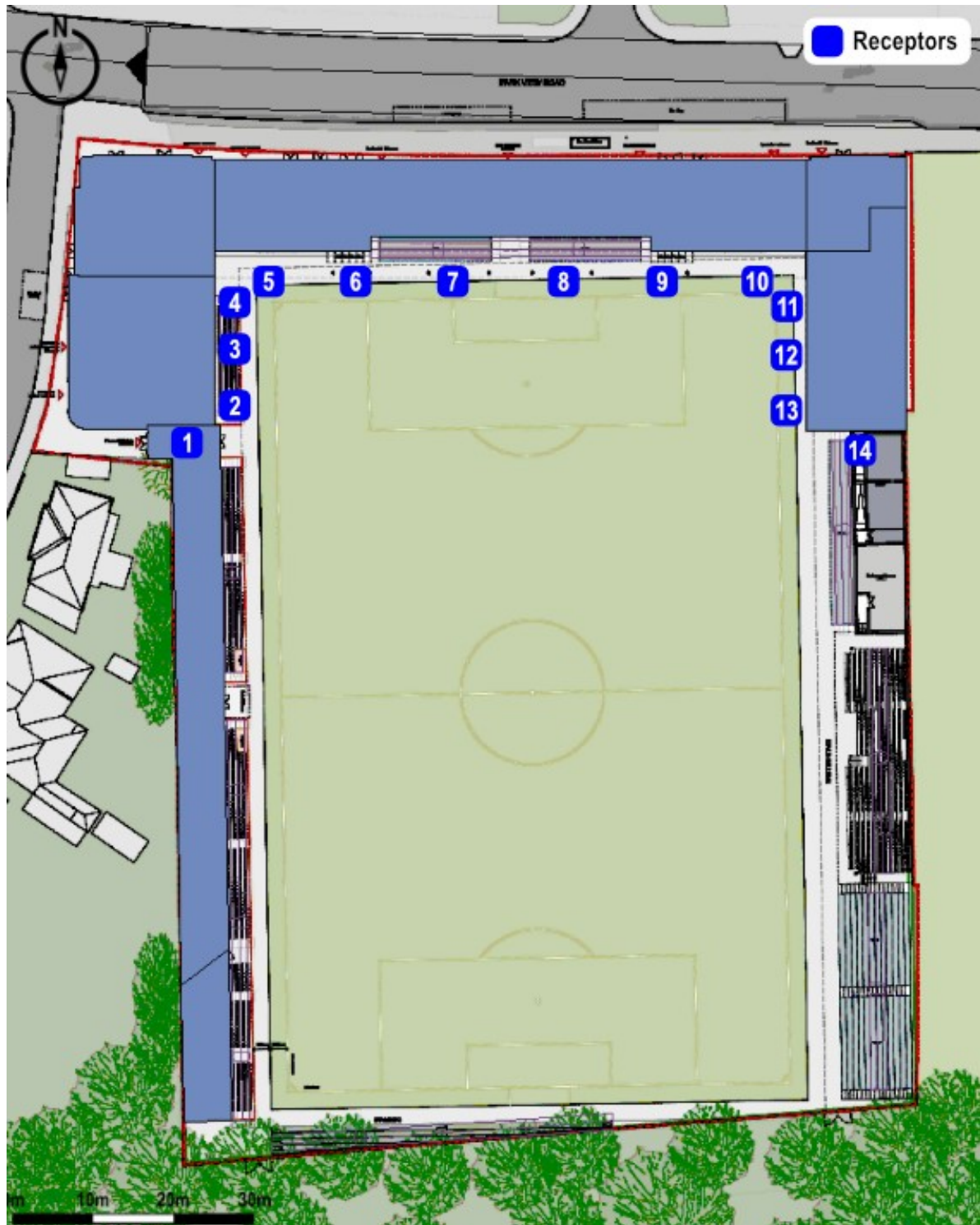
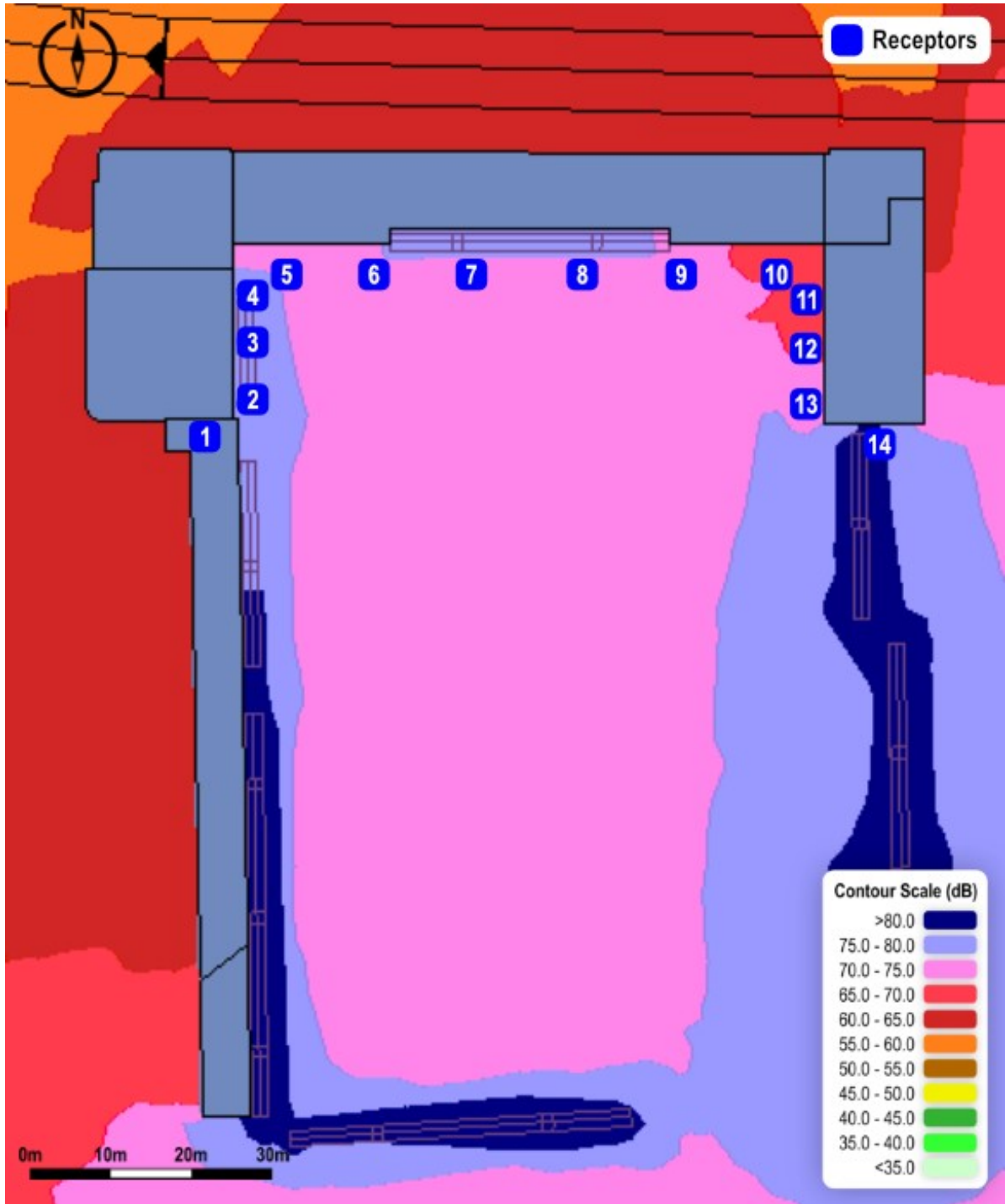


Figure 5.2: Noise Model Contours – Proposed Site Layout – Worst-Case 1 Hour Period (Ground Floor)



6. PROPG STAGE 2: ACOUSTIC DESIGN STATEMENT

The Stage 1 Initial Site Risk Assessment has identified that the noise risk is “*High*” 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 arrangement is formed of three blocks which comprise of two wings and a central section which runs parallel to Park View Road. The central section exclusively comprises of duplex apartments. All proposed dwellings include private amenity space in the form of balconies, terraces, and wintergardens. It is noted that all private amenity areas facing towards the football pitch features wintergardens, which would see a significant reduction in sound within these private amenity areas where occupants would have access to quiet private amenity space.

In addition, the massing of the proposed building significantly protects the southern aspect from road traffic noise emanating from Park View Road. The layout of the building sees bedrooms and living spaces situated on the outer facades. 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 – Road Traffic Noise

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. Criteria – Football Match Noise

British Standard BS 8233:2014 isn't considered appropriate to consider football match noise, since the criterion of the Standard only relates to transportation noise sources. Whilst it is not stated that noise from sports and leisure activities fall outside the scope of the standard, it is suggested that in section 6.9 of the standard, that the assessor should seek guidance through utilising codes of practice.

Since there are no available codes of practice or guidance which would suggest a criterion for sports stadia-related noise, it has been determined that it would be appropriate to adapt the criteria of BS 8233:2014 so that a single worst-case hour is considered during a football match. By ensuring compliance with a single hour criterion, this would also ensure compliance to the 16 hour L_{Aeq} assessment period of BS 8233 between 7am and 11pm. **Table 6.2** below presents the noise criteria.

Table 6.2: Summary of Noise Criteria: Football Matches

Activity	Location	Internal Ambient Noise Level
Resting	Living room	35 dB $L_{Aeq,1hour}$
	Bedroom	
Dining	Dining room/area	40 dB $L_{Aeq,1hour}$

6.2.3. 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 6.3** below in relation to the facades with a direct view of Park View Road.

Table 6.3: The Simple Calculation Procedure from Annex G of BS 8233: 2014

Criteria	Daytime $L_{Aeq,16hr}$	Night time $L_{Aeq,8hr}$
External (freefield)	69 dB	64 dB
Criteria	35 dB	30 dB
Internal Noise Level (assuming R_w of 33)	36 dB	31 dB
Comparison to Criteria	+1 dB	+1 dB
Action	<i>More detailed calculations would be required.</i>	

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 6.3** show that more detailed calculations will be required since internal noise levels will not be more than 5 dB lower than the criteria. Using the equation in Annex G of BS 8233, it is possible to calculate the internal noise levels based on typical construction details and room dimensions and therefore calculate the minimum R_w for the windows.

The calculations assume that the building will be constructed by traditional brick and blockwork methods with a wall R_w of 50 dB. Room dimensions and window sizes from the submitted plans have been utilized in the calculations. The calculations assume that the development will be mechanically ventilated and therefore trickle vents have not been included in the calculations.

The results of the calculations are shown in **Table 6.4** for the rooms of concern facing Park View Road.

The WHO guidance suggests that in bedrooms at night, individual noise events should not normally exceed 45dB L_{Amax} more than 10-15 times a night; therefore, when specifying sound insulation, the calculations would normally use the 11th highest measured night-time L_{Amax} noise level as the design criteria, which during the noise survey, was determined to be 82.0 dB(A) (free-field). Consequently, a design criterion of 82.0 dB L_{Amax} has been assumed. It should be noted that noise measurements are carried out to a resolution of 1 second; consequently, all L_{Amax} noise events have been properly characterised and logged during the night-time measurement period.

In the living room facing Park View Road, it has been calculated that a suitable internal noise environment can be created with a window with a minimum R_w of 37 dB. In the bedrooms, a higher level of acoustic attenuation is required, with a minimum R_w of 39 dB required. **Table 6.5** shows the minimum SRI values in each octave band frequencies required.

The minimum SRI values in each octave band frequencies required have been calculated using the reference values for airborne sound contained within ISO 717-1:2013 *Acoustics — Rating of sound insulation in buildings and of building elements — Part 1: Airborne sound insulation*. The reference curve has been moved up or down as appropriate, in accordance with ISO 717-1:2013, until the predicted internal noise levels achieve the recommendations contained within BS 8233:2014.

It should be noted that since Annex G of BS 8233 indicates that the calculation methodology is only precise to +/- 2dB, to account for this margin of error, all internal noise levels have been designed to be at least 2 dB lower than the criteria.

Table 6.4: Summary of BS 8233 Calculations and Minimum Window R_w

Room		2B4P Centre Block Bedroom	2B4P Wing Bedroom	2B4P Wing Living Room	
Day	L_{Aeq} External	68.8	68.8	68.8	
	L_{Aeq} Internal	BS 8233 Max.	35	35	
		Windows Closed	33.9	29.6	32.9
		Windows Open	56.9	55.8	55.8
Night	L_{Aeq} External	63.8	63.8	-	
	L_{Aeq} Internal	BS 8233 Max.	30	30	-
		Windows Closed	23.9	23.9	-
		Windows Open	50.8	50.8	-
	L_{Amax} External	82	82	-	
	L_{Amax} Internal	BS 8233 Max.	45	45	-
		Windows Closed	42.1	42.1	-
		Windows Open	69.0	69.0	-
Minimum R_w		39	39	37	

Table 6.5: Minimum R_w Values for the Glazing

Description	Octave Band Centre Frequency, dB					R_w
	125 Hz	250 Hz	500 Hz	1 kHz	2kHz	
Bedroom Windows	21	30	37	40	41	39
Living Room Windows	24	33	40	43	44	37

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.

6.2.4. 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. **Table 6.4** notes that suitable internal noise levels cannot be achieved within windows open. Therefore, one must consider the impacts of ventilation and overheating, with the need to provide a good acoustic environment.

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.

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

For a "High" risk site, noise levels are such that it is not considered appropriate to rely on the opening of windows to deal with overheating. It is important to note that it is not generally considered appropriate for windows to be sealed, as it is considered that residents should have the right to choose whether or not they open the window, plus they should still be openable for the rapid dilution of smells/water vapour/VOCs. However, the residents should not have to rely on opening the windows to ensure that conditions in the rooms are comfortable.

If appropriate, it will be necessary to ensure that any self-noise from fans associated with the ventilation system (i.e. mechanical noise audible within the rooms) achieves the maximum recommended noise levels contained within the AVO Guide. Similarly, it will be important to ensure that the ventilation system is designed to ensure that noise ingress into the building via the vent is adequately addressed. Typically, the ventilation specifier will be able to provide suitable attenuation for the system being proposed, based on the external noise level pertinent to the location of the external vent.

6.2.5. 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.

6.2.6. 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 Park View Road, where the 24-hour 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 Park View Road, is likely to normally benefit from lower noise levels, particularly when football matches are not occurring.

Regarding glazing requirements, **Section 6.2.2** of this report notes that windows facing Park View Road will require glazing to have a minimum R_w of 37 dB for living rooms and 39 dB for bedrooms. Given that the accommodation to the rear of the development will be located at a distance 16m further from Park View Road than the monitoring position. This is likely to result in noise levels in the region of 5 dB lower than the measurement location, based upon line source distance attenuation alone. When considering the attenuation afforded by the building itself, noise would likely be reduced further.

However, during football matches, noise levels to the rear of the development are likely to be similar to the front façade. As demonstrated within the NoiseMap 5 model, a worst-case scenario when the stadium is operating at its maximum capacity would yield a worst-case freefield $L_{Aeq,T}$ of 72 dB(A) at the second floor of the west wing.

To ensure suitable internal ambient noise levels for rooms facing towards the football pitch, the glazing recommendations of R_w 39 dB would apply for both bedrooms and living rooms. Where a wintergarden exists, it is anticipated that a combination of the wintergarden with a standard double-glazed system with a minimum R_w of 33 dB would be considered appropriate and would ensure that in a worst-case scenario, the internal ambient noise levels within the bedrooms and living rooms would be less than the criteria of **Section 6.2.2**.

With the above recommendations and considering the BS 8233:2014 criteria, this would therefore result in an internal daytime $L_{Aeq,16hours}$ of less than 35 dB and a night-time internal $L_{Aeq,8hours}$ of less than 30 dB within bedrooms and less than 40 dB in living rooms during the daytime.

In addition, noise levels would be even lower if one also took into account the barrier attenuation afforded by the proposed building itself, directivity of the noise sources, in addition to the canopy above the north stands.

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 could be similar or marginally greater than experienced on

the front façade, and to protect the occupants from excessive exposure to noise during football matches, it is also anticipated that accommodation to the rear of the development, without a direct view of Park View Road, noise levels would result in a “high” risk under the AVO Guide and therefore it is not considered appropriate to rely on the opening of windows to address overheating. As a consequence, a mechanical ventilation system is recommended.

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.”

At the development site, the $L_{Aeq,16hours}$ was measured to be 69 dB, which is greater than the “upper guideline value” of 55 dB. A great deal of consideration has been given to noise in outdoor amenity areas, as whilst flats to the rear of the property will benefit from private amenity and terraces with noise levels of typically less than 55 dB L_{Aeq} , dwellings facing the side and/or front (north) façade may likely experience noise levels of greater than 55 dB on their balconies.

Consequently, the ProPG suggests that where “significant adverse noise effects remain on any private external amenity space (e.g. garden or balcony) then the noise impact may be partially off-set if the residents are provided... with access to... a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings”, it has been determined that the provisions of rooftop terrace amenity spaces are likely to provide sufficient external amenity in terms of noise most of the time. However, during match days, noise levels may be higher than the ‘upper guideline value’ of 55 dB(A).

The ProPG goes on to say that “in exceptional circumstances, a quiet, protected, publically accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance)” could be used to offset the lack of onsite quiet amenity space. It has been observed that Danson Park, which abuts the southern boundary of the development site, is less than 300m from the development site and is considered to be relatively quiet and tranquil and could be considered a suitable proxy outdoor amenity space such as during football matches.

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.

6.4.1. Noise from Commercial Premises

Noise from adjacent commercial premises has also been considered in the assessment. Potential noise impacts from commercial premises include impacts through party floors, plant noise, refuse collection and delivery noise. It has been observed that the proposed development will feature commercial units on the ground floor with residential units situated above. The operations of the commercial units are not yet known.

With regards to noise through the party floor, it would be expected that the floor would comply with the requirements of Approved Document E of the Building Regulations and achieve the minimum standard of sound insulation appropriate for the floor. Given that relatively small shops on a suburban would not be expected to be particularly noisy, plus would only typically be expected to be open during typical working hours, it would be anticipated that no additional sound insulation would be required to the party floor over and above what would be expected to achieve the requirements of Approved Document E of the Building.

6.4.2. PA System Noise

With the redevelopment of the grounds, it would be anticipated that a new public address system would be designed. During the detailed design of a new public address system, the utilisation of a larger number of lower powered loudspeakers that are situated nearer to the crowd should be used such that most spectators would be in close proximity to a loudspeaker. This would allow the public address system to operate with better speech intelligibility, in addition to less noise generated by the system than at present. During the attended noise survey, a single loudspeaker would typically generate a sound pressure level of 68.4 dB(A) at 10m, however the loudspeakers at present are sparsely distributed with poor speech intelligibility.

Since the precise locations and the loudspeaker units of the public address system of the proposed scheme is yet to be determined, during detailed design, the system should be designed such that the cumulative noise level of the system should not exceed 74 dB(A) at 1 metre from the façade of the proposed residential dwellings.

6.4.3. Club Bar

One of the ground floor units will comprise the Welling United FC Club Bar. It is understood that the bar is likely to operate multiple times per week and simultaneously with football matches. The bar is likely to play host to a variety of events, functions and uses where it may be occupied during the daytime and into the evening periods up to 11pm. It is anticipated that the dominant source of noise emanating from the bar in a worst-case single hour period could be amplified music and noise from patrons.

In accordance with the Institute of Acoustics Working Group Annex – Control of Noise from Pubs and Clubs (2003), it has been recommended that since the club bar venue may operate more than once per week, the following criteria applies:

- “The L_{Aeq} of the entertainment noise should not exceed the representative background noise level L_{A90} (without entertainment noise), and

- *The L_{10} of the entertainment noise should not exceed the representative background noise level L_{90} (without entertainment noise) in any 1/3 octave band between 40 Hz and 160 Hz”.*

The Annex indicates that if the criteria is met, “entertainment noise will be virtually inaudible inside noise-sensitive property”. It also notes that the criteria is applicable for both internal and external assessments.

In regards to the party floor which separate the club bar to the residential units above, It would be expected that at minimum, the party floor would comply with the requirements of Approved Document E of the Building Regulations and achieve the minimum standard of sound insulation appropriate for the floor. However, since the club bar could play host to noisy activities, it would be appropriate for the party floor to be designed such that noise from the club bar is not audible in the residential dwellings situated above.

It is assumed that patron noise would be managed by staff within the premises so as to not disrupt adjacent residential dwellings. A noise management plan would be recommended to ensure that activities within the club bar are managed such that the potential impact to adjacent noise sensitive receptors are mitigated and reduced to minimum. The club bar should also be mechanically ventilated and comfort cooled, so that the façade may be closed during noisy functions, where the façade may be opened during quieter periods of operation.

Additional mitigation measures may be detailed within a noise management plan such as, but not limited to:

- Incorporation of noise limiters to ensure appropriate levels of noise emanating from amplified sources;
- Ensuring employees are trained on the importance of noise control to deal with excessive noise from patrons or activities;
- Consider noise impacts when planning for functions or events which may occur within the club bar;
- Ensuring an open line of communication with adjacent noise sensitive receptors with contact details provided to all adjacent residents; and
- Ensuring that a protocol is in place to deal with noise complaints efficiently and effectively.

6.4.4. Deliveries

Delivery noise for both the club bar and the two commercial units is unlikely to be considered significant. The two proposed commercial ground floor units and the club bar are not particularly large units (both under 110m²) and deliveries would need to occur at the front of the building at the designated loading bay.

As the commercial units, club bar and stadium would only likely be open during working hours, deliveries would not be anticipated outside of these hours. Given that the front façade of the residential dwellings would benefit from a good level of sound insulation, it is unlikely that deliveries would cause a significant disturbance, particularly against the residual acoustic environment comprising of significant levels of road traffic noise along Park View Road.

6.4.5. Context

Another consideration of the scheme is that it is important to be cognizant of the context. Since the proposed dwellings are effectively integrated into the new stadium, one would anticipate that the future occupants of the development would be aware of the likelihood that there may be some audible noise associated with the activities of the stadium. Therefore, whilst the criteria used in this assessment aims to ensure appropriate

internal ambient noise levels during maximum capacity football events, this does not suggest that noise upon the development of the site would be inaudible to future residents.

6.5. Recommendations to the Decision Maker

Since the internal and external noise criteria contained within BS 8233 and the ProPG guidance framework can be achieved and a reasonable level of acoustic design has been demonstrated with considerations of noise during days with football matches, it is recommended to the decision maker that planning consent may be granted, subject to the inclusion of suitable noise conditions, to ensure suitable internal and external noise levels.

7. IMPACT OF THE DEVELOPMENT

7.1. Overview

As well as considering the constraints the site poses in terms of using the site for residential development, the impact of the proposed development has been considered.

The impact of noise from footballing activities on existing surrounding properties has not been considered. The reason for this is because the current stadium has a capacity of 4000; the proposed stadium will still have a capacity of 4000 spectators. Since there will not be an increase in capacity of the stadium, rather an improvement of facilities, it is not anticipated that there will be an increase in footballing noise. In fact, given that the northern end of the stadium will be significantly enlarged, this will act as a noise barrier to the properties to the north of the site and therefore, some dwellings close to the proposed development site may actually experience a reduction in noise as a consequence of the proposed development.

As a consequence, only plant noise and construction noise impacts require consideration.

7.2. Plant Noise Limits

At this stage in the design process, the noise output of specific items of plant has yet to be determined; therefore it is not possible to provide a full and detailed assessment of the likely impact of plant noise. As a consequence, environmental noise limits for plant associated with the development should be set to protect the amenity of nearby noise sensitive premises, as well as future residents of the development itself in accordance with BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound'.

Prior to the publication of the 2014 version of BS 4142, acousticians would use the lowest measured background noise levels; however, BS 4142: 2014 provides substantially more guidance on the determination of background noise 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"*.

The background noise levels have been determined to be 58 dB and 38 dB during the day and night respectively. To ensure that an adverse impact as a consequence of plant noise is unlikely, it is recommended that the Rating noise level from the plant is below background noise level, i.e. the Rating noise level should be no more than 58 dB(A) during the day and 38 dB(A) during the night at the closest residential property. The Rating noise level is the predicted cumulative noise level from all plant at the receptor location and should include penalties for tonality, impulsivity and/or intermittency if appropriate. 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.

7.3. 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;
- 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 “*high risk*” site under the Pro-PG, with noise levels in excess of 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 8.1: Summary of Recommendations to Achieve Suitable Internal Noise Levels

	Front (north), east and west facades with a direct view of Park View Road		Rear (south) of the site, facing the football pitch	
	Bedrooms	Living Rooms	Bedrooms	Living Rooms
Minimum Sound Reduction of the Glazing in Relation to Noise	R _w of 39 dB	R _w of 37 dB	R _w of 39 dB, or Standard doubling glazing with an R _w 33 dB or more with a Wintergarden.	
Ventilation Recommendations in Relation to Noise	Based on the onsite noise levels, mechanical ventilation would be appropriate.		Based on the onsite noise levels, mechanical ventilation would be appropriate.	
Overheating Recommendations in Relation to Noise	Based on the onsite noise levels, windows cannot be opened to deal with overheating.		Based on the onsite noise levels, windows cannot be opened to deal with overheating.	

Since the internal noise criteria contained within BS 8233 and the ProPG guidance framework can be achieved and a reasonable level of acoustic design has been demonstrated, it is recommended to the decision maker that planning consent may be granted, subject to the inclusion of suitable noise conditions, to ensure suitable internal and external noise levels.

Since it has been shown that the proposed development meets the guidance contained within BS 8233: 2014, it is considered that the proposed development complies with Paragraph 185 of the National Planning Policy Framework since the new development will not be “*put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution*”. Since it has been shown that in terms of noise, the proposals adhere to local, London and national planning policy, it is considered that the noise environment of the site should not be a constraint on the proposed residential development.

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

Noise Assessment:

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Appendix 2: Schedule of Equipment

Equipment Set 3056:

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	1403056	U42312	UKAS Calibration: 0789	2 nd November 2022	November 2024
Nor-1209 Pre-amplifier	Norsonic	12528	U42312	UKAS Calibration: 0789	2 nd November 2022	November 2024
Nor-1225 Microphone	Norsonic	98361	42311	UKAS Calibration: 0789	2 nd November 2022	November 2024
Nor-1255 Sound Calibrator	Norsonic	25262	U42310	UKAS Calibration: 0789	2 nd November 2022	November 2023
Nor-1284 Dehumidifier	Norsonic	222	Not Applicable			
Nor- 1212 Weather Protection Kit	Norsonic	Not Applicable				
Nor1408A/5 Extension Cable	Norsonic/Lemo	Not Applicable				

Noise Assessment:

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Laboratory Location

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



Certificate of Calibration and Conformance

Certificate number: **U42312**

Test Object: **Sound Level Meter, BS EN IEC 61672-1:2003 Class 1**

Producer: **Norsonic AS.**
Type: **140**
Serial number: **1403056**
Customer: **Hawkins Environmental**
Address: **The Square, Basing View,
Basingstoke, Hampshire, RG21 4EB**
Contact Person: **Nick Hawkins**
Order No: **TBC**

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	Norsonic	1225	98361	42311
Calibrator*	Norsonic	1255	125525262	U42310
Preamplifier	Norsonic	1209	12528	Included

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

Additional items that have also been submitted for verification:

Wind shield N/A
Attenuator N/A
Extension cable N/A

These items have been taken into account wherever appropriate.

Instruction Manual: Im140_1Ed8R0En Firmware Version: 2.1.670 The test object is a single channel instrument.

Conditions	Pressure kPa	Temperature °C	Humidity %RH
Reference conditions	101.325	23	50
Measurement conditions	100.82 ±0.08	23.40 ±0.2	47.98 ±0.2

Calibration Dates:

Received date: 24/10/2022 Reviewed date: 03/11/2022
Calibration date: 02/11/2022 Issued date: 03/11/2022

Technicians: (Electronic certificate)

Calibrated by: *Katie Brown*

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.

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Doc ref: Slim-Cert-Master-V3-05

Certificate of Calibration and Conformance

Continuation of Certificate number: U42312

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:	BS EN IEC 61672-2:2003

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 - IEC61672-3 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). Actual measured microphone response has been used for the determination of the combined acoustic and electrical frequency response.

Statement of Conformance

The sound level meter submitted has successfully completed the periodic tests of the standard listed for the environmental conditions under which the tests were performed. As public evidence(1) was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with the manufacturer's standard to demonstrate that the model of sound level meter fully conformed to the requirements of the said standard, the sound level meter submitted for testing conforms to the relevant class of the said standard.

(1 - evidence is held on file at the calibration laboratory)

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:

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Laboratory Location

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



Certificate of Calibration

Certificate number: **42311**Test Object: **Measurement Microphone**

Producer: **Norsonic AS.**
Type: **1225**
Serial number: **98361**
Customer: **Hawkins Environmental**
Address: **The Square, Basing View,
Basingstoke, Hampshire, RG21 4EB**
Contact Person: **Nick Hawkins**
Order No: **TBC**

Measurement Results	Sensitivity (dB re 1V/Pa)	Sensitivity (mV/Pa)	Capacitance (pF)
Measurement 1	-25.95	50.39	26.46
Measurement 2	-25.97	50.32	26.44
Measurement 3	-25.96	50.32	26.40
Result (Average):	-25.96	50.34	26.43
Expanded Uncertainty:	0.10		2.00
Degree of Freedom:	>100		>100
Coverage Factor:	2		2

The stated sensitivity is the pressure sensitivity at 250Hz, S₂₅₀, and is valid at reference conditions. The following correction factors have been applied during the measurement:

Pressure:uncertainty dB/kPa Temperature:-0.005 dB/°C Humidity:0 dB/%RH

Conditions	Pressure kPa	Temperature °C	Humidity %RH
Reference conditions	101.325	23	50
Measurement conditions	100.988 ± 0.042	22.9 ± 0.1	48.7 ± 0.8

The calibration test report shown on the next page gives details of the response at other frequencies relative to this 250 Hz reference sensitivity. Results ≥100 Hz are obtained using an electrostatic actuator as described in BS EN 61094-8 and those below 100 Hz are obtained in a reference pressure chamber. Detailed results are available from the calibration laboratory upon request.

The reported expanded uncertainty of measurements is based on a standard uncertainty multiplied by the coverage factor of k=2, providing a coverage probability 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.

Calibration Dates:

Received date: 24/10/2022 Reviewed date: 03/11/2022
Calibration date: 02/11/2022 Issued date: 03/11/2022

Technicians: (Electronic certificate)

Calibrated by: *Katie Brown*
Reviewed by: *Jenny Crawford*

This certificate is issued in accordance with the CA Quality Management system. It provides traceability of measurement to recognized national standards, and to the units of measurement realized at the National Physical Laboratory or other recognized national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Doc ref. Mic-Cert-Master-V3-04

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Noise Assessment:

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Certificate of Calibration

Continuation of Certificate number: 42311

Reference Calibrator: WSC11 - Nor-1253.26672

Measurement Record: K:\C A\Calibration\Nor-1504\Nor-1017 MicCal\NOR1225_98361_M1.nmf

Preconditioning

The equipment was preconditioned for more than 12 hours at the specified calibration temperature and humidity.

Instruments and Program

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

Traceability

The measured values for sound pressure, frequency, voltage, capacitance, temperature, humidity and ambient pressure are traceable to an accredited national physical laboratory.

Observations

The differences between the two results at 100 Hz are within normal limits bearing in mind the different test methods and are taken into account in arriving at the uncertainties of measurement.

Method of Calibration

The open circuit sensitivity of the microphone has been determined at 250 Hz against a reference laboratory standard measurement microphone by insert voltage techniques using a laboratory standard sound calibrator as a transfer standard. The electrostatic actuator frequency response was then obtained for frequencies above 100 Hz as described in BS EN IEC 61094-6. In addition, where requested the optional free field frequency response over the range 2 – 100 Hz has been obtained using a pressure chamber; in this case the reference frequency is 100 Hz. All of these results and their associated uncertainties are detailed in the table on page 3 of this certificate. See the observations field below for details of any discrepancies between the 100 Hz results obtained via the electrostatic actuator and pressure chamber.

The overall uncertainty at any frequency $\sigma_{\text{Combined},Fn}$ may be obtained by combining the uncertainty of the open circuit sensitivity σ_{S250} with the uncertainty of the actuator / or LF pressure response at any other frequency $\sigma_{\text{Act},Fn}$ where Fn is the uncertainty at the frequency of interest using the relationship:

$$\sigma_{\text{Combined},Fn} = 2 \cdot \sqrt{(\sigma_{S250}^2 + \sigma_{\text{Act},Fn}^2)}$$

Appendix to this certificate

Where data is available from the microphone manufacturer to correct the actuator / pressure frequency response to obtain the random incidence and / or free field response it is shown in the appendix to this certificate. The uncertainty information relating to these corrections is the responsibility of the microphone manufacturer and when it is available the total uncertainty for the corrected frequency response at each point may then be obtained by including the correction uncertainty in the root-sum-square formula given above. These responses are outside the UKAS accredited scope, but are provided for information.

Observations

Certificate of Calibration

Page 2 of 4

Noise Assessment:

Welling United FC

Woolwich Road Limited • 21st November 2023 • H3848 – NV – v3

Laboratory Location

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



Certificate of Calibration and Conformance

Certificate number: **U42310**

Test Object: **Sound Calibrator**

Producer: **Norsonic AS.**
Type: **1255**
Serial number: **125525262**
Customer: **Hawkins Environmental**
Address: **The Square, Basing View,
Basingstoke, Hampshire, RG21 4EB**
Contact Person: **Nick Hawkins**
Order No: **TBC**

Measurement Results	Level dB	Level Stability dB	Frequency Hz	Distortion %
Measurement 1	114.05	0.02	1000.00	0.34
Measurement 2	114.05	0.02	1000.00	0.36
Measurement 3	114.06	0.02	999.99	0.34
Result (Average):	114.05	0.02	999.99	0.35
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 20 μ Pa. 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

Conditions	Pressure kPa	Temperature °C	Humidity %RH
Reference conditions	101.325	23	50
Measurement conditions	100.998 \pm 0.042	22.7 \pm 0.1	49.2 \pm 0.8

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 CalCal2022\NOR1255_125525262_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:	24/10/2022	Reviewed date:	03/11/2022
Calibration date:	02/11/2022	Issued date:	03/11/2022

Technicians: (Electronic certificate)

Calibrated by: *Katie Brown*
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-V3-05

Page 1 of 3

Noise Assessment:

Welling United FC

Woolwich Road Limited • 21st November 2023 • H3848 – NV – v3

Certificate of Calibration and Conformance

Continuation of Certificate number: U42310

Reference Microphone: WSM11 - 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 Conformance and Calibration

As public evidence was available*, 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.

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

Observations:

Continued on next page.

Certificate of Calibration and Conformance

Page 2 of 3

Noise Assessment:

Welling United FC

Woolwich Road Limited • 21st November 2023 • H3848 – NV – v3

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	U42092	UKAS Calibration: 0789	6 th October 2022	October 2024
Nor-1209 Pre-amplifier	Norsonic	15117	U42092	UKAS Calibration: 0789	6 th October 2022	October 2024
Nor-1225 Microphone	Norsonic	151240	42091	UKAS Calibration: 0789	6 th October 2022	October 2024
Nor-1251 Sound Calibrator	Norsonic	32849	U42090	UKAS Calibration: 0789	6 th October 2022	October 2023
Nor-1284 Dehumidifier	Norsonic	222	Not Applicable			
Nor- 1212 Weather Protection Kit	Norsonic	Not Applicable				
Nor1408A/5 Extension Cable	Norsonic/Lemo	Not Applicable				

Noise Assessment:

Welling United FC

Woolwich Road Limited • 21st November 2023 • H3848 – NV – v3

Laboratory Location

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



Certificate of Calibration and Conformance

Certificate number: **U42092**

Test Object: **Sound Level Meter, BS EN IEC 61672-1:2003 Class 1**

Producer: **Norsonic AS.**
Type: **140**
Serial number: **1405199**
Customer: **Hawkins Environmental**
Address: **The Square, Basing View,
Basingstoke, RG21 4EB**
Contact Person: **Nick Hawkins**
Order No: **PO-H5563**

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	Norsonic	1225	151240	42091
Calibrator*	Norsonic	1251	32849	U42090
Preamplifier	Norsonic	1209	15117	Included

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

Additional items that have also been submitted for verification:

Wind shield N/A
Attenuator N/A
Extension cable N/A

These items have been taken into account wherever appropriate.

Instruction Manual: Im140_1Ed8R0En Firmware Version: 3.0.1866 The test object is a single channel instrument.

Conditions	Pressure kPa	Temperature °C	Humidity %RH
Reference conditions	101.325	23	50
Measurement conditions	102.12 ±0.02	23.20 ±0.25	45.05 ±0.5

Calibration Dates:

Received date: 28/09/2022 Reviewed date: 06/10/2022
Calibration date: 06/10/2022 Issued date: 06/10/2022

Technicians: (Electronic certificate)

Calibrated by: *Martyna Silva*

Reviewed by: *Jenny Crauford*

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.

Noise Assessment:

Welling United FC

Woolwich Road Limited • 21st November 2023 • H3848 – NV – v3

Doc ref: Slim-Cert-Master-V3-05

Certificate of Calibration and Conformance

Continuation of Certificate number: U42092

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:	BS EN IEC 61672-2:2003

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 - IEC61672-3 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 has successfully completed the periodic tests of the standard listed for the environmental conditions under which the tests were performed. As public evidence(1) was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with the manufacturer's standard to demonstrate that the model of sound level meter fully conformed to the requirements of the said standard, the sound level meter submitted for testing conforms to the relevant class of the said standard.

(1 - evidence is held on file at the calibration laboratory)

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:

Welling United FC

Woolwich Road Limited • 21st November 2023 • H3848 – NV – v3

Laboratory Location

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

**Certificate of Calibration**Certificate number: **42091**Test Object: **Measurement Microphone**

Producer: **Norsonic AS.**
Type: **1225**
Serial number: **151240**
Customer: **Hawkins Environmental**
Address: **The Square, Basing View,
Basingstoke, RG21 4EB**
Contact Person: **Nick Hawkins**
Order No: **PO-H5563**

Measurement Results	Sensitivity (dB re 1V/Pa)	Sensitivity (mV/Pa)	Capacitance (pF)
Measurement 1	-26.14	49.31	21.47
Measurement 2	-26.13	49.38	21.48
Measurement 3	-26.13	49.37	21.49
Result (Average):	-26.13	49.36	21.48
Expanded Uncertainty:	0.10		1.00
Degree of Freedom:	>100		>100
Coverage Factor:	2		2

The stated sensitivity is the pressure sensitivity at 250Hz, S250, and is valid at reference conditions. The following correction factors have been applied during the measurement:

Pressure:uncertainty dB/kPa Temperature:-0.005 dB/°C Humidity:0 dB/%RH

Conditions	Pressure kPa	Temperature °C	Humidity %RH
Reference conditions	101.325	23	50
Measurement conditions	102.164 ± 0.042	22.7 ± 0.1	44.6 ± 1.0

The calibration test report shown on the next page gives details of the response at other frequencies relative to this 250 Hz reference sensitivity. Results ≥100 Hz are obtained using an electrostatic actuator as described in BS EN 61094-6 and those below 100 Hz are obtained in a reference pressure chamber. Detailed results are available from the calibration laboratory upon request.

The reported expanded uncertainty of measurements is based on a standard uncertainty multiplied by the coverage factor of k=2, providing a coverage probability 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.

Calibration Dates:

Received date: 28/09/2022 Reviewed date: 06/10/2022
Calibration date: 06/10/2022 Issued date: 06/10/2022

Technicians: (Electronic certificate)

Calibrated by: *Martyna Silva*
Reviewed by: *Jenny Crawford*

This certificate is issued in accordance with the CA Quality Management system. It provides traceability of measurement to recognized national standards, and to the units of measurement realized at the National Physical Laboratory or other recognized national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Doc ref: Mic-Cert-Master-V3-04

Noise Assessment:

Welling United FC

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Certificate of Calibration

Continuation of Certificate number: 42091

Reference Calibrator: WSC1 - Nor1253-24269

Measurement Record: K:\C A\Calibration\Nor-1504\Nor-1017 MicCal\NOR1225_151240_M1.nmf

Preconditioning

The equipment was preconditioned for more than 12 hours at the specified calibration temperature and humidity.

Instruments and Program

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

Traceability

The measured values for sound pressure, frequency, voltage, capacitance, temperature, humidity and ambient pressure are traceable to an accredited national physical laboratory.

Observations

The differences between the two results at 100 Hz are within normal limits bearing in mind the different test methods and are taken into account in arriving at the uncertainties of measurement.

Method of Calibration

The open circuit sensitivity of the microphone has been determined at 250 Hz against a reference laboratory standard measurement microphone by insert voltage techniques using a laboratory standard sound calibrator as a transfer standard. The electrostatic actuator frequency response was then obtained for frequencies above 100 Hz as described in BS EN IEC 61094-8. In addition, where requested the optional free field frequency response over the range 2 – 100 Hz has been obtained using a pressure chamber; in this case the reference frequency is 100 Hz. All of these results and their associated uncertainties are detailed in the table on page 3 of this certificate. See the observations field below for details of any discrepancies between the 100 Hz results obtained via the electrostatic actuator and pressure chamber.

The overall uncertainty at any frequency $\sigma_{\text{Combined},Fn}$ may be obtained by combining the uncertainty of the open circuit sensitivity σ_{S250} with the uncertainty of the actuator / or LF pressure response at any other frequency $\sigma_{\text{Act},Fn}$ where F_n is the uncertainty at the frequency of interest using the relationship:

$$\sigma_{\text{Combined},Fn} = 2 \sqrt{(\sigma_{S250}^2 + \sigma_{\text{Act},Fn}^2)}$$

Appendix to this certificate

Where data is available from the microphone manufacturer to correct the actuator / pressure frequency response to obtain the random incidence and / or free field response it is shown in the appendix to this certificate. The uncertainty information relating to these corrections is the responsibility of the microphone manufacturer and when it is available the total uncertainty for the corrected frequency response at each point may then be obtained by including the correction uncertainty in the root-sum-square formula given above. These responses are outside the UKAS accredited scope, but are provided for information.

Observations

Certificate of Calibration

Page 2 of 4

Noise Assessment:

Welling United FC

Woolwich Road Limited • 21st November 2023 • H3848 – NV – v3

Laboratory Location

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



Certificate of Calibration and Conformance

Certificate number: **U42090**Test Object: **Sound Calibrator**

Producer: **Norsonic AS.**
Type: **1251**
Serial number: **32849**
Customer: **Hawkins Environmental**
Address: **The Square, Basing View,
Basingstoke, RG21 4EB**
Contact Person: **Nick Hawkins**
Order No: **PO-H5563**

Measurement Results	Level dB	Level Stability dB	Frequency Hz	Distortion %
Measurement 1	114.09	0.04	999.73	0.35
Measurement 2	114.09	0.04	999.73	0.35
Measurement 3	114.09	0.04	999.74	0.35
Result (Average):	114.09	0.04	999.73	0.35
Expanded Uncertainty:	0.1	0.02	1	0.25
Degree of Freedom:	>100	>100	>100	>100
Coverage Factor:	2	2	2	2

The stated level is relative to 20 μ Pa. 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/ $^{\circ}$ C Humi:0 dB/%RH Load volume: 0.0003 dB/mm³

Conditions	Pressure kPa	Temperature $^{\circ}$ C	Humidity %RH
Reference conditions	101.325	23	50
Measurement conditions	102.189 \pm 0.041	23 \pm 0.1	44.7 \pm 0.8

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\2022\NOR1251_32849_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: 28/09/2022 Reviewed date: 06/10/2022
Calibration date: 06/10/2022 Issued date: 06/10/2022

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: Calib-Cert-Master-V3-05

Noise Assessment:

Welling United FC

Woolwich Road Limited • 21st November 2023 • H3848 – NV – v3

Certificate of Calibration and Conformance

Continuation of Certificate number: U42090

Reference Microphone: WSM8 - GRAS-40AG.147852

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 Conformance and Calibration

As public evidence was available*, 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.

*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.

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:

Welling United FC

Woolwich Road Limited • 21st November 2023 • H3848 – NV – v3

Appendix 3 Summary of Noise Measurements

Noise Assessment:

Welling United FC

Woolwich Road Limited • 21st November 2023 • H3848 – NV – v3

Appendix 3: Summary of Noise Measurements

Time	L _{Aeq}	L _{Amax}	L _{A10}	L _{A50}	L _{A90}
07:00	70.6	97.5	72.9	68.5	60.7
08:00	70.1	96.8	72.3	68.1	62.1
09:00	68.9	82.5	72.0	67.4	60.3
10:00	68.4	87.1	71.5	66.4	59.1
11:00	68.0	80.4	71.4	66.3	57.9
12:00	68.5	83.6	71.9	66.7	58.6
13:00	68.9	95.8	71.0	66.0	58.0
14:00	69.0	92.8	71.8	66.8	59.6
15:00	69.8	103.7	71.7	67.0	60.0
16:00	68.4	81.6	71.7	66.8	60.2
17:00	69.3	95.6	71.5	66.6	59.9
18:00	69.0	82.4	71.9	67.7	62.2
19:00	69.0	92.8	71.6	67.3	61.5
20:00	67.8	86.6	71.4	64.9	57.0
21:00	67.2	89.2	70.9	63.9	55.9
22:00	65.6	81.8	69.6	60.7	50.6
23:00	63.5	82.5	67.4	54.6	44.0
00:00	62.8	95.8	64.5	48.5	39.7
01:00	59.2	80.9	60.3	44.0	38.2
02:00	57.1	85.0	56.1	43.5	38.7
03:00	58.7	79.3	60.7	43.8	38.7
04:00	61.2	82.6	62.2	47.9	40.9
05:00	64.6	83.2	68.7	57.6	47.6
06:00	69.4	93.7	72.5	66.1	56.1
Day	68.8	103.7	71.6	66.3	59.0
Night	63.8	95.8	64.0	50.8	43.0