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PREPARED: Thursday, 09 July 2020

STAGE 2 ACOUSTIC DESIGN STATEMENT

LAND WEST OF GARBROOK, LITTLE TARRINGTON

CONTENTS

LIST OF ATTACHMENTS

Project Ref:	AS11606	**Title:**	Land West of Garbrook, Little Tarrington
Report Ref:	AS11606.200623.ADS	**Title:**	Stage 2 Acoustic Design Statement
Client Name:	KW Bell Group Ltd		
Project Manager:	Mike McLoughlin		
Report Author:	Michael Symmonds		
Clarke Saunders Acoustics Winchester SO22 5BE		This report has been prepared in response to the instructions of our client. It is not intended for and should not be relied upon by any other party or for any other purpose.	

1.0 EXECUTIVE SUMMARY

1.1 Ten residential dwellings are to be constructed at The Land West of Garbrook, Little Tarrington.

1.2 Planning condition 8 of the outline planning consent requires is written as follows:

The reserved matters application submitted pursuant to Condition 1 shall be accompanied by a noise risk assessment and where necessary an Acoustic Design Statement for the proposed dwellings in accordance with Stage 1 and Stage 2 of the ProPG guidance. The objective is to ensure that the layout and design of the site takes into account the acoustic environment of the site and the maximum internal and external desirable noise levels according to BS8233 are achieved wherever possible. Proposed noise attenuation measures are to be described in full.*

1.3 A survey of the prevailing noise climate has been undertaken by Clarke Saunders Acoustics, commissioned by KW Bell Group Ltd.

1.4 The initial Stage 1 Risk Assessment (appended to this report) identified the majority of the development as low to medium risk in terms of the significance of noise impact and overheating, which indicates a requirement for consideration of appropriate site layout and design.

1.5 Good acoustic design has been considered throughout the feasibility and planning stage, including careful attention to site layout, internal plot layout and glazing locations to achieve, wherever possible, maximum separation of habitable rooms from the A438.

1.6 It is feasible to maintain the aspirational internal noise level guidelines in habitable rooms in the development using standard thermal double glazing throughout.

1.7 Private external amenity spaces are also provided with the plots. Noise levels vary for the private amenity spaces across the site, however it is expected that areas within all gardens will meet the desirable range.

2.0 ELEMENT 1 - ACOUSTIC DESIGN CONSIDERATIONS

2.1 This Stage 2 Acoustic Design Statement considers in detail the extent of this noise impact on the site and any requirement for mitigation measures to address the risk identified.

2.2 The site is partially adversely affected by the proximity of the A438, notably the two houses on plots 24 and 25, which are approximately 15m from the A-road.

2.3 Good acoustic design has been considered from the beginning of this application, including the following examples:

- The site layout is shaped like a horseshoe, where the majority of properties are located towards the rear of site, increasingly distant from the A438;
- The buildings in closest proximity to the A438 are oriented such that the side of the buildings face the A-road, thereby minimising the number of windows directly exposed to road traffic noise.

- The two most noise effected properties are Plot 24 and 25. Plot 24 has been designed so that there are no windows on the façade overlooking the A438. Plot 25 has been designed so that all habitable rooms are dual aspect, where residents may prefer to open windows on a lesser noise effected façade for ventilation or personal preference;

- Garden fences separate the private external amenity spaces, providing acoustic screening.

- The layout of the development will lead to the houses to the north benefitting from a certain degree of building mass screening from the southern houses.

- Non-glazed building elements of suitable materials and mass have been proposed for dwellings across the site, where all facades are constructed from masonry, with casement double-glazed units.

3.0 ELEMENT 2 - INTERNAL NOISE LEVEL ASSESSMENT

3.1 The second element of the assessment is to seek to achieve recommended noise levels inside noise sensitive rooms in the new residential development.

3.2 PROPG INTERNAL NOISE LEVEL GUIDELINES

3.2.1 ProPG brings together relevant guidance from several sources including a British Standard (BS 8233: 2014 *Guidance on sound insulation and noise reduction for buildings*) and internationally published guidance in the form of World Health Organisation *Guidelines for Community Noise* (1999). This is summarised in the following table.

ACTIVITY	LOCATION	07:00 TO 23:00	23:00 TO 07:00
Resting	Living Room	35 dB $L_{Aeq, 16 hour}$	-
Dining	Dining Room	40 dB $L_{Aeq, 16 hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16 hour}$	30 dB $L_{Aeq, 8 hour}$

NOTE 1: *The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.*

NOTE 2: *The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels recommended in the Table.*

NOTE 3: *These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.*

NOTE 4: *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. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).*

NOTE 5: *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 internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.*

NOTE 6: *Attention is drawn to the requirements of the Building Regulations.*

NOTE 7: *Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (see Section 3.D).*

3.3 EXTERNAL BUILDING FABRIC SPECIFICATION & INTERNAL NOISE LEVEL ASSESSMENT

3.3.1 The following design review is based on the architectural drawings for the proposed construction and site layout available at the time of writing, targeting the internal noise levels set out in Section 3.2.1.

3.3.2 The environmental noise levels measured during the survey detailed in the appended Stage 1 report have been used in this assessment of internal noise levels.

Non-Glazed Façade Element

3.3.3 It has been assumed that all non-glazed elements, i.e. masonry walls/facings and the roof systems, will provide the following minimum sound insulation performance of R_w 51dB, when tested in accordance with ISO 10140-2:2010 and this is typically achievable with a traditional insulated brick and block external cavity wall.

Glazing and Trickle Vent Specification

3.3.4 Standard proprietary thermal double glazing is expected to be suitable throughout the development to control internal ambient noise levels below the target noise levels in all areas of the development. A suitable glazing configuration would be 4-12-4, for example.

3.3.5 Trickle vents with an acoustic rating of $D_{n,e,w}$ 32dB will be required on plots 24 and 25 in order to maintain the desirable internal noise levels with the provision of background ventilation. Standard trickle vents are expected to be suitable for all other houses.

3.3.6 If multiple vents are required, then the performance requirement of $D_{n,e,w}$ 32dB will increase by a value equal to +10log(*N*), with *N* being the total number of vents serving the room.

3.3.7 Although suitable background ventilation can be provided through use of trickle vents, there is no reason why windows could not be opened as a matter of personal preference or for purge ventilation. No internal noise criteria are specified for the purge scenario, during which the expulsion of odours and/or fumes such as burned toast or drying paint is the priority.

Discussion of the Overheating Scenario

3.3.8 ProPG states that an overheating scenario should also be considered where residents may require additional cooling during a particularly warm summer day. It should be noted that a formal Stage 2 assessment only becomes 'recommended' at the high-risk category.

3.3.9 The *Acoustics Ventilation and Overheating Residential Design Guide* (AVOG) acknowledges that the simplest way to cool properties is for the windows to be opened.

3.3.10 It is acceptable for occupants to experience elevated noise levels when rapidly ventilating their home in an overheating scenario. The magnitude of effect of the elevated noise levels is dependent on both the internal noise level and the duration for which the overheating scenario occurs.

3.3.11 Assuming an open window affords a noise reduction of 15dB, as demonstrated in *NANR116 'Open/Closed Window Research' – Sound Insulation Through Ventilated Domestic Windows*, predicted internal noise levels within houses in at the southern and northern extent of the development are shown below.

BUILDING	AVERAGE DAYTIME INTERNAL NOISE LEVEL, $L_{Aeq,16hr}$	AVERAGE NIGHT-TIME INTERNAL NOISE LEVEL, $L_{Aeq,16hr}$	TYPICAL MAXIMUM NIGHT-TIME INTERNAL NOISE LEVEL L_{AFmax}
Southern-most dwelling	45dB	36dB	55dB
Northern-most dwelling	39dB	30dB	46dB

3.3.12 These values, with the exception of the night-time average noise level at the rear of the development, are within the range at which there may be an increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night. These values should be considered in the context of the site and the frequency at which an overheating scenario is likely to occur, however.

3.3.13 The glazing ratio for the dwellings is relatively low, which will result in relatively low solar heat gains, thereby reducing the frequency at which an overheating scenario will occur.

3.3.14 The common use of dual aspect rooms means that it will be possible for a large number of the future residents to open windows on less effected façades.

3.3.15 It is noted that the existing houses at Garbrook are a similar distance from the A438 and are understood to have openable windows.

3.3.16 A detailed overheating study has not been conducted at this stage and would require the input of a third-party, competent specialist, if required. Based on the good acoustic design principles that have been used throughout the planning stage, however, it is considered that the effect of noise transmission through open windows during an overheating scenario has been reduced as far as is reasonably practicable.

4.0 ELEMENT 3 - EXTERNAL AMENITY AREA NOISE ASSESSMENT

4.1 The ProPG makes it clear that consideration of noise in proposed external amenity areas is an important element in managing noise impact in new residential developments. The ProPG encourages a more holistic consideration of amenity than simply rating the level of noise outside.

4.2 PROPG EXTERNAL NOISE LEVEL GUIDELINES

4.2.1 ProPG states the following regarding the consideration and assessment of noise in external amenity spaces:

3(i) "If 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".

3(ii) "The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB LAeq,16hr."

3(iii) "These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces."

3(iv) "Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process."

3(v) "Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:

- *a relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
- *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); and/or*
- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*

- *a relatively quiet, protected, publicly 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). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations."*

4.3 EXTERNAL AMENITY SPACE NOISE ASSESSMENT - PROPOSALS

4.3.1 It is proposed that all the plots on site will feature private fenced gardens, in addition to the informal village green in the centre of the development.

4.3.2 Given the relatively rural location of the development, the future residents will be in close proximity to a vast area of publicly accessible external amenity space.

4.4 EXTERNAL AMENITY SPACE NOISE ASSESSMENT

4.4.1 Anticipated noise levels in external amenity areas will largely be determined by (attenuated) contributions from the A438.

4.4.2 The existing measured average daytime noise levels at site were $L_{Aeq,16hour}$ 60dB(A) at the southern-most houses, closest to the A438. The inclusion of a 6-foot-high close boarded timber fence around each private garden will provide sufficient acoustic screening such that areas of each garden will be within the desirable range of $L_{Aeq,16hr}$ 50-55dB. The dwellings towards the rear of the site will benefit from increased distance propagation losses, and as such, will experience lower noise levels.

4.4.3 In addition to the private external amenity space, the residents will also benefit from two communal external areas, one in the centre of the site and the other towards the north western extent of the site. Noise levels in the north western area will be within the desirable range, whilst levels in the central area are likely to be up to 5dB above the desirable range. Any possible effects of these slightly elevated noise levels are expected to be outweighed by the benefits of having this additional space in which to socialise.

4.4.4 The future residents will also benefit from the significant areas of publicly available external amenity space in the vicinity of the development, many of which are further from transportation noise sources.

5.0 ELEMENT 4 - ASSESSMENT OF OTHER RELEVANT ISSUES

5.1 COMPLIANCE WITH RELEVANT NATIONAL AND LOCAL POLICY

5.1.1 National planning policy for England, set out in the Noise Policy Statement for England (NPSE), the National Planning Policy Framework (NPPF) and the ProPG, aims to promote the building of high quality sustainable homes in desirable areas whilst ensuring future and existing nearby residents and businesses are not adversely affected by the scheme (including by noise, amongst others).

5.1.2 The ProPG outlines a staged process by which to initially assess the risk posed by the existing noise climate followed by a more in-depth assessment of those risks and consideration of strategies by which they can be mitigated.

5.1.3 This assessment has demonstrated that through the use of good acoustic design, suitable mitigation measures, appropriate design of façade performance, layout of the site and internal layout of the dwellings, acceptable noise levels can be achieved both internally and externally.

5.2 COMPLIANCE WITH THE PROPG GUIDANCE

5.2.1 This assessment has demonstrated that whilst the acoustic environment at the development site is determined by road noise from the A438, appropriate internal and external noise levels can still be achieved across the proposed scheme. The development therefore complies with the guidance of the ProPG.

5.3 ACOUSTIC DESIGN VS. WIDER PLANNING OBJECTIVES

5.3.1 The acoustic design outlined in the report generally supports the wider planning objectives of providing necessary sheltered accommodation apartments in appropriate settings.

6.0 CONCLUSIONS

6.1 Measurements have been made of the prevailing noise climate at the proposed site for residential development at The Land West of Garbrook, Little Tarrington.

6.2 The measured levels have been assessed against the National Planning Policy Framework and currently available standards and guidance documents including the ProPG: *Professional Practice Guidance on Planning and Noise*, World Health Organisation *Guidelines for Community Noise (1999)* and BS8233:2014 *Guidance on Sound Insulation and Noise Reduction for Buildings*, to consider whether the site is suitable for its proposed residential use.

6.3 Good acoustic design has been considered throughout the feasibility and planning stages, including careful attention to site layout, internal plot layout and glazing locations to ensure, wherever possible, maximum separation of habitable rooms from the predominant noise source, the A438.

6.4 It is possible to achieve the aspirational internal noise level guidelines in habitable rooms in the development using standard thermal double glazing throughout. For plots 24 and 25, which are closest to the A438, acoustically rated trickle vents will be required to provide an appropriate level of background ventilation whilst maintaining indoor ambient noise levels.

6.5 During an overheating scenario, the internal noise environment within certain plots may be at a level that results in risk of material changes of behaviour. However, good acoustic design principles have been utilised to reduce this impact as far as is reasonably practicable.

6.6 Private external amenity space is provided for all dwellings, in which noise levels are anticipated to be broadly commensurate with the aspirational design range provided in the ProPG. Furthermore, there are large areas of publicly accessible quiet external amenity space in the vicinity of the development.

[redacted]

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1.1 Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as ‘loudness’, its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

Sound	Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.
Noise	Sound that is unwanted by or disturbing to the perceiver.
Frequency	The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of ‘pitch’, with low frequencies producing low ‘notes’ and higher frequencies producing high ‘notes’.
dB(A):	Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the ‘A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated ‘A' weighted sound level is designated as dB(A) or L_A.
L_{eq} :	A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc). The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction. Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.
L_{10} & L_{90} :	Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise. It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.
L_{max}:	The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.

1.2 Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000

1.3 Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

INTERPRETATION

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

1.4 Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.

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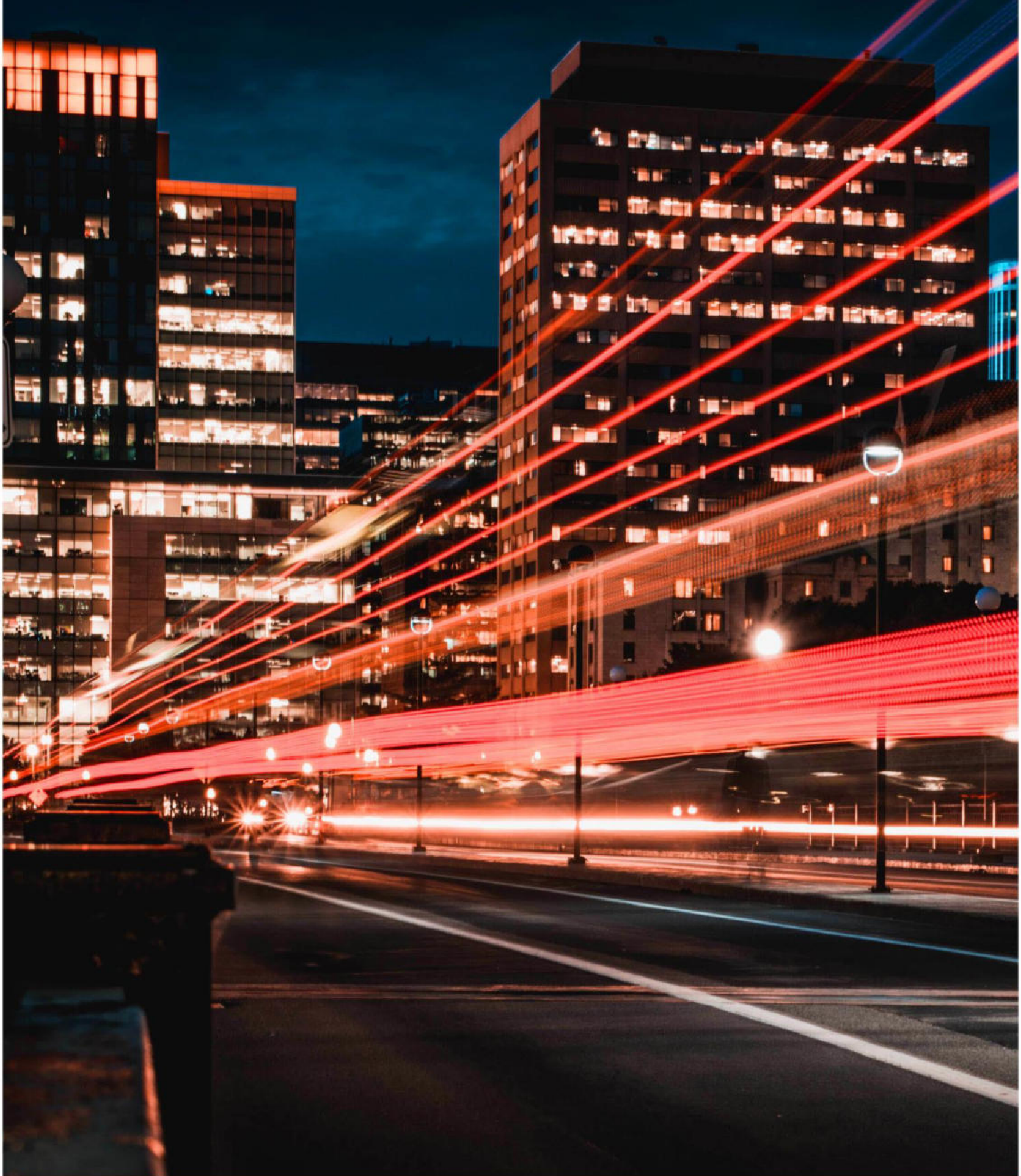

PREPARED: Thursday, 09 July 2020

PROPG STAGE 1 RISK ASSESSMENT;

LAND WEST OF GARBROOK, LITTLE TARRINGTON

CONTENTS

LIST OF ATTACHMENTS

Project Ref:	AS11606	**Title:**	Land West of Garbrook, Little Tarrington
Report Ref:	AS11606.200623.RA	**Title:**	ProPG Stage 1 Risk Assessment
Client Name:	KW Bell Group Ltd		
Project Manager:	Mike McLoughlin		
Report Author:	Michael Symmonds		
Clarke Saunders Acoustics Winchester SO22 5BE	This report has been prepared in response to the instructions of our client. It is not intended for and should not be relied upon by any other party or for any other purpose.		

1.0 EXECUTIVE SUMMARY

1.1 Clarke Saunders Acoustics has been commissioned by KW Bell Group Ltd to undertake an assessment of the current environmental noise impact on the Land West of Garbrook, Little Tarrington, in order to assess its suitability for residential development.

1.2 Noise will be assessed in accordance with the National Planning Policy Framework, ProPG: Planning and Noise[1] for new residential developments (ProPG) and with reference made to the relevant guidance set out in BS8233:2014 *Guidance on sound insulation and noise reduction for buildings* and the recently published guidance presented in the ANC *Acoustics Ventilation and Overheating Residential Design Guide, Jan 2020* (AVOG).

1.3 A survey of the prevailing noise climate and subsequent risk assessment following the ProPG has shown there to be a low to medium risk in terms of noise impact and overheating. The ProPG recommends that a Stage 2 Acoustic Design Statement be prepared to consider the noise impact of the site in detail and to address the requirement for any outline measures as appropriate for the proposed residential development. The Level 1 AVOG assessment indicates a possible risk of overheating without mitigation, thus recommends an AVOG Level 2 Assessment be prepared.

2.0 INTRODUCTION

2.1 The Applicant is proposing to develop the land west of Garbrook, Little Tarrington for residential dwellings. Herefordshire District Council have granted outline planning consent, subject to conditions. Planning Condition 8 is as follows:

The reserved matters application submitted pursuant to Condition 1 shall be accompanied by a noise risk assessment and where necessary an Acoustic Design Statement for the proposed dwellings in accordance with Stage 1 and Stage 2 of the ProPG guidance. The objective is to ensure that the layout and design of the site takes into account the acoustic environment of the site and the maximum internal and external desirable noise levels according to BS8233 are achieved wherever possible. Proposed noise attenuation measures are to be described in full.

2.2 Clarke Saunders Associates has been commissioned by KW Bell Group Ltd to undertake an assessment of the current environmental noise impact on the site. Noise will be assessed in accordance with the National Planning Policy Framework, ProPG*: Planning and Noise for new residential developments* and with reference made to relevant guidance set out in BS8233:2014 *Guidance on sound insulation and noise reduction for buildings* and the recently published guidance presented in the ANC *Acoustics Ventilation and Overheating Residential Design Guide, Jan 2020.*

2.3 This report presents the results of the ProPG Stage 1 Risk Assessment and Level 1 AVOG Assessment which will be used to inform the requirement for a subsequent Stage 2 Acoustic Design Statement and AVOG Level 2 Assessment.

2.4 Please refer to Appendix A for details of the acoustic terminology used throughout this report.

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[1] http://ioa.org.uk/publications/propg

3.0 SITE DESCRIPTION

3.1 The greenfield site is located to the west of the Garbrook houses and is bounded by the A438 to the south (speed limit 60mph), Phase 1 of the development to the west, a pond to the north and a small patch of trees and some houses to the east. Approximately 230m from the northern-most extent of the site is a railway line.

3.2 An approximate red line boundary of the proposed development site is shown on the attached risk assessment summary sheet, AS11606/SP1.

4.0 ENVIRONMENTAL NOISE SURVEY

4.1 A survey of the existing background noise levels was undertaken at Monitoring Position LT1 as shown in the attached risk assessment summary sheet AS11606/SP1. Additional synchronous measurements were taken at the short-term position also identified in AS11606/SP1. The measurement locations correspond to the approximate positions of the houses proposed to be closest to and furthest from the A438, respectively, allowing for the variation in noise levels across the site due road traffic on the A438 to be assessed.

4.2 Measurements of consecutive L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels were taken between 11:40 hours on Friday 26th June and 15:10 hours on Saturday 27th June 2020. Measurements were made following procedures in BS7445:1991 (ISO1996-2:1987) *Description and measurement of environmental noise Part 2 – Acquisition of data pertinent to land use*.

4.3 The weather during the survey was mostly dry with light to moderate winds, which are suitable conditions for the measurements of environmental noise. There were two periods of heavy rainfall during early Saturday morning, which have been excluded from the analysis.

4.4 The following equipment was used during the course of the survey:

- 1 no. Rion data logging sound level meter type NL52;
- 1 no. Norsonic data logging sound level meter type 118;
- 1 no. Norsonic sound level calibrator type 1251;
- 1 no. Rion sound level calibrator type NC74.

4.5 The calibration of the sound level meters was verified before and after use. No significant calibration drift was detected in either meter. All equipment has current laboratory calibration and certification is available upon request.

5.0 RESULTS

5.1 Figures AS11606/TH1-TH2 show the L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels as time histories at the measurement positions. The ambient noise climate at the site is determined by road traffic on the A438. No train passbys were audible during the site visits.

5.2 The average noise levels at the monitoring positions for the daytime and night-time periods are shown in the table below, along with the typical night-time maximum level, derived from the 90th percentile of the measured L_{AFmax} dataset.

Daytime $L_{Aeq,16hour}$	Night-time $L_{Aeq,8hour}$	Typical Night-time L_{AFmax}
Position LT1: 60dB	Position LT1: 51 dB	Position LT1: 70 dB

5.3 The synchronous short-term measurements, which were taken approximately in line with the houses furthest from the A438, were around 6dB quieter than those measured at the long-term position.

5.4 Stage 1 Risk Assessment Summary for ProPG: Planning and Noise (AS11606/SP1) and AVOG Level 1 Site Risk Assessment Summary relating to overheating condition (AS11606/AVOG) are attached.

6.0 CONCLUSION

6.1 The ProPG Stage 1 Risk Assessment and AVOG Level 1 Assessment has identified the development area as low to medium risk in terms of noise impact and overheating.

6.2 The ProPG recommends that a Stage 2 Acoustic Design statement be prepared to consider the noise impact of the site in detail and to address the requirement for any outline mitigation measures as appropriate for the proposed residential development. The AVOG Level 1 Assessment indicates a possible risk of overheating without mitigation, thus recommends a Level 2 Assessment be prepared.

6.3 Mitigation measures, including assessment and specification of appropriate glazing and ventilation provision to achieve suitable internal levels are not likely to be overly onerous given the Stage 1 Assessment outcome.

[redacted]

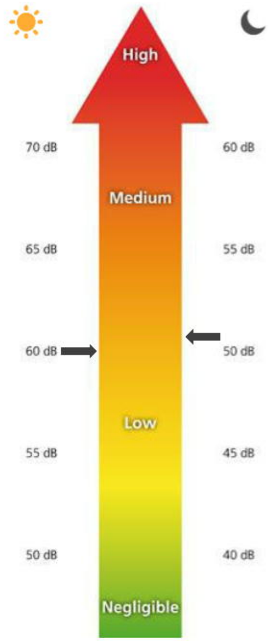
Michael Symmonds AMIOA
CLARKE SAUNDERS ACOUSTICS

ProPG: Planning & Noise – Stage 1 Risk Assessment Summary

Project:	Land West of Garbrook, Little Tarrington
Figure:	AS11606/SP1
Date:	23/06/2020

Position 1:

Daytime:	60 dB $L_{Aeq,16hour}$
Night-time:	51 dB $L_{Aeq,8hour}$; 70 dB $L_{Amax,fast}$



Executive Summary

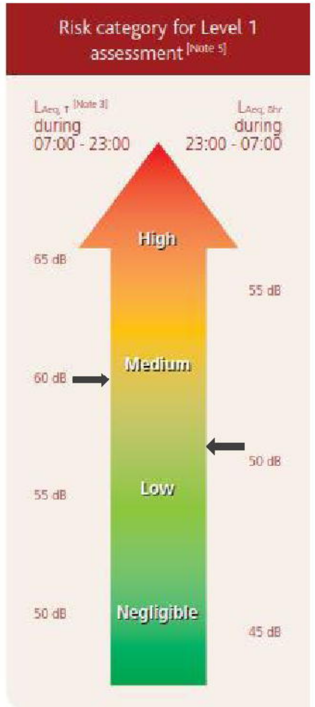
A survey of the existing noise climate was undertaken at the monitoring position between Friday 26th June and Saturday 27th June 2020.

Noise levels are considered to represent a low to medium risk in terms of impact. The ProPG recommends that a Stage 2 Acoustic Design Statement be prepared to consider the noise impact of the site in detail and to address the requirement for any outline mitigation measures as appropriate for the proposed residential development.

AVOG – Level 1 Site Risk Assessment for Overheating Condition Summary

Project:	Land West of Garbrook, Little Tarrington
Figure:	AS11606/AVOG
Date:	23/06/2020

Position 1:	
Daytime:	60 dB $L_{Aeq,16hour}$
Night-time:	51 dB $L_{Aeq,8hour}$; 70 dB $L_{Amax,fast}$

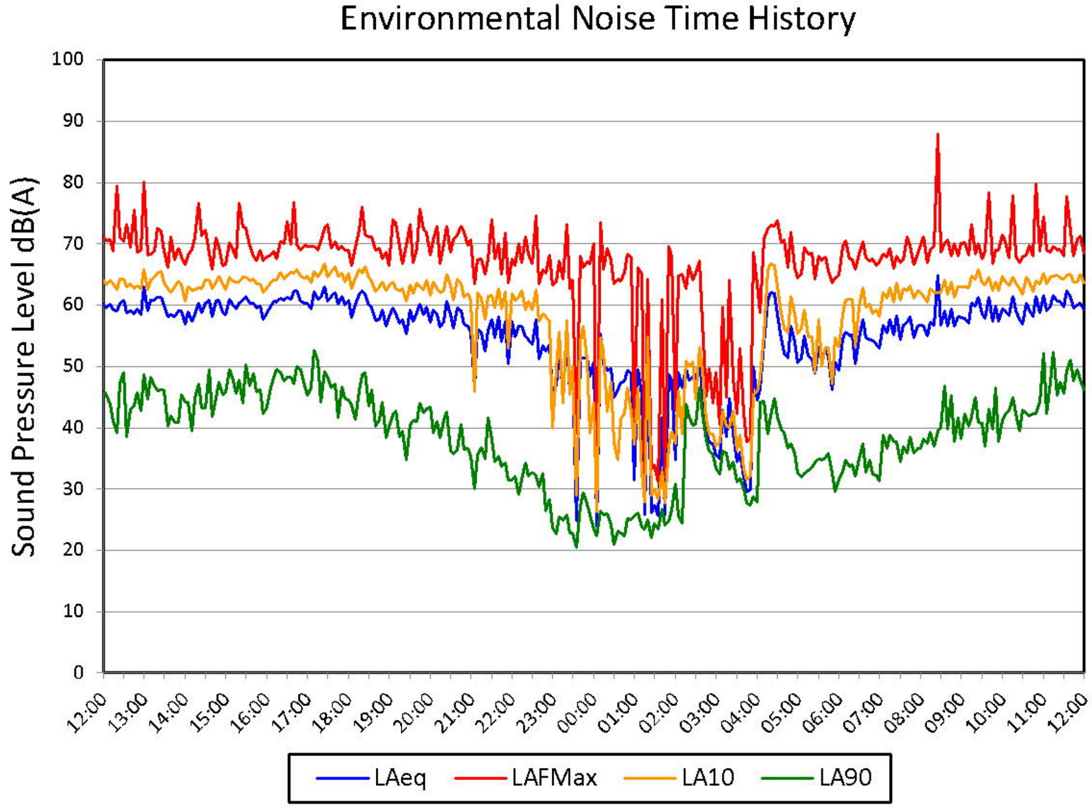


Executive Summary

A survey of the existing noise climate was undertaken at the monitoring positions between Friday 26th June and Saturday 27th June 2020.

Noise levels are considered to represent a low to medium risk indicating a possible risk of adverse effect in respect of overheating without mitigation. This depends on how frequently and for what duration the overheating condition occurs. The possible effect of this will be considered in the Stage 2 assessment.

Land West of Garbrook, Little Tarrington

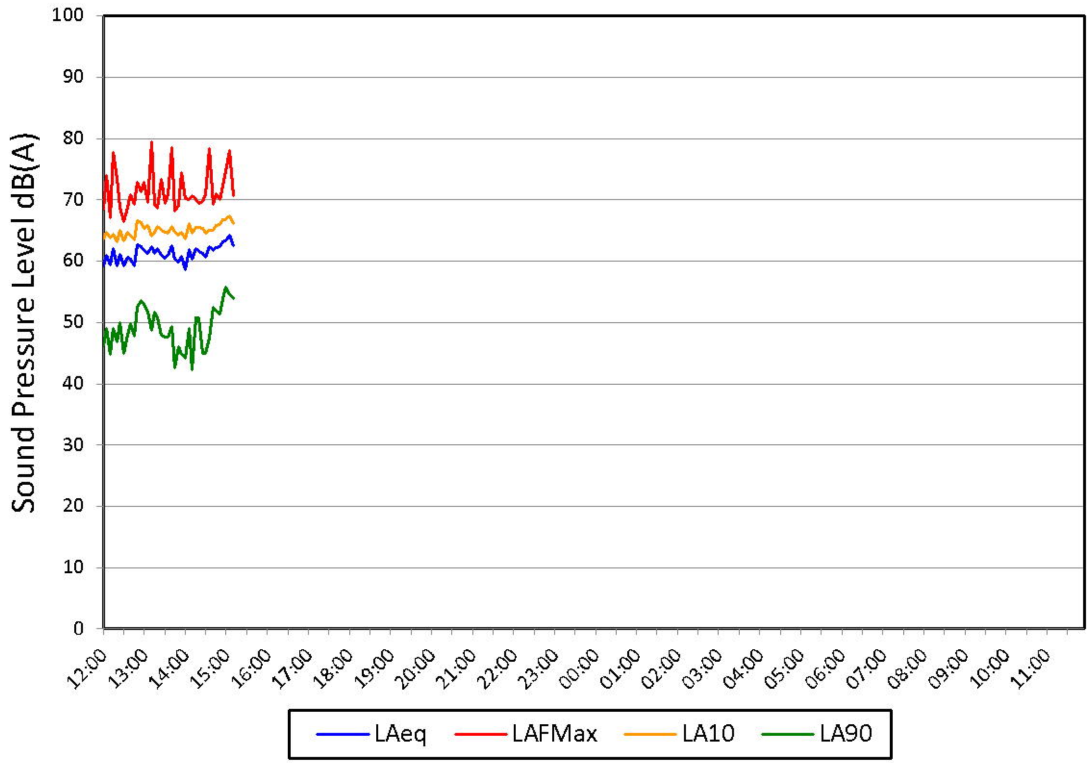


Friday 26 June to Saturday 27 June 2020

Figure AS11606/TH1

Land West of Garbrook, Little Tarrington

Environmental Noise Time History



Saturday 27 June to Sunday 28 June 2020

Figure AS11606/TH2

APPENDIX A

1.1 Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

Sound	Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.
Noise	Sound that is unwanted by or disturbing to the perceiver.
Frequency	The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.
dB(A):	Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or L_A.
L_{eq} :	A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc). The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction. Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.
L_{10} & L_{90} :	Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise. It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.
L_{max}:	The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.

1.2 Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000

1.3 Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

INTERPRETATION

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

1.4 Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.