

NOISE IMPACT ASSESSMENT

PROPOSED RESIDENTIAL DEVELOPMENT, LEICESTER ROAD, EARL SHILTON

REPORT REFERENCE NO. J005384-8656-SI-01

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This report has been prepared based upon a scope of works and associated resources agreed between the client and Philip Dunbavin Acoustics Ltd (PDA). This report has been prepared with all reasonable skill, care and diligence and has been based upon the interpretation of data collected. This has been accepted in good faith as being accurate and valid at the time of the collection. This report has been based solely on the specific design assumptions and criteria stated herein.



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1.0 SUMMARY

PDA Ltd was commissioned by Vistry South East Midlands to carry out a noise impact assessment for the proposed residential development located at Leicester Road, Earl Shilton in respect to Local Planning Condition 12.

The proposed development comprises the erection of 140 no. residential dwellings. The dwellings are understood to range between detached, semi-detached and terraced units. The current site is mainly comprised of open fields and agricultural land. The site is bordered by Leicester Road and Shilton Road to the east. Towards the south of site are a combination of residential properties and commercial units. Keats Lane also runs to the south of site.

The local noise climate was dominated by road traffic on Leicester Road during both the day and night-time periods.

Based upon the measured and predicted noise levels, calculations have been undertaken for the Bedrooms and Kitchen/Living spaces to evaluate the internal noise levels. Recommendations are given for glazing, ventilation and building façade elements to meet the internal noise level requirements of good practice guidance given in BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings. Calculations suggest that the noise level criteria of BS8233:2014 can be achieved within the proposed accommodation.

Furthermore, the noise level incident on the proposed dwellings indicates that the requirements of Approved Document O (ADO) are likely to be achieved at most residential receivers and therefore, may rely on openable windows for the purposes of mitigating overheating. However, for the plots nearest to Leicester Road, the noise levels are expected to exceed the internal noise criteria and therefore, the overheating mitigation strategy as required by ADO must provide an alternative method to removing heat other than relying on windows remaining open at night. Note that this will be subject to the outcome of a TM59 dynamic thermal modelling assessment to be undertaken by others.

With regards to noise levels within the external amenity areas of the development, our assessment suggests that the majority of the site is likely to achieve the lower guideline value of BS8233 (≤ 50 dB L_{Aeq}). The results of our noise model indicate that noise levels within the external areas of Plot 001 may be up to 54 dB L_{Aeq} and therefore achieves the upper BS8233 guideline value (≤ 55 dB L_{Aeq}) which is considered to be acceptable for developments which adjoin the strategic transport network.

2.0 SITE DESCRIPTION

The proposed development comprises the erection of 140 no. residential dwellings. The dwellings are understood to range between detached, semi-detached and terraced units. The current site is mainly comprised of open fields and agricultural land. The site is bordered by Leicester Road and Shilton Road to the east. Towards the south of site are a combination of residential properties and commercial units. Keats Lane also runs to the south of site.

An aerial photo presenting the location of the site and surrounding local area is shown in Figure 1 below. The proposed site layout is shown in Figure 2.

Figure 1. Location with proposed site outlined.

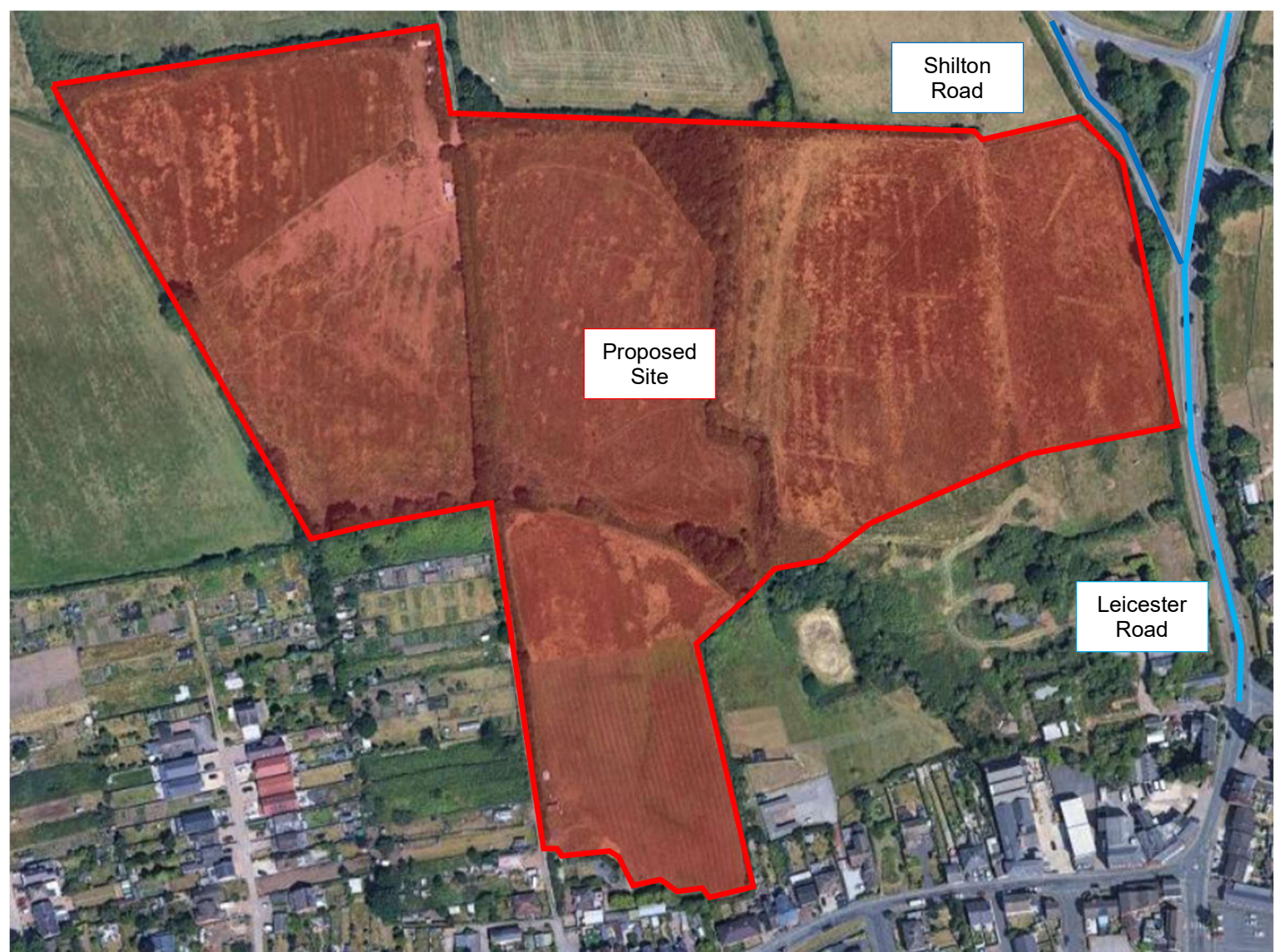


Figure 2. Proposed site layout



3.0 NOISE ASSESSMENT CRITERIA

3.1 Hinckley & Bosworth Borough Council – Planning Condition 12

It is understood that the proposed development is subject to Planning Application reference 25/00045/DISCON Condition 12 as follows:

Development shall not begin until a scheme for protecting the proposed dwellings from noise from Leicester Road, Earl Shilton has been submitted to and approved by the Local Planning Authority; and all works which form part of the scheme shall be completed before any of the permitted dwellings are first occupied.

Reason: To ensure that the proposed use does not become a source of annoyance to nearby residents in accordance with Policy DM10 of the adopted Site Allocations and Development Management Policies Development Plan Document (2016).

We would therefore consider the assessment criteria given in Section 3.2 to be applicable for the proposed development.

3.2 BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

Dwelling houses, flats and rooms in residential use

British Standard 8233:2014, *Guidance on Sound Insulation and noise reduction for buildings*, gives guidance on internal noise levels within dwellings, flats and rooms in residential use when unoccupied. The following criteria are for Living and Dining Rooms for daytime use and Bedrooms for night-time.

Table 1. BS8233 recommended indoor ambient noise levels

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 (daytime resting)	Bedrooms	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

It should however be stressed that the above criterion relates to steady noise, in this case from road traffic etc., excluding unusual noise events departing from the typical noise character of the area.

In addition, BS 8233 suggests, ‘*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.*

With regard to external areas of residential developments BS8233:2014 states the following;

For traditional external areas that are used for amenity space, such as gardens and patios, 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. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

3.3 WHO Guidelines for Community Noise

In 1999, the WHO (World Health Organisation) published Guidelines for Community Noise, stating the following internal noise levels are applicable within dwellings.

Table 2. WHO Guidelines for Community Noise criteria

Specific Environment	Critical Health Effect(s)	L _{Aeq} dB	Time Base (hours)*
Dwelling, indoors	Speech intelligibility & moderate annoyance, daytime & evening	35	16
Inside bedrooms	Sleep disturbance, night-time	30	8

* Typically taken to be daytime/evening - 07:00 – 23:00 hours and night-time 23:00 – 07:00 hours.

In addition to the above continuous equivalent noise levels, WHO guidelines indicates that exceedances of 45 dB L_{Amax} for single sound events should be limited to no more than 10 – 15 times per night, when measured with a 'fast' time weighting.

3.4 Approved Document O (ADO)

Approved Document O (ADO) 2021, provides guidance on meeting the requirements of the Building Regulations 2010, part 'O1 Overheating mitigation'. The aim of the Building Regulations part O1 is to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures.

Building Regulations part O1 requires that dwellings, institutions or any other buildings containing one or more rooms for residential purposes (other than a room in a hotel) to:

(a) *Limit unwanted solar gains in summer:*

(b) *Provide an adequate means to remove heat from the indoor environment*

However, in meeting the obligations of ADO the buildings overheating mitigation strategy for use by occupants must consider 'Noise at night' in addition to other non-noise related considerations.

In regards to 'Noise at night', ADO stipulates the following.

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).

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

a. 40dB L_{Aeq,T}, averaged over 8 hours (between 11pm and 7am).

b. 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am)

It should be noted that the above noise limits are with reference to internal noise levels within a bedroom.

Within Appendix A of 'Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O' July 2022 as published by the Association of Noise Consultants (ANC) and the Institute of Acoustics (IOA), it is discussed that for a partially open window approximately 5% of the floor area, a reduction of 9 dB between external and internal noise levels is calculated. Therefore ADO and the guidance document infer that windows will be required to remain closed when the external noise climate exceeds the following external noise limits.



49dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am)

64dB L_{AFmax} , more than 10 times a night (between 11pm and 7am)

Subsequently, where windows are required to be closed at night (due to the above noise limits being exceeded), the overheating mitigation strategy as required by ADO must provide an alternative method to removing heat other than relying on windows remaining open.

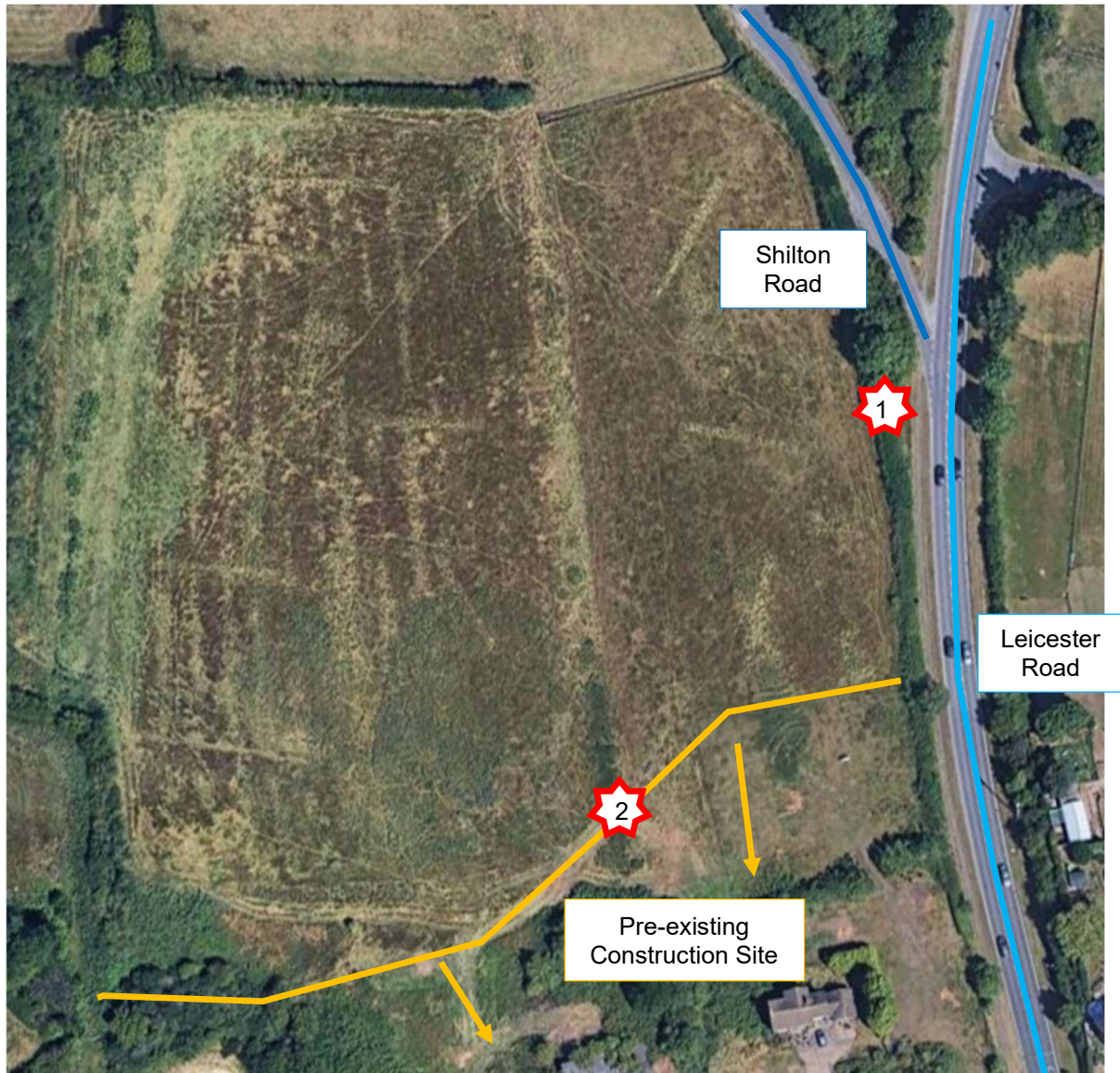
4.0 SURVEY DETAILS AND RESULTS

4.1 Environmental Noise Survey

A noise level survey was undertaken at the site between 13:23 hours on Tuesday 21st January and 14:43 hours on Wednesday 22nd January 2025. The periods measured were deemed to be representative of day and night-time hours.

Long-term noise measurements were taken to the east and south boundaries of the proposed site. The measurement locations are shown in the Figure below:

Figure 3. Noise survey locations



The microphones at the measurement positions were located on tripods at a height of approximately 1.5m. The measurement positions are detailed as follows:

- Measurement Position 1 – microphone located on a tripod on the eastern border of site, next to Leicester Road.

- Measurement Position 2 – microphone located on a tripod on the southernmost point of site.

All measurements were made and partly attended by Mr. Sam Iles of PDA Ltd. Measurements were of continuous 5-minute samples. The survey was conducted using 2 no. NTi XL2 sound level meters. Calibration certificates for the sound level meters are held.

The NTi meters are Class 1 frequency response as per BS EN 61672-1:2003. The sound level meters were field calibrated both before and after the measurement period, during which time no significant deviation from the calibrated level was observed. The sound level meters were fitted with outdoor microphone windshields at all times.

All measurements were undertaken with a fast time-weighting and broadband statistics were measured throughout. In addition, octave band frequency spectra were recorded along with compressed audio.

It is noted that immediately to the south of site – bordering measurement position 2 – is another separate construction site, which was operating and contributing to the noise climate during part of the noise survey. Upon review of the audio, and the processing of the survey noise data, times at which construction noise is present have been identified and removed from any subsequent calculations in this report.

Weather

21/01/2025

- Temperature: -2 – 7°C
- Wind Speed: 0 – 3 m/s – SW
- Clear skies with no precipitation

22/01/2025

- Temperature: -1 – 5°C
- Wind Speed: 0 – 3m/s – E-S-E
- Clear skies with no precipitation

Weather data has been taken from weather underground measurement position 'ILEICE117'.

Noise Sources

The local noise climate was dominated by road traffic on Leicester Road during both the day and night-time periods.

4.2 Measurement Results

Environmental Noise

A summary of the noise levels measured at each position across site is given in the table below.

Table 3. Summary of the noise levels measured across site.

Measurement Position	Date	Time Period (hh:mm)	L _{Aeq,T} (dB)	Range of Night-Time L _{Amax,5mins} (dB)
1	21/01/2025 - 22/01/2025	Day 13:27 – 23:00	59	-
		Night 23:00 – 07:00	53	36 - 75
		Day 07:00 – 14:43	60	-
2	21/01/2025 - 22/01/2025	Day 15:30 – 23:00	46	-
		Night 23:00 – 07:00	44	34 - 65

5.0 NOISE PROPAGATION AND IMPACT ASSESSMENT

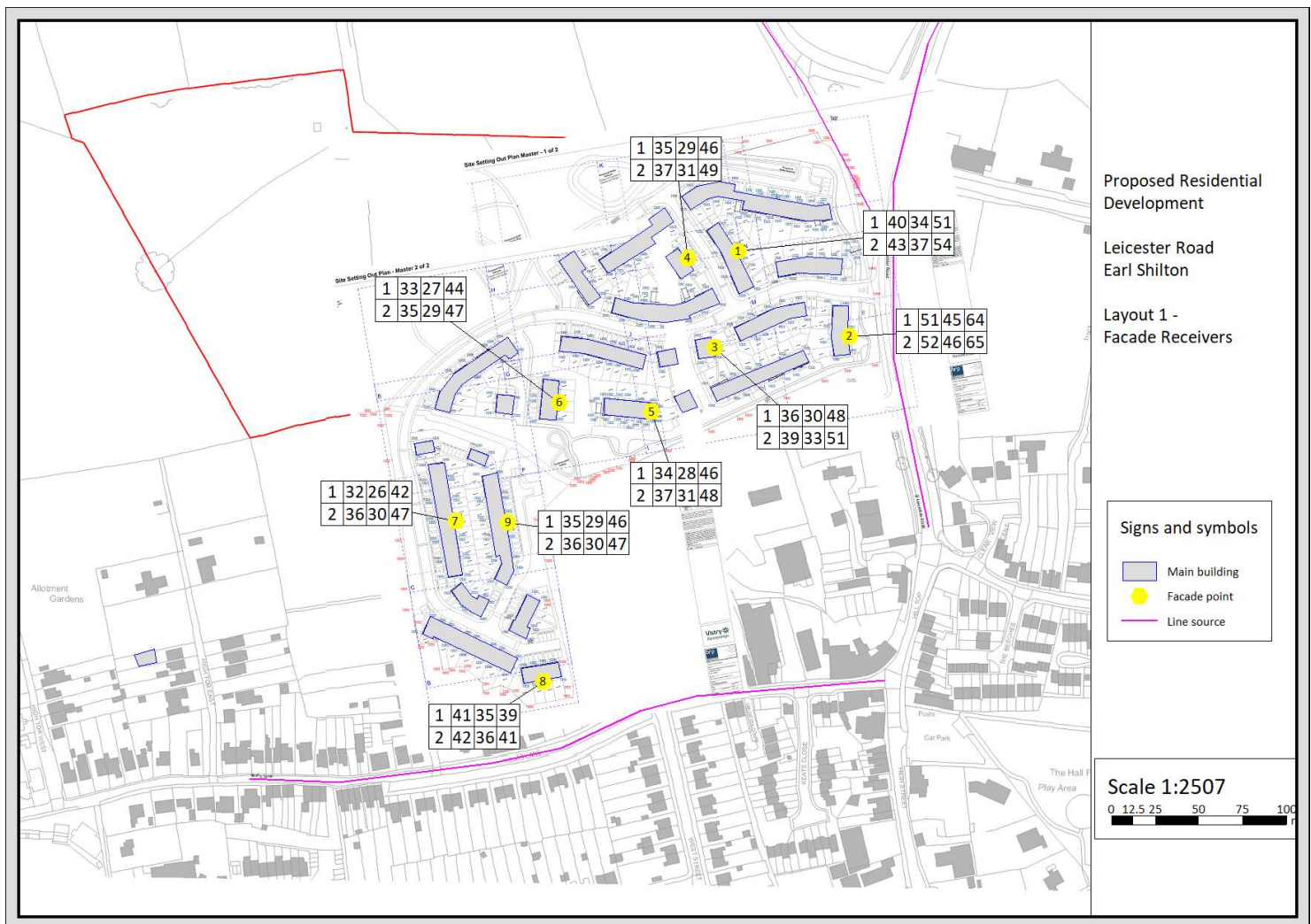
A 3-dimensional computer noise model has been constructed using SoundPLAN noise modelling software to determine the noise level impact upon the proposed development. All calculations have followed the methodology contained within ISO 9613-2:1996 *Attenuation of sound during propagation outdoors - Part 2: General method of calculation*. The topographical data for the site and surrounding area is taken from Google Maps. The proposed site layout is derived from the received BRP Architects drawings ref: 'MZ560-BRP-00-ZZ-DR-A-SIT-0004-C01' and 'MZ560-BRP-00-ZZ-DR-A-SIT-0005-C01' dated November 2024.

The model has been calibrated to the noise levels measured on-site as discussed within Section 4. A ground absorption coefficient of 1 has been used to account for areas of grassland and a coefficient of 0 for the areas of hard ground such as roads, hard standing etc.

Noise levels have been calculated at each façade and their respective floors at a height of 1.5m for ground floor and 4m for first floor.

Please note, to predict the noise level from Keats Lane we have utilised the method provided in *Calculation of Road Traffic Noise 1988* to provide a correction for mean traffic speed and percentage of heavy vehicles, given in Chart 4. We have adjusted the noise level measured at Position 1 of Leicester Road for the understood speed limit and percentage of heavy vehicles at Keats Lane.

Figure 4. Calculated levels at receivers – Daytime, Night-time, L_{max} .



6.0 NOISE LEVEL PREDICTIONS

Based upon the predicted noise levels in Section 5, calculations have been undertaken to determine internal noise levels for the proposed dwellings. The calculation of noise break-in to the residential rooms has been undertaken in accordance with the calculation methods of BS EN 12354-3:2000 *Building Acoustics – Estimation of acoustic performance of buildings from the performance of elements. Part 3: Airborne sound insulation against outdoor sound*, in octave bands. Reverberation time is 0.5 seconds as per the BS EN 12354-3 reference time for dwellings.

6.1 External Walls

It is assumed that the external wall construction will be a cavity masonry construction. Within our calculations it has been determined that the sound insulation performance of the façade should be no less than 54 dB R_w .

6.2 Glazing Requirements

The dominant paths for noise transfer to the interior of buildings are generally the glazing and ventilation elements of the façade constructions. Based on this premise, to achieve the required internal noise levels as discussed in Section 3 the development would require the following glazing and ventilation specifications. Note that the following specification apply to habitable rooms only.

The specifications in the table below should also comply with the respective minimum sound reduction index (R) values detailed within Tables 5 and 6.

Table 4. Glazing Schedule

Plots	Rooms	Minimum Glazing Rating R_w dB	Minimum combined Ventilator Rating $D_{n,e,w}$ dB	Internal Noise Level Target (Day/Night/Night L_{max}) ¹ (dB(A))	Calculated Internal Noise Level (dB(A))
All	Lounge/Kitchen	31	33	35/-/-	27/-/-
	Bedroom			35/30/45	27/21/44

Notes:

1. Values for night-time and night L_{max} are only required in bedrooms.

With the glazing and ventilation specifications proposed in Tables 5 and 6 below, calculations suggest that the internal day and night-time BS8233:2014/WHO noise level requirements can be achieved. Calculated internal noise levels are given on the worst-case internal receivers.

In addition to the above, calculations have been undertaken to determine L_{Amax} noise levels within the bedrooms at night-time. Using the full night-time L_{Amax} noise levels measured across site with the glazing and ventilation specifications above, the calculated L_{Amax} values will not normally exceed 45 dB L_{Amax} .

6.2.1 Glazing Specification and Installation Notes

Notes on Glazing Installation

For the glazing specifications in Table 5 below, all sound insulation values quoted must be achieved by the overall combination of frame and glazing, and not just by the glazing alone. The frame should not reduce the performance of the system overall. Glazing framing systems must be fully sealed with any small gaps (<10mm nominal) around the perimeter to be stuffed with dense mineral wool to full frame depth and sealed both sides with acoustic non-setting mastic, with additional weathering protection to be applied additionally externally to this. No gaps should be left unsealed.

Minimum performance requirements for the combination of glazing and framing recommended in the above tables are as follows:

Table 5. Required Minimum Sound insulation of Combined Glazing and Framing

Typical Product	Minimum Sound Reduction Index R (dB) at Octave Band Centre Frequency (Hz)								R_w dB
	63	125	250	500	1k	2k	4k	8k	
4/12/4	16	22	19	25	36	42	36	36	31

Figures stated in the table above are based on Saint Gobain manufacturer quoted data. Acoustic ratings should be checked with the manufacturer and supported by laboratory test reports where necessary.

6.2.2 Ventilator Requirements

Where natural ventilation is intended (see Section 6.3) BS8233:2014 would suggest ‘the Building Regulations’ supporting documents on ventilation recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant’s choice.’

The ventilator inlets described in the following table are calculated to provide adequate sound insulation to maintain internal noise levels compliant with the guidance criteria when used in conjunction with the selected glazing. Example ventilator products are noted below.

The acoustic specification relates to the combined performance of all ventilation elements. Please note that we have considered for 1 no. ventilator to bedrooms and 2 no. ventilators to lounges and kitchen/diners. Where additional ventilators are required the acoustic performance of a single ventilator must be selected so that the combined performance is as stated in the table below, e.g. for 2 no. ventilators to a bedroom, the acoustic performance of each will need to be $D_{n,e,w}$ 36 dB to meet a combined specification of $D_{n,e,w}$ 33 dB. Requirements should be checked with the manufacturer.

Please note that the treatment is generally not considered necessary for non-habitable rooms such as bathrooms etc.

Table 6 below gives the acoustic performance of the ventilator used in the calculations. Any alternative vent should achieve the same performance or greater in each octave band.

Table 6. Required ventilator performance

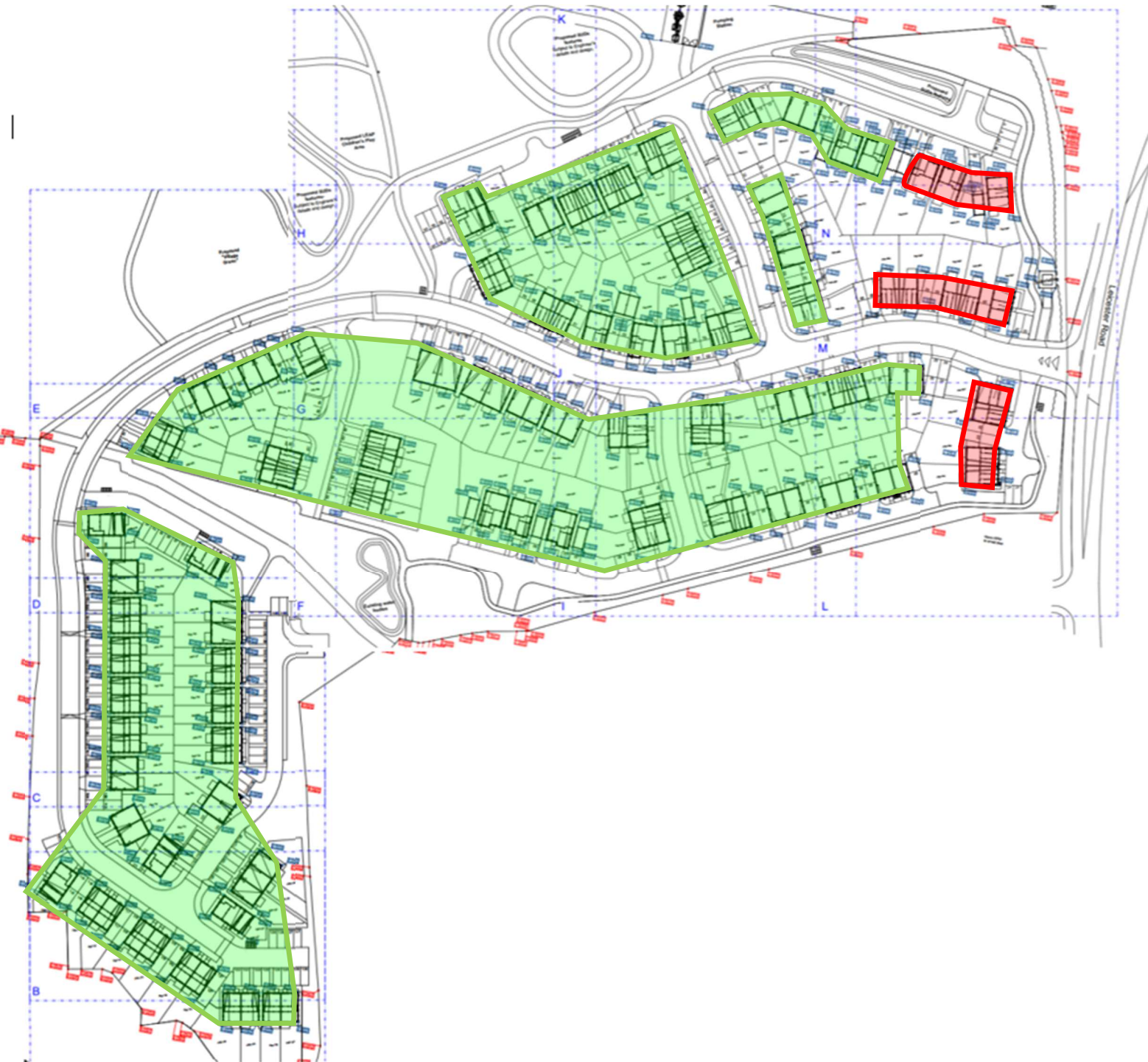
Typical Product	Minimum Sound Reduction Index R (dB) at Octave Band Centre Frequency (Hz)								$D_{n,e,w}$ dB
	63	125	250	500	1k	2k	4k	8k	
Simon Acoustic TTF Slimline	38	38	35	35	31	32	35	40	33

Please note that the specification of vents is in terms of acoustic performance only. Ventilation strategy needs to be checked with Local Authority and other standards and regulations for compliance. It should be noted that inclusion of ventilators alone does not ensure compliance with Building Regulations or other regulatory requirements for ventilation. The ventilation strategy should be checked by others.

6.3 Approved Document O (ADO), Method of Removing Heat

Figure 5 shows the ventilation schedule in regards to Plots which are predicted to exceed the criteria of Approved Document O.

Figure 5. Approved Document O Ventilation schedule



With reference to the predictions discussed in Section 5, we would note that the calculated noise levels are predicted to exceed the following criteria at Receiver Position 2 in Figure 4. Receiver Position 2 has subsequently been selected to represent all properties marked in red (i.e. plots 1-5, 18-20, and 21-24) in Figure 5. For all other residential receivers, the calculated noise levels are predicted to be below the following criteria.

49dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am)

64dB L_{AFmax} , more than 10 times a night (between 11pm and 7am)

Consequently, based on a partially open window, noise levels within bedrooms of plots 1-5, 18-20, and 21-24 are predicted to exceed the following ADO limits. Noise levels within bedrooms of all other residential receivers are expected to be below the following limits.

40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am)

55dB L_{AFmax} , more than 10 times a night (between 11pm and 7am)

Therefore, an alternative means of ventilation is recommended as opposed to relying on openable windows at any facades facing Leicester Road for plots 1-5, 18-20, and 21-24. We would consider partially open windows to be acceptable for all other residential receivers, and any facades that are not facing Leicester Road for plots 1-5, 18-20, and 21-24.

6.4 External Amenity Areas

Calculations have been carried out in order to assess the noise levels in the external amenity spaces of the proposed dwellings as shown in the Figure below. Please note that we have included for 1.8m high close boarded timber fences as proposed within the site layout drawing. We would consider that this is of a solid construction with no gaps between the panelling and of at least 10 kg/m³ surface mass. The results of the model are presented in the Figure below:

Figure 6. Calculated noise levels in amenity areas – grid noise map.



It can be seen from the grid noise map above that all outdoor amenity areas are expected to be below 51dB (A), with the sole exception of Plot 001. This outdoor amenity area is predicted to be below 54 dB(A). As previously mentioned within Section 3.3, BS8233:2014 discusses how it is desirable that external noise levels do not exceed 50 dB(A). It is further discussed how this may be increased to 55 dB(A), and potentially higher than this in noisier environments as follows:

'In higher noise 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.'

We would consider that as the location of the development is situated in close proximity to a number of local amenities with Leicester Road serving as an important connecting route, the predicted external amenity noise levels, which do not exceed 55 dB(A), presented in the figure above may be warranted.

7.0 CONCLUSIONS

PDA Ltd was commissioned by Vistry South East Midlands to carry out a noise impact assessment for the proposed residential development located at Leicester Road, Earl Shilton in respect to Local Planning Condition 12.

The proposed development comprises the erection of 140 no. residential dwellings. The dwellings are understood to range between detached, semi-detached and terraced units. The current site is mainly comprised of open fields and agricultural land. The site is bordered by Leicester Road and Shilton Road to the east. Towards the south of site are a combination of residential properties and commercial units. Keats Lane also runs to the south of site.

The local noise climate was dominated by road traffic on Leicester Road during both the day and night-time periods.

Based upon the measured and predicted noise levels, calculations have been undertaken for the Bedrooms and Kitchen/Living spaces to evaluate the internal noise levels. Recommendations are given for glazing, ventilation and building façade elements to meet the internal noise level requirements of good practice guidance given in BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings. Calculations suggest that the noise level criteria of BS8233:2014 can be achieved within the proposed accommodation.

Furthermore, the noise level incident on the proposed dwellings indicates that the requirements of Approved Document O (ADO) are likely to be achieved at most residential receivers and therefore, may rely on openable windows for the purposes of mitigating overheating. However, for the plots nearest to Leicester Road, the noise levels are expected to exceed the internal noise criteria and therefore, the overheating mitigation strategy as required by ADO must provide an alternative method to removing heat other than relying on windows remaining open at night. Note that this will be subject to the outcome of a TM59 dynamic thermal modelling assessment to be undertaken by others.

With regards to noise levels within the external amenity areas of the development, our assessment suggests that the majority of the site is likely to achieve the lower guideline value of BS8233 (≤ 50 dB L_{Aeq}). The results of our noise model indicate that noise levels within the external areas of Plot 001 may be up to 54 dB L_{Aeq} and therefore achieves the upper BS8233 guideline value (≤ 55 dB L_{Aeq}) which is considered to be acceptable for developments which adjoin the strategic transport network.

APPENDIX A – NOTES FOR QUALITY CONTROL

1. Blockwork

All blockwork is to be mortared to an almost fair faced standard both horizontally and vertically. Only perfect blocks may be used with no pitting or cracks. The blockwork must seal effectively to the underside of the soffit.

Where blockwork walls form a cavity wall, care should be taken to avoid rubble and snots from bridging the cavity. This is especially important where one or more of the leaves is floating.

2. Plasterboard

All plasterboard joints are to be butted tight. The rule of thumb is that the joint should be tight enough over its entire length to prevent a normal business card from being inserted. Multiple layers should be fitted with staggered joints.

Base details and deflection heads are to be as per the British Gypsum White Book unless otherwise stated, and copious amounts of mastic to be used when fitting to the walls, floor and ceiling respectively.

3. Mineral Fibre

Mineral fibre slabs are to be butted tightly together and to boundary structures, to form a homogeneous layer.

4. Windows

All window frames are to be a good tight fit into the building structure with any gaps to be filled both internally and externally with a non-setting mastic in addition to the usual weather proofing seal to the exterior. Any gaps between the frame and building that are greater than 5 mm are to be packed with a dense mineral fibre prior to mastic sealing.

5. Electrical Sockets

Electrical sockets must not be fitted back to back and removed areas of blockwork and plasterboard should be kept to an absolute minimum.

6. Water Pipes

All water pipes (and any other pipework) are to be resiliently mounted to avoid “water hammer”. This is particularly important for plasterboard walls.

7. Penetrations

Penetrations are to be dealt with as described in this report. Details for specific services penetrations may be supplied upon request.

8. Approved Samples and Inspections

Samples of each individual acoustic element should be provided for inspection at the beginning of its installation. Once approved, the Clerk of Works must ensure that the same level of quality continues throughout construction.

APPENDIX B – DEFINITION OF ACOUSTIC TERMS

The decibel

This is the basic unit of noise, denoted dB.

A Weighting

This is a weighting process which simulates the human ear's different sensitivity at different frequencies. A weighting can be shown two typical ways, 50 dB(A) L_{eq} or 50 dB L_{Aeq} . Both mean the same thing. (See below for a definition of L_{eq}). The dB(A) level can be regarded as the overall level perceived by human beings.

L_{eq} and $L_{eq(s)}$

This is the equivalent continuous noise level which contains the same acoustic energy as the actual time-varying sound. In other words it is a kind of average noise level. It is denoted dB L_{eq} or, for A-weighted figures dB(A) L_{eq} or dB L_{Aeq} . It can also be expressed in terms of frequency analysis (see later). $L_{eq(s)}$ is the sample L_{eq} level.

L_n

This is the level exceeded for n% of the time. It is denoted dB L_n or, for A-weighted figures dB(A) L_n or dB L_{An} . It can be expressed in terms of frequency analysis (see later). L_{90} is the level exceeded for 90% of the time and is a measure of the lowest level typically reached. L_{10} is the level exceeded for 10% of the time and is the highest level typically reached. L_{50} is the level exceeded for 50% of the time and, mathematically, it is the median.

L_{max}

This is the maximum level reached during a measurement period. The "time constant", or the ability of the equipment to respond to impulses is usually expressed along with it, e.g. "Fast", "Slow", etc. It is denoted dB L_{max} or, for A-weighted figures dB(A) L_{max} , dB L_{Amax} , etc. It can also be expressed in terms of frequency analysis.

Frequency Analysis

Whereas dB(A) gives a very useful overall figure, it has its limitations in that it cannot be used to model or predict the effect of noise control and mitigation as this nearly always has radically different performance at different frequencies.

Frequency analysis expresses an overall noise level at each frequency or band of frequencies in the audible range. Octave band analysis divides the audible range into 10 bands from 31.5 Hz to 16 kHz and the noise level in each band can be expressed in any form e.g. L_{eq} , L_{90} , L_{max} etc. One third octave band analysis uses 30 bands.

Narrow band analysis takes the process to resolutions of less than 1 Hz. This is useful for identifying the existence of tones (whines, hums, etc.) and in pin-pointing the sources.

APPENDIX C – Measured Noise Levels

Figure 7. Ambient Noise Survey – Chart – Position 1

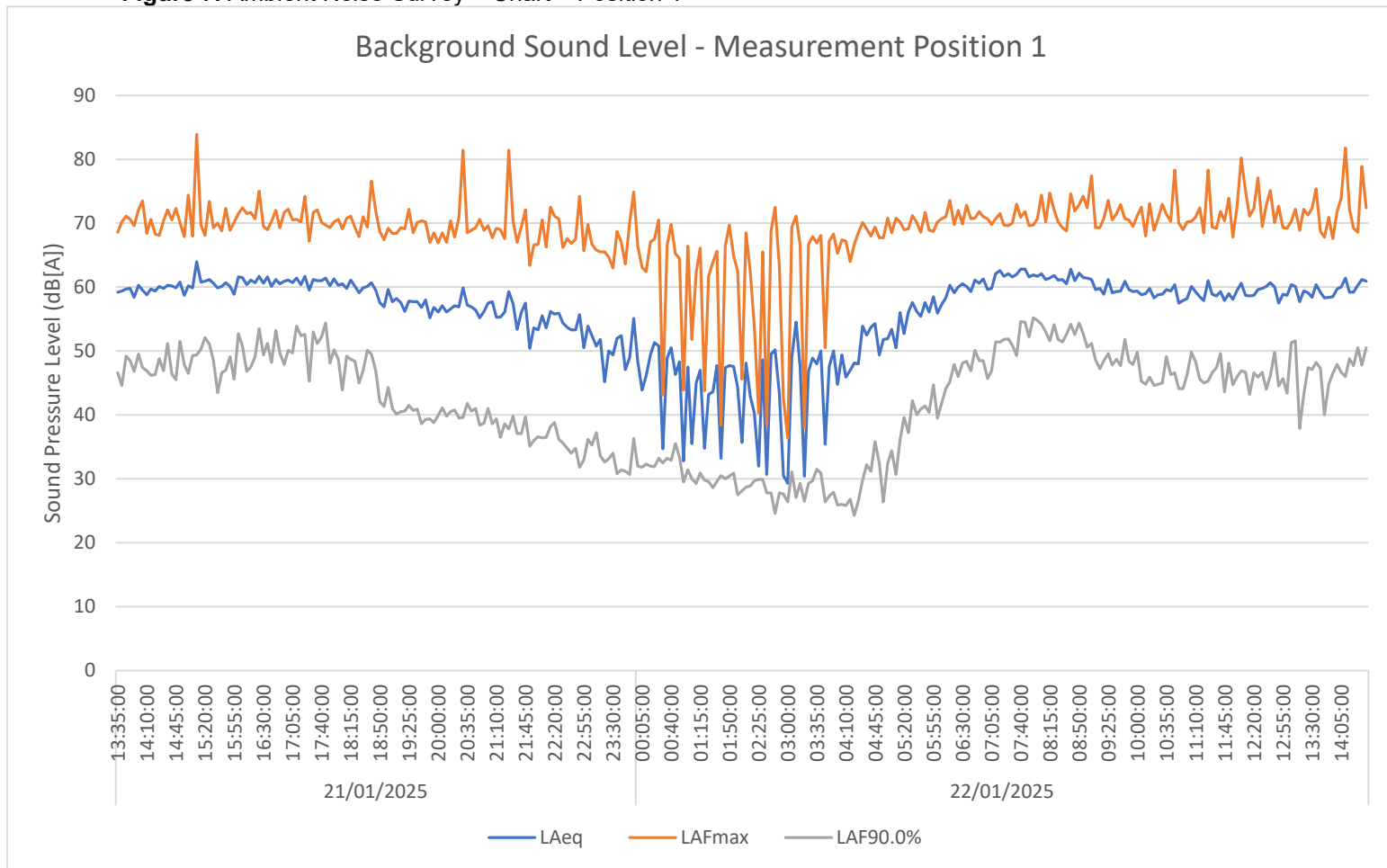


Figure 8. Ambient Noise Survey – Chart – Position 2

