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ADMIRAL ADULT GAMING CENTRE, 27 BRIDGE PLACE, WORKSOP S80 1DT
PROPOSED EXTENSION OF TRADING HOURS

NOISE ASSESSMENT

On behalf of:

Luxury Leisure

Report Number P23-448-R01v1
November 2023

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NOISE ASSESSMENT

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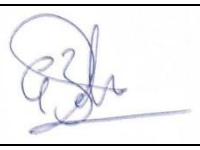
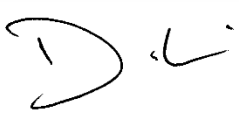
On behalf of:
Luxury Leisure

Report prepared by: George Zelenovic MSc MIOA –Consultant	
Report checked by: Donald Quinn BSc FIOA – Managing Director	

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1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd has been commissioned by Luxury Leisure to carry out a noise assessment in connection with an application seeking to extend the trading hours of the approved adult gaming centre located on the ground floor and basement at 27-29 Bridge Pl, Worksop S80 1DT.

1.2 We understand that the Client is seeking planning consent to vary the premises' approved trading hours which are currently 08:00 to 00:00 daily. Approval is sought for trading 24 hours a day, seven days a week.

1.3 The site is a two-storey building bounded by and fronting onto Bridge Place to the west, with Ryton Place to the rear/east, the north contains retail premises, and to the south of the site are further retail premises. Whilst we haven't been able to confirm, for the purposes of this assessment, we have assumed that the nearest dwelling could be on the first floor of the building immediately to the south of the site. Further dwellings are located beyond the car park to the rear (west) of the premises. The site location is shown in **Figure 1**.

1.4 The gaming/trading area of the approved adult gaming centre will be on the ground floor of the building, with ancillary areas including accessible WC and manager's office to the rear. The rear of the first-floor of the premises will be used for further WCs, storage, and staff facilities. The remainder of the first floor will be used for staff areas and storage. The proposed ground floor layout of the premises is shown in **Figure 2**.

1.5 The precise details of the new external plant/equipment to be installed have yet to be finalised.

1.6 The noise assessment has included the following:

- A site inspection;
- A survey of the prevailing night-time environmental noise levels at the site;
- Assessment of the potential impact of internal trading noise breakout via the shopfront;
- Recommending appropriate noise limits for new external plant/equipment; and
- Recommending noise mitigation measures where appropriate.

1.7 All recommendations are given for acoustics reasons only. Compliance with other requirements (e.g. fire, structural, thermal, etc.) must be checked by others.

1.8 The various noise units and indices referred to in this report are described in **Appendix I**. All noise levels mentioned in the text have been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 ACOUSTIC DESIGN CRITERIA

2.1 The *National Planning Policy Framework* (NPPF) 2021 provides some general guidance to local authorities on taking noise into account in planning policies and decisions. NPPF paragraph 185, a) states that planning policies and decisions should *"mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life"*.

2.2 For the internal noise design limits for nearby residences, we have referred to the guidance in British Standard 8233: 2014 *Guidance on sound insulation and noise reduction for buildings*. This is referred to as BS 8233 hereon.

2.3 BS 8233 recommends guidance on design criteria for acceptable noise levels within residential accommodation. BS 8233 guidelines for the daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods are summarised in **Table 1**.

Table 1: BS 8233 recommended acoustic design criteria

Activity	Location	Internal Noise Levels	
		Daytime 07:00 – 23:00	Night-time 23:00 – 07:00
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

2.4 BS 8233 clarifies that the above guidance relates only to noise without 'specific character' (e.g. such as that which has a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content) and that where such characteristics are present, lower noise limits might be appropriate.

2.5 The type of noise associated with the proposed gaming machines has 'specific character'. To account for this, we recommend that any noise intrusion from the ground floor trading area to any nearby residences should be controlled to be within NR 20 for living rooms during the daytime, and NR 15 for bedrooms at night. These are equivalent to no more than around 28 dB L_{Aeq} and 23 dB $L_{Aeq,}$ respectively, and are therefore well within the BS 8233 design limits stated in Table 1.

2.6 BS 8233 also recognises that regular individual noise events at night can cause sleep disturbance. Peaks of noise from individual events are usually described in terms of L_{Amax} values and these can be highly variable and unpredictable. Research described in WHO *Community Noise Guidelines* states, "*for a*

good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10-15 times per night". That threshold is therefore 22 dB(A) above the night-time L_{Aeq} criterion value as stated above.

BS 4142: 2014 + A1: 2019

2.7 The latest version is BS 4142: 2014 + A1: 2019 '*Methods for rating and assessing industrial and commercial sound'.* This provides methods for rating and assessing sound of an industrial and/or commercial nature. The standard will be referred to as BS 4142 for the rest of this report for brevity.

2.8 BS 4142 requires the 'rating' noise level for the operation to be compared with the background (L_{A90}) noise level in the absence of the operational noise being assessed.

2.9 The 'rating' level is derived based on the 'specific' L_{Aeq} noise level attributable to the operation with an *'acoustic feature'* penalty added for any noise sources which give rise to tonal, impulsive, intermittent, or other characteristics readily distinctive against the residual acoustic environment.

2.10 An initial estimate of the impact of the operation is determined by subtracting the background level from the rating level. BS 4142 states that:

- Typically, the greater this difference, the greater the magnitude of the impact
- 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

2.11 The lower the rating level is relative to the measured background level, the less likely it is that the operation 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.

2.12 For external plant, we understand that the Local Authority, Lambeth Borough Council, has no specific noise limits but recommends following the guidance *British Standard 4142: 2014 'Methods for rating and assessing industrial and commercial sound'.* The current version of British Standard 4142 is BS 4142: 2014 + A1: 2019 '*Methods for rating and assessing industrial and commercial sound'.* This

standard provides methods for rating and assessing sound of an industrial and/or commercial nature. The standard will be referred to as BS 4142 for the rest of this report for brevity.

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- 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 level, the less likely it is that the operation 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.

2.16 Where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be taken into account, including:

- The absolute level of sound;
- The character and level of the residual sound;
- The sensitivity of the receptor and whether dwellings … will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as: i) façade insulation treatment, ii) ventilation and/or cooling, and iii) acoustic screening.

3.0 NOISE SURVEYS

Environmental Noise

3.1 Environmental noise measurements were carried out at the site to determine the prevailing ambient noise levels of the area during the proposed extended operational hours. Noise was measured at Location A within the yard area to the rear of the site, and at Location B at the front of the site on Bridge Place. The locations are indicated on **Figure 1**.

3.2 The noise measurements were taken on Tuesday 8 November 2023 between 00:00 (midnight) and 02:00 to represent the most sensitive late-night conditions. Measurements were taken at Locations A and B successively. Measurements were taken in sequential 5-minute samples at both locations.

3.3 The measurement microphones at Locations A and B were mounted on a tripod 1.4m from ground level, in 'free-field' conditions.

3.4 The weather conditions throughout the noise survey were mild, dry, and overcast, with wind speeds below 5 m/s. These were considered suitable conditions for the noise survey.

3.5 The results of the noise survey are detailed in Appendix II. The measured noise levels are summarised in **Table 2**. The L_{Aeq} values in **Table 2** are the logarithmic average of the samples. The L_{A90} values in **Table 2** are the arithmetic average of the samples.

Table 2: Environmental noise levels summary (dBA)

Location	Noise levels		
	$L_{Amax,f}$	$L_{Aeq,T}$	$L_{A90,T}$
A	49 – 63	46	44
B	44 – 85	53	34

3.6 The main noise source during the survey was road traffic from the nearby road networks at Location B. Some noise from mechanical plant associated with other nearby commercial premises was audible at Location A.

Reference Trading Noise Levels

3.7 Hepworth Acoustics has carried out previous source measurements of noise taken inside a similar premises during a time representative of a typical busy period. The results are summarised in **Table 3**.

Table 3: Typical Admiral internal trading noise levels (dB)

Description	Octave Band Centre Frequency (Hz)								A
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	
L_{eq}	61	63	65	61	60	58	56	48	66
Typical L_{max}	89	85	83	81	79	74	79	69	85

3.8 Therefore, the trading noise is characterised by fairly modest average noise levels interspersed with occasional periods of more elevated peaks of noise, although these are by no means excessive.

4.0 ASSESSMENT

Trading Noise Break Out

4.1 We understand that the existing ground floor shopfront removed and replaced with a reinforced laminated glazed shopfront and entry doors. There will also be a new inner sliding entrance door installed forming an entrance lobby which will serve to effectively control noise break-out via the entrance even when customers arrive/depart. For the purposes of our calculations and assessment, we have assumed that the reinforced glazing will be a nominal 6.8mm thick single glazing.

4.2 The rear of the building currently comprises a brick façade, and a heavy steel security door. We understand this will not be altered. We would expect this to provide sound reduction of at least 30 dB R_w.

4.3 We have carried out calculations to determine the likely level of trading noise break-out via the proposed shopfront. The calculations have taken into account the internal trading noise levels (as set out in **Table 3**), the sound reduction indices and relative areas of the various elements of the shopfront and the distance to the nearest apartment. The calculation is shown in **Appendix III**, with **Table 4** below summarising the calculated trading noise levels outside the nearest apartment and a comparison with the adopted noise limits.

Table 4: Noise break-out through premises to sensitive receptor (dB)

Description	Octave band centre frequency (Hz)							A
	63	125	250	500	1k	2k	4k	
Calculated noise outside apartment windows	28	24	21	12	7	3	0	18
Adopted noise limit (measured background, L_{90})	39	40	36	31	29	24	16	34
Comparison	-11	-17	-15	-20	-23	-21	-16	-16

4.4 **Table 4** shows that trading noise break-out will be very low and at least 15 dB below the corresponding night-time background noise levels. On this basis, we do not anticipate any significant noise impact.

4.5 Since the rear elevation of the building is of solid masonry construction with ancillary areas adjoining the external wall and a lobbied fire escape, trading noise break-out to the rear will be even lower than set in **Table 4**. This alongside the greater separation distance to the nearest dwellings means that no trading noise impact is anticipated to the rear.

4.6 We therefore do not anticipate any issues of noise impact associated with break out of trading noise through the building envelope.

Plant Noise Limits

4.7 As noted above, there are no details of the noise emissions from this equipment at this stage. As such, we have derived appropriate noise design limits from the adopted representative background sound levels which will need to be taken into account in the selection, specification and installation of the equipment.

4.8 On this basis, the recommended cumulative fixed plant/equipment rating sound levels (i.e. rated according to BS 4142) are shown in **Table 5**.

Table 5: Cumulative Buildings Services Plant Noise Rating Level Design Limits (dB $L_{Ar,Tr}$)

Location	00:00-08:00
The nearest dwellings to the front	34
The nearest dwellings to the rear	44

4.9 We recommend that the above noise limits are taken into account at an early stage in the design of the new plant/equipment installation. Where necessary, noise control measures could include specifying low noise equipment, carefully siting equipment, installing proprietary acoustic enclosures etc.

4.10 We also recommend that once installed and operational the equipment is regularly maintained to ensure that noise emissions are minimised.

5.0 CONCLUSIONS

5.1 Hepworth Acoustics Ltd has been commissioned by Luxury Leisure to carry out a noise assessment in connection with an application seeking to extend the trading hours of the existing adult gaming centre located on the ground floor and basement at 27-29 Bridge Pl, Worksop S80 1DT.

5.2 This assessment has involved carrying out a baseline noise monitoring survey to establish the existing night-time noise climate in the vicinity.

5.3 Based on reference trading noise levels for the premises, we have calculated the likely level of trading noise break-out to the nearest dwellings. Our calculations have indicated that trading noise break-out will be very low and substantially below the measured night-time background noise levels. On this basis, there will be no significant noise impact associated with 24-hour trading and no sound insulation enhancements are warranted.

5.4 The results of the noise survey have also been used as a basis for recommending appropriate noise limits for any new external plant/equipment, the details of which are yet to be finalised, such that no unacceptable noise impact will result.

5.5 We therefore conclude that the noise impact of the proposed extension trading hours of the premises will be adequately controlled, with no loss of amenity to the adjacent residences.

Key:

Not to scale

- Approximate site boundary

X - Noise measurement positions

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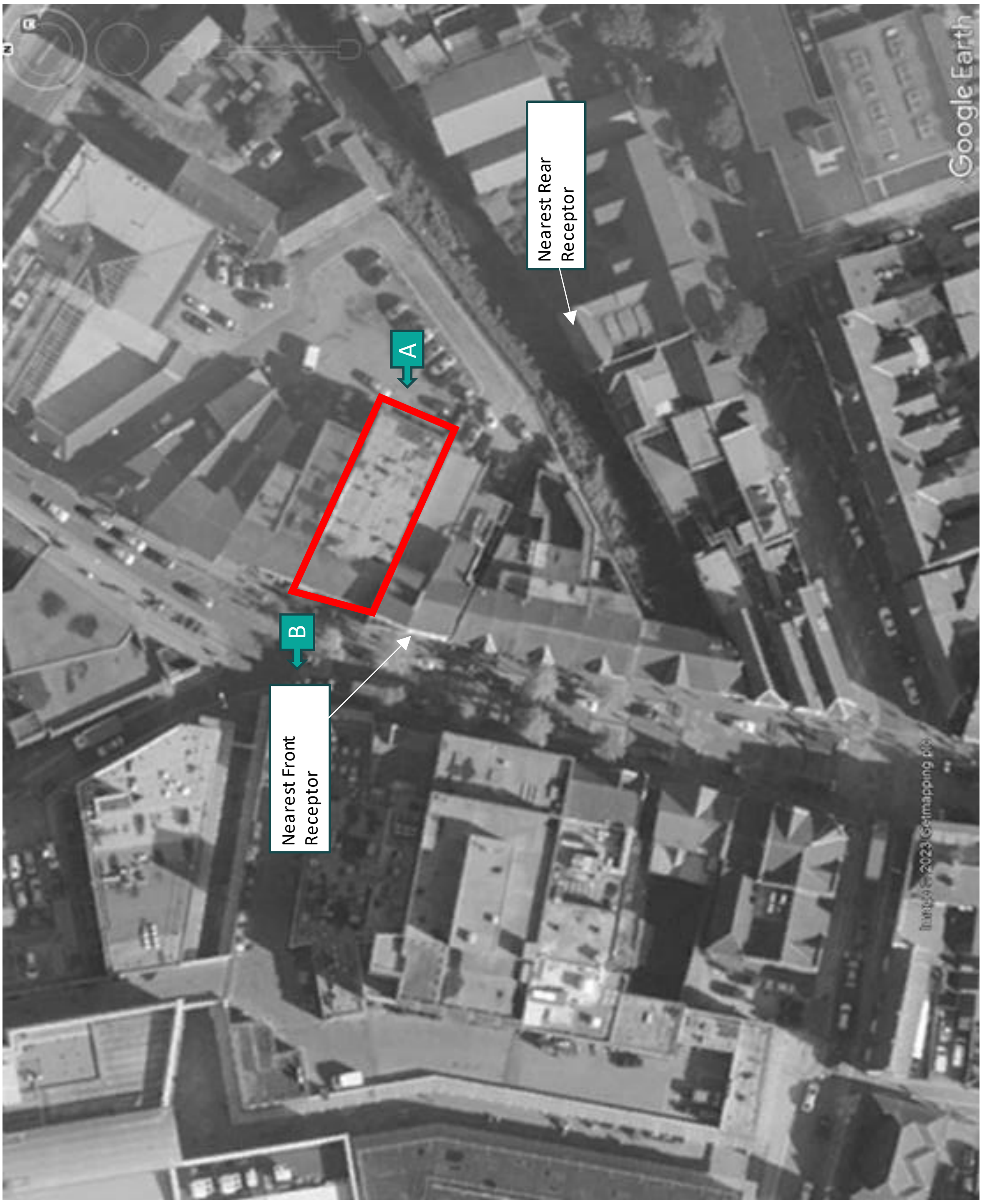
Title: Figure 1: Site location & noise measurement positions

Project: P23-448



Key: Not to scale

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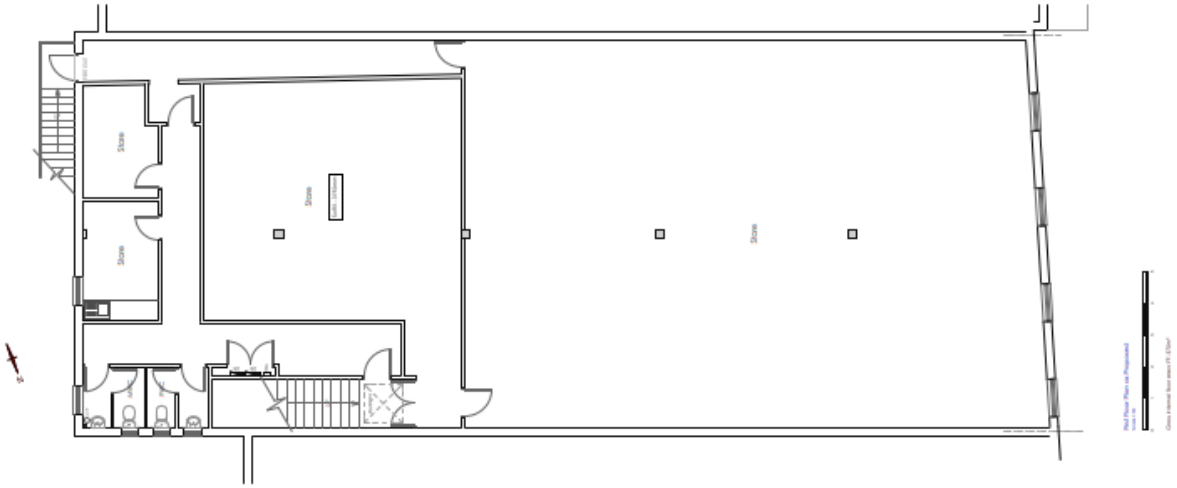
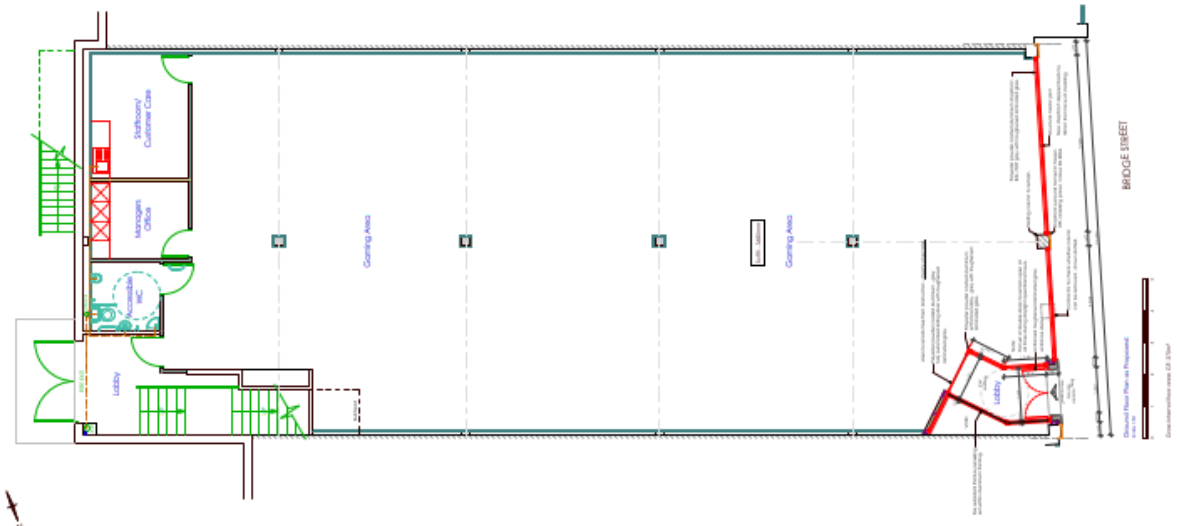
Title: Figure 2: Proposed Site Layout

Project: P23-448





Appendix I: Noise Units & Indices

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

$L_{Aeq,\,T}$ This is the A–weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period, T. In other words, $L_{Aeq,T}$ is the level of a continuous noise which has the same total (A–weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.

$L_{Amax,f}$ This is the maximum A–weighted noise level that was recorded during a sample duration, with the sound level meter on the 'fast' setting.

$L_{A90,T}$ This is the A–weighted noise level exceeded for 90% of the time period, T. L_{A90} is used as a measure of background noise.

Appendix I: Noise Survey Results

Date(s):	Night-time – Tuesday 7 November 2023
Equipment	NTi XL2 'Class 1' sound level meters (s/n: A2A-20228-E0) with associated calibrator and environmental outdoor monitoring kit
Weather	Night-time – Dry, ~6°C, clear skies and calm <3 m/s

Location A

Time	Measured Noise Levels (dB)			Comments
	L_{Amax}	$L_{Aeq,T}$	$L_{A90,T}$	
00:00	50	46	45	The dominant noise source was found to be plant noise from other nearby premises and road traffic on nearby road networks.
00:05	49	46	44	
00:10	63	47	45	
01:00	50	46	45	
01:05	49	45	44	
01:10	51	45	44	

Location B

Time	Measured Noise Levels (dB)			Comments
	L_{Amax}	$L_{Aeq,T}$	$L_{A90,T}$	
00:20	67	46	37	The dominant noise source was found to be distant road traffic and intermittent local road traffic on Bridge Place. Occasional pedestrian pass-bys including speech.
00:25	77	60	36	
00:30	70	51	37	
00:35	63	48	43	
00:40	59	45	38	
00:45	63	44	36	
01:20	85	60	38	
01:25	53	37	35	
01:30	44	35	34	
01:35	51	37	34	
01:40	46	38	35	

Appendix II: Noise Break-Out Calculation

Project Number	P22-458
Description	Internal trading noise breakout from front façade to nearest Dwelling

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Noise Break-out v6.0 February 2019

Source - Woods Practical Guide to Noise Control

		63	125	250	500	1k	2k	4k	A
SPL int		61	63	65	61	60	58	56	65

Element 1 - Wall

SPL int		61	63	65	61	60	58	56	74
Element *SRI*		34	40	44	45	51	56	56	
Area (*S*) =	17.3	12	12	12	12	12	12	12	
Distance (*r*) =	8.0	-18	-18	-18	-18	-18	-18	-18	
At receiver		7	3	1	-4	-11	-18	-20	0

→ BS8233 Example - Brick and block external wall

→ = SPL_{int} - SRI + 10 log S - 20 log(r) - 14

Element 2 - Glazing

SPL int		61	63	65	61	60	58	56	74
Element *SRI*		15	21	26	31	35	37	38	
Area (*S*) =	22.5	14	14	14	14	14	14	14	
Distance (*r*) =	8.0	-18	-18	-18	-18	-18	-18	-18	
At receiver		27	23	20	11	6	2	-1	18

→ 6.8 mm Optilam

→ = SPL_{int} - SRI + 10 log S - 20 log(r) - 14

Element 3 - Door — Is door lobbied? **Yes**

SPL int		61	63	65	61	60	58	56	74
Element *SRI*		15	21	26	31	35	37	38	
Area (*S*) =	4.0	6	6	6	6	6	6	6	
Distance (*r*) =	11.0	-21	-21	-21	-21	-21	-21	-21	
Lobby absorption (*A*) =			18						
At receiver		-4	-14	-22	-36	-45	-51	-55	-26

→ 6.8 mm Optilam

→ No Lobby = SPL_{int} - SRI + 10 log S - 20 log(r) - 14

→ Lobby = SPL_{int} - 2 x SRI + 10 log S - 20 log(r) - 14 - 10 log (A)

Overall Results

	63	125	250	500	1k	2k	4k	A
Resulting	28	24	21	12	7	3	0	18
Background/limit	39	40	36	31	29	24	16	34
Difference	-11	-17	-15	-20	-23	-21	-16	-16