hepworth acoustics

PROPOSED GOLDEN SLOTS PREMISES, 55 FLEET STREET, LONDON EC4Y 1JU

NOISE ASSESSMENT

On behalf of:

Equity First Holdings Ltd

Report Number P24-075-R01
June 2024

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NOISE ASSESSMENT

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1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd has been commissioned by Equity First Holdings Ltd to carry out a noise assessment in connection with a proposed Adult Gaming Centre (AGC) development in the existing basement and ground floor unit at 55 Fleet Street, London EC4Y 1JU. The site location is shown in Figure 1.

1.2 This assessment has been requested in connection with a planning application for the development. Currently the unit is vacant. The applicant proposes to convert this to an Adult Gaming Centre, which will include slot machines and other electronic gaming machines. We understand that the applicant proposes opening to customers for 24 hours a day, 7 days a week.

1.3 The site is on the corner of Fleet Street and Pleydell Court. There are residences on the opposite side of Fleet Street, around 20 metres away based our survey on site. To the rear are offices and, further south along Lombard Lane, a hotel (Temple Court Apex Hotel). There are retail units on either side.

1.4 There is an existing commercial office on the first floor of the building, currently vacant, directly above the ground floor trading premises. There is a proposal to convert this into a residence.

1.5 The gaming area of the proposed development will be on the ground floor of the building. The basement level of the premises will be used for WCs, storage, and staff facilities.

1.6 There are two existing condensers serving the climate control system for the premises. These are located externally, adjacent to the rear fire escape at first floor level. These were disconnected at the time of our inspection. We understand these will be retained.

1.7 This assessment has included the following:

- A site inspection;
- A survey of the prevailing environmental noise levels at the site;
- Measurement of indoor activity noise at a similar AGC to use as reference noise levels;
- Specification of the sound insulation performance of the separating construction between the ground and first floors;
- Assessment of mechanical plant noise;

- Assessment of noise impact on nearby noise-sensitive premises.

1.8 This assessment is based on the following drawings prepared by Colneside Building Design, dated 16th May 2024:

- 55FltStAGC-FUL-24-01
- 55FltStAGC-FUL-24-02
- 55FltStAGC-FUL-24-03
- 55FltStSCU-Pri-24-01
- 55FltStSCU-Pri-24-02
- 55FltStSCU-Pri-24-03
- 55FltStSCU-Pri-24-04

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

1.10 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), December 2023, provides some general guidance to local authorities on taking noise into account in planning policies and decisions. NPPF paragraph 191, a) states that planning policies and decisions should *"mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life"*.

2.2 Policy D14 of the London Plan, dated March 2021, includes the following guidance on noise, which has been followed in this assessment:

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

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

2.3 We understand that the Local Planning Authority, City of London Corporation, encourages the use of British Standard 8233: 2014 *Guidance on sound insulation and noise reduction for buildings*, as does the London Plan. This is referred to as BS 8233 hereon. For the internal noise design limits for the proposed first-floor residences, we have referred to the guidance in this standard.

2.4 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 $L_{Aeq,8hr}$

2.5 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.

2.6 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 residences should be controlled to be within NR 20 for living rooms during the daytime, and NR 15 for bedrooms at night, measured using the L_{eq} metric. 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.

2.7 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.

2.8 For external plant, we understand that the Local Authority does not apply specific noise criteria, but recommends assessing noise impact using the guidance in British Standard 4142. 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.

2.9 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.

2.10 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.

2.11 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

2.12 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.

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. Noise levels were measured at Location 1 on the pavement in front of the building, and at Location 2 outside the hotel to the rear. The locations are marked on Figure 1.

3.2 Attended noise measurements were taken on Thursday 16th May between 01:00 and 03:00 to represent typical night-time conditions and between 13.00 and 15.00 the same day to represent typical daytime conditions. Measurements were taken simultaneously at Locations 1 and 2. Measurements were taken in sequential 15-minute samples at both locations.

3.3 The measurement microphones at Locations 1 and 2 were mounted on tripods, around 1.5 metres above local ground level.

3.4 The weather conditions throughout the noise survey were mild, dry, and overcast, with wind speeds below 5 m/s. Wind was from the southwest. These were considered suitable conditions for the 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} and L_{A90} values in Table 2 are the logarithmic and arithmetic average respectively of the samples at each location for the relevant time period.

Table 2: Environmental noise levels summary (dBA)

Location	Time	Noise level		
		$L_{Amax,f}$	$L_{Aeq,T}$	$L_{A90,T}$
1	Daytime	78 – 83	71	60
	Night-time	68 – 74	64	51
2	Daytime	77 – 82	57	50
	Night-time	69 – 78	53	45

3.6 The dominant noise source at Location 1 was road traffic noise on Fleet Street. The dominant noise sources at Location 2 were distant road traffic and mechanical plant associated with nearby commercial premises.

Reference Noise Levels

3.7 Noise measurements were taken inside an existing operational AGC at 3 Seven Sisters Road, London N7 6AJ from 18.45 to 19.45 on Thursday 29th November 2018. This time was selected following consultation with staff to be representative of a typical busy period. This AGC is of a similar size to one proposed herein, and uses similar gaming machines, so this is considered to be equivalent with regards to trading noise. The results are shown in Appendix II and summarised in Table 3.

Table 3: Typical AGC 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.

Sound Level Meter Details

3.9 Noise measurements at Location 1 and inside the AGC at 3 Seven Sisters Road were carried out using a Brüel & Kjær Type 2250 sound level meter (serial no. 3011626).

3.10 Noise measurements at Location 2 were carried out using a NTi XL2-TA 'Class 1' sound level meter (serial no. A2A-20294-E0).

3.11 Both meters were fitted with windshields. Both meters have independent laboratory calibration certification valid for the date of all measurements.

3.12 The calibration levels of the meters were checked before and after the surveys with a Brüel & Kjær Type 4231 sound calibrator (serial no. 2412667). No significant calibration deviation was observed.

4.0 ASSESSMENT

Noise Break Out

4.1 We understand that the existing glazed frontage and glass entry door for the ground floor will be retained. We would expect this to provide an overall sound reduction comfortably in excess of 20 dB R_w.

4.2 Based on the reference trading noise levels shown in Table 4, and by taking typical values for the sound reduction indices (SRIs) equating to 20 dB R_w for a cautious assessment, as well as the area of the façade, the noise break-out levels at 20 metres have been calculated, as shown in Table 4.

Table 4: Predicted Noise Break-Out at 20 m from Frontage

	Octave Band Centre Frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Trading Noise L_{eq}	61	63	65	61	60	58	56	48	66
Trading Noise L_{max}	89	85	83	81	79	74	79	69	85
Frontage SRI	12	15	20	25	25	23	20	20	
Noise Break-Out L_{eq}	29	28	25	16	15	15	16	8	**23**
Noise Break-Out L_{max}	57	50	43	36	34	31	39	29	**44**

4.3 To note, 20 metres is representative of the nearest noise-sensitive premises to the front, on the opposite side of Fleet Street.

4.4 Break out noise reflecting or refracting back to the proposed first-floor residences in 55 Fleet Street is not expected to be significant.

4.5 The predicted worst-case noise break-out levels are considerably lower than the corresponding baseline noise levels at Location 1, as set out in Table 2. Therefore, no adverse impacts due to break out of noise through the premises frontage are anticipated.

4.6 The rear of the building comprises an entrance lobby with a door onto Pleydell Court. We would expect this to provide sound reduction of at least 50 dB R_w. There are no hotel or residential windows overlooking the entrance lobby, or in the vicinity of the rear door, so no impact on residences is anticipated from this elevation.

Internal Sound Insulation

4.7 The building is to be refurbished, which includes converting the first floor office into a residence. This will necessitate reconstructing the separating floor between the ground and first floors.

4.8 Based on the reference trading noise levels shown in Table 3 and the recommended noise intrusion limits stated in Section 2, we recommend that the new separating floor is specified to achieve the sound insulation performance shown in Table 5 or greater.

Table 5: Separating floor recommended minimum sound insulation performance (dB)

Description	Octave Band Centre Frequency (Hz)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Sound reduction performance	32	38	45	47	52	56	58	61

4.9 The performance shown in Table 5 should be achievable using standard floor and ceiling constructions if flanking sound transmission is sufficiently controlled. We recommend that the proposed floor construction is reviewed at the next stage to confirm that the advised sound insulation performance can be achieved.

4.10 As general good practice, we recommend that the ceiling in the ground floor space is kept in good condition in future, repairing any gaps or holes that may occur, to ensure sound insulation performance is maintained.

4.11 We do not anticipate there to be potential for noise disturbance to or from the adjacent retail premises through the party walls.

External Plant Noise

4.12 The two existing outdoor condensers serving the ground floor unit are Fujitsu brand, model AOYG12LMCA. Each unit has a sound power level output of 61 dB L_w, according to the manufacturer's test data.

4.13 There will be hemi-spherical distance attenuation of 12 metres to the nearest habitable room window giving 30 dB(A) reduction. The formula used for hemi-spherical distance attenuation in this context is as follows:

$L_p = L_w - 20 \log r - 8$

Where:

L_p = sound pressure level (dB)

L_w = sound power level (dB)

r = distance (metres)

4.14 There will be a noise barrier attenuation of 8 dB(A) provided by the intervening building to the rear. The barrier calculation is shown in Appendix IV.

4.15 Based on the manufacturer's data and our experience of this type of equipment, we do not expect the equipment to feature tonal or impulsive characteristics readily distinctive against the residual acoustic environment. The condensers will operate on demand and therefore will be intermittent. As such, we have applied a +3 dB acoustic feature correction for intermittency when calculating the rating level of sound from the condensers in accordance with the guidance in BS 4142.

4.16 The predicted condenser noise levels incident on the nearest habitable room window are shown in Table 6. This assumes both condensers are operating simultaneously to consider a worst-case scenario.

Table 6: Predicted Condenser Noise at Nearest Habitable Room Window

Description	dB(A)
Single condenser sound power level (dB L_w)	61
Two condensers sound power level (dB L_w)	64
Distance attenuation to nearest habitable room window (12 metres, hemispherical propagation)	-30
Barrier attenuation	-8
Resultant condensers specific sound level at nearest habitable room window (dB $L_{Aeq,15mins}$)	26
Acoustic feature correction	+3
Rating level	29
Lowest measured night-time background noise level at rear (dB $L_{A90,15mins}$)	43
Comparison (Rating level – $L_{A90,15mins}$)	-14

4.17 As can be seen from the result in Table 6, the plant noise rating level is predicted to be 14 dB(A) below the measured background noise levels. BS 4142 states, "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."

4.18 Taking into consideration context, the specific sound level is at least 20 dB(A) below the measured prevailing L_{Aeq} ambient night-time levels. This also indicates a low impact. On this basis, no specific noise mitigation measures are required for the condensers.

4.19 Based on this assessment, the noise impact of the condensers is expected to result in no discernible loss of amenity at the nearest noise-sensitive premises.

Outdoor Customer Noise

4.20 This section is to consider the potential noise impact at night from customers arriving at or leaving from the premises. Based on our experience of monitoring existing AGCs in Greater London, customers mostly arrive and leave alone or in pairs, and do not make significant noise. We expect similar to occur at this location. Based on expected occupancy levels at the proposed venue, around two to three customers are likely to arrive or leave in a 15-minute period at peak times.

4.21 If customers have a conversation when leaving, typical speech noise levels are around 65 dB(A) @ 1 metre. Taking into consideration the distance to the nearest proposed habitable-room window at the front, this will reduce to 50 dB(A) at first floor level. This is below the lowest measured night-time $L_{Aeq,15mins}$ level at the front of the building. It would also not be distinguishable from other conversing passers-by. Based on this, noise impact from customers arriving at or leaving from the premises is predicted to be low.

5.0 CONCLUSIONS

5.1 A noise assessment of the proposed new Adult Gaming Centre at 55 Fleet Street, London has been carried out.

5.2 This assessment has involved carrying out a baseline noise monitoring survey to establish the existing noise climate outside the building.

5.3 Noise measurements have been made in an existing AGC to provide reference internal noise levels for the expected gaming activities at the proposed development.

5.4 Limits for residential noise impact have been set based on relevant British standards.

5.5 Based on the reference noise levels and our recommended internal residential noise limits, the performance of the acoustic separation between the ground floor space and the proposed first-floor flat above has been specified.

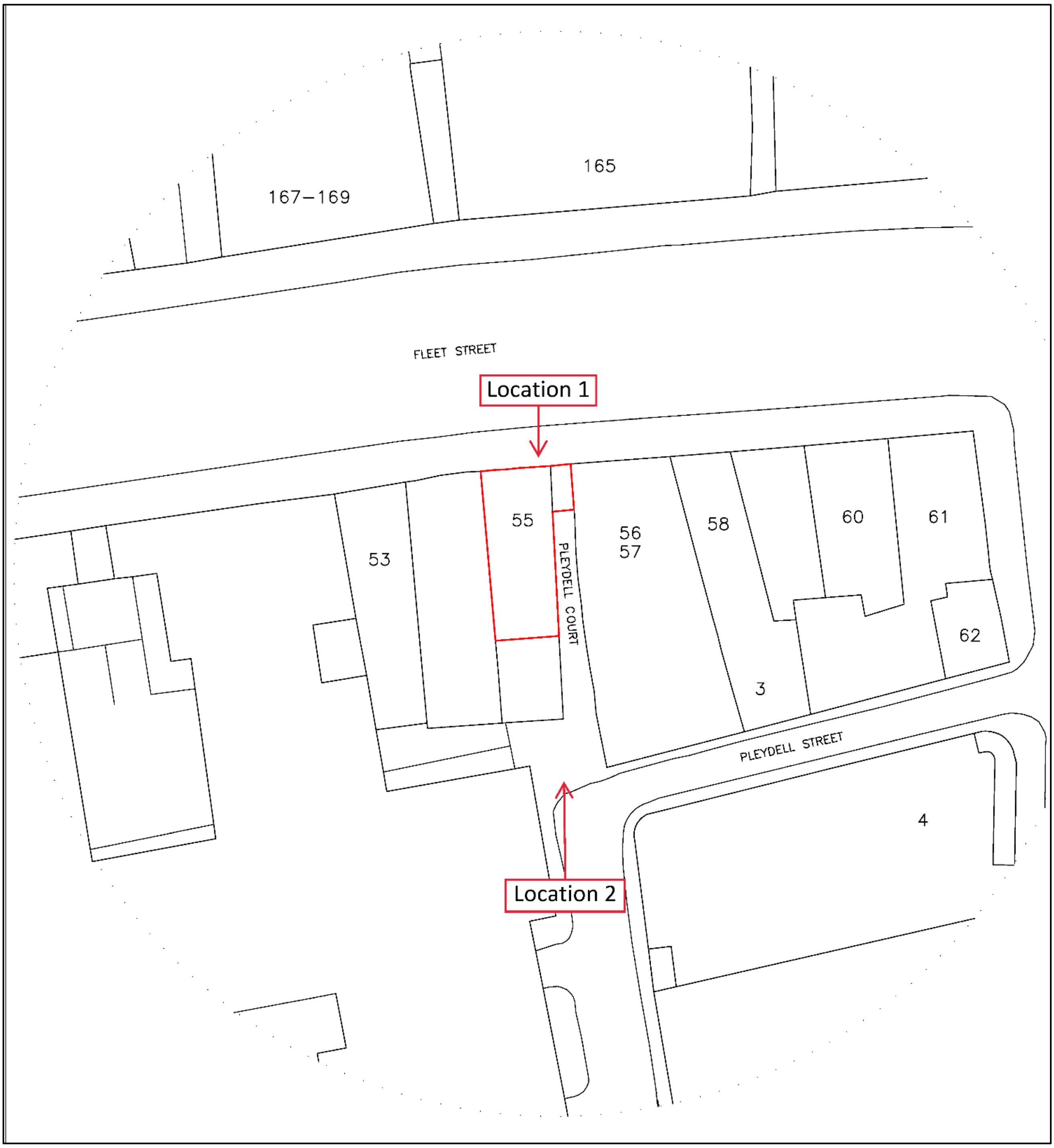
5.6 Noise breakout has been predicted and found to be low.

5.7 The noise impact of the condensers serving the climate control system for the premises has been determined and found to be low.

5.8 Comments on the likely noise impact of customers arriving and leaving the premises at night have also been provided.

5.9 By following the recommendations in this report, we conclude that the noise impact of the proposed development will not result in a discernible loss of amenity to local residents or hotel guests.

Figure 1 – Site Location



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, T. 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. $L_{A90,T}$ is used as a measure of background noise.

Appendix II: Noise Survey Results

Location 1

Equipment: Brüel & Kjær 2250 'Class 1' Sound Analyser (serial no. 3011626) with tripod and windshield

Weather: Dry, wind speed below 5 m/s

All levels in dB re 20 µPa.

Table A1: Measured external noise levels (dB)

Start	Duration (h:mm:ss)	$L_{Amax,f}$	$L_{Aeq,T}$	$L_{A90,T}$
16/05/2024 01:00	0:15:00	74	64	49
16/05/2024 01:15	0:15:00	69	65	50
16/05/2024 01:30	0:15:00	68	63	52
16/05/2024 01:45	0:15:00	68	66	54
16/05/2024 02:00	0:15:00	72	64	50
16/05/2024 02:15	0:15:00	69	64	51
16/05/2024 02:30	0:15:00	74	63	50
16/05/2024 02:45	0:15:00	70	65	49
16/05/2024 13:00	0:15:00	85	70	60
16/05/2024 13:15	0:15:00	78	72	61
16/05/2024 13:30	0:15:00	78	73	61
16/05/2024 13:45	0:15:00	85	70	59
16/05/2024 14:00	0:15:00	81	68	59
16/05/2024 14:15	0:15:00	84	71	60
16/05/2024 14:30	0:15:00	88	70	61
16/05/2024 14:45	0:15:00	85	72	61

Location 2

Equipment:	NTi XL2-TA ‘Class 1’ sound level meter (serial no. A2A-20294-E0) with tripod and windshield
Weather:	Dry, wind speed below 5 m/s

All levels in dB re 20 µPa.

Table A2: Measured external noise levels (dB)

Start	Duration (h:mm:ss)	$L_{Amax,f}$	$L_{Aeq,T}$	$L_{A90,T}$
16/05/2024 01:00	0:15:00	69	49	45
16/05/2024 01:15	0:15:00	72	51	44
16/05/2024 01:30	0:15:00	73	52	45
16/05/2024 01:45	0:15:00	71	53	46
16/05/2024 02:00	0:15:00	72	53	43
16/05/2024 02:15	0:15:00	78	56	44
16/05/2024 02:30	0:15:00	70	57	46
16/05/2024 02:45	0:15:00	69	51	45
16/05/2024 13:00	0:15:00	79	49	45
16/05/2024 13:15	0:15:00	82	56	51
16/05/2024 13:30	0:15:00	77	58	51
16/05/2024 13:45	0:15:00	78	63	53
16/05/2024 14:00	0:15:00	78	58	50
16/05/2024 14:15	0:15:00	79	56	50
16/05/2024 14:30	0:15:00	80	57	51
16/05/2024 14:45	0:15:00	78	55	49

Reference internal noise levels at existing Adult Gaming Centre, 3 Seven Sisters Road, London

Equipment: Brüel & Kjær 2250 Type 1 Sound Analyser (serial no. 3011626) with tripod and windshield
Date: Thursday 29th November 2018

All levels in dB re 20 µPa.

Table A3: Measured internal noise levels (dB)

Location	Time start	Time end	$L_{Amax,f}$	$L_{Aeq,5mins}$	$L_{A90,5mins}$
Gaming Area	18:45	18:50	78	66	60
	18:50	18:55	91	68	61
	18:55	19:00	89	67	61
	19:00	19:05	81	65	61
	19:05	19:10	72	64	60
	19:10	19:15	77	61	57
	19:15	19:20	90	65	60
	19:20	19:25	82	66	62
	19:25	19:30	77	68	60
	19:30	19:35	79	63	58
	19:35	19:40	82	64	61
	19:40	19:45	80	64	60

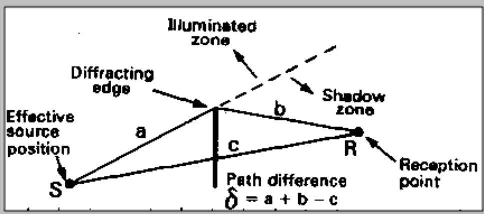
Appendix III: Barrier Calculation

Barrier Attenuation	h (Source)	h(Receiver)	h(Barrier)	d(S-B)	d(B-R)	d(S-B-R)	d(SBR)	d(SR)
	4.5	42.0	9.0	1.0	11.0	12.0	39.39	39.37

a	b	c	Path Diff	Log
4.61	34.79	39.37	0.021612	-1.67E+00

Frequency (Hz)	500	h(S)-H(R)	h(S)-H(R)/SBR	Theta	h(min shadow)	Zone
Speed (c)	344	37.5	3.125	1.261093	7.625	Shadow

		Freq Hz		Barrier Correction dB
Fresnel	At Frequency (Hz)			-6.3
Octave Band		63		-5.0
		125	BS5228	-5.2
		250		-5.6
		500		-6.3
		1000		-7.4
		2000		-9.0
		4000		-11.2
		8000		-13.6



Minimum mass kg/m²	10.0

	BS5228								
	63	125	250	500	1k	2k	4k	8k	A
Fresnel/BS5228	-5	-5	-6	-6	-7	-9	-11	-14	-8