hepworth acoustics

PUSS IN BOOTS, MACCLESFIELD

NOISE IMPACT ASSESSMENT

On behalf of:

Stonegate Pub Company Ltd

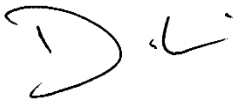
Report No: P23-191-R01v1
June 2023

PUSS IN BOOTS, MACCLESFIELD

NOISE IMPACT ASSESSMENT

Report prepared by:
Hepworth Acoustics Ltd
21 Little Peter Street
Manchester
M15 4PS

On behalf of:
Stonegate Pub Company Ltd

Report prepared by: David Thurstan BSc MIOA – Principal Consultant	
Report checked by: Donald Quinn BSc FIOA – Managing Director	

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1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd was commissioned by Stonegate Pub Company Limited to carry out an investigation into noise break out from the Puss in Boots Public House, Macclesfield during live music events. The assessment has been requested following receipt of complaints about the noise and a proposed licence review.

1.2 The premises are located off Burton Road, to the east of the adjacent to the canal. The main building fronts onto Burton Road, housing the bar and main trading area. Towards the rear of the premises is further seating and a function room. There is also access to the beer garden to the southeast and a door leading to the tow path via a stairwell. The kitchen area is also accessed off the function room. Access to the beer garden is not permitted after 21:00 hours.

1.3 The premises is surrounded by dwellings to the east and south. It is understood that the complainant's property is at 21 Roan Mews, which although is not the closest dwelling to the premises, it does overlook the function room.

1.4 The premises building is of traditional masonry construction and there are a number of single glazed windows in the facades.

1.5 The noise assessment has included:

- An inspection of the public house and surrounding area;
- Measurement of the sound insulation performance of the building envelope;
- Measurement of noise levels within the premises and dwelling during a busy trading period with live music (i.e. Saturday night);
- Commenting on the feasibility of noise control measures to adequately control the impact of live music on the adjoining dwelling.

1.6 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.

1.7 The advice and recommendations provided in this report have been made with respect to acoustics only, all other considerations (e.g. structural, fire and ventilation, etc.) will need to be reviewed by other engineers/consultants in the relevant field.

2.0 HISTORY AND GUIDANCE

History

2.1 We understand that complaints about noise, along with certain other issues unrelated to noise, has led to a licence review, with the associated hearing anticipated in the near future.

2.2 Generally, only one to two events are held per month in the function room, which can range from live bands to private parties. The live music is provided by a number of cover bands (with live acoustic drums), solo performers (with backing tracks) or DJs. The music is amplified via the artists' own PA systems.

2.3 The premises licence permits live music events until 23:00 hours seven days a week. However, it is understood that prior to events within the function room, an extension of hours to 00:00 hours is requested from the local authority under the Temporary Events Notice (TEN) procedure. In spite of this, we were informed that the Landlord ensures that the bands finish for each extended event at around 23:40 hours to help in the dispersal of customers after the event.

2.4 Following the complaints about noise the Landlord has made some improvements to the sound insulation of the function room area, these include:

- Lining/blocking-up the rear window in the function room with 2 layers of Gyproc SoundBloc plasterboard;
- Lining/Blocking-up the vent in the function room rear elevation with 1 layer of Gyproc SoundBloc plasterboard;
- Lining/blocking-up the round window facing the tow path with rigid insulation.

2.5 These measures will assist to some extent in reducing noise break out during live music events from the premises.

Guidance

Noise from Pubs and Clubs

2.1 There is no universally adopted method for assessment of noise impact from entertainment premises, such as breakout of music from community public houses, upon nearby residents and

Cheshire East Council does not provide guidance nor limits specific to the control of noise from existing entertainment premises.

2.2 There are a number of documents which refer to entertainment noise such as IOA 'Good Practice Guide on the Control of Noise from Pubs and Clubs' 2003, NANR92:2005 'Noise from Pubs and Clubs' and an article in Institute of Acoustics Acoustic Bulletin dated Nov/Dec 2003. NANR92 does show examples of the use of Noise Rating Curves to provide a design criterion, with one particular example from Sheffield City Council recommending night-time noise (i.e. 23:00 to 07:00 hours) is controlled to NR25 dB in bedrooms.

NANR45

2.3 NANR45:2011 'Procedure for the assessment of low frequency noise disturbance' describes field trials carried out in an effort to determine a procedure for assessing low frequency noise. The assessment is based on whether the measured levels of low frequency noise exceed a reference curve in third octave bands from 10 Hz to 160 Hz inside dwellings.

2.4 However, for the purposes of assessing low frequency music noise (e.g. from bass and bass drum beats), it is generally more practical to consider the 63 Hz and 125 Hz octave bands given that sound insulation data for building elements is only typically available in the range of 63 Hz or 125 Hz to 4 kHz octave bands.

2.5 The corresponding NANR45 reference curve values in the 63 Hz and 125 Hz octave bands are 47 and 41 dB $L_{eq,T}$ respectively. It is worth noting that these noise levels have been implemented as noise limits for inside habitable rooms of dwellings by Local Authorities for the control of music/entertainment noise, for example Manchester City Council.

BS 8233:2014

2.6 British Standard 8233: 2014, 'Guidance on sound insulation and noise reduction for buildings' is a wide-ranging British Standard which provides guidance on appropriate noise levels in a range of different building types including dwellings. BS 8233 recommends that it is desirable that noise from external sources does not exceed the guidelines values that are shown in Table 1 inside habitable rooms for daytime (07:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) periods.

Table 1: BS 8233:2014 recommended acoustic design criteria (dB $L_{Aeq,T}$)

Activity	Location	Daytime 07:00 – 23:00 hours	Night-time 23:00 – 07:00 hours
Resting	Living room	35	-
Dining	Dining room/area	40	-
Sleeping (daytime resting)	Bedroom	35	30

2.7 It is however noted that the design criteria set out in Table 1 relate to noise without any specific character. Where the noise under consideration does have characteristics that make it potentially more intrusive, lower noise criteria may be appropriate.

3.0 NOISE BREAKOUT TESTING & LIVE MUSIC EVENT NOISE SURVEY

Noise Breakout Testing

3.1 Façade noise breakout testing, and sound level difference testing, was carried out during a site visit made on Friday 5 May 2023. The purpose of this testing was to establish the existing sound insulation performance of the function space building envelope and to assist in identifying any acoustic weaknesses.

3.2 The acoustic testing was carried out by generating high levels of pink noise directly within the premises function space using a sound source and loudspeaker. The resulting source noise levels were then measured in the space and the corresponding transmitted noise levels were measured directly outside the premises. The acoustic testing was taken as a series of short term third octave band noise measurements.

3.3 The noise measurements were carried out with a Bruel & Kjaer 2260 'Type 1' Sound Level Meter (serial no. 02467016). Calibration checks were carried out both before and after the measurement periods with no variance in levels noted.

3.4 Using the results of the noise measurements, it has been possible to calculate the existing level of sound insulation of the building façade as follows:

Table 2: Calculated sound level difference values (dB)

Description	Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Sound level difference	34	50	56	53	47	50	62

3.5 The sound level difference values shown in Table 2 indicate a good overall performance from the building envelope, which will also include attenuation over distance. The existing sound insulation improvements will have helped to reduce noise break out, however it was noted that the single glazed bay window on the tow path elevation was observed to be an acoustically weak point in the building envelope.

Live Music Event Noise Survey

3.6 A noise survey was undertaken on a busy Saturday evening/night to measure live music noise levels within the building and corresponding noise break out from the premises at the dwelling to the rear.

The noise measurements were undertaken when a live band was playing. The noise survey was carried out on Saturday 3 June 2023. Calibration checks were carried out both before and after the measurement periods with no variance in levels noted. Frequency analysis was also carried out.

3.7 During the noise measurements, the band performing included live drums, and the vocals were through the band's own PA system with bass/guitars going through independent amplifiers. The results of the noise measurements carried out within the premises are summarised in Table 3 below.

Table 3: Measured internal noise levels during live band (dB L_{eq})

Description	Octave band centre frequency (Hz)							A
	63	125	250	500	1k	2k	4k	
Live band, L_{eq}	98	101	93	93	92	87	83	95

3.8 The external noise measurements were taken in 'free-field' conditions and at a microphone height of approximately 1.4m above the ground. The weather conditions during the noise survey were suitable for the purposes of the survey and subsequent assessment.

3.9 The results of the external noise survey are summarised in Table 4, and the full results along with details of the equipment used, and the weather conditions during the survey periods, are shown in Appendix II.

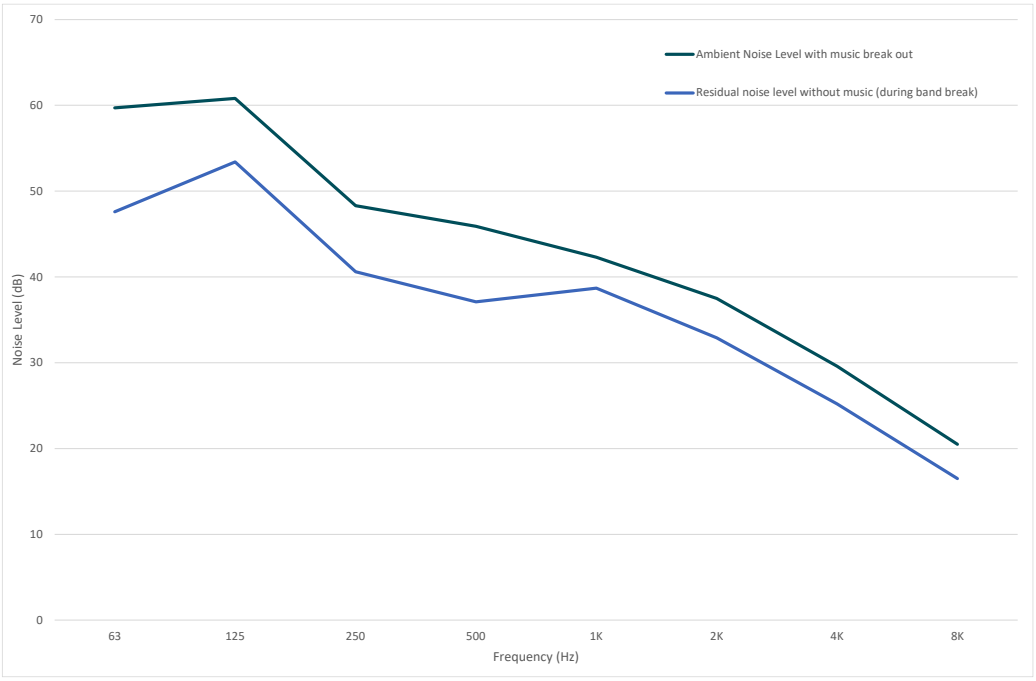
Table 4: Summary of Measured Noise Levels (dB)

Location	$L_{Aeq,5\ min}$	$L_{A90,5\ min}$
Adjacent to 21 Roan Mews	42 – 51	37 – 46

3.10 During the survey music noise break out from premises was audible at the measurement location. There was also noise from road traffic on Buxton Road. Although, the beer garden on the tow path is closed after 21:00, during the evening the door leading to the towpath beer garden via a stairwell was opened a number of times and some customers. People would congregate on the stairwell to smoke.

3.11 The band played until just before 22:00 hours, when they had a short 20 minute break, the band concluded just after 23:40 hours. The average ambient noise level was 49 dB $L_{Aeq,T}$ during periods with live music, with the corresponding residual noise level during the band break between 22:00 and 22:20 being 44 dB $L_{Aeq,T}$. Chart 1 overleaf shows the measured octave band noise levels with and without live music. The residual noise levels (in the absence of the live music were taken during the band break between 22:00 and 22:20.

Chart 1: Measured octave band noise levels outside 21 Roan Mews with/without live music (dB)



3.12 As indicated in Chart 1, low frequency music noise break out was prominent above the residual noise level, it was noted during the survey that this was mainly due to music noise break-out via the single glazed bay window. It was also noted that noise break-out in the 125 Hz octave band was more prominent than would be expected given the results of our noise break-out testing and the measurements of live music noise levels inside the building. This was possibly due to the precise set-up and orientation of the band's PA system.

3.13 Noise levels in the 1 kHz and higher octave bands were not significantly different during periods with and without live music which indicates that high frequency noise break-out is not significant. By logarithmically subtracting the measured residual octave band noise levels (those measured in the absence of the live music) from those measured during live music, it is possible to calculate the contribution from live music alone as shown in Table 5 overleaf.

Table 5: Calculation of contribution from live music to noise levels outside 21 Roan Mews (dB L_{eq})

Description	Octave band centre frequency (Hz)							A
	63	125	250	500	1k	2k	4k	
a) Measured noise levels during live music	60	61	48	46	42	38	30	49
b) Measured noise levels without live music	51	53	43	40	40	35	29	44
c) Calculated contribution from live music (a – b)	59	60	47	45	38	34	16	48

4.0 NOISE ASSESSMENT & RECOMMENDATIONS

4.1 Taking into account the measured/calculated live music noise levels outside 21 Roan Mews (as set out in Table 5) and applying a correction for the outside to inside sound insulation that would be provided by a typical residential dwelling with a window partially open for ventilation, we have calculated the likely corresponding noise levels within habitable rooms at the dwelling. The calculation is based on a Research Study conducted for 'Department for Environment, Food and Rural Affairs (Defra) – NANR116: 2007 Open-Closed Window Research'.

Table 5: Calculated music noise level inside habitable rooms at 21 Roan Mews glazing (dB)

Description	Octave Band Centre Frequency (Hz)							A
	63	125	250	500	1k	2k	4k	
a) Measured/Calculated noise level outside dwelling during live music (L_{eq})	59	60	47	45	38	34	16	48
b) Outside to inside sound level difference with partially open window (from NANR116)	23	17	19	20	16	21	23	
c) Resulting noise level inside dwelling (L_{eq}) (a – b)	36	43	28	25	22	13	-7	30

4.2 Table 5 indicates that the likely live music noise levels within 21 Roan Mews are equivalent to 30 dB $L_{Aeq,T}$. This is equal to the recommended noise level for bedrooms at night as set out in BS 8233, although as mentioned in Section 2 this criterion is for noise without character. It is however noted that the calculated noise level in the 125 Hz octave band is 4 dB above the reference level as set out in NANR45 which is often used to determine the acceptability of entertainment noise. We therefore recommend that some reduction in live music noise is warranted.

4.3 As set out in Section 3, the dominant noise transmission path between the function room and 21 Roan Mews was via the single glazed bay window. We therefore recommended that this should be the focus for sound insulation enhancements.

4.4 We recommend that the existing window is upgraded with the addition of a new inner window to form a secondary glazing system. A new standard thermal double glazed window with solid timber frames could be accommodated by enclosing the large bay sill with a new double glazed window unit forming a large cavity between the existing outer window and new inner window.

4.5 Table 6 indicates what reduction in live music noise break-out via the bay window would be expected as a result of the installation of secondary glazing:

Table 6: Calculated noise levels outside 21 Roan Mews with installation of secondary glazing (dB)

Description	Octave Band Centre Frequency (Hz)							A
	63	125	250	500	1k	2k	4k	
a) Measured/Calculated noise level outside dwelling during live music (L_{eq})	59	60	47	45	38	34	16	48
b) Change in sound insulation performance from the inclusion of secondary glazing	7	6	12	16	23	19	24	
c) Resulting noise level inside dwelling (L_{eq}) (a – b)	52	54	35	29	15	15	-8	39

4.6 Table 7 then considers these improvements in sound insulation calculating the noise break in to the dwelling via an open window. The calculations assume a partially open window at the dwelling. The octave band values are based on a Research Study conducted for 'Department for Environment, Food and Rural Affairs (Defra) - NANR116: 2007 Open-Closed Window Research'.

Table 7: Calculated music noise level inside habitable rooms at 21 Roan Mews glazing (dB)

Description	Octave Band Centre Frequency (Hz)							A
	63	125	250	500	1k	2k	4k	
a) Calculated noise level outside dwelling during live music (L_{eq})	52	54	35	29	15	15	-8	39
b) Outside to inside sound level difference with partially open window (from NANR116)	23	17	19	20	16	21	23	
c) Resulting noise level inside dwelling (L_{eq}) (a – b)	29	37	16	9	-1	-6	-31	21

4.7 These octave band noise levels would be below a noise rating curve of 17 dB NR and would be below the criteria for assessing low frequency music noise in the 63 and 125 Hz octave bands as set out in Section 2 of this report.

4.8 On completion of the sound insulation enhancement works to the bay window, may highlight other acoustic weakness' in the building envelope which were previously masked by the break out via the bay window. Therefore, any remaining shortfall in sound insulation could be offset where necessary using a suitable electronic music noise limiter.

4.9 During the survey it was noted that the door to the stairwell leading to the tow path was opened a number of times during the evening. It is therefore recommended that this better managed by the Landlord possibly including signs on the door notifying customers to use another exit.

5.0 SUMMARY

5.1 Hepworth Acoustics Ltd was commissioned by Stonegate Pub Company Ltd to carry out an assessment of the noise impact associated with live music at the Puss in Boots public house in Macclesfield. The assessment has been requested in connection with a noise complaint made by the resident of a dwelling to the rear of the premises.

5.2 The assessment has involved an inspection of the premises; carrying out sound level difference testing of the building envelope; and noise measurements both in the premises and outside the dwelling during a busy trading period which included live music.

5.3 Based upon the findings of our noise measurements and observations, we have concluded that a reduction in low frequency live music noise break-out from the premises is warranted.

5.4 We have made recommendations to achieve the warranted reduction in noise. Following completion of the sound insulation enhancement works, any remaining shortfall in sound insulation could be offset where necessary using a suitable electronic music noise limiter.

Key:

Not to scale

- Noise Measurement Position

- Approximate Building Outline

- Approximate Function Room Location

N

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Title: Figure 1: Site Location & Noise Measurement Position

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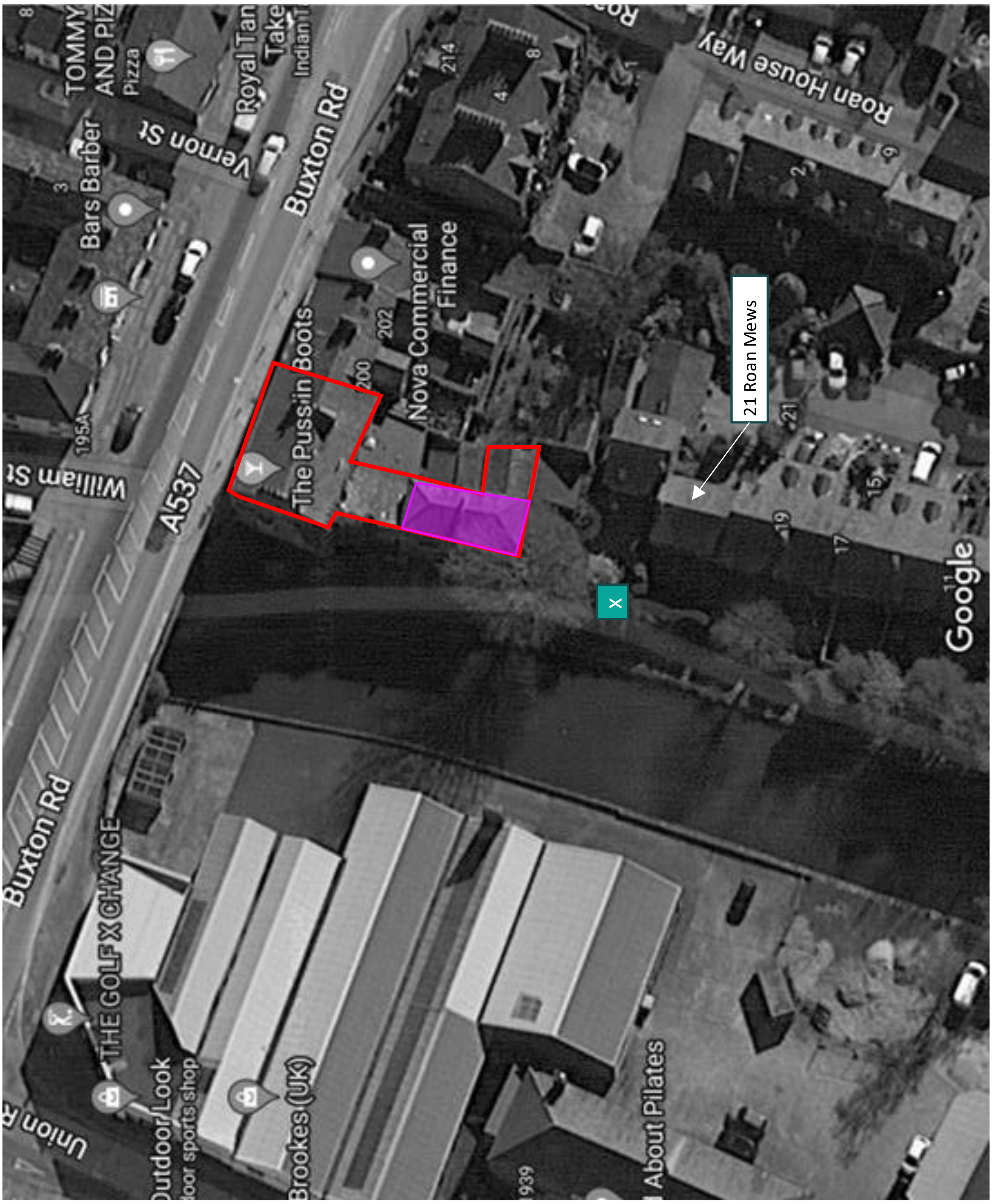

Appendix I: Noise Units & Indices

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 120dB (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

When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices can be used. The indices used in this report are described below.

C_{tr} This is an A-weighted urban traffic noise spectrum, which can be added to $D_{nT,w}$ or R_w in some standards to take into account different source spectra such as low frequency sound.

R This is the 'Sound Reduction Index' as measured in a laboratory, and is a measure of the sound insulation properties of an building element in a stated frequency band.

R_w This is the 'Weighted Sound Reduction Index', and is a single figure quantity of R, the laboratory measured Sound Reduction Index.

D This is the Level Difference and is a field measurement of the airborne sound insulation between adjacent spaces. As well as being field measurement, this term and all other D terms below therefore include on-site conditions other than direction noise transmission through, for example, a wall (flanking transmission).

$L_{Aeq,T}$ This is the A–weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. 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_{AFmax} This is the maximum A–weighted noise level that was recorded during the measurement period in terms of 'Fast' time weighting.

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

Appendix II: Noise Survey Results

Date(s):	Saturday 3 June 2023
Equipment	B&K 2260 'Type 1' sound analyser (serial no. 2467016) with tripod and associated calibrator
Weather	Dry, ~14-16°C, clear skies and calm <2 m/s

All levels in dB(A)

Location : On towpath adjacent to 21 Roan Mews

Time		Measured Noise Levels (dB)			Comments
Start	End	L_{AFmax}	$L_{Aeq,T}$	$L_{A90,T}$	
21:24	21:29	60.8	48.4	44.2	Music break out from premises, road traffic on Buxton Road
21:29	21:34	60.7	49.1	43.4	Music break out from premises, road traffic on Buxton Road
21:35	21:40	61.8	50.3	45.8	Music break out from premises, door open, people smoking on stairwell, road traffic on Buxton Road
21:41	21:46	61.7	50.8	45.2	Music break out from premises, door open, people smoking on stairwell, road traffic on Buxton Road
21:55	21:58	57.1	49.2	44.2	Music break out from premises, road traffic on Buxton Road
21:59	22:04	60.1	44.9	40.6	Band on break (no music break out), road traffic on Buxton Road
22:04	22:09	54.6	43.5	38.4	Band on break (no music break out), road traffic on Buxton Road
22:09	22:14	65.1	46.5	37.2	Band on break (no music break out), road traffic on Buxton Road
22:15	22:20	54.4	42.8	36.6	Band on break (no music break out), road traffic on Buxton Road
22:20	22:25	55.8	47.7	38.6	Music break out from premises, road traffic on Buxton Road
22:25	22:30	61.7	49.3	43.6	Music break out from premises, door open, people smoking on stairwell with raised voices, road traffic on Buxton Road
22:30	22:35	62.1	50.4	42.8	Music break out from premises, door open, people smoking on stairwell, occasional road traffic on Buxton Road
22:35	22:40	55.1	47.5	42.6	Music break out from premises, occasional road traffic on Buxton Road
22:45	22:50	63.5	47.9	41.4	Music break out from premises, occasional road traffic on Buxton Road
22:50	22:55	60.4	49.2	43.8	Music break out from premises, door open, people smoking on stairwell, occasional road traffic on Buxton Road
22:57	23:02	60.8	47.6	40.4	Music break out from premises, occasional road traffic on Buxton Road
23:02	23:07	54.1	46.5	41.0	Music break out from premises, occasional road traffic on Buxton Road

23:07	23:12	60.8	48.9	43.8	Music break out from premises, occasional road traffic on Buxton Road
23:12	23:17	63.4	48.9	40.2	Music break out from premises, door open, people smoking on stairwell, occasional road traffic on Buxton Road
23:17	23:22	62.8	48.3	37.6	Music break out from premises, occasional road traffic on Buxton Road
23:22	23:27	55.1	47.7	42.4	Music break out from premises, occasional road traffic on Buxton Road
23:30	23:35	53.6	46.4	39.2	Music break out from premises, occasional road traffic on Buxton Road
23:35	23:40	57.9	47.1	39.0	Music break out from premises, occasional road traffic on Buxton Road
23:41	23:46	49.6	42.4	39.4	Band finished (no music break out), occasional road traffic on Buxton Road