14 Stanley Street, Blyth

Noise Impact and Mitigation Assessment

NCC Planning Ref : 22/04045/PA

Change of use of First Floor from Office (B1) to 1-bedroom flat (C3)

Client: Dave Harland
Agent:
Distribution: Northumberland County Council; Dave Harland
Start date: March 2023

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Summary : Client seeks residential use on first floor.
Front of property is Living Room, 2 sash windows. Directly opposite established nightclub

Authority : Northumberland County Council
Planning Officer : Michael Waddell
Environmental Health Officer : Alex Wall

CONTENTS

1. The Property

1.1 The property on two floors, near the centre of a terrace of traditional brick-built dwellings in a district of Blyth town centre comprising many such terraces. Although most of these terraces remain almost entirely residential, this property is at the north most end of one of these terraces, where it appears that all addresses on this block, on both sides of the road, are now commercial. The properties on either side are occupied by businesses and the property directly opposite is a long-standing night club, generally trading at weekends only.

1.2 The ground floor of the property operates as a delicatessen shop and kitchen, with an internal door separating it from the upper floor, which is available to the operators for storage and uses ancillary to the shop and kitchen. To the rear stands a 3-storey residential care home for elderly residents. The top (north) of the block borders the town centre and Market Square with bus station nearby.

Fig. 1 view of the property (with dark grey-blue front door) in Stanley Street, Blyth.

The current application is made by the owners of the property. The application seeks to revert the upper floor to residential use, for occupation by one of the deli operators.

1.3 The front of the upper floor comprises just one room, with a door from the corridor and stairwell. There are two original sash windows to the front, looking out onto the street and the night club opposite. The original fireplace has been sealed up. To the rear are a bedroom, and in the offshoot, a kitchen and bathroom (see plans provided with the application)

Fig. 2 view of the night club situated opposite the property in Stanley Street, Blyth.

1.4 Characteristics of the front room of the first floor property :-

Room is a simple rectangle. Walls and ceiling are plastered
Two identical sash windows – retracting blinds, no curtains
Bare floor boards
1 Sold timer panelled door (half-hour fire resistant)

Contents: Minimal furnishing, with hard surfaces excl one soft sofa, many cardboard boxes and plastic storage containers.

Room dims = 6.779 (l) x 4.251 (w) x 2.811 (h)
Volume = 81.01 m^3
2x sidewalls = 38.11 m^2
2x end walls = 23.9 m^2
ceiling + floor = 57.63 m^2
total surface area = 119.64 m^2

Windows
Surface area each pane = 0.778 m^2
Surface area all 4 panes = 3.112 m^2
Existing glazing spec : not certain, apparently 2.2mm or 3mm float glass in upper pane of each window, and 6.4mm laminated glass in lower panes.

Door
Door surface area = ca. 1.7m^2

1.5 Measured Reverberation Time T20 at 1kHz = 0.68sec ; at 250Hz = 0.80sec.

(**Note** Reverberation time in a small room is likely to fail to satisfy the requirement for a well-mixed reverberant sound field, measured beyond the ‘critical distance’, (Dc), where the level of reflected sound exceeds that of direct sound.).

2. Assessment Criteria

2.1 **BS8233:2014** *Guidance on sound insulation and noise reduction for buildings*

2.1.1 This Standard specifies indoor noise levels for residential properties
The 2014 version of BS8233 brings the design criteria more into line with World Health Organisation (WHO) guidelines. The revised levels in internal noise criteria are summarised below :

Table 4 **Indoor ambient noise levels for dwellings**

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)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

2.1.2 The Standard also refers to a maximum number of short-term noise events – LAFMax
The limit of 45dB L_{AFMax} inside bedrooms caused by short term noise peaks (e.g. aircraft over-flights or train passes) is removed in the 2014 update of BS8233. This is a relaxation in criteria, although, the 2014 standard does contain the caveat:

> **NOTE 4** regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,P}$ depending on the character and number of events per night. Sporadic noise events could require separate values.

Consequently, this Note may be taken to retain the option to apply the 45dB L_{AFMax} criterion.

2.1.3 Noise in external amenity areas.
The property’s only external amenity area is the paved rear yard, shared with, and predominantly used by, the delicatessen shop & kitchen on the ground floor. It is not considered that this area constitutes an ‘amenity’, and certainly does not lend itself to any leisure or comfort in the nighttime when the club is operating.

2.2 Noise Rating curve

Noise Rating Curves have been developed by the International Organisation for Standards and present noise level criteria across the frequency spectrum as specified in ISO 1996-1
Noise rating curves provide a useful alternative to BS8233 by specifying limits within frequency bands. Particularly effective in locations where unwanted noise is dominant in some frequency bands.
NR30 is widely adopted as the standard to be achieved in residential properties, with NR35 being accepted in flats and busy urban environments.
NR25 is considered to offer and exceptionally good standard of amenity.
NR40 is reasonable within the connecting hallways of a property.

(**NOTE** The numerical part of the name of an NR curve corresponds to the noise level at 1kHz.)

2.3 **BS4142:2014** *Methods for Rating and Assessing Commercial and Industrial Noise*.

This standard specifically disapplies itself from the assessment of music noise or other entertainment, but does provide a useful framework for assessing the subjective impact of an unwanted noise. (*Scope* **S 1.3**)
In this context, the 'specific noise' would be noise when the nightclub is operating ; the 'background noise' would be noise when the nightclub is not operating. (i.e. the comparison between a weekend and midweek evening)

In this report, we will look at a BS4142 assessment of specific relative to background noise, both externally and internally.
The external assessment will consider street noise over the two contrasting time periods, and the internal assessment will consider the living room noise over a similar two time periods.

2.4 **Audio characteristics** :

The frequency spectrum of an unwanted noise has the potential to include features and characteristics that are associated with annoyance. These are identified in the BS4142 procedure both as "character corrections" and "penalties".
However, there are other characteristics which are associated with noise disturbance of a more subjective nature, not all measureable by standard acoustic procedures, and these will also be considered.

2.5 **Other properties in the vicinity**

The residential home to the rear (due west) is approx. 40mtrs from the *DejaVu* night club largely shielded from noise in Stanley Street by the properties along the west side of the Street.
The nearest residential property in Stanley Street is at the north end of the next block, on the west side, approx. 40mtrs from the *DejaVu* night club, tho exposed to noise in the Street, either directly, or through reflective transmission between the terraces.

Due to the distances involved, although not great, it has not been considered helpful to survey those other residential properties, nor to seek any historic records of nuisance or disturbance.

2.6 Representations received.

Two representations have been received by the Local Planning Authority.
One from a statutory consultee, the Local Environmental Health Department of the Authority, and one from the owner / operator of the nightclub directly opposite the property on Stanley Street.
Both of these are included in this report in **Appendix B**.
Both of these are considered to be fair and appropriate observations and raise legitimate concerns.
The points raised in these will be addressed in this report.

2.7 Planning Guidance

Two significant contributors to the assessment of this application will be the National Planning Policy Framework (NPPF) and the Professional Planning Guidance on Planning and Noise (ProPG).

The most significant section of the NPPF would appear to be the ‘Agent of Change’ principle, which will be considered in **Section 4.1**.

The ProPG, while not adopted as Standard, offers relevant guidance for new build residences which merits consideration in the present assessment. This will be given consideration in **Section 4.4**.

2.8 EHO’s suggested outline criteria for this assessment :

During an initial discussion between myself and the relevant Environmental Health Officer, and looking at the particular challenges of this application for a Change of Use, the following suggestions were proposed :-

- Consider multiple weekend’s noise data (incl bank holiday if possible)
- Quantify ‘worst-case’
- Satisfy BS8233 (35dB $L_{Aeq(8hrs)}$) internally
- Satisfy BS4142 (ambient level will have to be a night when club closed)
- Poss FFT to determine peak intrusion freqs.
- Mitigation design and carefully assess its efficacy.

2.9 Assumptions & Limitations

a. It is assumed that the sound pressure levels and acoustic characteristics measured on site during the environmental noise surveys are typical of the acoustic environment at the property. In the future, there may be dates on which noise levels vary from those measured, and other times of day or days of the week on which the nightclub operates.

b. It is assumed that the technical data provided by glazing manufacturers and construction industry sources is accurate and repeatable.

c. The analyses which use integrated noise level measurements (BS8233, NR curves and BS4142) will generally fail to capture peak noise levels which may at times be significantly louder, and have the potential to be audible within the property when the integrated data suggests that they would not. These peaks will be assessed on the evidence obtained.

d. The suggested sound insulation mitigation scheme specifications have looked at the expected individual separating window elements’ performance for planning purposes, while consideration during construction will have to consider flanking conditions (sound bypassing the separating elements via other elements) to ensure the predicted results are not reduced.

e. This report does not consider noise ingress through walls or external doors etc.

f. This report does not consider sound transmission between adjacent residential dwellings within the vicinity, and only deals with the sound insulation performance between the nightclub and its associated activities, before and after its periods of operation, and the proposed conversion to residence.

g. All suggested specifications require a good level of workmanship and for materials to be installed as the manufacture intends. Any poor workmanship may lead to weaknesses in the sound attenuation provided by the building façade.

3. Acoustic Performance of Existing Windows

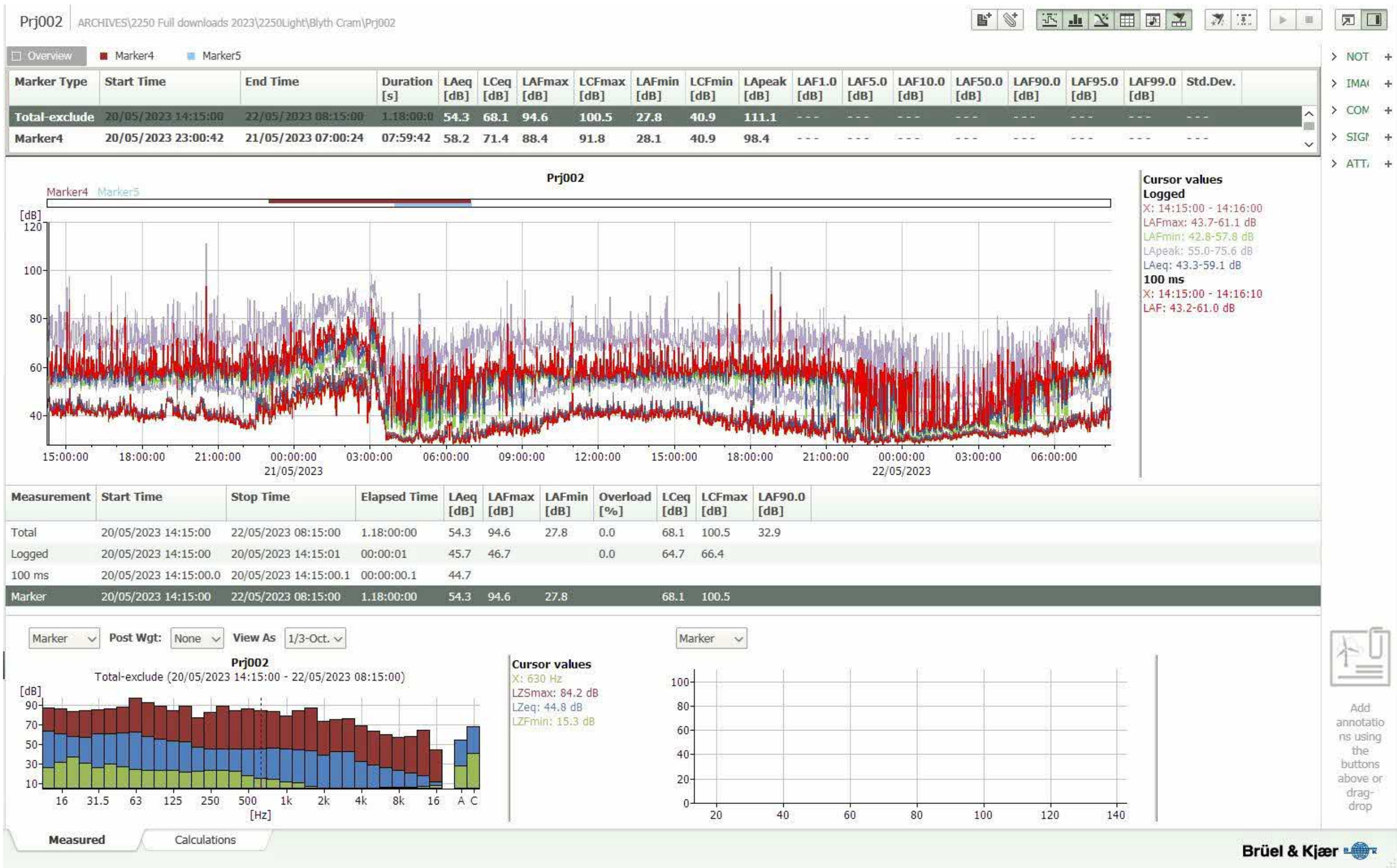
3.1 This section will examine the acoustic environment including exceptionally loud incidents on night while the night club is operating, and the performance of the existing front room windows in the context of that environment.

The two living room windows comprise 6.4mm laminated glass in their lower pane, and the original glass (poss 2.5 or 3mm) in their upper panes.

3.2 Environmental Noise

Measurements were made of the external noise levels outside the first floor windows over a few days.

Fig 1. Profile of street noise logged from a Saturday afternoon through to a Monday morning, measured outside one of the first floor front windows.



These plots clearly show the increased activity in the vicinity from 10pm to 4am on the Saturday night. A distinct ‘peak’ in street noise is apparent immediately after the nightclub stops trading at 3am. That can be contrasted with the same period on the Sunday night (when the *Déjà Vu* night club was closed).

The Sunday night noise is dominated by vehicles passing through the Town Centre, where bridge Street passes the end of Stanley Street just 65 mtrs to the north of the property.

3.3 Indoor Noise Levels

Indoor noise levels during night time over a Friday and Saturday night

Table 1-a 15minute integrated measurements 22:00hrs on Fri 19 to 06:00 on Sat 20/May/23

		Time period (start time of 15 minute measurement periods)															
		Internal noise levels (dB)															
	Time	22:00	22:15	22:30	22:45	23:00	23:15	23:30	23:45	00:00	00:15	00:30	00:45	01:00	01:15	01:30	01:45
	LAeq	23.3	24.4	25.3	24.6	24.0	24.0	25.6	27.7	30.0	30.8	30.0	31.6	33.1	32.6	33.1	36.2
	LAf90		n/a														

		Time period (start time of 15 minute measurement periods)															
		Internal noise levels (dB)															
	Time	02:00	02:15	02:30	02:45	03:00	03:15	03:30	03:45	04:00	04:15	04:30	04:45	05:00	05:15	05:30	05:45
	LAeq	34.5	34.3	34.8	32.3	38.3	39.6	39.2	20.7	20.8	25.6	26.6	21.0	20.1	39.6	27.1	21.3
	LAf90		n/a														

Overall nighttime LAeq = 33.3dB

Table 1-b 15minute integrated measurements 22:00hrs on Sat 20 to 06:00 on Sun 21/May/23

		Time period (start time of 15 minute measurement periods)															
		Internal noise levels (dB)															
	Time	22:00	22:15	22:30	22:45	23:00	23:15	23:30	23:45	00:00	00:15	00:30	00:45	01:00	01:15	01:30	01:45
	LAeq	27.2	32.1	2828	28.5	31.0	31.6	32.1	34.0	35.3	24.1	33.0	37.2	38.2	40.5	38.1	36.3
	LAf90	20.4	19.6	23.5	23.5	23.0	27.2	27.6	26.9	30.6	29.9	29.7	30.9	32.0	33.2	31.1	31.9

		Time period (start time of 15 minute measurement periods)															
		Internal noise levels (dB)															
	Time	02:00	02:15	02:30	02:45	03:00	03:15	03:30	03:45	04:00	04:15	04:30	04:45	05:00	05:15	05:30	05:45
	LAeq	40.1	40.4	37.2	35.7	44.3	35.4	26.2	22.9	28.7	25.1	25.8	30.4	29.2	22.6	34.2	21.5
	LAf90	34.6	34.2	32.2	27.7	36.8	24.2	18.8	19.3	18.0	17.9	17.4	18.6	19.2	18.0	18.6	18.7

Overall nighttime LAeq = 35.2dB Overall nighttime LAf90 = 19.0dB.

Fig 1-c. logged internal noise levels from 19:50 on night of Fri 19 to 13:50hrs on Sat 20/May/23

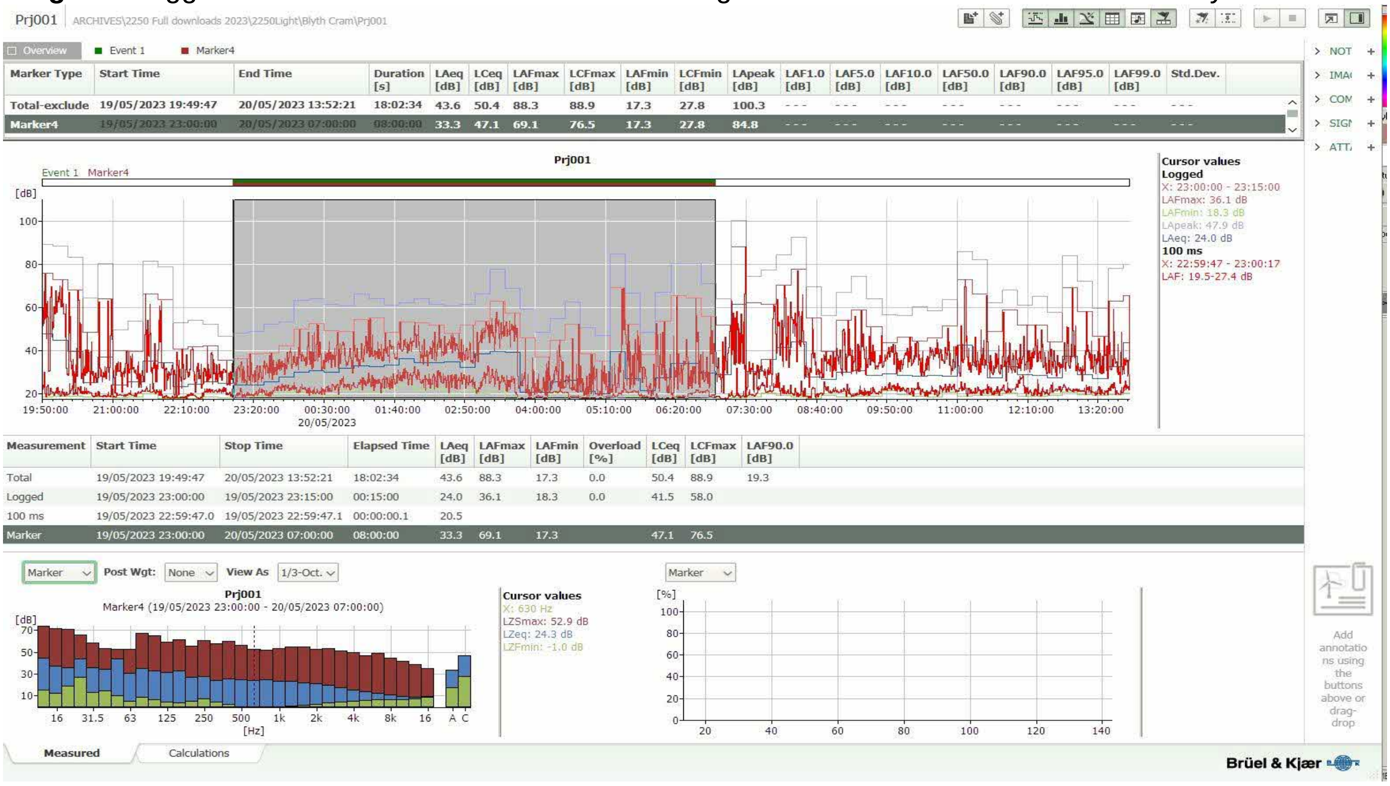


Table 1-d. Internal noise levels- 23:00hrs on Fri 19/May to 05:15hrs on Sat 20/May

	Time period (start time of 15 minute measurement periods)																									
	23:00				00:00				01:00				02:00				03:00				04:00				05:00	
	Internal noise levels (dB)																									
LAeq	24.0	24.0	25.6	27.7	30.0	30.8	30.0	31.6	33.1	32.6	33.1	36.2	34.5	34.3	34.8	32.3	38.3	39.6	39.2	20.7	20.8	25.6	26.2	21.0	20.1	
LAmax	36.1	38.5	38.9	42.2	50.0	52.7	49.0	48.9	54.2	55.1	48.5	53.3	53.0	52.0	48.0	51.7	53.8	62.9	57.4	45.8	36.9	44.9	52.3	38.6	35.0	
40Hz	31.7	31.1	31.3	32.5	28.6	30.3	30.4	32.4	32.7	32.9	36.4	34.8	36.7	44.0	37.3	34.7	32.9	31.6	27.3	26.0	26.8	32.6	28.6	28.8	29.5	
50Hz	37.4	37.5	44.5	48.2	36.0	34.1	36.6	47.6	46.3	40.4	40.3	45.7	49.1	42.9	41.9	43.0	47.8	46.4	33.2	27.4	41.1	48.4	43.0	33.2	33.9	
63Hz	26.9	28.6	28.2	29.4	28.7	29.5	30.4	34.0	32.0	34.8	34.0	35.3	34.2	34.9	35.4	35.6	27.6	26.0	17.5	13.7	20.4	26.3	21.6	18.4	16.8	

The graph of Friday night – Sat morning in **Table 1-C** (above) provides an excellent illustration of the elevated noise levels in the period between 3:00am and 3:45am.

3.4 Noise Transmission data

3.4.1 Simultaneous logging of internal and external noise levels.

This exercise has allowed us to identify significant acoustic events and then to compare internal & external levels, to determine noise transmission loss through existing building facade. Particular attention has been given to the seven low frequency bands of 32Hz to 125Hz.

The procedure seeks to quantify the performance of the existing windows by allowing the internal and external noise levels to be compared, using ‘A’-weighted, ‘C’-weighted and the 1/3 octave levels in the low frequency bands and at 1kHz. Measurements were logged every second.

16 incidents of the highest external noise levels recorded, on nights when the club was operating, have been selected for the comparison. Additionally, 4 of the highest incidents on nights when the club was not operating were selected for the comparison. These are tabulated in Tables 2 , 3 & 4 In **Appendix C**.

These tables present the differences between internal and external noise levels recorded during peak acoustic incidents, over 1 second measurement periods. These difference figures are shown for ‘A’ and ‘C’ weighted measurements, and over the 7 low frequency 1/3 octave bands.

3.4.2 The values obtained by simple subtraction of the internal level from the external level using each parameter must be viewed with caution for 5 reasons :-

- The external measurements are likely to be over-stated by up to 3dB due to the proximity effect of the façade of the building only 300mm from the measurement microphone. The data has not been adjusted for this ‘façade correction’.
- The internal measurements are likely to be over-stated by up to 3dB, due to the reverberant field of the largely unfurnished room. A reverberation time measurement showed values between 0.6 and 0.73 Sec across the spectrum plus a peak of 0.8 sec at 250Hz. The data above have not been corrected for room reverberation.
- Although the internal door to the front room under test was closed, there may have been other noise sources apparent in the internal noise level data such as from the rear of the property. These may have elevated internal values at times throughout the night, apparent in **Table 4** in **Appendix C** which presents data from quiet periods.
- The source and nature of the events which triggered these noise events will vary considerably. Some sources may have had an acute angle of incidence on the window, and some perpendicular. Some might have been impulsive and some sustained.
- Criteria which refers to absolute noise levels or differences between noise metrics must be considered in the context of the prevailing noise floor. The lower internal noise levels measured will represent the prevailing background noise in the proposed living room, whether from sources in the wider the environment or related to services and equipment, either in the property, or in the vicinity ; this is potentially likely to be dominated by chillers etc in the property below, and from transportation noise (from road traffic in the Town Centre, aircraft and heavy plant in the port nearby). These contributions can be seen in the last two measurements in **Table 4** which arose during ‘quiet’ periods (one while the club was operating at 00:29hrs without any significant increases to the external noise levels, and one when the club was closed at 03:47 with no acoustic events in the vicinity. For example, the internal measurements in the 50Hz band did not fall below 41dB for extended periods throughout the night of Sat 20 – Sun 21st May e.g. from 06:00 until 06:21hrs, while the external measurements in that band frequently fell below 35dB once the club had closed (and was seen to vary between 47dB and 73dB while the club was operating).

3.4.3 Despite the reservations discussed above, we can make some general conclusions about the performance of the existing windows by comparing the internal and external noise levels at various instants over the measurement periods, and obtaining the differences. We can disregard those exceptional data points which fall more than 10dB more or less than the vast majority of measured differences where these can more plausibly be attributed to noise sources other than the street outside, and also those where the internal noise levels fall within 6dB of the night-time background internal levels.

The outside-to-inside differences show a reasonably consistent correspondence, and this is attributed entirely to the attenuation through the existing windows. These results suggest that the windows provide approx. 19.5dB(A) attenuation, and to quantify the low-frequency performance, 16.0dB C-weighted attenuation. In the low frequency 1/3 octave bands, the data from incidents with external noise exceeding 50dB suggests that the attenuation performance for the two windows are approx. 20dB in the 32 and 40Hz bands, 25dB in the 50Hz band, 27dB in the 63 & 80Hz bands, and 24dB in the 100 and 125 Hz bands.

3.4.4 As stated above, the thickness of the upper panes of the existing glazing is not certain, if they have been fitted with 2.2mm float glass, the 'critical frequency' f_c can be expected to be at 5k5Hz, and if 3mm glass, at 4kHz.

3.4.5 The standard of woodwork of the sliding sash windows in their frames was seen to be of a high standard, apparently attributable to recent work to renovate the original windows and frames. A good fitting sash window fitted with 2.2mm – 3mm glass can expect to provide an Rw of ca. 26dB, where the performance over the frequency spectrum will range from just 16dB attenuation at 100Hz to 34dB at 2kHz.

3.4.6 It is assumed that the exterior wall is constructed of 2 or 3 courses of brickwork, plastered on the inside and rendered on the outside, offering noise attenuation of ca. 45dB RW, with a higher consistency of performance across the audio frequency spectrum. In the context of the premises under consideration, the acoustic performance of the walls is not considered to be a contributor to the control of residential amenity, as the windows are transmitting considerably more noise from outside to inside.

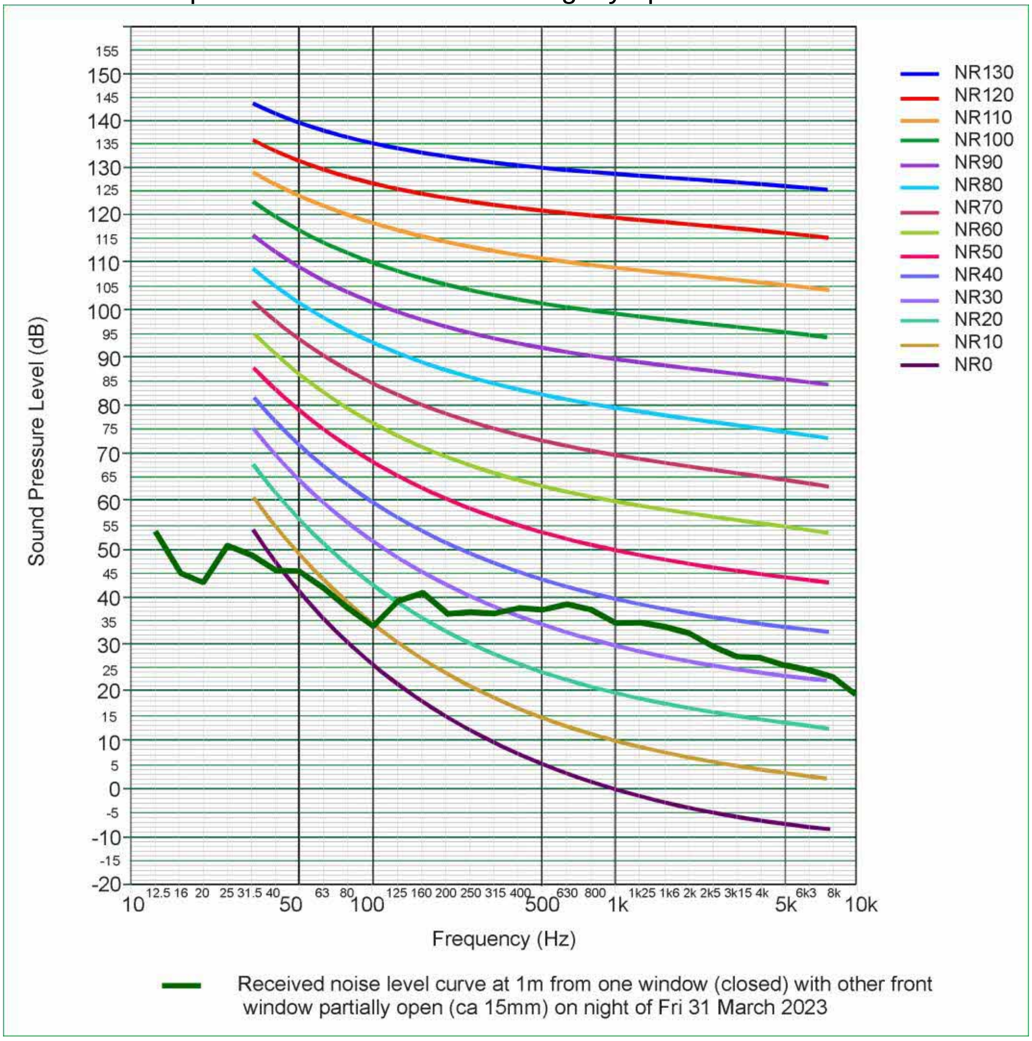
3.5 Summary of Existing Window Performance

The data obtained from the existing windows can be summarised :-
Internal $L_{Aeq, (23:00 – 04:30hrs)}$ = 37.7dB $L_{Ceq, (23:00 – 04:30hrs)}$ = 43.9dB.
External $L_{Aeq, (23:00 – 04:30hrs)}$ = 58.4dB $L_{Ceq, (23:00 – 04:30hrs)}$ = 74.3dB
RW : 20.7dB (A) 30.4dB (C)

These results represent an internal amenity level, which without any mitigation works, and with one window slightly open, is considerably better than NR 40.

The data obtained of the internal noise level during a period of just over 6 hours to include the operating period of the nightclub can be presented as a Noise Rating curve (**Figure 5**).

Fig 5. NR Curve of internal noise on night of Fri 31st March 22:12hrs to 04:36 hrs on Sat 1st April 2023 with one window slightly open.



The profile of internal noise levels while the nightclub was operating (and in the hours after it closed) is presented graphically in **Figure 6**.

Fig 6. Log of internal noise levels from 22:10 to 04:30 on the night of Fri 31st March 2023 with one window slightly open

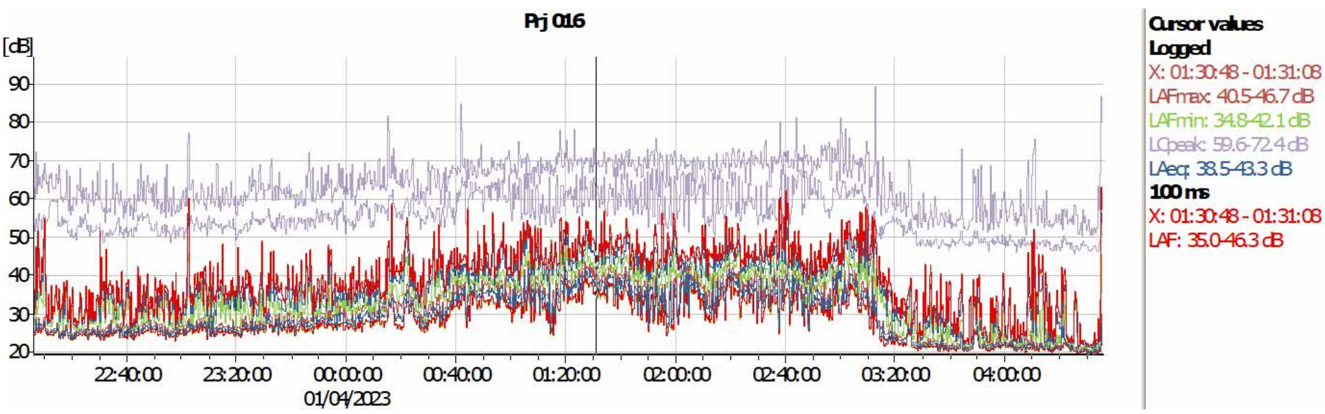
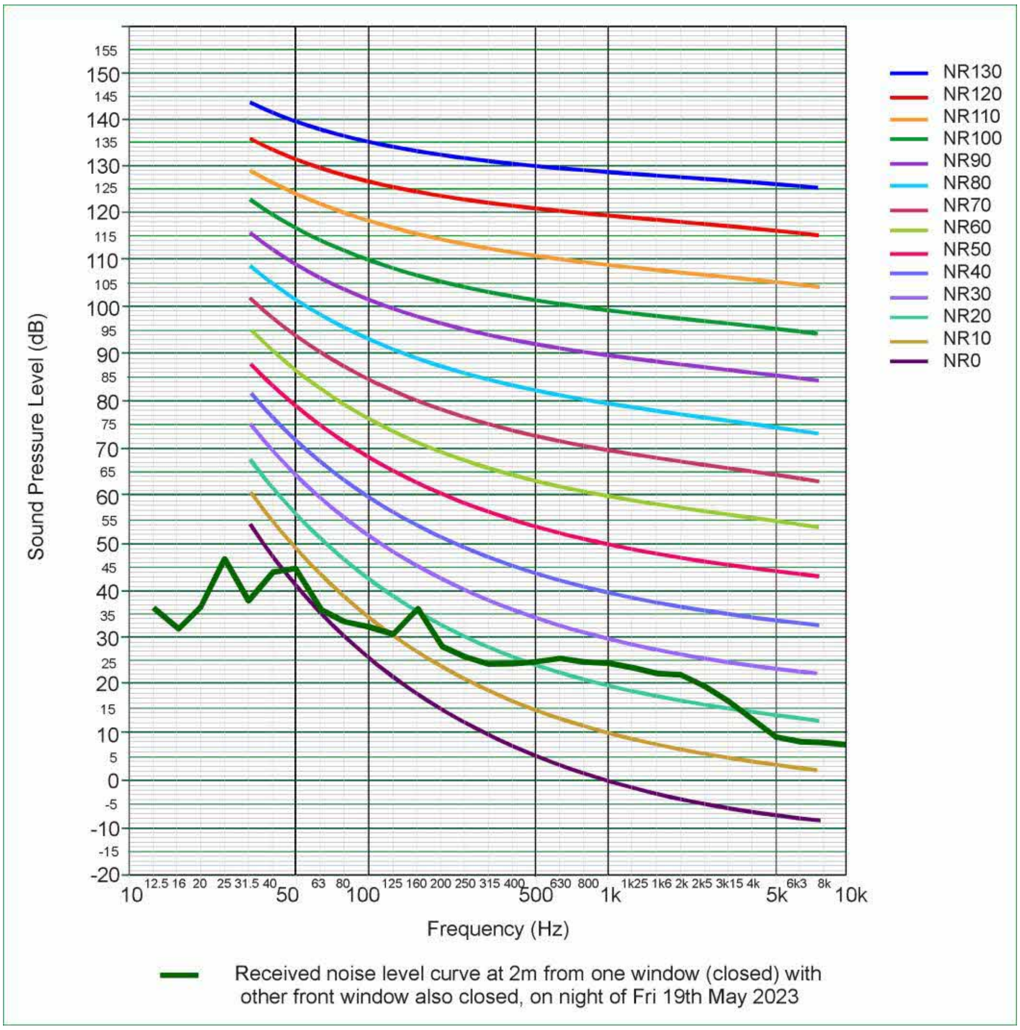


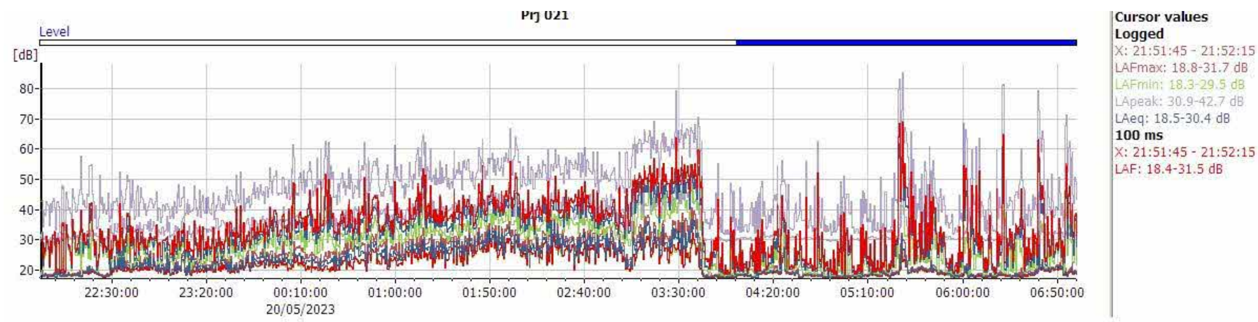
Fig 7. NR Curve of internal noise on night of Fri 19th May 23:00hrs to 05:206 hrs on Sat 20th May 2023 with both windows closed



Internal $L_{Aeq, (23:00 – 05:20hrs)}$ = 33.7dB $L_{Ceq, (23:00 – 05:20hrs)}$ = 48.9dB.

These results represent an internal amenity level, which without any mitigation works, and with both windows closed, is considerably better than NR 30.

Fig 8. Log of internal noise levels from 21:50 to 07:00 on the night of Fri 19th May 2023 with both windows closed



Measurement	Start Time	Stop Time	Elapsed Time	LAeq [dB]	LAFmax [dB]	LAFmin [dB]	Overload [%]	LCeq [dB]	LCFmax [dB]	LAF99.0 [dB]	LAF90.0 [dB]	LASmin [dB]	LCSmin [dB]
Total	19/05/2023 19:49:45	20/05/2023 13:52:34	18:02:49	43.7	90.7	17.2	0.0	51.7	91.2	17.9	19.1	17.5	30.9
Logged	19/05/2023 21:51:45	19/05/2023 21:51:46	00:00:01	18.7	19.0	18.3	0.0	38.1	41.5				
100 ms	19/05/2023 21:51:45.0	19/05/2023 21:51:45.1	00:00:00.1	18.6									
Marker	19/05/2023 19:49:45	20/05/2023 13:52:34	18:02:49	43.7	90.7	17.2		51.7	91.2				

3.6 The minimum standard for living rooms is specified 35dB LAeq, by day or night (BS8233:2014), though it must be acknowledged that many traditional buildings fail to achieve that standard, particularly in lively urban areas.
Additionally, the LC levels should be no more than approx. 10dB higher than the LA levels. The LAeq is represented by the bright red trace in the graph above.

Log on 31/March/23 shows 23:00 – 04:30 (approx.) Internal Leq(dB) : LAeq 37.7 LCeq 52.6
and, highest 1/3 oct bands :- 25Hz @ 50.1 LZeq ; 40Hz @ 46.1 LZeq ; 50Hz @ 46.5 LZeq & 160Hz @ 42.4

Log on Fri 19/May 23:00 – 07:00 (both windows closed)

Internal features :-
Overall Leq : 33.3 LAeq ; 47.1 L_{Ceq}. (north end nr window : 2250 L)
Overall Leq : 33.7 LAeq ; 48.9 L_{Ceq} (south end, centre : 2250 full)
Max LFmax 69.1dB L_{Afmax} ; 76.5dB L_{Cfmax}. (north end nr window : 2250 L)
Max LFmax 69.2dB L_{Afmax} ; 75.3dB L_{Cfmax} (south end, centre : 2250 full)
Before 4am overall Leq : 34.6 L_{Aeq} ; 49.7 L_{Ceq}
Before 4am Highest 15min is L_{Aeq} 39.6dB L_{Aeq} betw 3:15 and 3:30hrs (L_{Ceq} = 49.6)
After 4am overall Leq : 31.6 L_{Aeq} ; 47.0 L_{Ceq}.
After 4am Highest 15min L_{Aeq} is (also) 39.6 at 05:15 – 05:30hrs (L_{Ceq} = 51.3)

Log on Sat 20/May 23:00 – 07:00 (one window slightly open)

External features :-
Overall Leq : 58.2dB L_{Aeq} ; 71.4dB L_{Ceq}.
Overall Leq before 4am : 60.1dB L_{Aeq} ; 73.2dB L_{Ceq}
Max LFmax before 4am : 88.4dB L_{Afmax} ; 91.8dB L_{Cfmax} (betw 03:03 and 03:04 hrs)
Overall Leq after 4am : 44.7dB L_{Aeq} ; 58.6 L_{Ceq} (betw 04:56 and 04:58 hrs)
Max LFmax after 4am : 77.7dB L_{Afmax} ; 86.3dB L_{Cfmax} (betw 04:56 and 04:58 hrs)

Table 5. External noise Spectrum (23:00 to 07:00hrs) on Sat 20/May 2023 :

	External noise levels overnight with club operating (dB)																														
1/3 oct freq	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1k25	1k6	2k	2k5	3k15	4k	5k	6k3	8k	10k	12k5
LZeq(1sec)	49.8	49.7	54.8	56.8	57.9	62.9	67.0	67.0	62.1	58.2	57.8	57.2	50.5	47.6	46.3	50.2	49.6	50.2	51.1	49.4	49.1	45.4	44.2	41.8	40.7	37.6	33.6	30.8	29.3	25.9	20.9

Octave fr	16	31.5	63	125	250	50	1k	2k	4k	8k
LZeq(1sec)	56.9	64.8	70.7	62.5	53.3	54.8	54.7	48.8	43.0	33.9

Log on Sat 20/May 23:00 – 07:00 (one window slightly open) (as above)

Internal features :-
Overall Leq : 35.6dB L_{Aeq} ; 49.6dB L_{Ceq} (one window slightly open)
Overall Leq before 4am : 37.3dB L_{Aeq} ; 51.1dB L_{Ceq}
Max LFmax before 4am : 64.0dB L_{Afmax} ; 74.6dB L_{Cfmax}
Overall Leq after 4am : 27.3dB L_{Aeq} ; 44.4dB L_{Ceq}
Max LFmax after 4am : 64.1dB L_{Afmax} ; 77.1dB L_{Cfmax} (betw 05.36 and 05.39 hrs)

Log on Sun 21/May 23:00 – 07:00 (one window slightly open) (club not operating)

Internal features :-
Overall Leq before 4am : 21.0dB L_{Aeq} ; 42.dB L_{Ceq}
Max LFmax before 4am : 50.0dB L_{Afmax} ; 71.1dB L_{Cfmax}
Overall Leq after 4am : 27.8dB L_{Aeq} ; 48.1dB L_{Ceq}
Max LFmax after 4am : 65.8dB L_{Afmax} ; 81.7dB L_{Cfmax} (betw 06.39 and 06.47 hrs)

Log on Mon 22/May 22:40 – 04:40 on Tues 23/May (club not operating)
(there was significant activity noise from approx. 04:30 to 09:00hrs and continuing into the morning – this period has been excluded).

Internal features:-
Overall Leq : 20.3dB L_{Aeq} ; 39.9dB L_{Ceq}
Max LFmax : 48.0dB L_{Afmax} ; 66.4dB L_{Cfmax}
L_{Af90} est 18.1dB

Log on Mon 22/May 22:40 – 04:40 on Tues 23/May (club not operating)

External features :-
Overall Leq : 44.4dB L_{Aeq} ; 59.9dB L_{Ceq}
Max LFmax : 86.4dB L_{Afmax} ; 86.7dB L_{Cfmax}
L_{Af90} est 35.5dB

3.7 It is significant that the internal noise levels on the Monday night – Tuesday morning represent an excellent level of internal amenity for a legacy building near a town centre.

Existing performance
RW 20.7dB (A) 30.4dB (C)
Poss 3mm float glass RW 31dB (18dB @125Hz, 35dB @ 1k , 27 @ 2k)

Fig. 9. View of the property's front room showing one of the two identical existing windows, one of the measuring instruments, and the nightclub on the opposite side of the street.

4. Noise Assessment

4.0.1 An assessment to BS8233:2014 is the usual criterion applied to the assessment of amenity in residential property. (BS8233 Section 7.7.2) The maximum level advised for a living room in BS8233 over the 'daytime' period of 07:00 to 23:00 hrs is 35dB LAeq. No figure is given for the 'nighttime period' of 23:00 to 07:00hrs in living rooms, though a figure is given for bedrooms in this period, of 30dB LAeq.
That maximum level of 30dB LAeq for bedrooms at night is also the level proposed in the WHQ '*Guidelines for Community Noise*'. This assessment will be presented in **Section 4.2**

4.0.2 However, it is recognised that the particular characteristics of the late night noise from night clubs and their customers will have a significant potential to give rise to disturbance. The particular features which may not be adequately quantified in the LAeq measurement are a) low frequency noise from the bass energy in dance music and vehicle engines; and, b) the short-term impulsive noise from shouts in the street, the slamming of car doors, and potentially noisy shoes on hard paving, all of which may arise in the hour after the club premises have ceased operating. Additionally, the 'canyon effect' of noise retained within the parallel walls of terraced properties can contribute to noise from even a few hundred metres away being received at the intensity normally expected of much closer sources.

4.0.3 To provide an assessment which safeguards residential amenity, and by extension, protects the existing night-club operation from the potential for complaints of noise disturbance, it would be appropriate to adopt more robust criteria. To this end, four additional criteria are evaluated :-

1) a more demanding criterion of noise levels over the frequency spectrum is to be preferred. An NR curve will be adopted for the maximum internal noise level, rather than a single figure A-weighted level ;
2) an analysis of the received noise levels at the proposed residence will adopt the 'worst case' noise level detected on a Saturday night and propose mitigation to the front façade of the property which achieves the required standard of internal amenity under those conditions ;
3) an assessment will be made to BS4142 (in so far as is possible), with some adjustments to provide a realistic comparison ; and
4) an evaluation of the noise characteristics of actual external noise in this location, including frequency content, shall be considered.

1. Noise Rating curve (NR). The more detailed survey data has been analysed and plotted against the NR curves.
NR 30 is considered to represent a good level of residential amenity, (in which the L_{Eq} at 1kHz.is 30dB.). NR20 represents an exceptionally good standard of residential amenity (in which the L_{Aeq} at 1kHz is 20dB). The evidence demonstrates that NR25 is achieved at present, on nights when the club is operating.
2. The 'worst case'. The two highest external noise levels adopted were detected (while the night club was operating) at 02:09:00hrs on the night of Sat 20/May & Sun 21/May with an $L_{Aeq(1sec)}$ of 67.2dB and $LCeq_{(1sec)}$ of 74.7dB ; and (after the night club had ceased operating) at 03:06:00hrs on

the night of Sat 20/May & Sun 21/May with an $LAeq_{(1sec)}$ of 69.1dB and $LCeq_{(1sec)}$ of 71.6dB.

3. The BS4142 assessment will be made by treating the recorded noise level data on a night when the night club was not operating (Monday 22nd May) as the 'background' and the predicted internal level with the chosen mitigation as the 'specific sound'.
4. The noise characteristics have been examined, revealing significant acoustic energy across the low frequency bands, attributable to a) motor vehicles, sometimes with engine's idling, b) night club music, often present in bursts presumably related to doors opening and closing, and c) plant generating steady 50Hz tones. There are also significant loud events in the 600 – 1k5 Hz frequency range, associated with persons shouting and to sea birds.

4.1 National Planning Policy Framework (NPPF)

4.1.1 **'Agent of Change'**
A relevant Planning consideration is found in the National Planning Policy Framework (NPPF), where Paragraph 187 states that:

> *'Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.'*

4.1.2 Additionally, and if Planning Permission was granted for residential use in the upper flat of 14 Stanley Street, then "Permitted Development Rights" would pertain which include 'prior approval' for conversion to residential use. While this report is focussed on future residential accommodation in the upper flat, the potential adverse noise impact of the night club and its associated noise sources late at night should, at this planning stage, be considered. The phrase in NPPF "*Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established".* appears to invite anticipation of this potential for adverse impact, and subsequent expressions of a private nuisance.

This risk was highlighted very clearly in the representation made to the Planning Authority by the owner / operator of the night club (see **Appendix B**.)

To satisfy this policy, the applicant must provide mitigation which eliminates as far as reasonably possible, the potential to avoid any significant adverse impact on health and the quality of life for future occupiers, as well as an adverse impact which could be interpreted as 'a nuisance' under the 1990 *Environmental Protection Act* (EPA), and as a result may interfere with the operation of the existing business, the nightclub opposite.

4.1.3 NPPF Section 11, paragraph 123 advises that Planning policies and decisions should aim to:

- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*

New developments must comply with this condition, including Changes of Use.

4.2 Assessment to BS8233:2014 *Guidance on Sound Insulation and Noise Reduction for Buildings*

4.2.1 It can be seen from the logged Friday night-Saturday morning 15minute L_{Aeq} that the internal noise level was 33dB L_{Aeq} ; in fact, the highest recorded night-time LAeq(8hrs) was 33.7dB.
This is below the maximum level advised for a living room in BS8233 of 35dB L_{Aeq} over the 'nighttime period' of 23:00 to 07:00hrs. Consequently, it is confirmed that the property, in its present condition, satisfies this criterion of BS8233:2014 Section 7.7.2.

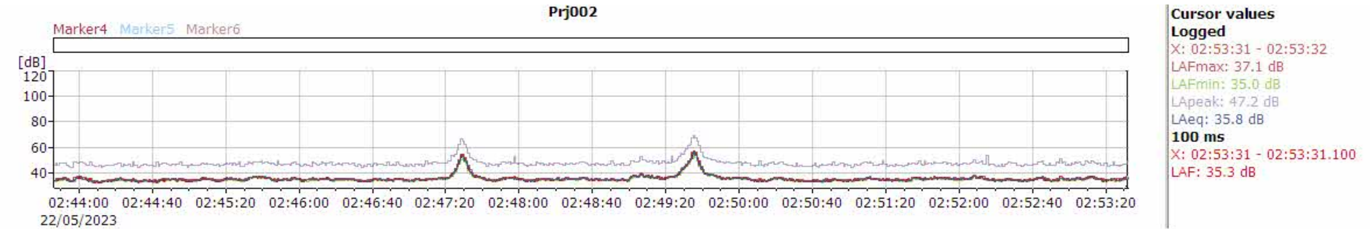
4.2.2 Maximum short-term noise events – L_{AFMax}
It was noted that the period of operation of the night club included numerous short-term acoustic events. These are illustrated in the graphs and tables above (**Figs 1** in **Section 3.2** and **Tables 2**, **3**, & **4** in **Appendix C**)

Short term event Assessment

A small number of events were recorded indoors over a Saturday night in the range 55 to 65dB L_{Amax}.
Although BS8233 no longer stipulates a maximum noise level for short-term peaks, The previous version specified a maximum of 10 'events' during a night time period which exceed 45dB L_{Afmax}. these recorded incidents have the potential to give rise to disturbance, and although the front of the property is the living room, there is the potential for noise to be transmitted internally to the bedroom at the rear with only some attenuation through the doors and corridor between those rooms.
The ProPG (2017) does echo the proposal that noise 'events' in bedrooms should not exceed 45dB(A) on more than 10 occasions in a night.

BS5228-1 does still refer to limits to short term 'events' in residential areas in its Annexe E.3, and although that standard is concerned with noise from construction sites and similar operations, is also specifies 45dB LAeq as the threshold level at night, measured outside a residential window, above which potential significant effect is indicated.
It is evident that whenever a car on Bridge Street passes the end of Stanley Street, an external level of 45 – 47dB(A) is briefly experienced. (see graph below).

Fig 10. External noise levels showing 2 cars on Bridge Street passing the north end of Stanley St on the morning of Monday 22nd May '23.



That plot of noise from passing vehicles on one of the town busiest roads is entirely representative of many urban properties and should not be interpreted as having the potential for adverse impact affecting residents of a town centre property.

However, the same survey also demonstrated that the external noise remained above 60dB L_{Aeq} almost continuously between 3am and 3:20am while the night club had been operating up to 3am..

4.2.3 Informing a specification for Mitigation

The datasets discussed above, plus knowledge of the nature of the noise environment at night, and the proposed use of the upper floor of 14 Stanley Street, can be used to determine the degree of mitigation that would be required to achieve a given standard of residential amenity. By selecting some of the 'worst case' periods of external noise, it becomes straightforward to quantify the attenuation required from any mitigation scheme.
These schemes will be discussed in **Section 6**.

4.2.4 Noise in external amenity areas.

The property's only external amenity area is the paved rear yard, shared with, and predominantly used by, the delicatessen & sandwich shop on the ground floor. It does not offer leisure amenities nor is its size and aspect amenable to such uses in the future. It is not expected that any resident will seek the use of the yard for recreational purposes while the night club is operating, and consequently, no assessment will be made.

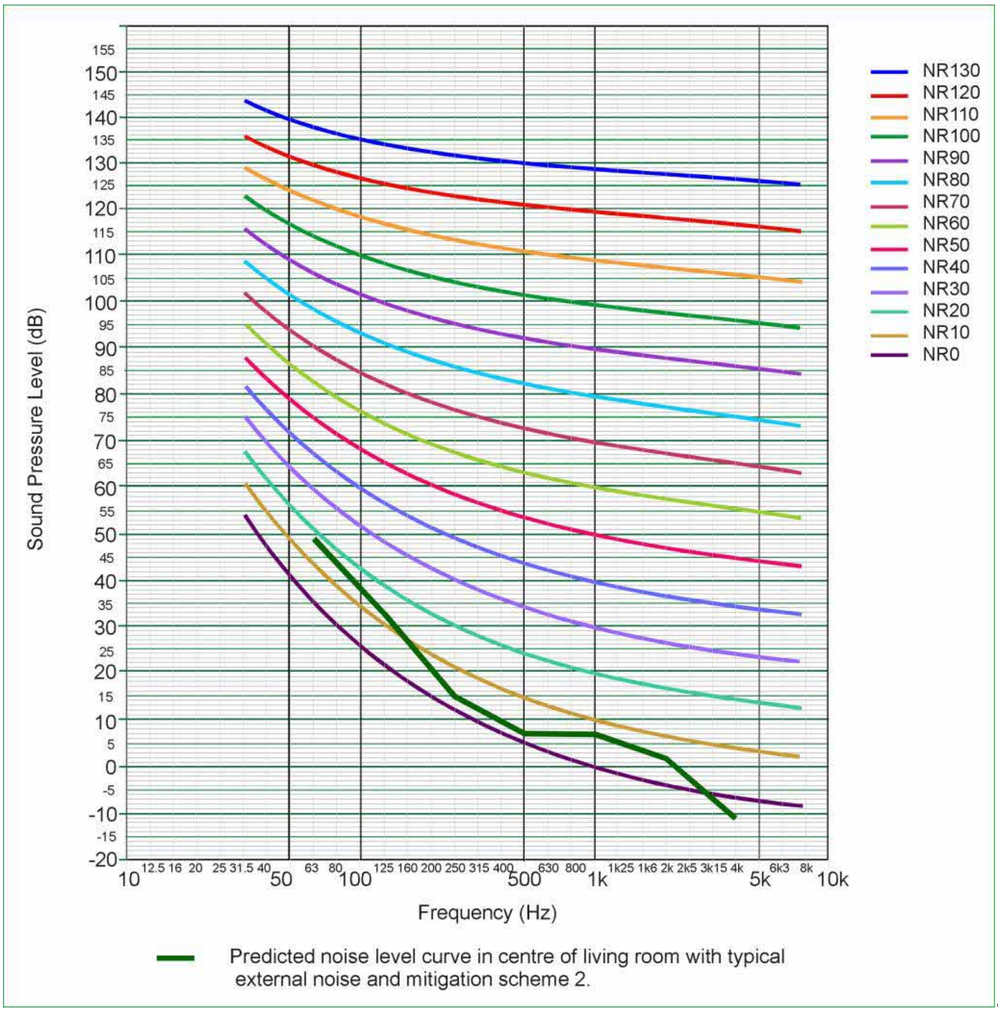
4.3 Noise Rating curve

The use and application of ISO Noise Rating Curves were discussed in **Section 2.2**. The existing performance of the windows has been plotted on the NR curves (see **Fig 5** & **Fig 7** above)

These demonstrate that on night when the club is operating, the existing windows provide internal amenity of NR40 with one window slightly open, and NR25 with both windows closed.

To enhance amenity, mitigation is proposed as discussed in **Sections 5** & **6**, below. The performance of the proposed widows has been predicted and the data for Mitigation Scheme 2 has been plotted onto the NR curves :-

Fig 11. Internal noise levels integrated over the night time period, with mitigation scheme 2.



It is apparent that the internal noise levels will remain within the NR20 curve, which represents an excellent standard of internal amenity for residential property.

4.4 ProPG

4.4.1 The Institute of Acoustics - *Professional Practice Guidance on Planning & Noise,* ***ProPG***, is intended to assist in designing and assessing new residential developments. However, its provisions are also of assistance to the introduction of leisure uses in the vicinity of an existing residence. It emphasizes 'good acoustic design' and 'observing internal "Noise Level Guidelines"' in achieving residential developments which may be granted permission. ***ProPG*** requires an initial assessment of the noise levels involved, and it is very clear that the entertainment noise from the *Deja Vu* nightclub all fall within the category of 'high risk of adverse effect' which can only be mitigated by good acoustic design principles and good management procedures.

4.4.2 ProPG is intended to be applicable to the design of new build properties rather than a Change of Use of a legacy building, and it does address the challenge of achieving adequate amenity indoors by keeping windows closed where adequate ventilation and thermal comfort may be compromised. Though it does acknowledge that this may be challenging in urban areas :

"*In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide "whole dwelling* *ventilation" in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position (see Supplementary Document 2). Furthermore, in this scenario the internal LAeq target noise levels should not generally be exceeded*." ProPG S.2.34

4.4.3 The ***ProPG*** adopts the internal noise levels for residential properties from BS8233:2014, with some additional detail on specific circumstances.

4.4.4 A qualitative assessment scale is offered, in 4 ranges, from No Observed Effect Level (NOEL), through Low Observed Adverse Effect Level (LOAEL), Significant Observed Adverse Effect Level (SOAEL), to Unacceptable Adverse Effect Level (UAEL), also noting that

"*Although the word 'level' is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs*."

Table 4 *Recommended Maximum, LOAEL sound levels based upon an absolute criterion.*

Location	**Time Period**	**Ambient Level (dB $L_{Aeq,T}$)**	**Maximum noise level (dB L_{AFmax})**
		LOAEL	**LOAEL**
External amenity areas	0700-2300	55	-
External amenity areas	2300-0700	45	60
Habitable room	0700-2300	35	-
Bedroom	2300-0700	30	45
Dining Room	0700-2300	40	-

4.4.5 No figure is provided for the ambient noise level in a 'habitable room' during the nighttime period, but the figure for a 'habitable room' during the daytime period of 35dB LAeq can be taken as a maximum. This is consistent with the figure adopted above from BS8233.

4.4.6 Additionally, the ***Noise Policy Statement for England*** (NPSE) 2010, refers annoyance from amplified music to the *Code of Practice on Environmental Noise Control at Concerts* which in turn, is intended both for occasional events on a site and for premises operating full time. It provides a policy vision, including the avoidance of significant adverse impacts from noise, and the mitigation and minimising of adverse impacts.

4.5 Worst Case Noise Impacts

The two highest external noise levels adopted were detected (while the night club was operating) at 02:09:00hrs on the night of Sat 20/May & Sun 21/May with an $L_{Aeq(1sec)}$ of 67.2dB and $L_{Ceq(1sec)}$ of 74.7dB ; and (after the night club had ceased operating) at 03:06:00hrs on the night of Sat 20/May & Sun 21/May with an $L_{Aeq\ (1sec)}$ of 69.1dB and $L_{Ceq\ (1sec)}$ of 71.6dB.

Analysis of specific low frequency incidents provided peaks on the same night of 59.1dB $L_{Zeq,(1min)}$ at 40Hz (at 03:10hrs) and 57.7dB $L_{Zeq,(1min)}$ at 50Hz (at 00:16hrs).

The first of those two events contains the higher proportion of low frequency energy (which is the most difficult to attenuate through building facades), and so will be adopted in the assessment of the selected mitigation schemes in **Section 6.3**, below.

4.6 Assessment to BS4142 : 2014 *Methods for Rating and Assessing Industrial and Commercial Sound*

The application of BS4142 was discussed in **Section 2.3**

4.6.1 An assessment to BS4142 requires data to be obtained both with and without the proposed source of noise present in the environment.
In this application, the ‘source of noise’ is not a component of the proposal but is an existing feature of the acoustic environment.

An assessment to BS4142 is carried out at the exterior of a property, allowing a comparison to be made between the external noise level while the proposed noise source is present, and with the background noise level when the proposed noise is absent.

4.6.2 Note that BS4142 specifically disapplies itself from music and other entertainment noise, from sound from people, and from the determination of a nuisance. (Section 1.3 – “*The Standard is not intended to be applied to the rating and assessment of sound from : recreational activities . . . music and other entertainment . . . people*” and “*is not intended to be applied to the derivation of indoor sound levels arising from sound levels outside, or the assessment of indoor sound levels*”)
BS4142 considers the introduction of a new noise-sensitive receptor (Section 8.5) and notes that ‘*where . . . there is extant industrial and/or commercial sound, it ought to be recognised that the industrial and/or commercial sound forms a component of the acoustic environment.*’

4.6.3 Notwithstanding those exclusions, the principle of BS4142 can be helpful in identifying and quantifying a probable source of disturbance from noise and predicting its impact.

The ‘Specific Noise’ shall be taken from the logged noise while the night club was operating on the night of Sat 20th May
The ‘Background Noise’ shall be taken from the logged noise while the club was not operating, on the night of Mon 22nd May.

The assessment will be made with the existing first floor front living room windows closed, and while multiple noise sources created a lively and noisy environment in the street outside at night.

4.6.4 Acoustic Feature Corrections a.k.a. ‘penalties’ :-

BS4142 applies ‘correction factors’ to elevate the measured source noise level in an attempt to quantify some of the subjective or psychoacoustic features of sound commonly associated with annoyance.

Tonality 0 – 6dB

Music, voices and even idling car engines all exhibit tonality.

Using ‘the objective method’ (Annexe C) of BS4142, there was frequent tones as follows, each of which can be compared to a ‘threshold’ level, above which, a ‘correction’ is advised :

- In the low frequency bands : tones in the 50Hz band 11dB higher than the adjacent bands (threshold 15dB);
- In the mid-frequency bands : tones in the 160Hz band 10dB higher than the adjacent bands (threshold 8dB), and
- In the high frequency bands : tones in the 800Hz band 8dB higher than the adjacent bands (threshold 5dB)

The Standard proposes that a 6dB ‘penalty’ is to be applied if any of the thresholds are exceeded in any of the three frequency bands.

The threshold was exceeded in two of the bands.

However, the period of the exceedance in each case is very much shorter than the entire measurement period of interest, in fact they are mostly instantaneous events, (the subjective effect of the instantaneous nature of these events is captured by the ‘impulsivity’ assessment below), so I propose that only 4dB penalty is applied for tonality.

Impulsivity 0 – 9dB

The acoustic events, excepting vehicles arriving, idling and departing, and the low background of music are largely impulsive.

Referring to Annexe E of BS4142, in a nighttime assessment, the loudest impulse event in a 15 minute period should be examined. The onset of an impulse is defined as the point when the rising gradient of the ‘A’-weighted time history exceeds $10dB/s^{-1}$ and the end point is where the falling gradient falls to less than $10dB/s^{-1}$. The level difference is defined as the LAf difference between those two points.

In fact, the impulsive incidents recorded vary in characteristics significantly and are highly irregular.

An prominent incident chosen for analysis occurred at 03:34hrs on the morning of 21st May which was one of the highest impulses recorded. Its energy was predominantly in the 800Hz and 1.25kHz bands, consistent with a human shout. The ‘A’-weighted noise level rose by 13.5dB over 200ms.

Onset rate = dB/s i.e. 67.5 with level difference of 13.5 dB

The ‘predicted prominence’ is derived from :

$$P = 3\log(\text{onset rate}/[\text{dBs}]) + 2\log(\text{level difference}/[\text{dB}])$$

$$P = 7.75$$

Where $P > 5$, then a further adjustment, K, is derived from $k = 1.8(P-5)$

$$K = 4.95$$

Another incident at 00:46hrs on the same night lacked any specific spectral features though had significant low frequency content, consistent with a slamming car door.
The 'A'-weighted noise level rose by 18.1dB in 100ms.
Onset rate = dB/s i.e. 181 with level difference of 18.1 dB
P = 9.29
K = 7.72

These events are representative of the highest incidents throughout the night time measuring period. The mean value of K is 6.33. Based on the procedure in Annexe E11 of BS4142, a penalty of 6dB should be applied for impulsivity.

Intermittency 0 – 3dB
This penalty is advised if the feature is not captured by the selection of measurement period. Noise events appear to be regular and relatively consistent throughout the club's trading hours and shortly after.
1dB penalty is applied for intermittency.

Total 'penalties' :
11dB

4.6.5 External assessment to BS4142

Clearly the external assessment will identify the considerable noise impact in the street, not only from the club premises, but from persons and vehicles in the street during and after the premises' trading hours.

Overall Leq between 23:00 and 04:00hrs : 60.1dB L_{Aeq} on Sat 20/May
Background noise level from comparable time period on night of Mon 22 – Tue 23/May : background between 23:40 and 04:40hrs : 35.5dB (est) L_{Af90}
background after 4:40am : 32.0dB (est) L_{Af90}

Assessment to BS4142 based on external noise levels.

	dB
External ound pressure as measured [Sat 20May 2023]	60.1
Adjustments :	
Façade correction 400mm distance microphone to window	-3.0
Specific sound level ($_{LAeq}$)	57.1
Correction factors for tonality	+4.0
Correction factor for impulsivity	+6.0
Correction factor for intermittency	+1.0
Rating value	71.1
Background Noise level	35.5
Excess of Rating Level over background	35.6

It is hard to find any conclusions that can be drawn from this assessment which are particularly helpful in assessing the amenity in a first floor living room of a property in an urban area late at night . This assessment specifically aims to quantify a wide difference in environmental noise between two extreme and different circumstances ; regardless of the obviously elevated acoustic environment during and for a while after, the nightclub's hours of operation, the internal noise levels will be considerably reduced by the fabric of the building, as we have seen in the BS8233 assessment. The mitigation schemes proposed in this report, seek to reduce the internal noise level to a comfortable and acceptable level, so any conclusions drawn from this BS4142 assessment of external noise is given no significant weight in this report.

We shall, however, apply the principles and results of the BS4142 assessment of the internal acoustic environment, and make an informed recommendation.

4.6.6 Internal assessment to BS4142

The internal assessment will provide an effective representation of the impact on residential amenity with the proposed mitigation in place.

Three 'mitigation schemes' will be specified and assessed in **Section 6**. Here, we simply take the predicted performance of the second of those three proposals for the present purpose of applying BS4142 to internal noise levels.

This internal BS4142 Assessment is based on the construction of mitigation scheme 2, and uses data obtained from internal noise measurements taken during a noisy night in the street outside.

Log on Fri 19/May 23:00 – 07:00 (both windows closed)

Internal features :-
Overall Leq : 33.3 L_{Aeq} ; 47.1 L_{Ceq}. (north end nr window : 2250 L)
Overall Leq : 33.7 L_{Aeq} ; 48.9 L_{Ceq} (south end, centre : 2250 full)
Max LFmax 69.1dB L_{Afmax} ; 76.5dB L_{Cfmax}. (north end nr window : 2250 L)
Max LFmax 69.2dB L_{Afmax} ; 75.3dB L_{Cfmax} (south end, centre : 2250 full)
Before 5am : overall Leq : 33.7 L_{Aeq} ; 48.9 L_{Ceq}
Before 5am : highest 15min is L_{Aeq} 39.6dB L_{Aeq} betw 3:15 and 3:30 (L_{Ceq} = 49.6dB)

Background noise level from comparable time period on night of Mon 22 – Tue 23/May.
Background noise level between 23:40 and 04:40hrs : 18.1dB (est) L_{Af90}

	dB
Internal sound pressure as measured [19May2023]	33.7
Adjustments :	
Additional attenuation attributable to Mitigation Scheme 2	-9.8
Predicted Specific noise (L_{Aeq})	23.9
Correction factors for tonality	+4.0
Correction factor for impulsivity	+6.0
Correction factor for intermittency	+1.0
Rating value	34.9
Background Noise level	18.1
Excess of Rating Level over background	16.8

NOTE. The interpretation and significance of this assessment should be given careful consideration in view of the very low internal noise levels of only 23.9dBA. In this context, the addition of 11dB of penalties to such a low internal noise level is disproportionate where the L_{Af90} background was only 18.1dB and the specific noise would only elevate that to a figure which is 10dB below the prevailing ambient noise level of 33.3dB L_{Aeq}..
On its face, BS4142 would propose that these assessments represent a high risk of adverse impact. However, an internal noise level of 23.9dB L_{Aeq} in an urban living room at night represents an exceptionally good acoustic environment. The disapplication of BS4142 to this assessment referred to above (**Section 2.3** and **4.6.2**), and its intended application to external noise levels, should be given consideration.

I do not consider that an interpretation of a Specific noise level of 23.9 dB L_{Aeq} in a living room as 'adverse' could be justified.

4.6.7 BS4142 assessment of alternative mitigation schemes

As mentioned already, three mitigation schemes are proposed in **Section 6**. The exercise above can be repeated for the other 2 mitigation schemes, in which the only variable is the figure for the additional mitigation due to the scheme. The results would be :-

	Additional attenuation attributable to Mitigation (dB)	Excess of Rating Level over background (dB)	Predicted Specific noise (dB L_{Aeq})
Mitigation Scheme 1	-12.5	14.1	21.2
Mitigation Scheme 2	-9.8	16.8	23.9
Mitigation Scheme 3	-21.8	4.8	11,9

Evidently, mitigation scheme 3 results in the lowest 'excess of Rating Level over background', and one might wish to ensure that the highest standard is provided. But at these low levels of internal noise, the absolute noise levels must also be considered, which in this case, provide a very good level of residential amenity indoors, in a style of property which frequently fails to provide 30dB LAeq at night. Clearly, the predicted specific noise of 11.9 dB L_{Aeq} from scheme 3 could not be achieved due to other noise sources both within and without the building.

4.7 Audio Characteristics

It is recognised that the loud acoustic events while the night club is operating, and in the hour after it closes is characterised by a number of features which have the potential to contribute to annoyance.
Some of these are well categorised by the scheme of 'penalties' in BS4142 (see **S 4.6.4**) and are considered below, and a consideration of qualitative features are discussed in BS 7445 – Pt 2, however, to assess the impact of those features which contribute to annoyance, some additional features will also be considered in this section.

4.7.1 Tonality / dominant Frequencies (from BS4142 assessment **Section 4.5.4**)

BS4142 Tonality 0 – 6dB
music, voices and even idling car engines all exhibit tonality. 4dB

4.7.2 Impulsiveness (from BS4142 assessment)

BS4142 Impulsivity 0 – 9dB
the audible events excepting vehicles arriving and departing are largely impulsive. 6dB

4.7.3 Intermittency (from BS4142 assessment)

BS4142 Intermittency 0 – 3dB
if not captured by the measurement period. Noise events appear to be regular and relatively consistent throughout the club's trading hours and shortly after. 1dB

4.7.4 Intelligibility and other unquantified impacts

Many sounds, particularly the human voice, can trigger an emotional reaction which might not arise from another sound of the same volume, pitch and duration. Good examples of human sound which can cause anguish or enhance alertness would be a cry of distress, aggressive shouted language, loud swearing, or even just an audible conversation whose subject was offensive or disturbing.

Because these 'human factors' give rise to annoyance over and above any disturbance attributable simply to the equivalent inanimate sound, they deserve consideration when assessing adverse impacts.

The *ProPG* offered the concept of a 'Significant Observed Adverse Effect Level' (See **Section 4.4**), but does not quantify the noise which contributes to the effects mentioned.

BS4142 allows for 'other sound' characteristics of the 'specific sound' to be allocated a 'penalty' but only if no penalty has been applied for tonality or impulsivity.
For these reasons, I consider that 'penalties' offered by BS4142 fail to quantify the potential impact of the actual acoustic environment during the late night activity in and around the nightclub in Stanley Street, where we have evidence of loud shouts and conversation in the Street for the 30mins after the club ceases trading.

While the rating method of BS4142 is often criticised for the harshness of the 'penalties', and I am sympathetic to those criticisms, it would be helpful to consider how to assess some often cited subjective impacts such as intelligibility and unquantified subjective characteristics, in accord with the purpose of a BS4142 assessment in seeking to arrive at a prediction of the impact on human residents.
But rather than purport to introduce a 'penalty' which is outwith the procedures in BS4142, I have undertaken the BS4142 assessment (above) without a 'penalty'

for these unquantified impacts, but will also make a separate assessment in the next section for 'audible characteristics'.

4.7.5 Assessment of subjective audible characteristics

Returning to the view, above, that m*any sounds, particularly the human voice, can trigger an emotional reaction which might not arise from another sound of the same volume, pitch and duration,* it could be argued that the use of an L_{Aeq} noise level overlooks the highest incidents of acoustic energy which may arise during moments of increased activity and impact on the receptor property. The consideration of 'worst case noise impacts' in **Section 4.5** (above) seeks to ensure that incidents of loud shouting are adequately addressed

4.7.6 The procedure of BS4142 makes an approximation of the subjective impact of quantifiable acoustic properties in the form of 'penalties' which are calculated from objective analysis, and added to the L_{Aeq} values when making the comparison with the measured background noise levels.

4.7.7 The characteristics referred to in this section are all features of human speech which lie in the mid-range of frequencies and which are well-represented by the 'A'-weighting of acoustic measurements. So, to provide any assessment of their adverse impact, we could usefully add a further 'correction' in the form of a penalty to the 'A'-weighted 'specific noise' in exactly the same manner as the system of 'penalties' adopted by BS4142. The question then remains of how to quantify such a 'correction'.
In my view, the measures already applied in the BS4142 assessment to take account of the tonality and impulsivity of aggressive human shouting or offensive swearing would benefit from an additional 3dB of attenuation, in addition to the mitigation required to reduce the 'source' noise level, and an absolute limit on the internal noise level in specific frequency bands during the loudest impulsive incidents detected.
These will be 18dB in the 500Hz and 1kHz frequency bands associates with speech, and 50dB in the 63Hz band associated with car engines and doors.
In any scheme of mitigation, these additional requirements would contribute to ensuring that human voices unlikely to contribute to annoyance than the mere presence of another sound of the same intensity as the voices.

This feature of noise will be assessed in **Section 6.4**.

5. Mitigation Requirements

5.1 Mitigation against the impacts of the acoustic environment discussed above, which would impact on residential amenity, and potentially on health, must reduce the internal noise levels to levels which would not raise concern when assessed using the criteria and metrics adopted in this report.

5.1.2 These impacts have been calculated from the internal noise levels obtained during my surveys. These included :

representative noise levels obtained over different days and weekends of activity.

Internal Noise measurements obtained with existing windows closed over 2 nights of two weekends, and with one existing window slightly open over 2 nights of a weekend

External noise measurements obtained over 4 nights of two weekends.

External and internal noise measurements have also been obtained over a weekend and mid week night when the night club was <u>not</u> operating.

5.1.3 The impacts can be summarised as :

- Internal noise levels integrated over the night time period when club is operating : 33.7dB $L_{Aeq(8hrs)}$;
- Internal noise levels integrated over the night time period when club is <u>not</u> operating : 20.3dB $L_{Aeq(8hrs)}$;
- Internal noise short-term peaks measured at 67.0 dB $L_{Aeq,(1min)}$, 59.1dB $L_{Zeq,(1min)}$ at 40Hz and 57.7dB $L_{Zeq,(1min)}$ at 50Hz (from **Section 4.5**) ;
- approx. NR25 with both existing windows closed (**Fig 7** in **Section 3.5**) ;
- 16.8dB above background noise (from internal BS4142 assessment in **Section 4.6.6**) with windows closed..

5.2 The other acoustic features which will be relevant to the assessments are :

Audio frequency characteristics

The internal noise levels which include break-in from external noise sources should not feature any characteristics which exceed 10dB above the existing background noise (when the nightclub is not operating) and an additional 3dB reduction should be provided in respect of identifiable speech.

Transmission paths (incl flanking transmission)

While the existing two windows in the front façade are observed to present the dominant transmission path for noise from the street and nightclub to enter the first floor living room, other transmission paths will exist and will contribute to internal noise levels. These will include transmission through the outer brick walls, flanking around the window frame, through the slated roof and the plaster and lath ceiling of the front room, and through the lower floor frontage and the stair well.

Noise floor.

There will be a natural lower limit to the ambient noise level in the proposed residence due to noise from services and equipment, and environmental noise transmitted through other routes. However, measurement on a midweek night (when the nightclub was not operating) provided a useful figure for the existing internal background noise level of 18.1 dB L_{Af90}. That is an exceptionally good figure for a legacy terraced dwelling in a town centre, and there is no benefit in a mitigation scheme which seeks achieve ambient noise levels any lower than 20dB L_{Aeq}.

Practical constraints

The client has expressed a strong desire to retain the visual characteristics of the renovated sash windows, which retain the original design and features.

The proposed mitigations schemes must be cost-effective, must recognise the visual appeal of the restored timber window frames and surrounds, must provide a high standard of air-tight sealing, and also allow for opening for cleaning and exceptional purge ventilation.

5.3 Noise break-in calculations :

(External Noise square-on / perpendicular) :

$$L2 = L1 + 10\log(S / A) – SRI \text{ dB}$$

(External Noise at an acute angle) :

$$L2 = L1 + 10\log(S / A) – SRI + 3 \text{ dB}$$

Internal noise level through both windows in any octave band :

$$L2 = L1 – R + 10\log(S \times Rt / V) + 11 \text{ dB}$$

Where L2 = the internal noise level (dB) ;
L1 = the external noise level (dB) ; S = total window surface area (m);
Rt = reverberation decay time (s) ; V = room volume (m^3) ;
SRI = Sound Reduction Index (dB) ; and R = noise attenuation figure (dB).

The factor of 11dB corrects for the analysis over 7 octave bands.

These calculations shall be used to assess the mitigation schemes considered.

5.4 Conclusions for mitigation specification

In view of the above factors, three mitigation proposals will be developed in respect of the windows only (including window frames and recesses), and assessed against criteria which do not seek to achieve internal noise levels any lower than 20dB $L_{Aeq,(1min)}$.

The evaluation of these impacts help us to derive target specifications for mitigation :

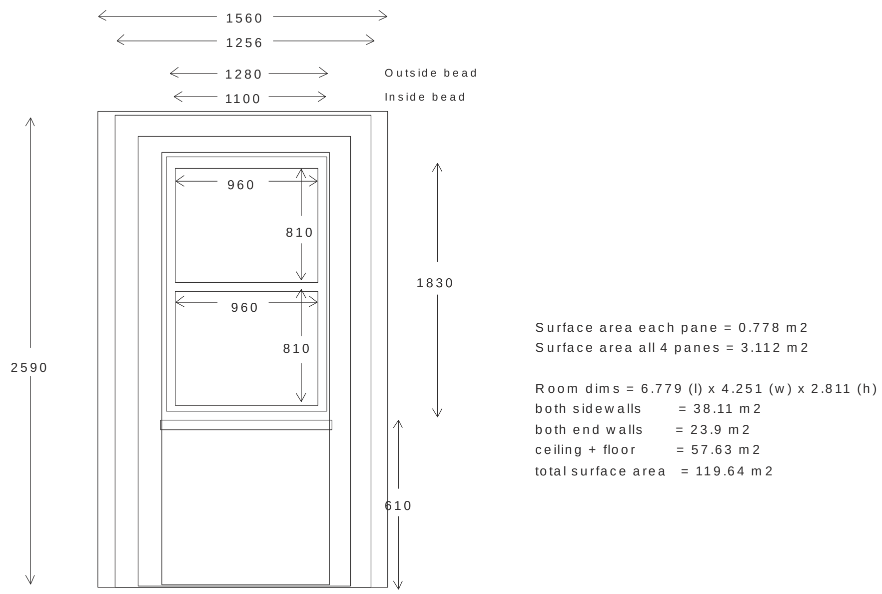
To reduce internal noise levels by at least 14dB to bring them significantly below the existing ambient level of 33.7dB L_{Aeq}.and close to the weekday ambient level of 20.3dB L_{Aeq}. recorded when the club was not operating.
A further 3dB reduction to adjust for subjective characteristics (**S 4.7**)

5.5.1 In view of the above considerations, the specification for mitigation shall be acoustic attenuation of the windows and their surrounds of approx. 40dB RW, to bring the internal noise levels integrated over a 15 minute period to below 25 dB LAeq and below NR20.

5.5.2 Additionally, during ‘worst case’ incidents outside, to bring the internal noise levels over any 1 minute period down to no more than 27dB $L_{Aeq,(1min)}$ and with additional specifications within specific frequency bands of 50dB LZeq,(1min) in the 63Hz octave band and 18dB LZeq,(1min) in the 500 Hz and 1kHz bands.

5.6 Existing Window Design

Fig 12. Sketch of existing window design – dimensions not to scale



14 Stanley Street, Blyth
First floor front room

5.7 Mitigation scheme 1

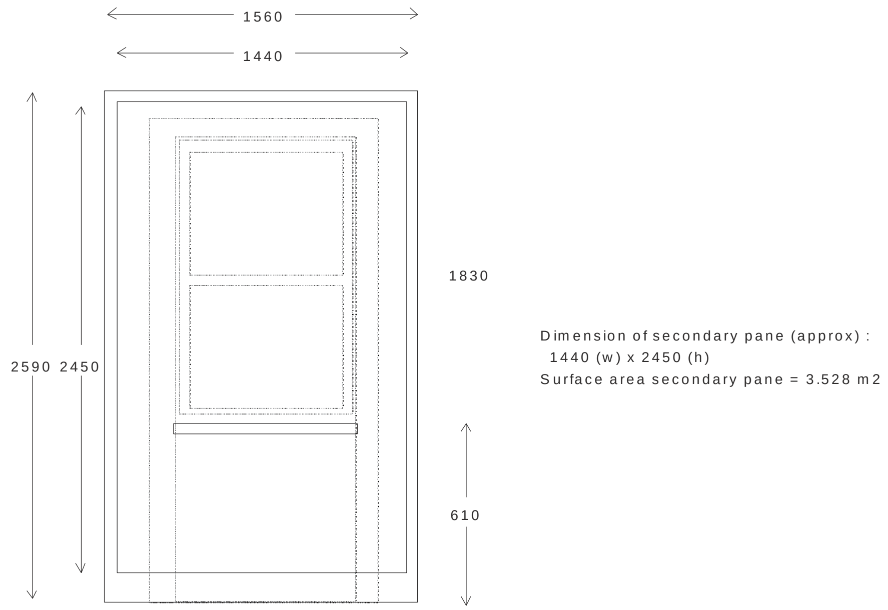
Proposed mitigation scheme 1 requires the retro-fitting of thick sealed-unit glazing units to the existing frames.
The potential need for remedial work to the existing frames must also be undertaken to ensure that excellent seals exist round all sides of each frame.

5.8 Mitigation Schemes 2 & 3.

Proposed mitigation schemes 2 & 3 involve secondary / tertiary glazing with a 100mm (approx.) gap. This is achieved by the creation of a door-sized secondary frame mounted to the inside of the existing window surround.
Construction may be of timber or synthetic materials (metal frames are unlikely to provide good thermal insulation).
In addition, these schemes require an upgrade of the existing glass to 6.8mm laminated glass.

Variations on the design of the internal, secondary frame are possible while still providing a comparable degree of noise attenuation.

Fig 13. Sketch of proposed new secondary frame dimensions



14 Stanley Street, Blyth
First floor front room
Secondary window frame

It will be essential that the additional internal frame for mitigation scheme 2 and 3 to provide excellent air seals on all sides, and where elements are to be openable for maintenance, cleaning, purge ventilation etc, then the deals must be airtight and under compression.

5.9 The acoustic performance of these 3 mitigation schemes will be examined in **Section 6**.

5.10 Assessment of observations made in letters of representation opposing the Planning Applications

Two representations were made in respect of the proposed Change of Use. These are included, in summary, for reference in **Appendix B**.

5.10.2.The relevant Environmental Health Department identified the "*potential risk that the proposed development could be unsuitable for residential development as the occupiers could suffer from sleep deprivation and other ill-health effects due to the volume, timing and type of music to be played"* at the night club. I fully agree with this concern. It is mitigated to some degree by the location of the bedroom at the rear of the property, but it is aggravated by the recognition that in addition to noise from the club, loud noise events arise in the street after the nightclub has ceased trading. This has been analysed in some detail in **Section 3**.

5.10.2 Mitigation has been proposed in this report which reduces internal noise below the threshold of noise identified as associated with the health risks referred to. The representation requires that "*A noise impact assessment must be carried out which identifies the worst-case scenario and the potential suitability of the Office for conversion – the acoustic standards contained within BS 8233 : 2014 should be referred to."*

This report has demonstrated that the standards of BS8233 are satisfied with the standard of construction already present in the property. It has also shown that more challenging criteria have also been satisfied, including an assessment of just the hours during which high noise levels are present, rather than over a full night-time period. This report has also demonstrated that the more onerous Noise Rating curve NR25 can be satisfied during those periods.

5.10.3 The second representation has been made by the owner / operator of the nightclub opposite. *Dejavu Nightclub & Events* , 11-13 Stanley Street

The representation correctly identifies the sources of potential disturbance : *"the premises currently operates to 3am on Friday, Saturday and Bank Holiday Sundays, with permitted hours extending to 2am on Thursdays & Sundays. Given the levels of attendance at the premises, the current office space surrounding the property prevents disturbance to the nearby residential premises from patrons dispersing between 3 to 3:30am.*
Additionally our premises is currently licenced to operate from 10am should we wish."
and *"Our operation would most certainly cause a disturbance to an immediate residential occupier"*
These concerns are well-made and have been considered carefully in this report. The mitigation schemes proposed have been informed by the actual noise levels detected over a few nights of operation, and have reduced the noise level to an extent that is no longer considered likely to cause a disturbance or other adverse effect.

The representation also notes the responsibility of the applicant, "*the applicant would be creator of change in the circumstance which without doubt would result in complaints from the occupiers of the flat."* This comment mirrors the provisions of the NPPF discussed in **Section 4.1**. and is correct in identifying the applicant as the 'agent of change'.
It is in recognition of this responsibility to protect the interests of the operation at the existing business, that care has been given to the design of the mitigation which ensures that a very high standard of internal amenity is provided.

6. Mitigation Schemes

Various options for enhanced noise insulation of the front façade of the proposed living room have been considered and their performance assessed against the criteria discussed in the previous section.

An initial estimate of the required performance led to the evaluation of several options for mitigation against noise from outside the front of the property, which also considered the practical and aesthetic preferences of the client. Three of these approaches to re-glazing the existing sash windows have been selected for thorough assessment.

These three schemes provide 1) a reduced internal noise level with enhanced low-frequency performance from a double glazing unit, 2) similar performance from a wide-gap secondary glazing arrangement, though with enhanced low-frequency attenuation, and 3) exceptional broadband noise attenuation from a wide-gap secondary glazing arrangement.

Each of these is assessed in terms of their performance across the frequency spectrum, in octave bands, – firstly, assessed against the integrated night-time noise levels obtained while the night club was operating (data in **Table 5**), and secondly, against the short-term 'worst-case' noise levels observed during one of the busy nights (the night of Saturday 20th May 2023).

6.1 Mitigation design detail

Three options for mitigation to the windows have been selected for evaluation. In each of the three options for mitigation, the standard of assembly and construction is at least as critical as the selection of products and the design. The frames and fixtures of the existing windows must make good air-tight seals with the surrounds.

6.1.1 Mitigation scheme 1.

Replace existing glazing with sealed unit 10 – 12 – 6.8 laminated in original sash windows.
The glass in all four of the existing sash window panes are replaced with sealed units, comprising 10mm float glass, a 12mm gap, and 6.8mm laminated glass in the other side.

Fitting a sealed unit of almost 29mm overall thickness to the existing frames is likely to necessitate additional woodwork to support the thicker and heavier assemblies, rebating the frame further to accommodate the thicker unit, and replacing the existing beading with a low-profile alternative. Advice will be necessary to advise on providing adequate strength from the significantly thinner support for the glazing product, (Additional material may have to be incorporated into the frames).
It is also probable that the weight of the sash counter-weights must be increased, which will require opening up the existing casements to access the counterweights, at which time it may be beneficial to investigate and enhance the

airtightness and density of materials inside the casement where these may provide a noise transmission path from outside in.

.

The expected performance of the specified glazing unit in isolation is 40dB RW. The manufacturer's specification for this product can be found in **Appendix D-a**.

6.1.2 Mitigation scheme 2.

Introduce a wide gap secondary glazing panel (gap approx. 100mm wide) and upgrade the glazing in the existing frames

Large gap with secondary glazing 6 -100 – 6.8 lam (or 6.4 lam where already fitted in lower panes).

The simplest arrangement would be a floor-to lintel and outer surround left to right frame arrangement. However, other options are possible, most convenient might be an arrangement which involves a shelf at window sill height (approx. 610mm from floor) and a new frame which seals only the upper portion.

In this scheme, the glass in the upper pane of the original windows is exchanged with 6.8mm laminated glass and adjusting the frames' rebate and beading to accommodate the thicker glass (the lower panes have already been upgraded to 6.4mm lam). There will be options to either increase the sash weights, or to include 'stops' to hold the windows open during purge ventilation and maintenance.

A secondary frame must be built around the existing surround, large enough to secure a secondary window, at approx. 100mm or more inside the original windows. This secondary window to be well sealed, and with a height, either, corresponding to the existing glazed area (i.e. ca. 1980mm) with solid shelf returning to the window cill, or panel to floor level, or, to the new frame at floor-level (i.e. ca. 2450).

The inner window is glazed with 6mm float glass.

6.1.3 Mitigation scheme 3.

Introduce a wide gap secondary glazing panel (gap approx. 100mm wide) with acoustic laminated glass and upgrade the glazing in the existing frames.

Large gap with secondary glazing 6 – 100 – 10.8 'Stadip *Silence*' acoustic laminated glass

This involves exchanging the glass in the original windows with 6mm float glass and adjusting the frames rebate and beading to accommodate the thicker glass as in Mitigation scheme 2 (above).

The secondary frame provides at least 100mm inside the original glazing is fitted with 10.8mm 'Stadip *Silence*' acoustic laminated glass, with the frame well sealed.

6.1.4 Noise attenuation

The three schemes will be assessed in each octave frequency band, using the formula in **Section 5.3**, and the received external noise spectra from **Sections 3.2**, and **3.6**, where the assessment has regard to the surface area of the windows, the room's volume and its reverberation time.

NOTE. If the room is occupied as a living room, it is likely that the reverb time will fall, with the consequence that the internal noise levels will also reduce slightly, thereby improving the performance beyond the predictions of this report.
Note the qualification to the use of Reverberation Time, Rt, data in **Section 1.5**

The acoustic performance of the window assemblies has been drawn from a number of sources, including Pilkington Glass data sheets (see **Appendix D**).

6.1.5 Cleaning & Maintenance

While the interior and exterior of the windows may be maintained and cleaned by traditional methods with no special considerations, the arrangements of Scheme 2 and Scheme 3 will require periodic if infrequent access to the void between the original sash windows and the new internal frame and glazing.
As the internal frame must be well sealed, this access must be a secured arrangement with pressure fixings to maintain good seals while permitting opening for cleaning and maintenance.

The inner frame may be constructed to be detachable and/or openable, but the seals on all sides must be airtight and under compression when closed.
A number of suitable fittings are available such as casement window fastenings and 'Brighton' fasteners.

6.1.6 Ventilation & Overheating

The living room windows face to the east and are therefore unlikely to contribute to any overheating in times of bright sunlight. Routine ventilation of the property is to be from the west facing elements of the property at the rear.
However, the interior frame of the windows in mitigation schemes 2 and 3 may be detached and/or opened for exceptional purge ventilation (e.g. after an incident in the kitchen, insanitary odour from pets, the use of noxious products).

6.1.7 Construction

The standard of workmanship must be of the highest order, ensuring that tight seals are provided around all perimeters of both the existing frames and the additional secondary frame required in schemes 2 and 3. The work must be air-tight.

6.1.8 Air-tight seals

Mitigation scheme 1 will require the existing sash mechanisms to be examined air gaps, and arrangements made to enhance the air-tightness around the openings to ensure good seals.

Mitigation schemes 2 and 3 will require an additional frame to be provided internal to the window recess. This must be rigid and well sealed, leaving a void of 100mm or more without air-gaps. In order to facilitate maintenance, cleaning and exceptionally, purge ventilation, an opening and fixing mechanism will be necessary. This may take any of a number of designs, in which the essential requirements of rigidity and air-tight sealing is achieved. This could involve a hinged panel with pressure fastening of a compression seal all round the perimeter.

6.2 Mitigation schemes assessed using measured integrated noise night-time noise levels.

6.2.1 Mitigation scheme 1. Sealed unit glazing
Sealed unit 10 – 12 – 6.8 lam

Calculation of façade noise attenuation

Living room		Provide :	room type AND either day or night hours below
			room dimensions
Volume , V (m3)	81		external noise spectrum (day & night)
Window area , S (m2)	3.11		window specs
Reverb time , T (sec)	0.68		vent specs
		Result :	Internal noise levels

Nighttime LAeq, 8hour (dB)	dB (A)	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k
External free-field noise , L1,ff (dB)	**57.7**	70.7	62.6	53.3	54.8	54.7	44.2	37.6
Glazing spec 10/12/6.8 mm , R (dB)		23	27	30	36	41	42	52
Result 1 : Noise thru glazing (dB)	**21.2**	**44**	**32**	**19**	**15**	**10**	**-2**	**-18**

6.2.2 Mitigation scheme 2. Large gap secondary glazing + original
Large gap & secondary glazing 6.8 lam -100 – 6

Nighttime LAeq, 8hour (dB)	dB (A)	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k
External free-field noise , L1,ff (dB)	**57.7**	70.7	62.6	53.3	54.8	54.7	44.2	37.6
Glazing spec 6.8/100/6 mm , R (dB)		18	26	34	44	44	38	45
Result 2 : Noise thru glazing (dB)	**23.9**	**49**	**33**	**15**	**7**	**7**	**2**	**-11**

6.2.3 Mitigation scheme 3. Large gap secondary glazing with acoustic laminated glass + original.
6 – 100 – 10.8 ‘Stadip *Silence*’ laminated glass

Nighttime LAeq, 8hour (dB)	dB (A)	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k
External free-field noise , L1,ff (dB)	**57.7**	70.7	62.6	53.3	54.8	54.7	44.2	37.6
Glazing spec 6.8/100/10.8 mm , R (dB)		30	38	48	53	56	52	51
Result 3 : Noise thru glazing (dB)	**11.9**	**37**	**21**	**1**	**-2**	**-5**	**-12**	**-17**

6.3 Mitigation schemes assessed using measured worst case noise levels

The three mitigation schemes considered in the previous section are re-assessed against the higher noise levels adopted as ‘worst case’.
Noise levels on 21/May/23 @ 02:09:00 hrs contained the adopted ‘worst case’ noise incident.

The external noise level adopted for ‘the worst case’ while the night club was operating : with an $LAeq_{(1sec)}$ of 67.2dB and $LCeq_{(1sec)}$ of 74.7dB ;

at 02:09:00hrs on the night of Sat 20/May & Sun 21/May.
.
Three approaches to re-glazing the existing sash windows are re-examined.

6.3.1 Mitigation scheme 1. Sealed unit glazing (See **Section 6.2.1** for detail)
Sealed unit 10 – 12 – 6.8 lam

Calculation of façade noise attenuation

Living room		Provide :	room type AND either day or night hours below
			room dimensions
Volume , V (m3)	81		external noise spectrum (day & night)
Window area , S (m2)	3.11		window specs
Reverb time , T (sec)	0.68		vent specs
		Result :	Internal noise levels

Nighttime LAeq, 8hour (dB)	dB (A)	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k
External free-field noise , L1,ff (dB)	**67.0**	73.2	65.1	55.4	65.3	63.3	57.6	54.3
Glazing spec 10/12/6.8 mm , R (dB)		23	27	30	36	41	42	52
Result 4 : Noise thru glazing (dB)	**26.5**	**46**	**34**	**22**	**25**	**18**	**12**	**-2**

Almost achieves NR20

6.3.2 Mitigation scheme 2. Large gap secondary glazing + original (See **Section 6.2.2** for detail)
Large gap & secondary glazing 6 -100 - 6

Nighttime LAeq, 8hour (dB)	dB (A)	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k
External free-field noise , L1,ff (dB)	**67.0**	73.2	65.1	55.4	65.3	63.3	57.6	54.3
Glazing spec 6/100/6 mm , R (dB)		18	26	34	44	44	38	45
Result 5 : Noise thru glazing (dB)	**27.3**	**51**	**35**	**18**	**17**	**15**	**16**	**5**

Achieves NR20

6.3.3 Mitigation scheme 3. Large gap secondary glazing with acoustic laminated glass + original. (See **Section 6.2.3** for detail)
6 – 100 – 10.8 'Stadip *Silence*' laminated glass

Nighttime LAeq, 8hour (dB)	dB (A)	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k
External free-field noise , L1,ff (dB)	**67.0**	73.2	65.1	55.4	65.3	63.3	57.6	54.3
Glazing spec 6/100/10.8 mm , R (dB)		30	38	48	53	56	52	51
Result 6 : Noise thru glazing (dB)	**15.4**	**39**	**23**	**4**	**8**	**3**	**2**	**-1**

NOTE: There is some uncertainty of the expected performance of the mitigation schemes at low frequencies

Calculations within each octave band : Result = L1 – R + 10log(S . Rt / V) + 11 dB
Where the Result n provides the internal noise level in each octave band and the overall 'A'-weighted internal noise level predicted. (Formula discussed in **Section 5.3**).
.

6.4 Corrections for subjective characteristics.

I considered an additional 'correction' in **Section 4.7** for the subjective impacts of the human voice occurring in some incidents late at night (such a distressed shouting and loud swearing). Those considerations led to a proposal to add an additional 3dB to the 'A'-weighted criterion of any mitigation.

6.4.1 The highest LAeq recorded with the existing windows was 33.7dB $L_{Aeq,(15min)}$. For each of the the three proposed mitigation schemes, the reduction of the 'worst case' noise levels has been predicted for each scheme, above.

6.4.2 Using the 'worst case' assessments of the schemes, we can update their 'Results' by adding 3dB to the calculated L_{Aeq} internal noise levels through the glazing as follows :-

Mitigation scheme 1 : result 4 : 26.5 dB(A) + 3 = 29.5 dB(A) ;
Mitigation scheme 2 : result 5 : 27.3 dB(A) + 3 = 30.3 dB(A) ;
Mitigation scheme 3 : result 6 : 15.4 dB(A) + 3 = 18.4 dB(A) .

6.4.3 While this proposed 'correction' is not adopted in any Standard or Guidance, and only BS4142 allows for some interpretation of the impacts to be assessed, this analysis helpfully indicates the potential for annoyance from the type of noise events that are likely to take place in Stanley Street late at night.
The resulting figures, however, still show a compliance with BS8233 Section 7.7.2, a Standard which is intended to apply 'A' weighted noise levels integrated over a full day or night-time period, without and regard for the subjective impacts of any noise events.

6.5 Comparison of the 3 mitigation schemes.

It is apparent that there is not a great performance difference between scheme 1 and scheme 2. Scheme 1 offers a slightly high degree of attenuation of mid-range noise, while the wide gap of scheme 2 offers a higher degree of attenuation of low frequency noise. The significant difference between the two is in the construction methodology.

6.5.1 While scheme 3 clearly offers an improved attenuation of external noise, it is debatable whether the 'improvement' offers any meaningful increase in amenity in the context of a living room in a town centre flat and with the potential for noise from other sources and other transmission paths, as discussed. These provide a noise floor which lies above the levels that would be attributed to any higher standard of mitigation to the front windows. It is likely that the measured existing internal noise level of 18.1 dB L_{Af90} provides both an adequate degree of residential amenity, and resilience against noise ingress through the front windows which scheme 3 seeks to further reduce.

6.6 NR curves

The performance of scheme 1 and scheme 2 have been plotted against NR curves in Figs 14 & 15 below. These illustrate that NR 20 can be achieved with both schemes, though with minor variations across the frequency spectrum between the two schemes.

Fig 14/ NR Curve - Worst case external noise and mitigation scheme 1

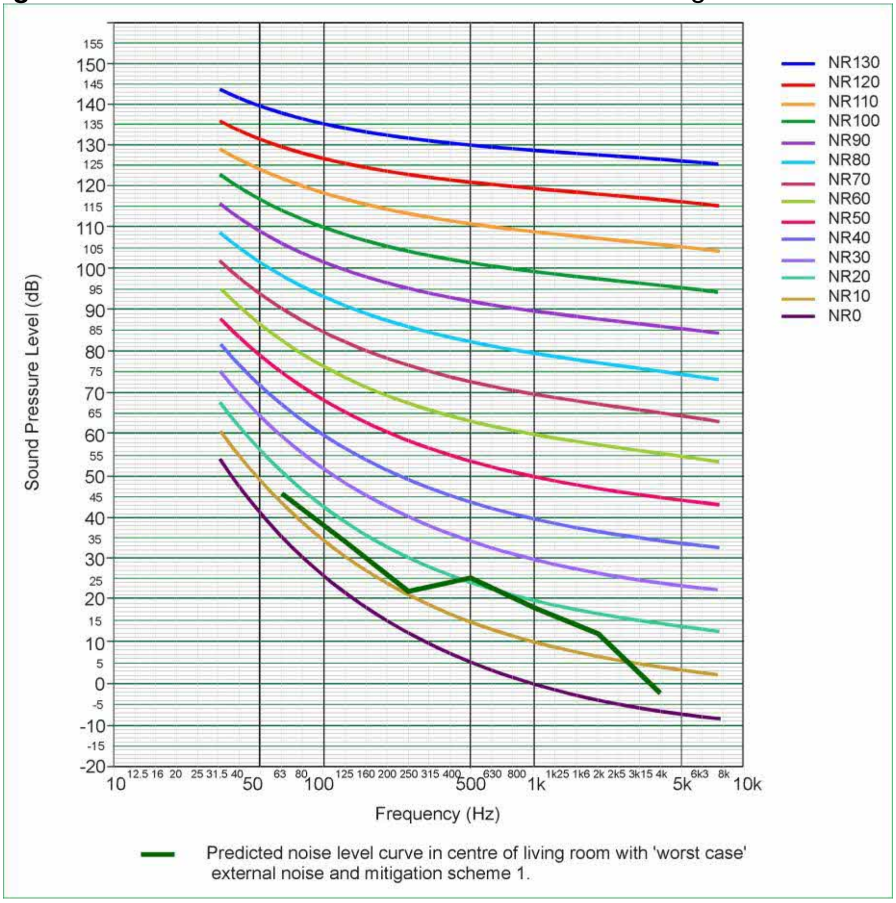
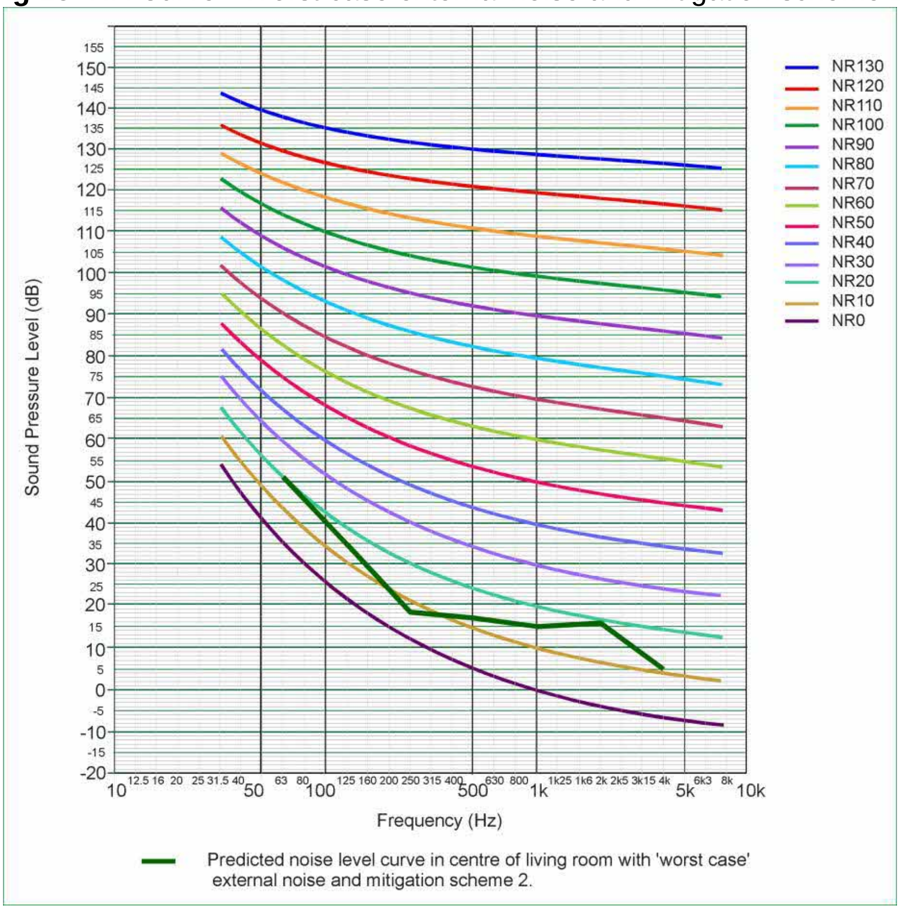


Fig 15. NR Curve - Worst case external noise and mitigation scheme 2



7. Conclusions

It is likely to be difficult to achieve a high standard of residential amenity in a legacy brick terrace property so close to a lively nightclub.

Surprisingly, the property's front room (the living room) already achieves the standard set out in BS8233 for living rooms when the existing windows are closed. However, more thorough analysis of the actual noise climate has revealed features of the sound from the nightclub and from activity in the street after it closes, which indicate a high probability of causing disturbance to occupants.
It is also recognised that the introduction (or re-introduction) of residential use opposite a trading night-club poses a potential threat to that business from future residents who may be disturbed by the noise from the club and the associated activity in the street outside, and then seek to limit the business' activities.

This report has gone beyond the approved methodology for the assessment of internal amenity attempted, and has sought to quantify those potential risks by several methodologies, so that a robust mitigation scheme can be developed with a high degree of confidence in achieving a good standard of residential amenity for the occupants, and a similar degree of confidence that the existing night-time business does not face any restrictions from the presence of residents nearby.

Three mitigation schemes have been considered, offering high degrees of noise isolation from the street outside, and these have been evaluated against both typical night-time noise levels, and against the worst case noise levels obtained. They have additionally been evaluated against an 'adjusted' criterion which allows for the adverse subjective impact of certain behaviours late at night.

It was apparent that the first scheme (scheme 1) offers adequate amenity when assessed against the criteria adopted, though may present difficulties in construction if as much as possible of the original woodwork is to be retained.
The middle scheme (scheme 2) offers slightly higher protection against intrusive low-frequency noise, and is considered not to give rise to disturbance to persons with typical sensitivities.
The most effective of those three schemes (scheme 3) provides additional resilience in the form of increased attenuation of noise from the street outside, though it is not proposed that the applicant is required to provide that additional level of protection, as the level of amenity it appears to offer is expected to be below the ambient noise level in the property from services and other noise transmission paths. However, scheme three does lend itself to a relatively simple upgrading from scheme 2 should the wish to do so arise in the future.

This report has explored the potential for adverse impact far more thoroughly than is usual for a Change of Use from commercial to residential use, but has reached the conclusion that the C-o-U would be satisfactory, and as a result to the care in assessing the impacts from several points of view against several criteria, reaches that conclusion with a high level of confidence both in protecting future residents from adverse impacts, and in protecting the existing business from the likelihood of substantiated complaints.

Appendix A - Location Plan

Blyth centre street plan
showing the premises outlined in red, with the night-club opposite outlined in purple.

Appendix B

EHO Consultee response :

The proposed residential flat is situated opposite a nightclub on Stanley Street which has extensive opening hours including during the acoustic night time (23:00 – 07:00) which is recognised as an acoustically sensitive period for residential receptors. There is a potential risk that the proposed development could be unsuitable for residential development as the occupiers could suffer from sleep deprivation and other ill-health effects due to the volume, timing and type of music to be played. A noise impact assessment must be carried out which identifies the worst-case scenario and the potential suitability of the Office for conversion – the acoustic standards contained within BS 8233 : 2014 should be referred to.

Representation : Dejavu Nightclub & Events Venue , 11-13 Stanley Street

My premises at 11-13 Stanley street has operated as a viable commercial business as a "Nightclub" since the approval for conversion from the seamans mission to a "Public House and Nitespot" on 31/10/1975 the premises currently operates to 3am on Friday, Saturday and Bank Holiday Sundays, with permitted hours extending to 2am on Thursdays & Sundays. Given the levels of attendance at the premises, the current office space surrounding the property prevents disturbance to the nearby residential premises from patrons dispersing between 3 to 3:30am.

Additionally our premises is currently licenced to operate from 10am should we wish. Whilst any disturbance to our current commercial neighbours would be minimal should we operate from 10am to 3am on weekends and 10am to 1-2am weekdays and Sundays. Our operation would most certainly cause a disturbance to an immediate residential occupier.

. . .

No allowances for the proximity to our premises has been made, it is my concern the suitability of the premises for residential use in close proximity to a music venue has not been given due consideration by the applicant. I feel a conflict will occur in the future should the development go ahead as our premises have operated in a commercial environment for a substantial period of time, the applicant would be creator of change in the circumstance which without doubt would result in complaints from the occupiers of the flat.

Appendix C

Table 2. Peak acoustic incidents while the night club was operating showing internal and external noise levels.
One window was slightly open during these measurements (approx. 15mm) to allow for the external microphone to be supported. The gap was loosely filled with fabric, and the internal measurements were made closer to the other window, which was closed.

Note. This table presents raw data. No correction has been made for façade reflection on the external values not room reverberation on the internal values.

Fri 19 – Sat 20/May/2023

	22:18:23			22:22:53			01:06:48			02:38:25			03:07:13		
	Int	Ext	Diff	Int	Ext	Diff	Int	Ext	Diff	Int	Ext	Diff	Int	Ext	Diff
LAeq	37.0	53.1	16.1	34.7	57.1	22.4	50.1	68.5	18.4	53.3	63.0	9.7	52.1	70.0	17.9
LCeq	53.5	71.9	18.4	56.0	76.3	20.3	55.6	76.5	20.9	58.9	80.3	21.4	57.7	72.3	14.6
LAmx	55.4	57.9	2.5	35.5	61.0	25.5	53.3	80.6	27.3	60.5	69.1	8.6	56.8	77.8	21.0
LCmx	63.8	81.3	17.7	58.3	85.5	27.2	57.4	83.7	26.3	62.1	87.0	24.9	59.7	79.0	19.3
LZ32	38.0						33.3			44.4			47.4		
LZ40	44.8						38.8			46.4			42.2		
LZ50	39.3						49.7			50.7			36.9		
LZ63	45.6						49.4			51.4			20.1		
LZ80	48.1						43.6			46.2			27.9		
LZ100	34.5						34.1			44.5			27.8		
LZ125	38.7						37.6			47.6			23.2		

From the above 5 measurement periods, the average 'difference' between indoors and outdoors measurements were : LAeq -21dB and LCeq -19dB.

Table 3-a. Exceptionally loud peak incidents during night of Sat 20 to Sun 21/May/2023
Note. This table presents raw data. No correction has been made for façade reflection on the external values not room reverberation on the internal values.

	22:15:06			00:45;04			01:20:15			01:35:03			02:23:41		
	Int	Ext	Diff	Int	Ext	Diff	Int	Ext	Diff	Int	Ext	Diff	Int	Ext	Diff
LAeq	58.9	65.7	6.8	55.3	76.8	21.5	52.3	72.0	19.7	50.9	74.3	23.4	52.6	76.9	24.3
LCeq	61.3	78.9	17.6	62.3	84.4	22.1	55.4	79.2	23.8	55.3	77.6	22.3	53.5	77.1	23.6
LAmx	64.6	70.6	6.0	57.6	68.5	10.9	56.2	75.7	19.5	54.5	77.0	22.5	58.0	82.3	24.3
LCmx	65.6	81.0	15.4	64.1	86.2	24.1	58.0	80.7	22.7	58.2	79.3	21.1	58.0	82.3	24.3
LZ32	50.3	62.1	11.8	47.9	69.0	21.1	27.5	42.4	14.9	39.6	58.7	19.1	34.6	55.4	20.8
LZ40	41.9	65.9	24.0	39.1	62.3	23.2	34.5	54.7	20.2	53.8	73.1	19.3	35.8	55.8	20.0
LZ50	45.9	69.8	23.9	39.6	60.7	21.1	48.8	71.9	23.1	43.6	66.6	23.0	31.7	49.1	17.4
LZ63	35.0	70.0	35.0	34.0	60.5	26.5	48.5	77.6	29.1	35.6	68.8	33.2	22.5	52.3	29.8
LZ80	44.1	76.0	31.9	31.6	60.1	28.5	38.6	65.8	27.2	40.0	67.1	27.1	23.1	47.8	24.7
LZ100	35.7	65.1	29.4	45.4	69.9	24.5	41.3	62.8	21.5	32.1	54.5	22.4	43.3	43.3	0.0
LZ125	34.7	62.1	17.4	56.5	61.5	5.0	45.3	64.2	18.9	34.9	56.1	21.2	36.5	42.8	6.3
Lz1k	49.7	55.8	6.1	42.0	63.6	21.6	47.5	67.7	20.2	43.6	64.6	21.0	50.8	74.8	24.0

Table 3-b. Exceptionally loud peak incidents during night of Sat 20 to Sun 21/May/2023, continued.

		03:00:56			03:01:36			03:03:36			03:08:42			04:10:44		
															car	
		Int	Ext	Diff	Int	Ext	Diff	Int	Ext	Diff	Int	Ext	Diff	Int	Ext	Diff
	LAeq	55.7	75.2	19.5	52.6	70.1	17.5	58.4	81.8	23.4	54.0	73.5	19.5	33.2	56.2	23.0
	LCeq	55.5	75.5	20.0	53.9	71.0	17.1	58.7	82.1	23.4	54.2	73.6	19.4	49.0	62.2	13.2
	LAmx	58.8	78.0	19.2	57.9	73.5	15.6	64.0	88.4	24.4	59.2	78.3	19.1	33.9	58.9	25.0
	LCmx	57.9	78.4	20.5	58.9	74.1	15.2	63.9	88.2	24.3	59.0	78.1	19.1	52.1	63.9	11.8
	LZ32	32.9	52.4	19.5	30.2	55.6	25.4	45.2	68.5	23.3	28.2	42.0	13.8	36.5	50.5	14,0
	LZ40	35.4	49.3	13.9	32.0	50.1	18.1	33.4	48.6	15.2	32.1	39.1	7.0	31.8	50.0	18.2
	LZ50	34.5	49.9	15.4	34.7	57.6	22.9	38.7	64.0	25.3	35.4	43.9	8.5	38.3	49.9	11.6
	LZ63	23.5	54.8	31.3	20.8	47.9	27.1	46.1	72.1	26.0	17.5	41.2	23.7	19.6	51.6	32.0
	LZ80	28.6	44.7	16.1	18.9	46.2	27.3	23.1	48.0	24.9	19.3	44.6	25.3	16.3	50.1	33.8
	LZ100	18.9	44.3	25.4	26.2	50.1	23.9	24.5	48.2	23.7	18.2	41.5	23.3	24.6	50.3	25.7
	LZ125	21.9	48.5	26.6	30.3	52.7	22.4	30.8	50.0	19.2	24.9	47.8	22.9	23.8	49.0	25.2
	Lz1k	47.5	66.2	18.7	37,8	56.9	19.1	50.3	72.3	22.0	52.6	71.6	19.0	25.3	48.7	23.4

Table 4. Noise levels simultaneously indoors and outdoors during night of Sat 20 to Sun 21/May/2023 when club is operating and at quiet times when club is NOT operating.

Quiet refs		Club operating 21/5 00:29:54			Club closed Plant operating 21/5 03:47:25			Club closed Plant Not op. 21/5 05:58:56			Monday night 22-23/5 00:36:29			Monday night 22-23/5 03:47:25		
		Int	Ext	Diff	Int	Ext	Diff	Int	Ext	Diff	Int	Ext	Diff	Int	Ext	Diff
	LAeq	31.7	54.7	23.0	19.9	33.1	13.2	18.6	33.1	14.5	18.3	35.0	16.7	20.1	37.5	17.4
	LCeq	48.6	72.2	23.6	43.9	45.4	1.5	40.1	50.4	10.3	31.1	47.3	16.2	36.6	47.2	10.6
	LAmx	34.5	57.2	22.7	20.2	34.7	14.5	19.3	34.6	15.3	18.8	35.7	16.9	20.7	38.0	17.3
	LCmx	50.8	74.7	23.9	45.4	49.2	3.8	42.0	51.9	9.9	34.6	48.2	13.6	41.0	48.9	7.9
	LZ32	25.4	51.0	25.6	25.8	35.3	9.5	35.2	47.3	12.1	23.1	39.0	15.9	20.1	34.4	14.3
	LZ40	39.7	64.3	24.6	32.0	36.8	4.8	34.3	44.5	10.2	24.3	39.0	14.7	23.1	33.7	10.6
	LZ50	43.7	64.2	20.5	44.4	34.8	10.4	34.2	38.4	4.2	20.8	40.2	19.4	34.8	39.3	4.5
	LZ63	40.9	67.1	26.2	33.5	37.0	3.5	14.9	36.1	21.2	12.4	36.8	24.4	14.4	37.9	23.5
	LZ80	35.9	63.2	27.3	20.1	33.2	13.1	12.1	35.0	22.9	9.9	36.5	26.6	14.5	32.7	18.2
	LZ100	41.0	61.1	20.1	23.5	35.8	12.3	15.3	36.9	21.6	16.5	37.3	20.8	32.1	36.1	4.0
	LZ125	38.8	63.9	25.1	13.5	29.4	15.9	12.8	34.1	21.3	16.1	34.3	18.2	19.2	35.7	16.5
	Lz1k	14.1	39.1	25.0	5.2	21.7	16.5	3.5	22.0	18.5	2.8	24.6	21.8	4.5	26.2	21.7

Appendix D-a

Glazing Manufacturer's Acoustic Specification.
The following table is taken from "Glass and Noise Control", Technical Bulletin published by Pilkington Ltd.

Table 2 –Pilkington Insulight ™

Thirdoctaveband Centre Frequency (Hz)	Sound Insulation (dB) for Glass Thickness (mm)											
	4/12/4		6/12/6		6/12/6.4 PVB		10/12/4		10/12/6		10/12/6.4 PVB	
100	25		17		19		23		27		27	
125	24	24	26	20	24	21	28	25	27	26	28	27
160	23		22		21		26		24		26	
200	21		18		19		19		24		26	
250	21	20	18	19	19	20	23	22	29	27	30	29
315	19		24		24		26		31		32	
400	22		27		28		31		33		34	
500	25	25	29	29	32	31	33	33	34	34	36	36
630	30		33		34		36		37		40	
800	33		37		38		39		39		41	
1000	36	35	39	38	40	39	41	40	41	40	42	41
1250	38		39		40		41		41		41	
1600	40		39		39		41		39		41	
2000	41	38	34	36	35	37	45	43	37	38	42	42
2500	35		37		39		45		40		44	
3150	31		42		44		42		43		49	
4000	40	35	47	45	49	47	44	44	47	46	53	52
R_m (dB)	29		30		31		34		34		36	
R_w (dB)	31		33		34		36		38		40	
R_{TRA} (dBA)	25		26		27		29		32		34	

Appendix D-b

Table 3 – Double Windows (Secondary Sashes)

Thirdoctaveband Centre Frequency (Hz)	Sound Insulation (dB) for Glass Thickness (mm)					
	6/100/4		6/150/4		10/200/6	
100	25		27		32	
125	27	26	30	29	37	35
160	27		30		39	
200	33		34		45	
250	33	34	34	35	46	46
315	37		39		46	
400	41		42		47	
500	46	44	46	45	45	46
630	50		50		45	
800	54		54		44	
1000	57	56	57	56	45	46
1250	59		58		50	
1600	58		58		53	
2000	52	53	52	52	58	56
2500	51		49		58	
3150	48		47		64	
4000	57	52	52	50	64	65
R_m (dB)	44		44		47	
R_w (dB)	46		47		49	
R_{TRA} (dBA)	37		39		45	

Appendix E

Author

The author of this report is Dave Cross, who has over 40 years' experience working in the field of sound, its control and its impacts, and 18 years in developing strategies to protect residential amenity around music events and venues.

Qualifications

Acoustics Qualification:

Equipment and tests were performed under the direct supervision of Dave Cross who holds a current *Certificate of Competence in Environmental Noise Measurement* awarded by the *Institute of Acoustics*.

Equipment

Sound measuring equipment:

instruments included *Bruel & Kjaer* **2250** Class 1 sound analyser meters, and *Cirrus Research* **CR-171B** Class 1 meter including logging and spectral analysis functions.

Meters are calibrated before and after tests with *Bruel & Kjaer* 4230 '*Pistonphone*' calibrator.
