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PROPOSED MIXED-USE REFURBISHMENT - 20-21 HOPE STREET, WREXHAM - NOISE SURVEY

NOISE IMPACT ASSESSMENT

On behalf of:

JR+Margo Ltd

Report No: P25-236-R01v1
March 2025

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NOISE IMPACT ASSESSMENT

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1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd was commissioned by JR+Margo Ltd to carry out a noise impact assessment in connection with a proposed planning application for a proposed refurbishment of an existing building with commercial premises on the ground floor and a residential development on the upper floors at 20-21 Hope Street, Wrexham.

1.2 The location of the site is shown in **Figure 1**. The ground floor commercial demise is currently occupied and the upper floors are vacant. The site is bounded by commercial units to the east and west with Hope Street to the north, east and west.

1.3 It is proposed to redevlop the upper floors of the building for residential use, although exactp proposals have yet to be finalised at this stage. The ground floor will be refurbished, with the existing use as a phone shop centre being retained. The phone shop therefore foccusses on the potential impact of existing noise on the proposed upper floor residences

1.4 The existing separating ceiling/floor construction between the ground floor phone shop and vacant upper floors is a timber joist floor overlaid with floorboards and with a lath and plaster ceiling that has numerous holes/gaps. This floor is then underdrawn by a separate suspended ceiling with a very large (circa 2m) cavity which is to be removed as part of the refurbishment. As such, no in-situ testing of the sound insulation of this existing arrangement was deemed appropriate/useful. We have nevertheless provided advice on the need for sound insulation enhancements as part of the refurbishment works but note that the detailed requirements for this are a Building Regulations rather than planning matter.

1.5 The assessment has been based on the indicative layout as provided by JR + Margo Ltd dated February 2025. The proposed layout of the development is shown in **Figure 2**.

1.6 The noise assessment has included:

- An inspection of the site and surrounding area;
- Measurement of noise levels during representative periods of the daytime and night/early morning;
- Recommendation of appropriate mitigation measures.

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

2.0 GUIDANCE

NPPF:2023

2.1 Paragraph 191 of the National Planning Policy Framework (NPPF) 2023 states that planning policies and decisions should *"ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: a) mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*"

NPSE:2010

2.2 The Noise Policy Statement for England (NPSE) 2010, which is referred to the in NPPF, includes three aims:

i. Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

ii. Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

iii. Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

BS 8233:2014

2.3 No specific guidance is given in the NPPF on acoustic design criteria, therefore, the guidance discussed below has been used for acoustic design purposes.

2.4 Guidance on acceptable noise levels in habitable rooms and private gardens is set out in British Standard 8233: 2014, 'Guidance on sound insulation and noise reduction for buildings'. BS 8233 recommends that it is desirable that noise from external sources does not exceed the guidelines values that are shown in Table 1 inside habitable rooms for daytime (07:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) periods.

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

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

2.5 BS 8233 also recognises that regular individual noise events at night can cause sleep disturbance. Peaks of noise from individual events are usually described in terms of *L*AFmax values and these can be highly variable and unpredictable.

2.6 For private outdoor amenity spaces of the new houses (e.g. rear gardens) BS8233 states that 'it is desirable that the external noise level does not exceed 50 dB *L*Aeq,16hr with an upper guideline value of 55 dB *L*Aeq,16hr which would be acceptable in noisier environments'. In our experience, most local planning authorities have traditionally adopted, or accepted, the 55 dB(A) guideline value for rear gardens of proposed new residential developments near busy roads. However, the standard also recognises that these guideline values are not achievable in all circumstances where development might be desirable and, in such cases, for sites near to the 'strategic transport network' higher noise levels than 55 dB *L*Aeq,16hr in gardens may be acceptable.

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

'Technical Advice Note (Wales) 11 – Noise', 1997 (TAN 11) and CL-01-15 updates

2.8 TAN 11 sets out Noise Exposure Categories (NECs) for proposed residential development land that is exposed to different types of noise, and their suitability for residential use.

2.9 The NECs for land exposed to road traffic noise are shown in **Table 2**.

Table 2: Noise Levels[1] Corresponding to the Noise Exposure Categories for New Dwellings $L_{Aeq,T}$ dB

Noise Source		Noise Exposure Category			
		A	B	C	D
Road Traffic	07:00-23:00	<55	55-63	63-72	>72
	23:00-07:00[2]	<45	45-57	57-66	>66
Rail Traffic	07:00-23:00	<55	55-66	66-74	>74
	23:00-07:00[2]	<45	45-59	59-66	>66
Air Traffic[3]	07:00-23:00	<57	57-66	63-72	>72
	23:00-07:00[2]	<48	48-57	57-66	>66
Mixed Sources[4]	07:00-23:00	<55	55-63	63-72	>72
	23:00-07:00[2]	<45	45-57	57-66	>66

Notes

(1) Noise levels: the noise level(s) (LAeq,T) used when deciding the NEC of a site should be representatives of typical conditions.

(2) Night-time noise levels (2300-0700): sites where individual noise events regularly exceed 82dBLAmax (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the LAeq,8H (except where the LAeq,8H already puts the site in NEC D).

(3) Aircraft noise: daytime values accord with the contour values adopted by the Department of Transport which relate to levels measured 1.2m above open ground. For the same amount of noise energy, contour values can be up to 2 dB(A) higher than those of other sources because of ground reflection effects.

(4) Mixed sources: this refers to any combination of road, rail, air and industrial noise sources. The "mixed source" values are based on the lowest numerical values of the single source limits in the table. The "mixed source" NECs should only be used where no individual noise source is dominant. To check if any individual noise source is dominant (for the purposes of this assessment) the noise level from the individual sources should be determined and then combined by decibel addition (remembering first to subtract 2 dB(A) from any aircraft noise contour values). If the level of any one source then lies within 2 dB(A) of the calculated combined value, that source should be taken as the dominant one and the site assessed against the appropriate NEC for that source, rather than using the "mixed source" NECs. If the dominant source is industrial noise see paragraph B17 of Annex B. If the contribution of the individual noise sources to the overall noise level cannot be determined by measurement and/or calculation, then the overall measured level should be used and the site assessed against the NECs for "mixed sources".]

Category A - Noise need not be considered as a determining factor in granting planning permission.

Category B - Noise should be taken into account and steps taken to ensure an adequate level of protection against noise.

Category C - Planning permission should not normally be granted. Where development is permitted, steps should be taken to ensure a commensurate level of protection against noise.

Category D - Planning permission should normally be refused.

2.10 The Noise Exposure Categories only apply to transportation noise. For other types of noise, TAN11 includes the following:

B18. Commercial developments such as fast food restaurants, discos, night clubs and public houses pose particular difficulties, not least because associated activities are often at their peak in the evening and late at night. Local planning authorities will wish to bear in mind not only the noise that is generated within the premises but also the attendant problems of noise that may be made by customers in the vicinity. Disturbance that can be caused by traffic and associated car parking should not be underestimated.

Noise from Pubs and Clubs

2.11 There is no universally adopted method for assessment of noise impact from entertainment premises, such as breakout of music from community public houses, upon nearby residents and the local authority does not provide guidance nor limits specific to the control of noise from existing entertainment premises.

2.12 There are a number of documents which refer to entertainment noise such as IOA 'Good Practice Guide on the Control of Noise from Pubs and Clubs' 2003, NANR92:2005 'Noise from Pubs and Clubs' and an article in Institute of Acoustics Acoustic Bulletin dated Nov/Dec 2003. NANR92 does show examples of the use of Noise Rating Curves to provide a design criterion, with one particular example from Sheffield City Council recommending daytime noise (i.e. 07:00 to 23:00 hours) is controlled to NR30 in habitable rooms.

NANR45

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

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

2.15 The corresponding NANR45 reference curve values are equivalent to 47 and 41 dB *L*eq,T in the 63 Hz and 125 Hz octave bands respectively. It is of note that these noise levels have been implemented as noise limits for inside habitable rooms of dwellings by Local Authorities for the control of music/entertainment noise, for example Manchester City Council.

Acoustic Design Criteria

2.16 Taking into account all of the above, we have therefore adopted the following criteria in respect of internal noise with windows closed and trickle ventilation provided:

- Daytime noise below 30 dB *L*Aeq,16hr inside living rooms and bedrooms, 35 dB *L*Aeq,16hr inside dining rooms; and
- Night-time noise levels not exceeding 25 dB *L*Aeq,8hr and generally not exceeding 40 dB *L*AFmax in bedrooms (i.e. no more than 10 times per night); and
- Internal noise levels of 47 and 41 dB *L*eq,T for octave bands at 63 Hz and 125 Hz respectively.

3.0 NOISE SURVEY

3.1 A noise survey was carried out between 13:30 on Friday 14 March and 12:30 on Monday 17 March 2025, using automated noise monitoring equipment.

3.2 The purpose of the noise survey was to quantify the prevailing noise levels at the site.

3.3 Noise levels were measured at one primary location, as shown in **Figure 1** and described below:

- **Location A**: At the front of the site facing Hope Street at 2nd Floor level, microphone protruding out of window.

3.4 The measurement was carried out using an NTi Audio XL2 'Class 1' sound analyser and associated environmental kit, with the microphone fitted with a windshield and tripod mounted. Calibration checks were carried out on the sound analysers both before and after the measurement periods with no variance in levels observed.

3.5 The automated noise measurements were taken in consecutive 5-minute periods in 'free-field' conditions and with the sound analyser microphone protruding on a pole from an upper floor window. Frequency analysis was carried out, and audio was also recorded in order to assist in identifying significant sources of noise contributing to the noise climate.

3.6 Weather conditions during the survey were considered acceptable for the purposes of the survey and subsequent assessment.

3.7 Hope Street is pedestrianised and pedestrian noise on Hope Street was found to be the main source of noise on site during the day, with entertainment noise (including music) in the vicinity being the main source of noise in the evening and early part of the night-time. Indeed, noise levels in the early part of the night on Friday and Saturday were found to be higher than in the day.

3.8 The results from the automated measurements have been used to calculate the daytime *L*Aeq,16hr value from the logarithmic average of all five-minute measurements for each day of the survey as well as the night-time *L*Aeq,8hour value with the 10th highest *L*AFmax for the 23:00 – 07:00 period also adopted.

3.9 On this basis, the adopted noise exposure values are as follows:

Table 3: Summary of daytime & night-time noise exposure values at Locations A (dB)

Location	Daytime	Night-time	
	$L_{Aeq,16h}$ r	10th highest L_{AFmax}	$L_{Aeq,8hr}$
Friday	58	82	62
Saturday	58	78	62
Sunday	57	73	52
Monday	58	-	-

3.10 The results were mainly dictated by entertainment noise over Friday and Saturday night and pedestrian passers-by during the day with road traffic noise being a only a minor contributing factor to measured noise levels, with the nearest trafficked road approximately 20m away.

3.11 The full results along with details of the equipment used, and the weather conditions during the survey periods, are shown in **Appendix II**.

4.0 NOISE ASSESSMENT & RECOMMENDATIONS

4.1 Since the highest night-time noise levels were found to be higher than the corresponding values for the daytime it is the night-time noise climate that will dictate the requirement for building envelope sound insulation enhancements.

4.2 From analysis of the results of the noise survey, we have determined the highest '10th highest' night-time *L*Amax and highest night-time average *L*Aeq over the whole of the survey, which is due predominantly to entertainment noise in the early part of the night. This approach will ensure the robustness of the mitigation measures employed to reduce the noise break-in. The adopted values are presented below:

Table 4: Summary of Measured/Adopted Noise Levels in Octave Bands(dB)

Description	Octave Band Centre Frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Entertainment Noise (L_{eq})	73	65	57	58	59	55	47	40	**62**
Entertainment Noise (L_{max})	84	77	75	79	79	73	68	61	**82**

4.3 Based on the drawings supplied by JR + Margo Ltd, noise break-in calculations have been carried out to determine the level of noise mitigation required in order to control the level of internal noise within the proposed apartments.

Building Envelope Sound Insulation

4.4 We understand that, at this stage, proposals are for the existing windows to be overhauled and new secondary glazing is to be installed to the inside.

4.5 In order to adequately control the ingress of the measured/adopted external noise levels on the Hope Street elevation, it will be necessary to achieve a high standard of building envelope sound insulation.

4.6 For those windows facing Hope Street as indicated, we recommend a substantial secondary glazing specification (i.e. double windows in two separate frames separated by a large cavity) with the following minimum laboratory airborne sound insulation performance values shown in **Table 5**.

Table 5: Recommended Glazing *R* values in Octave Bands(dB)

Description	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Minimum *R* values for windows	**30**	**33**	**35**	**43**	**50**	**48**	**48**	**51**

4.7 The above laboratory airborne sound insulation performance values could typically be achieved with a double-glazing specification of:

- 6.8mm glass and 100mm air gap followed by secondary glazing with 4mm glass - nominal (12mm) cavity – 4mm acoustic laminated glass.

4.8 Ideally, any ventilation openings would be away from the Hope Street elevation. If this is unavoidable, we would recommend acoustic ventilation as follows:

- Aereco EHA2 Acoustic Trickle Ventilator with acoustic canopy and sleeve (44 dB *D*n,e,w); or
- Rytons AAC125HP Super Acoustic Controllable LookRyt AirCore Ventilator (43 dB *D*n,e,w); or
- Another ventilation system with a good acoustic performance (i.e. above 43 dB Dn,e,w).

4.9 Ventilation proposals will need to be agreed with the Council at an early stage.

External Walls

4.10 The exact construction of the external walls is not known at this stage however it is assumed that the sound insulation performance of the wall construction will not be less than 50 dB *R*w.

4.11 For full calculations of noise break-in please see **Appendix III**.

Control of Sound Transmission from Ground Floor Commercial Premises to Apartments

4.12 The existing, and to be retained, ground floor premises is a massage therapy centre. As such, trading noise levels are very low (typically lower than most commercial uses include shops etc.).

4.13 As such, there is no need for any specific enhancements to the sound insulation between the ground floor massage therapy premises and proposed upper floor apartments beyond the minimum requirements of Part E of the Building Regulations (i.e. 43 dB *D*nTw + *C*tr)

4.14 Since meeting the minimum requirements of Part E of the Building Regulations will be matter of Building Control Approval, there is no need for any additional planning controls. Nevertheless, we have provided outline advice on what will typically be required to achieve this:

- Following strip out of the existing suspended ceiling, any holes/gaps in the lath and plaster ceiling should be made good;
- Install a new suspended ceiling formed as follows:
  a) Two layers of 15mm Gyproc SoundBloc/Fireline plasterboard suspended via a MF system with joints staggered and well-sealed;
  b) Minimum 250mm cavity between the existing lath and plaster ceiling and upper face of the new ceiling; and
  c) Minimum 100mm mineral wool inserted into the ceiling void.
- Any holes or penetrations in the ceiling/floor will reduce the effectiveness of the sound insulation and should therefore be avoided;
- Unavoidable penetrations, such as for electrical services, must be minimised, kept as small as possible and be well sealed with mastic;
- Any soil/water pipes common between apartments and the ground floor premises must be boxed in using two layers of 15mm Gyproc SoundBloc/Fireline plasterboard attached to a timber/metal frame, with mineral wool quilt wrapped around the pipes/columns. The frame/plasterboard must not be in contact with the pipes.

Conclusion

4.15 Subject to the recommendations for sound insulation enhancements set out above we conclude that external noise break in and potential noise transmission from the ground floor commercial use would not result in any unacceptable harm to the amenity of residents of the approved apartments by reason of noise disturbance.

1.0 SUMMARY

1.1 Hepworth Acoustics Ltd was commissioned by JR+Margo Ltd to carry out a noise impact assessment in connection with a proposed planning application for a proposed refurbishment of an existing building with commercial premises on the ground floor and a residential development on the upper floors at 20-21 Hope Street, Wrexham.

1.2 Specifically, our assessment has considered the noise break-in from existing external noise and transmission of noise from the ground floor commercial premises use to the apartments above.

1.3 Our recommendations are based upon a review of the findings of our noise survey and assessment, and consideration of the existing separating floor/ceiling construction.

1.4 The acoustic recommendations made in this report need to be taken into account by all relevant members of the design team, contractors and suppliers.

Figure 1 – Site Location & Noise Measurement Position



Figure 2 – Proposed Site Layout



Appendix I: Noise Units & Indices

Sound and the decibel

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

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

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

Frequency and Hertz (Hz)

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

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

Glossary of Terms

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

*C*tr This is an A-weighted urban traffic noise spectrum, which can be added to *D*nT,w or *R*w in some standards to take into account different source spectra such as low frequency sound.

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

*D*nT This is the Standardised Level Difference, which is equivalent to the measured *D*n and corrected to a standardised reverberation time of 0.5s.

DnT,w This the Weighted Standardised Level Difference, is a single figure value of *D*nT, and is the field measurement of airborne sound transmission

*D*nT,w + *C*tr This is the Weighted Standardized Level Difference with Spectrum Adaption Term *C*tr

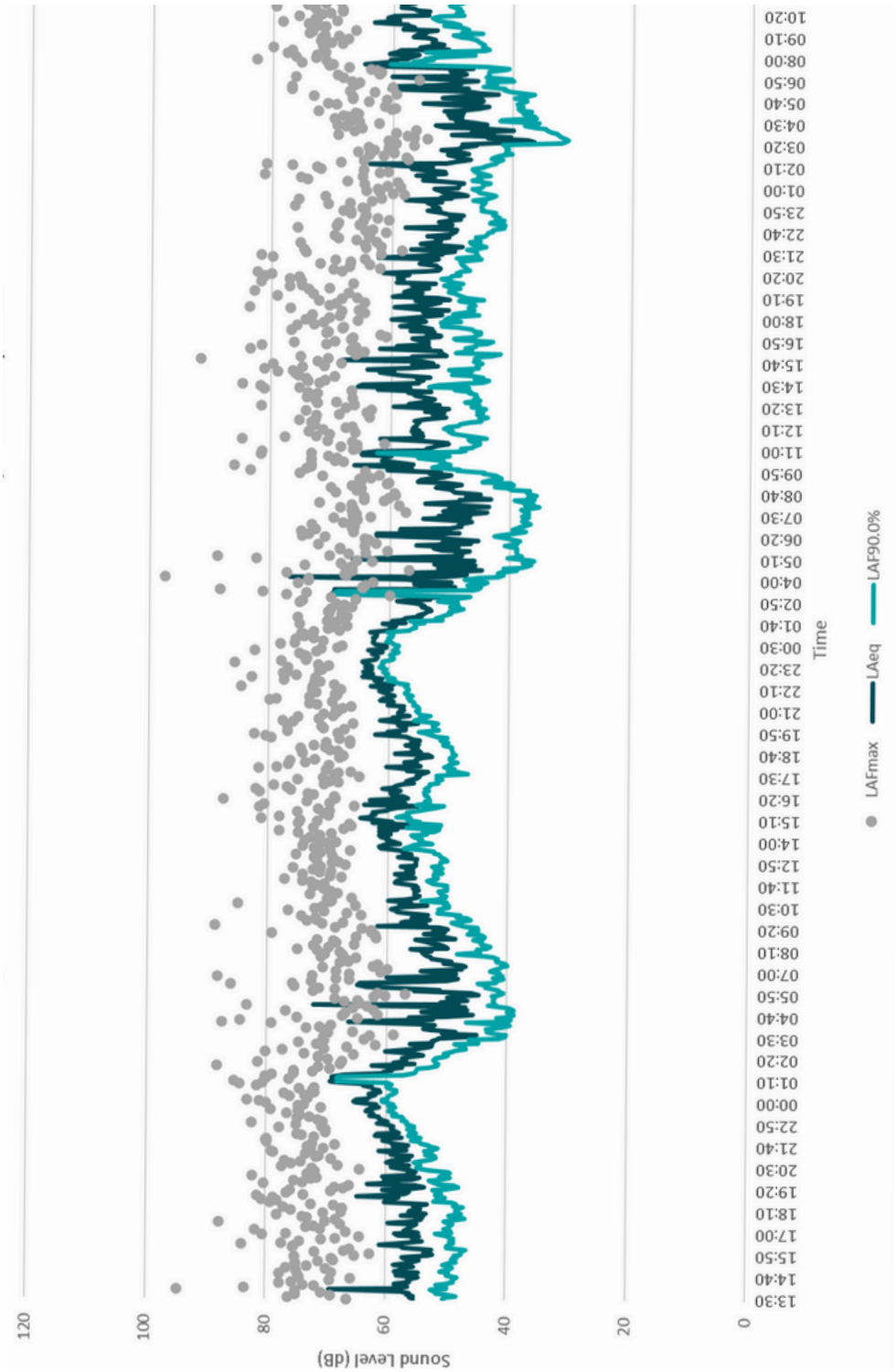
*L*Aeq,T This is the A–weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, *L*Aeq,T is the level of a continuous noise which has the same total (A–weighted) energy as the real fluctuating noise, measured over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

*L*AFmaxThis is the maximum A–weighted noise level that was recorded during the measurement period in terms of 'Fast' time weighting.

Appendix II: Noise Survey Results

Date(s):	Friday 14 March to Monday 17 March 2025 NTi XL2 ‘Class 1’ sound level
Equipment	meters (s/n: A2A-20228-E0) with associated calibrator and environmental outdoor monitoring kit
Weather	Daytime – Dry, ~11°C, clear skies and calm <3 m/s

Please see chart overleaf.


Sound Level (dB)
120
100
80
60
40
20
0
Time
LAFmax
LAeq
LAF90.0%

Appendix III: Noise Break-In Calculation

BS8233 Calculation of Noise Breakin

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Version 8.0 February 2019

The expected precision of this calculation is ±2 dB

Project Number	P25-236
Site	20-21 Hope Street,
Period	Night
Plot/Room	Hope Street elevation
Consultant	GZ

Term	Term Description	V alue
S_f	Façade area (incl. window) (m2)	9.0
S_{wi}	Area of the windows (m2)	5.0
S_{rr}	Area of the ceiling (m2)	0.0
S_{ew}	Area of the external wall (m2)	4.0
S	Area of facade and roof	9.0
x	Room Dimension x	5.0
y	Room Dimension y	3.0
z	Room Dimension z	3.0
	Façade correction	0.0
r	Distance to window / vent (m)	1.00
V	Volume of Room (m3)	45

SRI of ceiling/roof not present in calculation

	63 - 8k
LAmax	39.2

	k
LAeq	20.7

RT	Receiving Room RT

standard rev times for a furnished room from worked example in BS 8233, V= 35m3

			Octave Band Centre Frequency								
			63	125	250	500	1000	2000	4000	8000	T_{mf}
			0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4

			Octave Band Centre Frequency								
			63	125	250	500	1000	2000	4000	8000	dBA
L_{max}	Free-field L_{max} outside room	Enter the Octave Band L_{max} Data	84	77	75	79	79	73	68	61	82
$L_{eq, ff}$	Free-field L_{eq} outside room	Enter the Octave Band L_{eq} Data	73	65	57	58	59	55	47	40	62

Dn,e	SRI of the vent	Ignore Trickle Vent	130	130	130	130	130	130	130	130	131 -1;-1
Rwi	SRI of the window	Selectaglaze Series 10 - 6.8mm 100mm air gap 4:12:4	30	33	35	43	50	48	48	51	46 -1;-4
R_{ew}	SRI of the external wall	BS8233 Example - Brick and block external wall	36	40	44	45	51	56	60	60	51 -1;-4
Rrr	SRI of roof/ceiling	BS8233 Example - Tiled pitched roof & 9mm plasterboard ceiling with thermal insulation	20	28	34	40	45	49	52	55	44 -2;-5
A	Equivalent Absorption Area	———	12	14	18	21	21	19	18	18	
		10 x log (S/A)	-1	-2	-3	-4	-4	-3	-3	-3	

Leq - Direct + Reverberant

Term	Term Description	Octave Band Centre Frequency								A
		63	125	250	500	1000	2000	4000	8000	
Leq, 2	Vent	-55	-64	-72	-72	-72	-75	-83	-90	-6 7 .6
	Glazing	42	30	20	12	5	4	-4	-14	19.8
	Wall	35	22	10	9	3	-5	-17	-24	13.1
	Ceiling	-100	-100	-100	-100	-100	-100	-100	-100	-100
	Total	43	31	20	14	8	4	-4	-13	20.7

Lmax - Direct

Term	Term Description	Octave Band Centre Frequency								A
		63	125	250	500	1000	2000	4000	8000	
Lmax	Vent	-43	-50	-52	-48	-48	-54	-60	-66	-4 5 .2
	Glazing	55	44	40	36	29	26	20	10	37.9
	Wall	48	36	30	33	27	17	7	0	33.1
	Ceiling	-100	-100	-100	-100	-100	-100	-100	-100	0
	Total	56	45	40	38	31	26	20	11	39.2