

PROPOSED BAR AT 1 SALMON STREET, MANCHESTER

NOISE IMPACT ASSESSMENT

On behalf of:

Nick Arnoutis

PROPOSED BAR AT 1 SALMON STREET, MANCHESTER

NOISE IMPACT ASSESSMENT

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1.0 INTRODUCTION

- 1.1 Hepworth Acoustics Ltd was commissioned by Hidden Club to carry out a noise impact assessment in connection with a proposed planning application for a new bar/restaurant at 1 Salmon Street in Manchester city centre.
- 1.2 The site has previously been granted planning permission for use as a bar, however, since then the proposals have changed as described in Section 2 of this report. The nearest existing dwellings to the development are located on the upper floors of an adjoining building. We understand there is also potential for another adjoining building to be converted into a hotel.
- 1.3 This report is an update of our original report (reference P18-427-R01v1 dated January 2019) that considers the latest proposals which will form the subject of a new planning application. This report also includes testing of the existing party wall between the premises and the adjoining building, undertaken in April 2023. The report describes the following:
- An inspection of the site and surrounding area;
 - Measurement of noise levels during a weekend and weekday periods;
 - Determination of appropriate plant noise design limits;
 - Assessment of penitential trading noise transmission to the adjoining dwellings;
 - Assessment of potential trading noise breakout from the building envelope to the adjacent dwellings; and,
 - Recommendation of appropriate noise mitigation measures.
- 1.4 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 SITE DESCRIPTION & PLANNING HISTORY

Site Description

- 2.1 It is proposed to develop the building into a bar/restaurant. The ground floor is proposed to be the main restaurant area with associated kitchen located in the basement floor. The proposed bar is to be located on the first/second floors.
- 2.2 We understand that while the ground floor will be used as a restaurant, the upper floor will be used as a bar area with the intention to include foreground music. The ground floor area will have bi-folding doors opening onto Salmon Street. It is proposed to install enhanced acoustic glazing on the upper floors to control trading noise break out. The glazing specification is set out later in this report.
- 2.3 The proposed trading hours for the bar are as follows: 10:00 - 03:00 seven days a week with an additional 30 minutes at the end of trading within which patrons will vacate the premises.
- 2.4 The nearest existing dwellings are understood to be located in the first and second floors of the adjoining building above the Hare and Hounds pub. We understand there is also the potential for another adjoining building to be converted into a hotel which is based on information provided by Manchester City Council's Environmental Protection Team during a previous application. The location and orientation of the development relative to the nearest dwellings is shown in Figure 1.
- 2.5 It is understood that the party wall between the proposed development and the adjacent dwelling is comprised of two structurally separate twin leaf masonry walls, as well as the proposed bar and the adjoining potential hotel. We have been informed that this construction is due to the development building being built later than the adjacent buildings resulting in a new external wall being built adjacent to the existing external walls. Such an arrangement will provide a good level of sound insulation.
- 2.6 Proposals for externally mounted mechanical services equipment are not yet available, however it is understood that the proposed kitchen extract will terminate at roof height behind the pitched roof i.e. away from accommodation above the Hare and Hound on Salmon Street.

Planning History

- 2.7 In March 2020 the site was granted planning permission (reference 123983/FO/2019) for a similar development. A further S73 amendment application (reference 133520/JO/2022) was approved in May 2022, again for use of the building as a proposed bar. Both applications were supported by our previous noise assessment report (reference P18-427-R01v1 dated January 2019) and planning conditions were attached to the permissions based upon the noise mitigations recommendations, and proposed noise design limits for plant, that were set out in the report.
- 2.8 Therefore, it seems appropriate that the requirements of these noise conditions form the basis for the acoustic design criteria set out in this report for the proposed new scheme. Details of the criteria are set out in the Section 3 of this report.

3.0 GUIDANCE AND NOISE CRITERIA

NPPF:2021

- 3.1 Paragraph 185 of the National Planning Policy Framework (NPPF) 2021 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 impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;”*

NPSE:2010

- 3.2 The Noise Policy Statement for England (NPSE) 2010, which is referred to 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.

Manchester City Council Planning & Noise Technical Guidance 2015

- 3.1 Manchester City Council Planning & Noise Technical Guidance 2015 provides guidance for assessing the potential impact from entertainment noise on residential dwellings.
- 3.2 For plant noise the guidance states: *‘The noise assessment should be based on BS 4142: 2014 and any application for fixed plant, equipment or machinery must demonstrate that: ‘Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance*

with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location’.

3.3 To ensure that the development is suitable within the context of the planning permission being sought, the guidance states that “...*applicants and consultants should predict the noise impact of a proposed entertainment venue using noise levels that are representative of those found in ‘typical’ venues of the kind being applied for.*”

3.4 The following guidance is provided by Manchester City Council regarding entertainment venues that are structurally attached to the nearest dwelling:

“Music noise levels in the 63Hz and 125Hz octave centre frequency bands (Leq) should be controlled so as not to exceed (in habitable rooms) 47dB and 41dB (Leq), respectively”.

3.5 The guidance considers that operation within these criteria would result in “inaudible” or “virtually inaudible” entertainment noise, which would be desirable.

3.6 The following guidance is also provided regarding entertainment venues that are not structurally attached to the nearest dwelling, which may also be appropriate for attached dwellings in some cases:

3.7 *“A planning application for a new entertainment venue that is structurally detached from other building uses should demonstrate that music noise from the proposal will not be ‘audible’ in nearby residential properties, assuming that the residential properties in question have their windows open. The criterion here is: ‘Entertainment noise (LAeq) should be controlled to 10dB below the background noise level (LA90) without the entertainment noise present, in each octave band at the nearest noise sensitive location’.*”

Criteria

3.8 Therefore, taking into account the guidance relating to noise in Manchester City Councils planning document discussed above, and considering the wording of conditions previously approved for this site, the following noise criteria are proposed:

- Trading noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{Ze}) should be controlled so as not to exceed (in habitable rooms at structurally adjoined residential properties) 47dB and 41dB (L_{Ze}), respectively; and,

- The trading noise levels ($L_{Zeq,T}$) should be 10 dB lower than the prevailing background noise levels ($L_{Z90,T}$) in each octave band at the facade of the nearest noise sensitive location;
- Any externally mounted ancillary equipment, plant and servicing shall achieve a rating level of 5dB ($L_{Aeq,T}$) below the typical background ($L_{A90,T}$) level at the nearest noise sensitive location.

4.0 ENVIRONMENTAL NOISE SURVEY

4.1 Automated environmental noise measurements were carried out between 14:35 on Friday 18 and 09:15 on Tuesday 22 January 2019. The purpose of the noise survey was to establish the prevailing ambient noise climate of the area. The noise measurements were taken at two locations in the elevations of the existing building, as follows:

- Location A: outside the front elevation overlooking Salmon Street; and
- Location B: outside the rear elevation overlooking Shudehill.

4.2 The noise measurements were taken in 15-minute periods, 1m from the building façade. Calibration checks were carried out both before and after the measurement periods with no variance in levels.

4.3 Weather conditions during the noise survey were suitable for sound level measurements, full details of the weather conditions and the equipment used can be seen in Appendix II.

4.4 Full results of the noise survey can be seen in Appendix II, and a summary of the measured noise levels is shown in Table 1. The summarised data is presented as the arithmetic means for L_{AFmax} and $L_{A90,15mins}$ values and the logarithmic means for $L_{Aeq,15mins}$ values. The daytime period covers 07:00-23:00 and the night period covers 23:00-07:00.

Table 1: Summary of Measured Noise Levels (dB)

Day	Period	Location A - Front Elevation			Location B - Rear Elevation		
		L_{Amax}	L_{Aeq}	L_{A90}	L_{Amax}	L_{Aeq}	L_{A90}
Friday	Daytime	80	64	58	85	70	63
Friday/Saturday	Night	77	62	54	83	66	56
Saturday	Daytime	81	66	57	86	70	62
Saturday/Sunday	Night	77	62	55	84	66	57
Sunday	Daytime	78	62	55	83	68	59
Sunday/Monday	Night	75	60	49	82	67	50
Monday	Daytime	81	64	56	86	69	62
Monday/Tuesday	Night	75	60	50	81	66	52

- 4.5 These are fairly high levels of noise that reflect the city centre location. During the proposed periods of operation, the noise climate of the area was due to traffic on the surrounding road network and occasional voices from pedestrians during the late evening from the surrounding area.
- 4.6 In order to determine appropriate background noise levels on which to base the criteria for control of trading noise levels, statistical analysis was carried out of the measured $L_{A90,T}$ levels over the proposed trading hours including the additional 30 minutes for patrons to vacate the premises as a worst case.
- 4.7 The mode of the measured night-time levels (from 23:00 until 30 minutes after the end of trading i.e. 3:30), which is the most frequently occurring level, has been ascertained for each night as shown in Table 2 below.

Table 2: Most Frequently Occurring Noise Levels During Night Trading Periods (dB)

Trading Period	Front Elevation - Salmon Street	Rear Elevation - Shudehill
Friday Night (L_{A90})	55	58
Saturday Night (L_{A90})	59	60
Sunday Night (L_{A90})	53	53
Monday Night (L_{A90})	46	45

- 4.8 In order to ensure a robust assessment, the lowest mode has been used as the representative background levels for the front and rear elevations, these being 46 dB $L_{A90,T}$ and 45 dB $L_{A90,T}$ respectively.
- 4.9 The arithmetic mean of the $L_{Z90,T}$ spectra measured during the night trading hours has been adopted and 10dB has been subtracted from the levels to derive the trading noise limits outside the nearest dwelling. The trading noise limits are shown below in Table 3.

Table 3: Trading Noise Limits (dB)

Trading Noise Limits	Octave Band Centre Frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Front Elevation Salmon Street (L_{eq})	42	40	38	38	34	30	26	21	39
Rear Elevation Shudehill (L_{eq})	41	39	37	37	33	29	25	20	38

- 4.10 In order to determine a representative background noise level for the control of plant noise, we have used the noise levels measured on the Front - Salmon Street elevation. As the plant could potentially operate during the night, which is the most sensitive period, we have determined the representative

background noise level by statistical analysis of the measured $L_{A90,15\text{mins}}$ levels over the survey night periods. The adopted background level is 53 dB $L_{A90,T}$, which is the mode of the measured night time levels which is clearly the most frequently occurring level - in line with BS 4142:2014 guidance.

Sound Level Difference Testing

- 4.11 Sound level difference testing was carried out during a site visit on Thursday 20 April 2023, to establish the existing acoustic separation between the premises and the living spaces on the upper floors in the adjacent building.
- 4.12 The testing was carried out by generating high levels of pink noise directly within the first floor space of the premises using a sound source and loudspeaker. The resulting source noise levels were measured in the space along with the transmitted noise levels in the first floor living room space on the other side of the wall. The acoustic testing was taken as a series of short term third octave band noise measurements.
- 4.13 It was observed on site that the existing brickwork wall was in poor condition within the premises. The wall within the retail unit appeared to be plastered and was covered in wallpaper. Using the results of the noise measurements, it has been possible to calculate the existing level of sound insulation between the ground and first floor spaces as follows:

Table 4: Calculated sound level difference values (dB)

Description	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
First floor to adjacent living space	31	38	45	52	56	64	65	61

- 4.14 Whilst the construction of the party wall is understood to be two masonry/brickwork walls, the exact construction is not known. Nevertheless, the sound insulation performance values shown in Table 4 demonstrates the wall construction provides reasonable sound insulation, which is typical of a cavity masonry construction.

5.0 NOISE IMPACT ASSESSMENT

Control of Trading Noise Break-out from Building

- 5.1 Hepworth Acoustics has carried out numerous noise assessments in connection with proposed bars in the past and we have a library of noise levels for a variety of bar/drinking establishment styles. We understand that the proposal is for a bar/restaurant with foreground music played at modest background levels only.
- 5.2 The adopted trading noise levels are based on noise measurements undertaken during busy weekend evening trading periods in similar premises shown below in Table 5.

Table 5: Adopted Trading Noise Levels Inside Premises (dB)

Description	Octave band centre frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Adopted Trading Noise Levels (L _{eq})	70	81	76	83	83	80	74	68	87

Noise Transmission via the Party Walls

The likely transmitted trading noise levels from the premises in the adjacent living spaces are shown in Table 6 below.

Table 6: Noise Transmission via the Party Walls (dB)

Description	Octave Band Centre Frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Adopted Trading Noise Levels (L _{eq})	70	81	76	83	83	80	74	68	87
Measured Level Difference	31	38	45	52	56	64	65	61	
Calculated resulting transmitted levels	39	43	31	31	27	16	9	7	33
Manchester criteria	47	41	-	-	-	-	-	-	-
Difference	-8	2	-	-	-	-	-	-	-

- 5.3 Based on our findings as can be seen in Table 6, the separating wall arrangement will meet the Manchester City Council 63 Hz criterion, however the 125 Hz criterion will be exceeded by a narrow

margin. Therefore, mitigation measures will be necessary to control potential transmission of trading noise via the party walls.

Noise Break-out via the Front Elevation

- 5.4 The front elevation of the development building overlooking Salmon Street contains three existing windows at the first-floor level. It is assumed that these windows are to be fitted with enhanced double-glazed construction, which we have assumed to be 10mm glass – 12mm cavity – 6mm glass.
- 5.5 We have calculated the potential trading noise break-out via the first-floor of the front elevation taking into account the enhanced glazing, the area of wall and a 3m distance between the windows and the nearest dwelling windows. The calculated noise break-out is shown in Table 7 along with the trading noise limits.

Table 7: Noise Transmission via the Front Elevation (dB)

Description	Octave Band Centre Frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Adopted Internal Trading Noise Levels (L_{eq})	70	81	76	83	83	80	74	68	87
External Trading Noise Limit (L_{eq})	42	40	38	38	34	30	26	21	39
Calculated Noise Break-out (L_{eq})	35	40	38	34	28	21	14	5	35
Difference	-7	0	0	-3	-7	-9	-12	-15	-4

- 5.6 As can be seen in Table 6, the calculated noise break-out is within the trading noise limits outside the nearest dwelling with the existing windows in place.

Noise Break-out via the Rear Building Envelope

- 5.7 The rear building envelope, overlooking Shudehill contains one existing window at the first-floor level. It is assumed that the window is to be fitted with enhanced double-glazed construction, which we have assumed to be 10mm glass – 12mm cavity – 6mm glass.
- 5.8 We have calculated the trading noise break-out via the first-floor of the rear building envelope taking into account the enhanced glazing, the outer wall and a 3m distance between the windows and the nearest dwelling windows. The calculated noise break-out is shown in Table 8 along with the trading noise limits.

Table 8: Noise Transmission via the Rear Elevation (dB)

Description	Octave Band Centre Frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Adopted Trading Noise Levels (L_{eq})	70	81	76	83	83	80	74	68	87
Trading Noise Limit (L_{eq})	44	42	41	39	37	34	29	21	42
Calculated Noise Break-out (L_{eq})	32	37	34	31	25	18	11	2	32
Difference	-9	-2	-3	-5	-9	-11	-14	-17	-6

- 5.9 As can be seen in Table 8, the calculated noise break-out is within the trading noise limits outside the nearest dwelling with the existing window in place.

Noise Break-out via the Roof

- 5.10 In the centre of the development building away from the front and rear elevations there is a slanted tiled roof above the part of the proposed first-floor bar. We understand that some of the windows in the adjacent buildings overlooking the courtyard may be dwellings windows.
- 5.11 No access to the courtyard or a window overlooking the courtyard was provided, therefore it was not possible for us to measure noise levels in the courtyard. However, the lowest adopted background noise levels are likely to be representative of typical levels outside windows overlooking the courtyard. Based on these considerations and the available data we consider it reasonable to adopt the lowest elevation trading noise limit of 42 dB $L_{Aeq,T}$ for assessing trading noise break-out from the roof.
- 5.12 We have calculated the trading noise break-out via the roof taking into account the existing window, and a 4m distance to the nearest dwelling windows. The calculated noise break-out is shown in Table 9 (overleaf) along with the trading noise limits.

Table 9: Noise Transmission via the Roof (dB)

Description	Octave Band Centre Frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Adopted Trading Noise Levels (L_{eq})	70	81	76	83	83	80	74	68	87
Trading Noise Limit (L_{eq})	41	39	37	37	33	29	25	20	38
Calculated Noise Break-out (L_{eq})	44	51	41	42	41	37	31	22	45
Difference	3	11	4	5	7	7	5	2	7

- 5.13 As can be seen in Table 9, the calculated noise break-out are above the trading noise limits outside the nearest dwellings. Therefore, mitigation measures will be necessary to control potential trading noise break out from the roof.

Patrons Smoking and Leaving the Premises

- 5.14 A quantitative assessment of noise from patrons smoking outside the premises and patrons leaving the premises after trading has ceased is not readily possible due to its inherently unpredictable nature. Therefore, we have provided outline comments regarding the potential noise impact from these activities based on the proposal and the context of the area.
- 5.15 The proposals for the new bar do not include an outdoor smoking area, which means that patrons wishing to smoke will likely do so outside on Salmon Street itself or nearby. We also understand that there are several premises nearby which cease trading at similar times to the proposed bar. Therefore, potential noise resulting from patrons smoking and leaving the premises once trading has ceased would not result in any significant increase to the existing noise and character of the area.

Environmental Noise Limits for Mechanical Services Equipment

- 5.16 We understand that as part of the development some mechanical services equipment will be installed, including air conditioning units and kitchen extract ventilation with the exhaust termination at roof height (i.e. above third floor level). However, there are no details of the noise emissions from this equipment at this stage.
- 5.17 As such, we have derived an appropriate cumulative noise design limit from the adopted representative background sound level which will need to be taken into account in the selection, specification and installation of any mechanical services equipment.

- 5.18 As set out in Section 4 above, the typical background sound level during trading hours is considered to be 53 dB $L_{A90,T}$. Therefore, to comply with Manchester City Council's plant noise control requirement, the noise level from the external plant must be controlled so as not to exceed a BS 4142 rating level of 48 dB $L_{Ar,T}$ during trading hours outside the nearest dwelling.
- 5.19 Typical measures that can be taken to adequately control noise from the installation of fixed plant and equipment include:
- Specifying low noise equipment;
 - Careful siting of equipment away from dwellings where appropriate;
 - Installation of acoustic enclosures around the fixed plant and machinery where necessary;
 - Installation of noise attenuators/in duct silencers, acoustic louvres, etc;
 - Carrying regular maintenance of equipment to minimise noise emissions.

Recommendations

- 5.20 The noise assessment indicates that there is potential impact from trading noise transmission via the party walls and breakout via the roof.
- 5.21 In order control potential noise impact and to ensure that the bar operates within its proposed scope, in this case we have made the following recommendations:
- The existing rooflight/window should be underdrawn with an acoustic ceiling covering the extent of the roof area, formed of at least two layers of 12.5mm thick Gyproc Fireline/SoundBloc plasterboard (with joints staggered and well-sealed) fixed to the underside of the joists with at least 100mm mineral wool insulation (rather than rigid insulation) between the joists.
 - All party walls (i.e. to the Hare and Hound building and the adjoining proposed hotel building) across all floors should be acoustically lined with 2 layers of 15mm thick Gyproc Fireline/SoundBloc plasterboard (or equivalent with minimum surface mass of each board layer of 10 kg/m²) mounted onto independent timber or metal studs, with a minimum cavity of 100mm between the existing wall and the new acoustic liner and with 100mm thickness of Rockwool (minimum density 33 kg/m³) in the cavity. The timber or metal studs must not be rigidly connected to the building structure – ideally there would be no ties to the existing masonry walls, but if such ties are necessary appropriate acoustically resilient wall ties must be used. All holes and gaps in the brick

work are to be made good and a 6mm parge coat is to be applied to the wall before the independent plasterboard lining is installed.

- All timber beams and structural steel beams should be effectively 'boxed in' with 2 layers of 12.5mm thick Gyproc Fireline/SoundBloc plasterboard and Rockwool (minimum density 33 kg/m³) in the cavity.
- The upper floor windows (on Salmon St and Shudehill) should be replaced with well-sealed double glazing formed of 10mm glass - (12-20) cavity - 6mm glass, with a minimum sound reduction performance of at least 32 Rw + Ctr. The windows of the bar should remain closed during trading hours.
- The PA system to be installed should be designed in order to minimise noise levels in the entrance areas i.e. by orientating loudspeakers away from entrances, windows and by careful selection of loudspeakers, etc;
- No low frequency loudspeakers (subwoofers and bass bins) should be installed anywhere in the premises.
- Loudspeakers should be installed on appropriate resilient mounts;
- There should be no loudspeakers anywhere external to the building.
- Entrance doors and bi-folding windows should be fitted with effective perimeter seals and should not be pinned open after 21:00 hours.
- Noise can be further controlled by an appropriate noise management plan.

5.22 Further to the mitigation measured recommended above it will be necessary to control the amplified music levels in the premisses. Music should only be played through an in-house system with music levels set and enclosed in a tamper proof cabinet. We therefore recommend that the maximum permissible noise levels are limited in the areas described to no higher than those set out in Table 10.

Table 10: Recommended Maximum Music Noise Levels (dB)

Description	Octave band centre frequency (Hz)								A
	63	125	250	500	1k	2k	4k	8k	
Ground Floor - Maximum Music Noise Levels (L_{eq})	56	62	65	71	70	66	59	57	74
Upper Floors - Maximum Music Noise Levels (L_{eq})	70	78	76	82	81	77	71	65	85

Conclusion

- 5.23 In summary, the findings of our assessment indicated that the bar would operate within the Manchester City Council criteria if the premises adheres to the current proposals and all the recommendations set out in this report.

6.0 SUMMARY AND CONCLUSION

- 6.1 Hepworth Acoustics Ltd was commissioned by Hidden Club to carry out a noise impact assessment in connection with a proposed planning application for a new bar at 1 Salmon Street, Manchester.
- 6.2 Appropriate noise criteria have been adopted to ensure the residential amenity of the nearest dwelling adjacent to the proposed bar development.
- 6.3 An environmental noise survey was carried out over weekend and weekday periods to measure the prevailing noise climate in the area.
- 6.4 Appropriate cumulative noise limits for externally mounted building services plant have been determined based on the noise survey data and Manchester City Council requirements.
- 6.5 Trading noise transmission via the party wall, via the front elevations, via the rear elevation and via the roof has been calculated and assessed in line with Manchester City Council guidance.
- 6.6 Appropriate noise mitigation recommendations have been made in order to ensure that any potential noise impact is minimised.

Do not scale from this figure

Key:

- 

Hare and Hounds Pub,
46 Shudehill,
Manchester
M4 4AA
- 

Inaccessible
courtyard (to us)
belonging to
Hare and Hounds Pub
- 

A Cut In Time,
7, Thomas Street,
Manchester
M4 1EU
- 

1 Salmon Street,
Manchester
M4 4AA

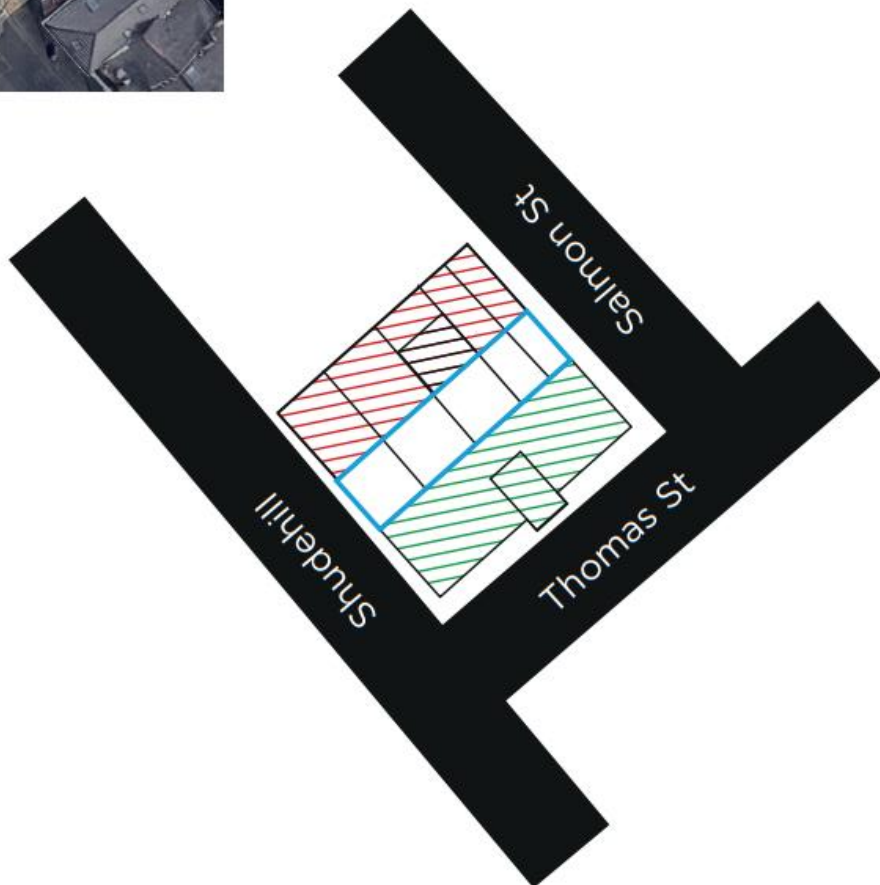
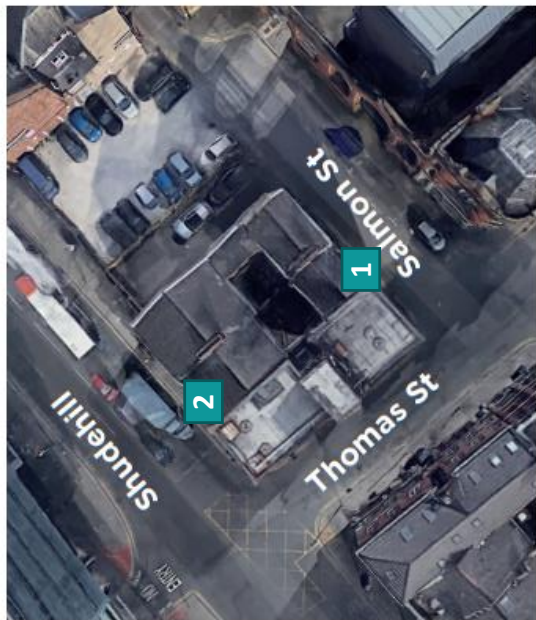
 - Noise Measurement
Position



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Title: Figure 1: Site Location &
Noise Measurement
Positions

Project: P23-100



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Title: Figure 2: Proposed Floor
Layouts

Project: P23-100



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.

- R** This is the 'Sound Reduction Index' as measured in a laboratory, and is a measure of the sound insulation properties of a building element in a stated frequency band.
- R_w** This is the 'Weighted Sound Reduction Index' (L_w), and is a single figure quantity of R, the laboratory measured Sound Reduction Index.
- 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.
- L_{Aeq}** 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} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.
- L_{Amax}** This is the maximum A-weighted noise level that was recorded during the monitoring period.
- L_{A90}** This is the A-weighted noise level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

Appendix II: Noise Survey Results

Date(s): Friday 18 to Tuesday 22 January 2019

Equipment: Rion NL-52 'Class/Type 1' sound level meter (S/N: 00242747) and Rion NL-31 'Class/Type 1' sound level meter (S/N: 01120845) with calibrator and environmental kits

Weather: Generally Dry with some light showers on Saturday afternoon, cool temperatures between 3-6°C with low winds <2m/s and moderate cloud coverage.

Please see noise survey results in the graphs overleaf.

