

**PROPOSED RESTAURANT
9 – 11 CHAPEL WALKS, MANCHESTER**

NOISE IMPACT ASSESSMENT

**On behalf of:
Peter Harrison 1997A Settlement Trust**

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9 -11 CHAPEL WALKS, MANCHESTER**

NOISE IMPACT ASSESSMENT

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1.0 INTRODUCTION

- 1.1 Hepworth Acoustics Ltd was commissioned by the Peter Harrison 1997A Settlement Trust to carry out a noise impact assessment in connection with a change of use of the former hairdressing salon on the ground floor of 9 – 11 Chapel Walks in Manchester city centre to a pizza restaurant.
- 1.2 The proposals are for a change of use from the existing retail use (Use Class E) to a restaurant and hot food takeaway and include some minor alterations to the rear elevation of the building. The ground floor demise is only one of several commercial demises on the ground floor of the building. The proposed trading hours of the restaurant will be 12:00 to 22:00 on Sunday to Friday and 12:00 – 23:00 on Saturdays.
- 1.3 The site is located at the junction of Chapel Walks and Cheapside near to the busy Cross Street and Metrolink line. Immediately in front of the demise, Chapel Walks is pedestrianised, but it is open to traffic from Cheapside onwards. To the rear of the building is Back Pool Fold which is a narrow street with numerous existing building services equipment items, including condenser units and extract fans fixed to the walls. The site location is shown in Figure 1.
- 1.4 The building is of substantial masonry external wall construction with timber joist separating floors.
- 1.5 The proposed pizza restaurant will occupy an L-shaped demise with a narrow shopfront on Chapel Walks and a narrow section leading to a larger (albeit still fairly small) area to the rear as shown in Figure 2.
- 1.6 The unit has been mainly stripped out, although there remains a suspended ceiling in place, with all services (including air conditioning cassettes, recessed loudspeakers etc.) removed. To the rear of the unit there are large single glazed windows that overlook Back Pool Fold. Proposals are for these to be altered to form smaller new windows, one of which will be partially blocked up to provide a location for the pizza oven flue to exit the demise.
- 1.7 The upper floors of the building are currently being converted into apartments and, at the time of this assessment, the apartment directly above the pizza restaurant entrance, which also extends all the way to the rear, was almost complete.
- 1.8 Due to the on-going COVID-19 related restrictions, it was not possible to measure representative ambient/background noise levels at the site for the purposes of this assessment. As such, in line with

joint Institute of Acoustics and Association of Noise Consultants guidance, we have instead referred to appropriate historical noise data, namely that collected by Wardell Armstrong in 2018 in connection with the planning application for residential conversion of the upper floors of the building (a set out in their report ref. MC10045-0002v1.0 dated January 2019 – application reference 123676/FO/2019). We sought agreement with this approach from Manchester City Council and this was confirmed in an email from Graeme Souter dated 7 April 2021. The noise assessment has therefore included:

- An inspection of the demise, wider site and surrounding area;
- A review of the results of the 2018 noise survey carried out by Wardell Armstrong in connection with the residential conversion of the upper floors of the building;
- Sound level difference testing of the existing separating floor between the ground floor demise and the apartment directly above
- Evaluation of the potential noise impact of the development (i.e. trading noise break out from the building, and noise transmission via the separating floor);
- Recommendation of appropriate noise limits for new fixed plant and equipment; and
- Recommendation of appropriate noise mitigation measures.

1.9 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 NOISE CRITERIA

- 2.1 Manchester City Council have well-established noise design criteria for developments such as restaurants. These criteria were confirmed by Graeme Souter in his email of 7 April 2021 as follows:

“Where entertainment noise is proposed in the restaurant, the L_{Aeq} (entertainment noise) shall be controlled to 10dB below the L_{A90} (without entertainment noise) in each octave band at the facade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63 Hz and 125 Hz octave frequency bands shall be controlled so as not to exceed (in habitable rooms) 47dB and 41dB, respectively.”

Any plant associated with the restaurant including kitchen extraction equipment will need to be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.

3.0 REVIEW OF WARDELL ARMSTRONG NOISE SURVEY RESULTS

- 3.1 Wardell Armstrong carried out a noise impact assessment in connection with the now approved and almost completed conversion of the upper floors of the building to residential accommodation.
- 3.2 The assessment, which is described in their report ref. MC10045-0002v1.0 dated January 2019 included a noise survey carried out at the front (southern elevation) and rear (northern elevation) of the building. Measurements on the front elevation were taken over the period Thursday 19 July to Tuesday 24 July 2018., with those on the rear taken between Saturday 21 July and Tuesday 24 July 2018 and so covered weekday and weekend daytime, evening and night-time periods.
- 3.3 The noise measurements were carried out with sound level meter microphones mounted onto poles protruding 1m from the first-floor proposed apartment windows and so were at locations representative of noise levels outside the nearest noise sensitive receptors.
- 3.4 The noise data set out in the Wardell Armstrong report is in terms of broadband A-weighted noise levels including the usual L_{Aeq} , L_{A90} and L_{Amax} parameters. The daytime (note - defined as 07:00-23:00 for noise assessments) results which are relevant for this assessment (since the restaurant is to trade until 22:00 every night except Saturday when it will trade until 23:00) are given in terms of one-hour values and indicate, as one would expect, that noise levels generally reduce as the evening goes on. As such, we have reviewed the evening noise data for the period from 19:00 up to 23:00 for the Saturday and 19:00 up to 22:00 for the other evenings. The range of measured noise levels were as follows:

Table 1: Range of noise levels measured by Wardell Armstrong (dB)

Period	Front elevation		Rear elevation	
	$L_{Aeq,1hour}$	$L_{A90,1hour}$	$L_{Aeq,1hour}$	$L_{A90,1hour}$
Sunday to Friday (19:00 to 22:00)	58 – 63	55 – 58	65	64
Saturday (19:00 to 23:00)	62 – 65	57 – 59	62 – 65	51 – 65

- 3.5 The levels are fairly high and reflect the usually busy city centre location.
- 3.6 It is clear that noise levels to the rear were influenced by existing plant and equipment noise until around 22:00 hours on each day (hence the very steady noise levels up to 22:00 hours on the Sunday and Monday, but reduced minimum levels for the period up to 23:00 on the Saturday).

- 3.7 Whilst the Wardell Armstrong noise data is only given in terms of broadband A-weighted levels, the Manchester City Council noise control criteria in respect of trading noise (i.e. entertainment noise) break-out are in terms of octave band noise levels. As such, we have referred to noise data that Hepworth Acoustics have obtained in connection with other developments nearby in the city centre to use as a basis for adopting appropriate octave band noise levels. We have reviewed octave band L_{90} noise data from a nearby development on Deansgate (a proposed restaurant at 61 Deansgate as set out in Hepworth Acoustics report ref. P18-416-R01v2 dated October 2018) to obtain representative octave band values equivalent to A-weighted values which closely match the lowest measures L_{A90} values as follows:

Table 2: Adopted lowest octave band L_{90} noise levels (dB)

Description	Octave band centre frequency (Hz)							A
	63	125	250	500	1k	2k	4k	
Front elevation	58	57	54	52	51	46	39	55
Rear elevation	54	51	49	48	47	42	34	51

4.0 SOUND LEVEL DIFFERENCE TESTING

- 4.1 Sound level difference testing of the existing party floor was carried out between the proposed ground floor pizza restaurant demise and three rooms of the apartment directly above. The testing was carried out in order to quantify the existing sound separation between the spaces. The apartment directly above the proposed pizza restaurant demise has two bedrooms towards the rear (with windows overlooking Back Pool Fold) and a kitchen/living/dining room towards the front with windows overlooking Chapel Walks. At the time of the testing, the new double-glazed windows had been installed to the rear bedrooms but, although the secondary glazing frames were in place in the kitchen/living/dining room, the glass was not yet installed (hence only the existing single glazing was in place).
- 4.2 The testing was carried out on Thursday 15 April 2021, using a Rion NL-52 'Class 1' sound analyser (s/n: 00242747). The sound level difference testing involved generating very high levels of pink noise via a loudspeaker in the ground floor space, with source noise measurements taken on the ground floor and resulting transmitted noise levels measured in the apartment rooms above. Background noise measurements were also carried out in each of the apartment rooms to allow the measured transmitted noise level to be corrected for any extraneous background noise. By comparing the corrected transmitted noise levels with the source noise levels on the ground floor, the acoustic separation between the spaces can be calculated. Some modest corrections for reverberation have also been applied to account for the excessively reverberant conditions of the apartment rooms during the testing due to lack of floor finishes or any furnishings. The calculated sound level difference values are as follows:

Table 3: Measured/calculated sound level differences (dB)

Description	Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
To larger rear bedroom	27	43	58	70	75	74	72
To smaller rear bedroom	24	42	57	72	75	71	68
To kitchen/living/dining room	34	41	55	68	69	68	75

- 4.3 The above values reflect fairly good sound level differences, although the acoustic separation between the ground floor demise and the bedrooms is significantly lower in the 63 Hz octave band than at other frequencies and the corresponding performance at the front of the building. It must however be borne in mind that the measured level differences include noise break-out via the

existing ground floor windows and back in via the apartment windows. It is possible that there is some influence from low frequency sound readily breaking out through the large single glazed windows to the rear before reflecting off the building on the far side of Back Pool Fold only a few metres away before breaking in through the bedroom windows.

5.0 NOISE IMPACT ASSESSMENT & RECOMMENDATIONS

Potential Trading Noise Impact

- 5.1 Hepworth Acoustics has carried out numerous noise assessments in connection with proposed restaurants and we have a library of noise levels for a variety of restaurant styles. We understand that on the ground floor the proposed restaurant will play amplified music at modest background levels only. We have measured the following trading noise levels during busy weekend evening trading periods in similar premises with a modest PA system without bass-bins:

Table 4: Adopted trading noise levels (dB)

Description	Octave band centre frequency (Hz)							A
	63	125	250	500	1k	2k	4k	
Trading noise in L_{eq}	66	72	75	81	80	76	69	84

Trading Noise Break-out

- 5.2 Using the adopted trading noise levels in Table 4 alongside details of the external building envelope, we have calculated the likely resulting trading noise levels outside the apartments above and compared these to the adopted noise limits (i.e. the background noise levels shown in Table 2 minus 10 dB).
- 5.3 For noise break-out through the premises shopfront on Chapel Walks, we have assumed that the existing single glazed window and entrance door (6mm glazing) will remain. The results of our calculation of noise break-out through the shopfront on Chapel Walks is shown in Appendix II and summarised below:

Table 5: Trading noise break-out through premises shopfront on Chapel Walks (dB)

Description	Octave band centre frequency (Hz)							A
	63	125	250	500	1k	2k	4k	
Calculated trading noise outside apartment windows above	34	34	33	32	27	29	15	34
Adopted noise limit (background - 10 dB)	48	47	44	42	41	36	29	45
Comparison	-14	-13	-11	-10	-14	-7	-14	-11

- 5.4 Table 5 shows that trading noise break-out will be well within the adopted noise limits. As such, trading noise break-out through the shopfront will not result in any unacceptable noise impact.

- 5.5 For noise break-out to the rear, we have assumed that the new windows that are to replace the existing large single glazed windows will be well-sealed double-glazed units. We have also assumed that the window that is to be blanked off will be done so in such a way that it will not be an acoustic weak point in the elevation (our recommendations to achieve this are set out below).
- 5.6 Some initial calculations indicated that, due to the lower background noise levels to the rear, double glazing with enhanced sound insulation will be required in order to adequately control trading noise break-out. As such, the calculations set out in Appendix II and summarised below assume double glazing with a laboratory sound insulation performance of 33 dB $R_w + C_{tr}$ which could typically be achieved with units formed of 10mm glass – nominal (12-20mm) cavity – 6mm glass.

Table 6: Trading noise break-out through rear elevation on Back Pool Fold (dB)

Description	Octave band centre frequency (Hz)							A
	63	125	250	500	1k	2k	4k	
Calculated trading noise outside apartment windows above	33	33	35	34	27	24	9	34
Adopted noise limit (background - 10 dB)	44	41	39	38	37	32	24	41
Comparison	-11	-8	-4	-4	-10	-8	-15	-7

- 5.7 Table 6 shows that, subject to installation of appropriate enhanced double glazing, trading noise break-out to the rear will be within the adopted noise limits. As such, trading noise break-out through to the rear will not result in any unacceptable noise impact.

Trading Noise Transmission within Building

- 5.8 Using the measured/calculated sound level difference values between the proposed ground floor restaurant demise and the apartment rooms above as shown in Table 3 and the adopted trading noise levels in Table 4, we have calculated the likely transmitted trading noise levels in the apartment rooms as follows, with the Manchester City Council noise limits also shown for comparison:

Table 7: Calculation of trading noise transmission through separating floor (dB)

Description	Octave band centre frequency (Hz)							A
	63	125	250	500	1k	2k	4k	
Trading noise in L_{eq}	66	72	75	81	80	76	69	84
Measured/calculated sound level differences								
To larger rear bedroom	27	43	58	70	75	74	72	
To smaller rear bedroom	24	42	57	72	75	71	68	
To kitchen/living/dining room	34	41	55	68	69	68	75	
Calculated transmitted trading noise levels in apartment rooms								
In larger rear bedroom	39	29	17	11	5	2	<0	18
In smaller rear bedroom	42	30	18	9	5	5	1	19
In kitchen/living/dining room	32	31	20	13	11	8	<0	19
Manchester City Council Limits	47	41	-	-	-	-	-	-

5.9 Table 7 shows that transmitted noise levels will be low, and well within the Manchester City Council noise limits, being at least 5 dB below the maximum permissible noise level in the 63 Hz octave and at least 10 dB below the corresponding limit in the 125 Hz octave band. We therefore conclude that, providing the restaurant fit out does not affect the existing sound insulation performance of the ceiling/separating floor, there will be no unacceptable noise impact due to trading noise transmission within the building.

5.10 In order to ensure that any fit-out of the restaurant does not reduce the acoustic separation between the ground floor demise and apartments above, or affect the level of noise break-out via the external walls, we would make the following outline recommendations:

- There should be no unsilenced ventilation openings in external walls. Windows should not be opened and the entrance door should not be pinned open in the mid-late evening;
- If the existing suspended ceiling is to be retained, make good any existing holes. Where desirable, air conditioning cassettes can utilise the existing holes in the ceiling, but we recommend that there are no recessed ceiling mounted loudspeakers;
- If the existing suspended ceiling is to be stripped out (e.g. to increase ceiling height), it will be necessary to install an appropriate new mass-barrier acoustic ceiling to maintain the existing acoustic separation between the spaces. This would typically be formed of multiple layers of

dense plasterboard suspended via acoustic hangers to form as large a cavity as possible, with mineral wool inserted into the cavity. The new ceiling should have no penetrations and any services should then be suspended below the new ceiling;

- We recommend that some additional sound level difference testing is carried out once the existing ceiling has been stripped out to determine the change in sound insulation and establish the precise specification of the new mass barrier acoustic ceiling;
- The premises PA system should be carefully designed with more numerous small/quieter loudspeakers rather than fewer larger/louder loudspeakers; and
- Loudspeakers should be mounted via proprietary anti-vibration mounts and angled towards the centre of the trading (i.e. not towards external walls or the entrance).

Noise limits for Fixed Plant & Equipment

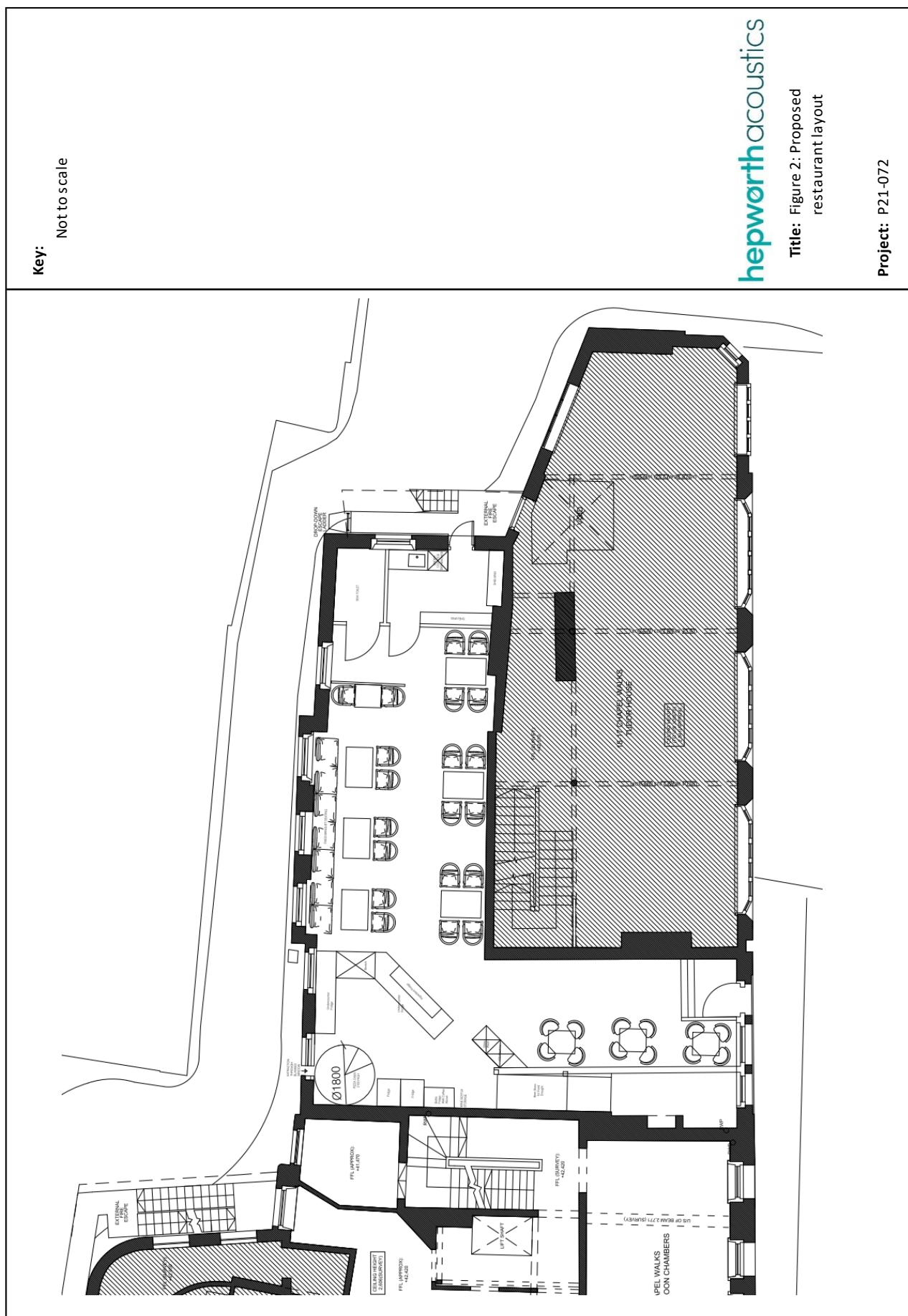
- 5.11 At this stage, no details are available of any plant and equipment to be installed as part of the development. As such, we have recommended appropriate noise design limits which can be considered in the selection and installation of the equipment.
- 5.12 Table 1 shows that the lowest background noise level measured by Wardell Armstrong to the rear of the building during proposed trading times is 51 dB $L_{A90,1\text{hour}}$. On this basis, the corresponding Manchester City Council noise limit is a noise rating level (in terms of $L_{Ar,1\text{hour}}$) of no more than 46 dB outside the nearest apartment windows.
- 5.13 The need to adequately control plant and equipment noise to this level can be secured by an appropriately worded planning condition.
- 5.14 For general guidance purposes, it is our experience that pizza restaurants that only feature pizza ovens (i.e. with no other cookline), do not usually require any dedicated mechanical kitchen ventilation equipment since pizza ovens generally only require a passive flue system. Nevertheless, for any necessary outdoor equipment, the following measures may need to be incorporated to adequately control noise:
- Specifying low noise equipment;
 - Careful siting of equipment as far from apartment windows as possible;

- Installation of acoustic enclosures around the fixed plant and machinery where necessary;
- Any equipment that has the potential to generate vibration should be isolated from the building with effective anti-vibration mounts; and
- Carrying out regular maintenance of equipment to minimise noise emissions.

6.0 SUMMARY AND CONCLUSION

- 6.1 Hepworth Acoustics Ltd was commissioned by the Peter Harrison 1997A Settlement Trust to carry out a noise impact assessment in connection with a change of use of the former hairdressing salon on the ground floor of 9 – 11 Chapel Walks in Manchester city centre to a small pizza restaurant.
- 6.2 The methodology and assessment criteria for the assessment were agreed in advance with Graeme Souter, EHO with Manchester City Council and has included review of noise data previously gathered at the site in connection with residential conversion of the upper floors of the building, along with some testing of the existing acoustic separation between the proposed pizza restaurant demise and an apartment directly above.
- 6.3 Appropriate noise limits have been adopted for the control of trading noise break-out via the shopfront and rear elevation, and for the control of plant/equipment noise.
- 6.4 Our assessment has demonstrated that noise break-out via the shopfront will be within the adopted noise limits and, subject to appropriately enhanced glazing for the new windows to the rear, noise break-out to the rear will also be within the corresponding noise limits.
- 6.5 Providing that the fit-out of the pizza restaurant does not affect the existing acoustic separation between the restaurant demise and the apartments above, the transmitted trading noise levels will be well within the corresponding Manchester City Council noise limits. We have provided outline recommendations to ensure that the existing acoustic separation is maintained.
- 6.6 Full details of the proposed plant/equipment are yet to be finalised, so we have recommended an appropriate noise limit to meet Manchester City Council's noise control requirements. The need to ensure that plant/equipment noise is adequately controlled can be secured with an appropriate planning condition.
- 6.7 We therefore conclude that there will be no unacceptable noise impact associated with the proposed pizza restaurant.





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.

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_{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: Trading Noise Break-out Calculations

Project Number	P21-072
Description	Noise break-out to front elevation

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Noise Break-out v6.0 February 2019

Source - Woods Practical Guide to Noise Control

	63	125	250	500	1k	2k	4k	8k	A
SPL _{int}	66	72	75	81	80	76	69	69	84

Element 1 - Window

SPL _{int}	66	72	75	81	80	76	69	69	84
Element SRI	14	20	24	31	35	29	36	39	
Area (S) =	4.0	6	6	6	6	6	6	6	
Distance (r) =	4.0	-12	-12	-12	-12	-12	-12	-12	

6 mm

At receiver	32	32	31	30	25	27	13	10	32
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$$\rightarrow = \text{SPL}_{\text{int}} - \text{SRI} + 10 \log S - 20 \log(r) - 14$$

Element 2 - Wall

SPL _{int}	66	72	75	81	80	76	69	69	84
Element SRI	34	41	45	48	56	65	69	72	
Area (S) =	15.0	12	12	12	12	12	12	12	
Distance (r) =	4.0	-12	-12	-12	-12	-12	-12	-12	

255mm Single leaf brick, plastered both sides

At receiver	18	17	16	19	10	-3	-14	-17	17
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$$\rightarrow = \text{SPL}_{\text{int}} - \text{SRI} + 10 \log S - 20 \log(r) - 14$$

Element 3 - Door

Element 3 - Door		Is door lobbied?			No					
SPL _{int}		66	72	75	81	80	76	69	69	84
Element SRI		14	20	24	31	35	29	36	39	→
Area (S) =	2.5	4	4	4	4	4	4	4		
Distance (r) =	4.0	-12	-12	-12	-12	-12	-12	-12		
Lobby absorption (A) =		18								
At receiver		30	30	29	28	23	25	11	8	30

6 mm

$$\rightarrow \text{No Lobby} = \text{SPL}_{\text{int}} - \text{SRI} + 10 \log S - 20 \log(r) - 14$$

$$\rightarrow \text{Lobby} = \text{SPL}_{\text{int}} - 2 \times \text{SRI} + 10 \log S - 20 \log(r) - 14 - 10 \log(A)$$

Overall Results

	63	125	250	500	1k	2k	4k	8k	A
Resulting	34	34	33	32	27	29	15	12	34

Limit	48	47	44	42	41	36	29	29	45
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Noise limit based upon L₉₀ - 10 dB

Difference	-14	-13	-11	-10	-14	-7	-14	-17	-11
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Project Number	P21-072
Description	Noise break-out to rear

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Noise Break-out v6.0 February 2019

Source - Woods Practical Guide to Noise Control

	63	125	250	500	1k	2k	4k	8k	A
SPL _{int}	66	72	75	81	80	76	69	69	84

Element 1 - Window

SPL _{int}	66	72	75	81	80	76	69	69	84
Element SRI	20	26	27	34	40	38	46	49	
Area (S) =	13.2	11	11	11	11	11	11	11	
Distance (r) =	3.5	-11	-11	-11	-11	-11	-11	-11	

10:12:6 mm

At receiver	32	32	34	33	26	24	9	6	34
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$$\rightarrow = \text{SPL}_{\text{int}} - \text{SRI} + 10 \log S - 20 \log(r) - 14$$

Element 2 - Wall

SPL _{int}	66	72	75	81	80	76	69	69	84
Element SRI	34	41	45	48	56	65	69	72	
Area (S) =	36.9	16	16	16	16	16	16	16	
Distance (r) =	3.5	-11	-11	-11	-11	-11	-11	-11	

255mm Single leaf brick, plastered both sides

At receiver	23	22	21	24	15	2	-9	-12	22
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$$\rightarrow = \text{SPL}_{\text{int}} - \text{SRI} + 10 \log S - 20 \log(r) - 14$$

Overall Results

	63	125	250	500	1k	2k	4k	8k	A
Resulting	33	33	35	34	27	24	9	6	34

Limit	44	41	39	38	37	32	24	24	41
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Noise limit based upon L₉₀ - 10 dB

Difference	-11	-8	-4	-4	-10	-8	-15	-18	-7
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