BROOKMOOR

NOISE ASSESSMENT FOR PLANNING PURPOSES

HARTER STREET MANCHESTER

4 August 2014

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1.0 INTRODUCTION

1.1 Acoustic & Engineering Consultants Limited (AEC) has been instructed by Brookmoor to undertake a noise assessment, for planning purposes, in relation to the proposed residential development, 2 Harter Street, Manchester.

1.2 The noise sources affecting the proposed development site are external road traffic, pedestrian and mechanical services, in addition to amplified music from the adjacent Charlie's Karaoke Bar.

1.3 In order to agree appropriate limits relating to music noise levels, a meeting was held on Thursday 3 April 2014 with Richard Knightley of Manchester City Council's (MCC's) Environmental Health Department and Angela Leckie of MCC's planning department. The outcome of this meeting has been used as the basis of the assessment.

1.4 With regard to setting internal noise level limits from typical external sources such as road traffic and pedestrian noise, and noise level limits associated with any mechanical services plant appropriate guidance is identified in the MCC planning guidance document GD 03, *'Public Protection Information for Developers'*, version 1.01 February 2014.

1.5 This report presents the results of the daytime and nigh-time noise level measurements undertaken by AEC and an assessment of the acoustic requirements of the glazing and associated ventilation to meet MCC's requirements. With regard to the potential impact from music noise affecting the future properties an assessment has been undertaken that presents the proposed mitigation works to the party walls, external walls, windows and floors. In addition an external noise level limit has been set in relation to any external mechanical services plant.

1.6 Acoustic terminology used throughout this report is presented in Appendix A.

2.0 SITE DESCRIPTION

2.1 The existing Grade 2* listed building consisting of five storeys over lower ground to fourth floor is situated on Harter Street, Manchester, as indicated on Figure 1 at the back of this report. All external walls are solid masonry and due to the listed nature of the building the existing sash windows will be retained, upgraded and repaired.

2.2 The east façade of the building fronts onto Harter Street and the rear (western) façade of the building overlooks an existing car park serving Linley House an existing large multi-storey office building.

2.3 The north side of the building adjoins another warehouse type building that houses Charlie's Karaoke Bar on the ground floor level with office space on the remaining levels. The separating party wall shared with the nightclub consist of two solid masonry walls (each over 200mm deep), that have been constructed directly adjacent to each other and appear to be in direct contact via a shallow mortar infill, in effect resulting in a significant solid masonry party wall.

3.0 DESIGN CRITERIA

Noise Levels Due to External Sources

3.1 With regard to internal noise level limits in residential spaces from external sources, the MCC guidance document GD-03 states:

'BS 8233 and the World Health Organisation (WHO) have recommended specific limits for internal noise levels inside residential properties to allow appropriate living and sleeping conditions. MCC has adopted the following internal noise limits for residential properties:

- *Bedrooms (Night time - 23:00 to 07:00): 30dB L_{Aeq} and individual noise events should not normally exceed 45 dB (L_{Amax}).*
- *Living Rooms (Day time 07:00 to 23:00): 40 dB (L_{Aeq}).*
- *Gardens/External Amenity Areas (Not applicable for City Centre developments and housing near busy roads): 55 dB (L_{Aeq}).*

Where it is necessary to keep windows closed to achieve the required internal noise levels it may be a requirement to provide additional mechanical ventilation to ensure that residential properties can be adequately ventilated if its occupants choose to keep their windows closed for noise reasons. Any ventilation will need to meet the requirements of Part F of the Building Regulations, which will be assessed by the Building Control Department. Where additional ventilation is required it should be capable of achieving the same noise reduction as the closed glazing and building structure.'

Music Noise Levels

3.2 Initial discussion with MCC indicated that there was a requirement to ensure complete inaudibility in relation to music noise levels. As achieving this absolute limit would have significant impact on the construction requirements to the point where it is understood that the proposed scheme may not be viable a meeting was arranged with MCC in order to discuss potential alternative design targets.

3.3 Based on the meeting held with held on Thursday 3 April 2014 with Richard Knightley of Manchester City Council's (MCC's) Environmental Health Department and Angela Leckie of MCC's planning department, it was agreed that provided the music noise was controlled to a level where it would be 'virtually inaudible' as a worst case situation, this should be acceptable.

3.4 In order to achieve this noise level limit AEC referenced the DEFRA report *'Noise from Pubs and Clubs – Phase 1',* which, on page 17, reproduces the Institute of Acoustics (IOA) working group guidance to achieve music noise levels which are 'virtually inaudible' inside the residential property. Although these limits are suggested at 1m from the nearest noise sensitive property, the guidance notes indicate that where a habitable room is attached to a source building, internal measurements may be appropriate.

3.5 Based on the above, to control amplified music in order that is 'virtually inaudible' in the future residential properties, the following limits would apply:

'L_{Aeq} (entertainment noise) should not exceed L_{A90} (without entertainment noise), and L_{10} (entertainment noise) should not exceed L_{90} (without entertainment noise) in any 1/3 octave band between 40 and 160Hz.'

3.6 Due to the difficulty in obtaining 1/3 octave band sound insulation performance data for various constructions, AEC has suggested the following criteria:

L_{Aeq} (entertainment noise) should not exceed L_{A90} (without entertainment noise), and L_{max} (entertainment noise) should not exceed L_{90} (without entertainment noise) in any 1/1 octave band between 63Hz and 250Hz.'

3.7 Based on previous nightclub amplified music noise level measurements undertaken by AEC at more than one venue, low frequency L_{10} music noise levels are generally 4dB lower than the low frequency L_{max} music noise levels. Based on this, it is considered that the suggested 1/1 octave band L_{max} limits are equivalent to the 1/3 octave band L_{10} limits.

3.8 As the background noise levels in the future residential properties are currently unknown, the proposals are to elevate the background noise levels in each of the rooms affected by music noise using the mechanical services system. As such, the proposals are to install a system that is constantly operational and generates background noise level of at least NR25 in the habitable rooms. The NR25 noise level is an absolute minimum target and the level must be achieved in each 1/1 octave band centre frequency between 63Hz and 250Hz.

3.9 It should be noted that the above limits are approximately equivalent to the guidance presented in the MCC guidance GD-03 which states:

'*A planning application for an entertainment venue should demonstrate that music noise from the proposal will not be audible inside residential properties nearby assuming that the residential properties in question have their windows open. The target noise criteria here should be 10dB (LAeq) below the existing LA90 in each octave band*'

3.10 Further to the above, Richard Knightley confirmed that he will require pre-completion noise tests in the building to demonstrate that the agreed limits have been achieved. Richard agreed that these measurements are likely to prove very difficult to undertake and, as such, a subjective assessment may be required.

Mechanical Services Plant

3.11 In relation to atmospheric mechanical services plant noise, based on the MCC guidance document GD-03 design aim is that the noise from all plant items combined will be at least 10dB below the lowest measured background noise levels over the period that the plant will be operational.

4.0 NOISE LEVEL MEASUREMENTS

4.1 AEC attended site on Saturday 8 February 2014 to undertake night-time noise level measurements between approximately 2330h and 0230h. Daytime measurements were undertaken on Thursday 17 April 2014 between approximately 0800h and 1030h.

4.2 Full details of the measurement procedure are presented in the attached Appendix B with the measured noise levels presented in Tables B1 and B2.

4.3 When the night-time noise level survey was undertaken, it was understood that Charlie's was located at lower ground floor level and, as such, internal music noise level measurements were undertaken on the lower ground floor and first floor levels only.

4.4 However, when AEC returned to site during the daytime and undertook an external site inspection at the rear of the building, it was observed that Charlie's is actually located on the ground floor level.

4.5 Although internal music noise level measurements were not undertaken at ground floor level subjectively, it was noted that the noise levels at ground floor level were not noticeably greater then those measured at lower ground floor level. As such, the anticipated music noise levels

at ground floor level have been calculated based on the measured noise levels at lower ground floor level.

4.6 The noise climate affecting the front of the building was largely dominated by noise from traffic on Princess Street and mechanical services plant serving the surrounding buildings during both the daytime and the night-time periods, with noise from Charlie's clientele (smoking outside the front entrance) also adding to the noise climate during the night-time.

4.7 At the rear of the building, the noise climate was due to road traffic on the surrounding roads, and mechanical services plant noise during the daytime. During the night-time, music noise breaking out from the rear of Charlie's Karaoke Bar was the dominant noise external to windows close to the rear of Charlies. For windows situated away from Charlies, noise levels were mainly due to mechanical services plant and distant road traffic.

4.8 Charlie's is basically a night-club with associated Karaoke booths and at the time of the survey, Charlie's door staff confirmed that the event occurring during the survey period represented a typical weekend night for the venue.

4.9 Based on the external noise level surveys, the worst case free-field noise levels at the various building facades are presented in Table 1, below.

Table 1: External Free-Field Noise Levels

Façade	Free-field noise level, dB		
	Daytime, L_{Aeq}	Night-time	
		L_{Aeq}	L_{Amax}
Front	60	65	84
Rear	58	57	69
Side	58	55	71

4.10 Further to the above, the maximum music noise levels measured at both lower ground floor and first floor level were in the order of 43dBL_{Amax} and around 65dBL_{max} @ 63Hz. Table B1 in appendix B shows the measured data for the 63, 125 and 250Hz Octave band centre frequencies only as these were the only frequencies were the measured noise levels were due to music noise alone.

5.0 GLAZING AND VENTILATION REQUIREMENTS

General

5.1 To achieve appropriate internal noise levels all windows on all facades will need to remain closed and, as such, alternative means of ventilation will be required.

5.2 Windows can be openable provided that they are effectively sealed when closed and it is important that any seals and frames do not downgrade the sound insulation performance requirements identified in this section. Based on the existing sash windows, in all instances, these will need to be upgraded and have a good standard of acoustic seals fitted. Test data should be obtained from any manufacturer of the proposed seals for the existing windows.

5.3 Given the nature of the noise sources (music and clientele noise), rooms with windows on the front and rear facades will be supplied with mechanical ventilation in order that rapid ventilation can be provided without needing to open windows.

5.4 Rooms that are affected by the worst case clientele and music noise levels should not have any non-ducted openings in the building façade. However, for rooms on the side façade and those located on the front faced located away from Charlie's Karaoke Bar entrance, it should

be acceptable to ventilate using acoustic trickle ventilation but this would need to be agreed with MCC.

Front Façade

5.5 For windows to living rooms and bedrooms close to the Charlie's bar entrance, noise from clientele associated with Charlie's Karaoke Bar will be the main sources.

5.6 To control the worst-case maximum noise levels from clientele entering Charlie's and smoking outside the front door, to no greater than 35dBL_{Amax} in future habitable rooms, the existing sash windows will need to be well sealed and a secondary glazed element will be required internally consisting of 6.4mm glazing fitted on a frame with compressible rubber seals and forming a cavity of at least 150mm between the frames. In addition, the reveals of the windows should be lined with an acoustically absorbent material. Provided each window frame is well sealed, this arrangement should provide a sound insulation performance of 47dBR_w.

5.7 For windows further than 12m from the ground floor entrance of the building, the glazing requirement can be reduced but this will require development.

Side (Southern) Façade

5.8 Based on the external noise levels identified in Table 1, above, any standard glazing achieving a minimum sound insulation performance of 31dBR_w would control external to internal noise levels to comply with MCC's required limits for both bedrooms during the night-time and living rooms during the daytime.

5.9 Provided that it can be demonstrated that the frames windows can be appropriately sealed to achieve this level of sound insulation performance, the glazing installed would be adequate. If this cannot be demonstrated, the existing windows would require upgrading.

Rear Façade

5.10 Based on the external music noise level data presented in Table B2, glazing providing a very good low frequency sound insulation performance of 30dB in the 63Hz 1/1 octave band centre frequency will be required to windows closest to Charlie's.

5.11 Subject to development, it will be possible to reduce this requirement in relation to living rooms and also bedrooms located away from Charlie's. However, the glazing sound insulation performance required would still be high.

5.12 This element is discussed further below, taking into account noise transfer via the party wall also.

6.0 MITIGATION MEASURES TO CONTROL MUSIC NOISE

General

6.1 Based on the internal sound level measurements undertaken by AEC, the most onerous requirement is to control the low frequency music sound levels. AEC measured music sound levels of 65dBL_{max} of 63Hz (OBCF) in the building at lower ground floor level. It was noted that this noise level was due to transfer via the party wall and noise break-in via the window and based on external noise levels of 79dBL_{max} at 63Hz, it is considered that the noise levels via the party wall alone will be in the order of 62dBL_{max} at 63Hz.

6.2 This represents the noise level at lower ground and first floor level and at ground floor level (i.e. the same floor as the club, it is anticipated that the worst case maximum noise level via the party wall), will in the order of 67dBL_{max} in the 63Hz octave band centre frequency (i.e. 5dB higher).

6.3 The separating wall between Charlie's and the proposed development is understood to be at least 500mm wide masonry, consisting of 2 x 250mm thick masonry walls rigidly coupled. Based on AEC's calculations, this wall would provide an overall reduction in noise levels of 65dBD_w overall and around 46dB at 63Hz. Further to this, AEC has calculated the anticipated music noise levels in Charlie's during the time of the survey and these were 115dBL_{Amax} overall with 115dBL_{max} and 110L_{max} in the 63Hz and 125Hz octave band centre frequencies.

6.4 The sound transmission paths that need to be controlled between Charlie's Karaoke Bar and the future residential properties are identified on Figures 1 and 2, below.

6.5 The main sound transmission paths are the party wall and the windows, as indicated by a bold red arrow on Figures 1 and 2. The lesser sound transmission paths are those elements identified by black arrows. Whilst the lesser sound transmission paths will transmit significantly less sound energy than the main paths, as the noise is reduced via the main paths, the lesser paths become more important.

Figure 1 – Sound Transmission Paths (Section View)

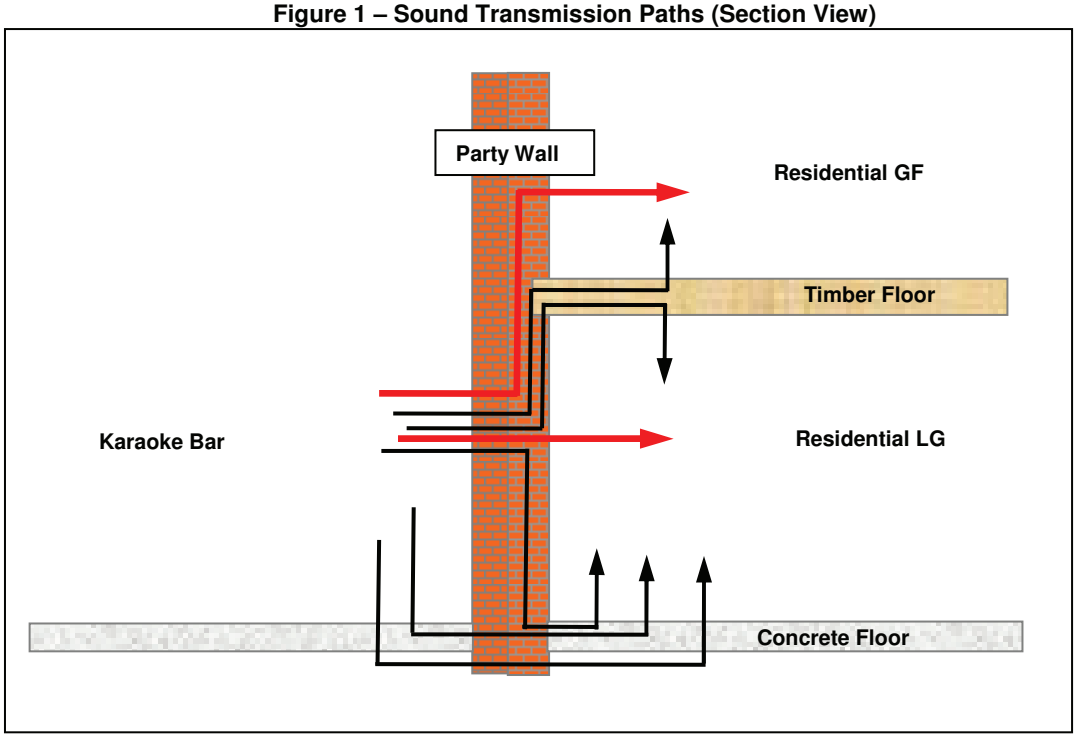
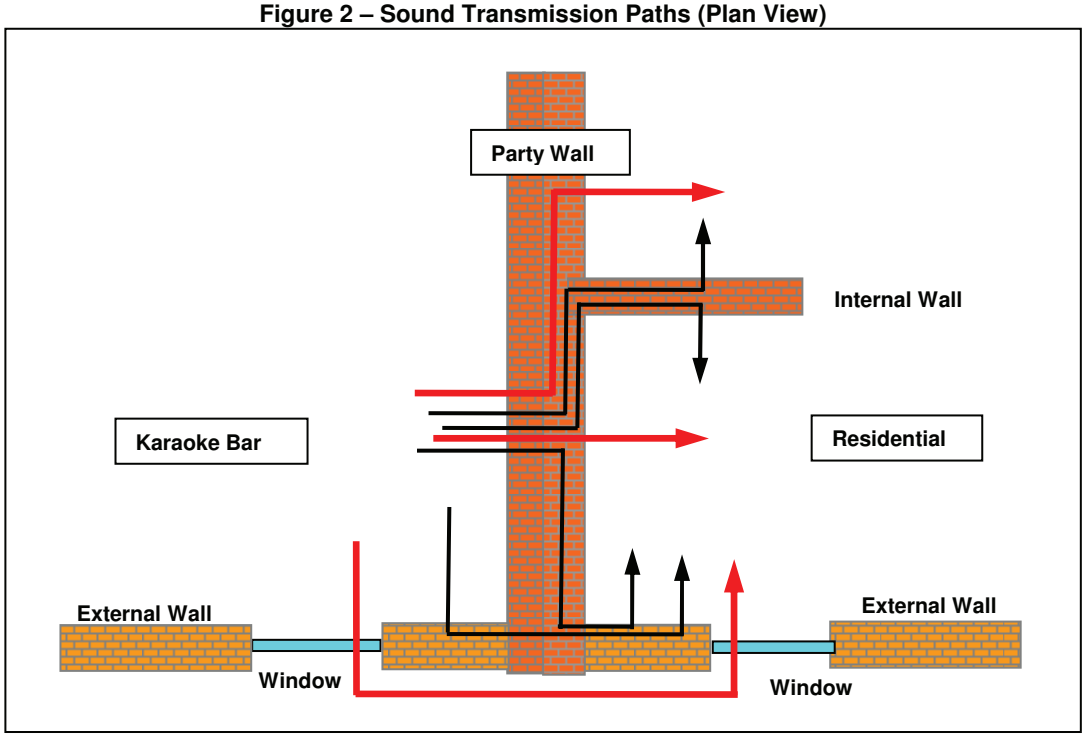


Figure 2 – Sound Transmission Paths (Plan View)



6.6 To control the music noise levels to no greater than NR25 in the residential apartments, the following mitigation measures will be required. An example of how the required mitigation measures have been specified is included in Appendix C and the floor plans showing the proposed mitigation measures are presented on the Figures included in Appendix D.

6.7 It is important to note that the measurements undertaken by AEC were limited to some degree by the fact that the existing windows are not all sealed. As such, Brookmoor may undertake further measurements before installing the internal mitigation measures identified below. If these future measurements demonstrate that the proposed wall linings can be reduced, it is Brookmoors intention to report this and agree reduced mitigation measures.

6.8 The worst case mitigation requirements are apartments, 5, 6 and 10, from LG to 1st floor level that adjoin Charlie's and have windows on the rear façade.

Separating Party Walls

General

6.9 With regard to any new ductwork installed in the new development Manchester Council was concerned that this may potentially alter the performance of the wall and, in short, act as a an amplifier for the music noise that travels via the party wall between Charlie's nightclub and the development, however, AEC is satisfied that this will not occur

6.10 The required mitigation measures to the party walls are presented below. It is important to note that

Apartment 5 (LG)

6.11 At lower ground floor level the lining will consist of 100mm thick dense blockwork (at least 1800kg/m^2 density) forming a cavity of 100mm with the existing wall, with 25mm thick mineral wool roll fitted in the cavity.

6.12 This lining should extend across the entire party wall in this apartment and should be constructed on a resilient layer (e.g. Regupol) at the based of the wall if this is possible. All junctions should be well sealed.

Apartment 1 (LG)

6.13 Based on the layout the party walls will be buffered by non habitable rooms and as such, there should be no requirement to independently line the party wall.

Apartments 6 & 10

6.14 The required reduction from the party wall at ground floor level represents the worst case situation where it is assumed the levels could be up to 67dBL_{max} at 63Hz via the party wall.

6.15 As such this wall will require plasterboard lining consisting of 3 layers of 15mm thick Soundbloc (or board with equivalent surface weight) on an **independent** frame forming a 350mm cavity with the wall with 350mm thick mineral wool based insulation (at least 30kg/m^2) in the cavity.

6.16 It may be possible to reduce the required cavity marginally to apartment 10 but this will require development.

Other Apartments

6.17 For other apartments, based on the reduction of shared party wall areas and distance and room types, at this stage, these should be independently lined with 2 layers of 15mm thick Soundbloc (or board with equivalent surface weight) forming a cavity of 100mm with 50mm thick mineral wool roll in the cavity.

Rear Windows

6.18 The performances indicated below assume that there are no ventilation openings in the façade. High performance acoustic vents may be acceptable to rooms situated away from the karaoke bar but these would not be allowable to rooms close to the karaoke bar.

Apartment 5, 6 & 10 – Bedrooms

6.19 The bedroom windows of these apartments have the most critical sound insulation performance requirements.

6.20 To this extent, the existing sash windows will need to be well sealed and the new internal glazing layer should be at least 13mm laminate glazing. The new frames must be fitted with compressible rubber seals.

6.21 The cavity formed between the glazing panes must be **at least** 200mm and, ideally would be deeper if this can be accommodated. AEC would strongly recommend that the cavity to these windows is the maximum possible. In addition, the reveals of these windows must be lined with an acoustically absorbent material.

Apartments 5, 6 & 10 Lounges

6.22 Based on increased distance attenuation, music sound levels external to these rooms should be around 10dB lower than the rooms indicated above.

6.23 Again, the existing sash windows should be well sealed and the internal lining should be at least 10mm glass forming at least a 200mm cavity and the frame must be compressible rubber seals. There is no requirement for absorbent reveals to these windows.

Other rear windows

6.24 In all cases the existing sash windows should be well sealed and at this stage, it would be prudent to allow for secondary glazing. However, the internal glazing only needs to be 6mm thick and the cavity 100mm. Again, compressible rubber seals should be used.

6.25 It may be that the secondary element could be reduced to rooms further away from the nightclub. However, this would depend upon the reduction provided by the existing widows. As this cannot be accurately confirmed, it is recommended that the currently proposed secondary windows are allowed for at this stage.

Rear External Wall

6.26 These are uncertain elements as full details of the existing constructions are unknown. However, based on guidance in BS12354 Part 1, it is anticipated that the sound transmission via this path will be around 10dB lower than the main wall at 63Hz. Based on this, the following lining will be required to the external walls.

Apartment 5, 6 & 10 Bedrooms

6.27 3 layers of 15mm thick Soundbloc (or board with equivalent surface weight) constructed on an independent frame forming a 100mm cavity with the wall with 100mm thick mineral wool based insulation (at least 30kg/m^2) in the cavity.

Other apartments

6.28 For the external wall to the other apartments, this can be reduced but this will require further development.

Internal Wall to Stairwell (Apartment side only)

6.29 At this stage, this wall should be lined to habitable rooms as per the external wall lining identified above. For non-habitable rooms, and rooms above the second floor, the lining can be reduced to 2 layers of board.

Timber Floors

6.30 AEC cannot confirm the sound transmission via this route. Whilst it will be significantly lower than via main separating wall, there may still be a requirement for a heavyweight independent plasterboard ceiling for rooms in apartments 5 and 6. For apartment 10, an allowance should be made to underline the roof in a similar manner. At this stage 2 layers of 15mm thick Soudbloc should be allowed for on an MF system forming a 200mm cavity with 50mm thick mineral wool insulation in the cavity.

6.31 It is understood that floating timber floor will be constructed on top of the existing timber floors in order to achieve the internal requirements for ADE purposes. At this stage, the for the habitable rooms in apartments 6 and 10, an allowance should be made for a floating floor consisting of 3 layers of dense board (resulting in a surface weight of at least 45kg/m^2) on a cradle an batten system with a 20mm thick resilient layer, forming a cavity of 100mm with mineral wool in the cavity. It may be possibly to reduce this requirement but this will require future measurements.

7.0 PLANT NOISE

Internal Plant Noise

7.1 As indicated above, in order to mask the noise break-in from the night-club, it is essential that the mechanical services serving all apartments adjoining Charlie's Karaoke Bar is designed to achieve noise levels of NR25. The NR25 noise level is an absolute minimum target and the level must be achieved in each 1/1 octave band centre frequency between 63Hz and 500Hz.

External Plant Noise

7.2 Based on the lowest measured background noise levels, the maximum allowable plant noise levels at the nearest residential properties situated directly opposite the front and side façades of the site on Harter Street are presented in Table 2, below.

Table 2: Plant Noise Level Limits

Period	Plant Noise Limit (at properties to north of site)
Day (0700-2300)	45dBL_{Aeq}
Night (2300-0700)	45dBL_{Aeq}

7.3 It should be noted that the existing background noise levels are relatively high, even for a city centre, which is due to plant serving existing properties. Assuming that the above limits are achieved, there will be no background level 'creep' in the area as a result of operation of any new plant items.

8.0 CONCLUSIONS

8.1 AEC has undertaken daytime and night-time noise level measurements internal to and external to the proposed residential development situated at Hater Street, Manchester.

8.2 The dominant noise sources in the area during the daytime are traffic noise on Princess Street and mechanical services plant serving the surrounding buildings. During the night-time, clientele associated with the adjacent Charlie's Karaoke Bar are main noise source.

8.3 Based on MCC's requirements internal noise levels from transportation noise sources need to be controlled to no greater than 40dBL_{Aeq} in living rooms during the day and 30dBL_{Aeq} and 45dBL_{Amax} in bedrooms during the night-time.

8.4 In order to control external to internal noise levels on all façades, windows will need to remain closed and, as such, alternative means of ventilation is required.

8.5 To control noise levels breaking in to habitable rooms on the front façade as a result of Charlie's clientele noise, secondary glazing has been specified based on the existing sash windows being fitted with a good standard of acoustic seal and an internal secondary glazed 6.4mm laminated window installed forming a cavity of 150mm with the existing window.

8.6 Calculations indicate that standard glazing should be acceptable to lounges and bedrooms on the side façade.

8.7 During the night-time, the building is subjected to music noise from the adjacent Charlie's night-club, which breaks into the building via the adjoining party wall and the rear windows.

8.8 Based on a meeting with MCC, it was agreed that amplified music must be controlled to a level were it will be 'virtually inaudible' as a worst case situation. To achieve this, AEC has suggested that the maximum, dBL_{max}, noise levels must be controlled to no greater than the background, dBL_{90}, noise levels in each octave band centre frequency.

8.9 To control music noise levels, the minimum required mitigation measures are presented in section 6 of this report, which include mass barrier linings to walls and floors and secondary glazed windows. In addition, a minimum background noise level of NR23 will need to be achieved in the habitable rooms based on the use of the mechanical plant serving the building.

8.10 In order to confirm the need for the mitigation measures proposed by AEC, Brookmoor may choose to undertake further acoustic measurements when the building is sealed and the rooms close to the party wall have been constructed. The currently proposed mitigation measures may then potentially be reduced.



Andrew Burke

APPENDIX A – Acoustic Terminology in Brief

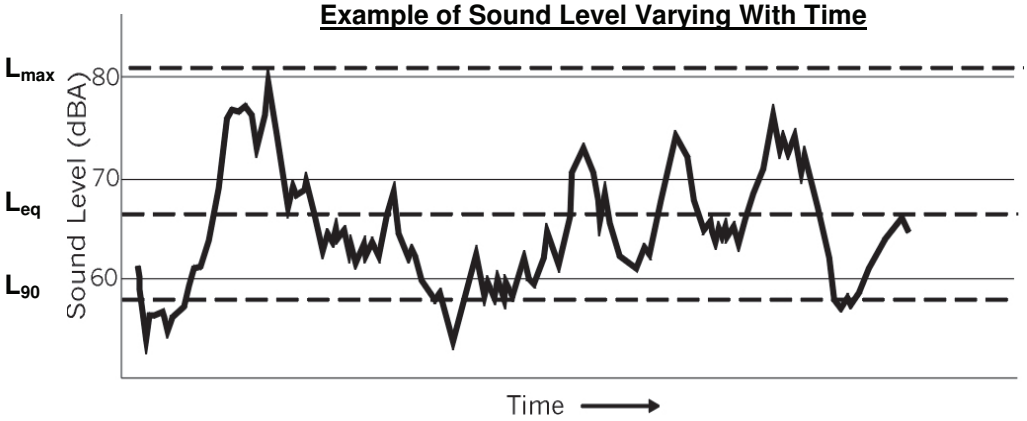
Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz *(Hz)*, that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discreet frequency - a 'pure tone' - most noise is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA,* normally used to assess the effect of noise on people. The dBA weighting emphasises or reduces the importance of certain frequencies within the audible range.

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the noise.

The figure below shows an example of sound level varying with time. Because of this time variation the same period of noise can be described by several different levels. The most common of these are described below.

Example of Sound Level Varying With Time



$L_{Aeq,T}$ The equivalent continuous (A-weighted) sound level may be considered as the "average" sound level over a given time, T. It is used for assessing noise from various sources including transportation, industrial and construction sources and can be considered as the "ambient" noise level.

L_{A90} The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value used to describe the "background" noise.

L_{Amax} The maximum (A-weighted) sound level during a measurement period.

Free-field Level This refers to the sound level measured outside, away from reflecting surfaces.

Façade Level This refers to the sound level measured outside, at 1m from a hard reflecting surface, typically 3dB greater than the free-field level.

R_w Single number rating used to describe the airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz, when ***measured in a laboratory***.

$D_{n,e,w}$ Weighted element-normalised level difference. Single number rating used to describe the performance of a ventilation unit.

APPENDIX B – Measurement Procedure

Date & Time of Survey:	Wednesday 8 February 2013, 2330-0230h.
Personnel Present:	Andy Burke (AEC).
Equipment Used:	B&K 2260 Real Time Analyser (AEC Kit 2)
Weather Conditions:	Overcast, continuous light rain, wet roads, 6°C, average wind speeds of 1.5m/s with occasional gusts up to 4m/s.
Measurement Procedure:	Noise levels were measured at 3 locations external to the façade of the building and 2 locations within the building, as described below.

External

A. At first floor level on the eastern façade, external to the northern most window adjacent to he entrance of Charlie's Nightclub.

B. At first floor level external to the northern most window of the western façade, adjacent to the rear of Charlie's Nightclub.

C. At ground floor level, external to the southern façade, 5m back from the Harter Street façade.

Internal

D. Basement level, central to the party wall with the nightclub.

E. First floor level close to the lift shaft.

External locations were selected to measure general ambient, background and maximum noise levels, due to all sources, which were measured in terms of L_{Aeq}, L_{A90} and L_{Amax}, typically over 10-15 minute periods. Full octave band noise level data was also obtained for each of these measurements.

Measurements were undertaken just external to the large open windows.

Internal locations were selected to measure music noise levels, which were measured in terms of L_{Aeq}, and L_{Amax}. Full octave band noise level data was also obtained for the music noise.

The sound level analyser, which conforms to BS EN 61672-12003 *'Electro acoustics – sound level meters - Part1Specifications'* for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.

Measured Data:	Full results are given in Table A1 and A2.

FIGURE B1 – Site Location Plan Showing External Monitoring Locations

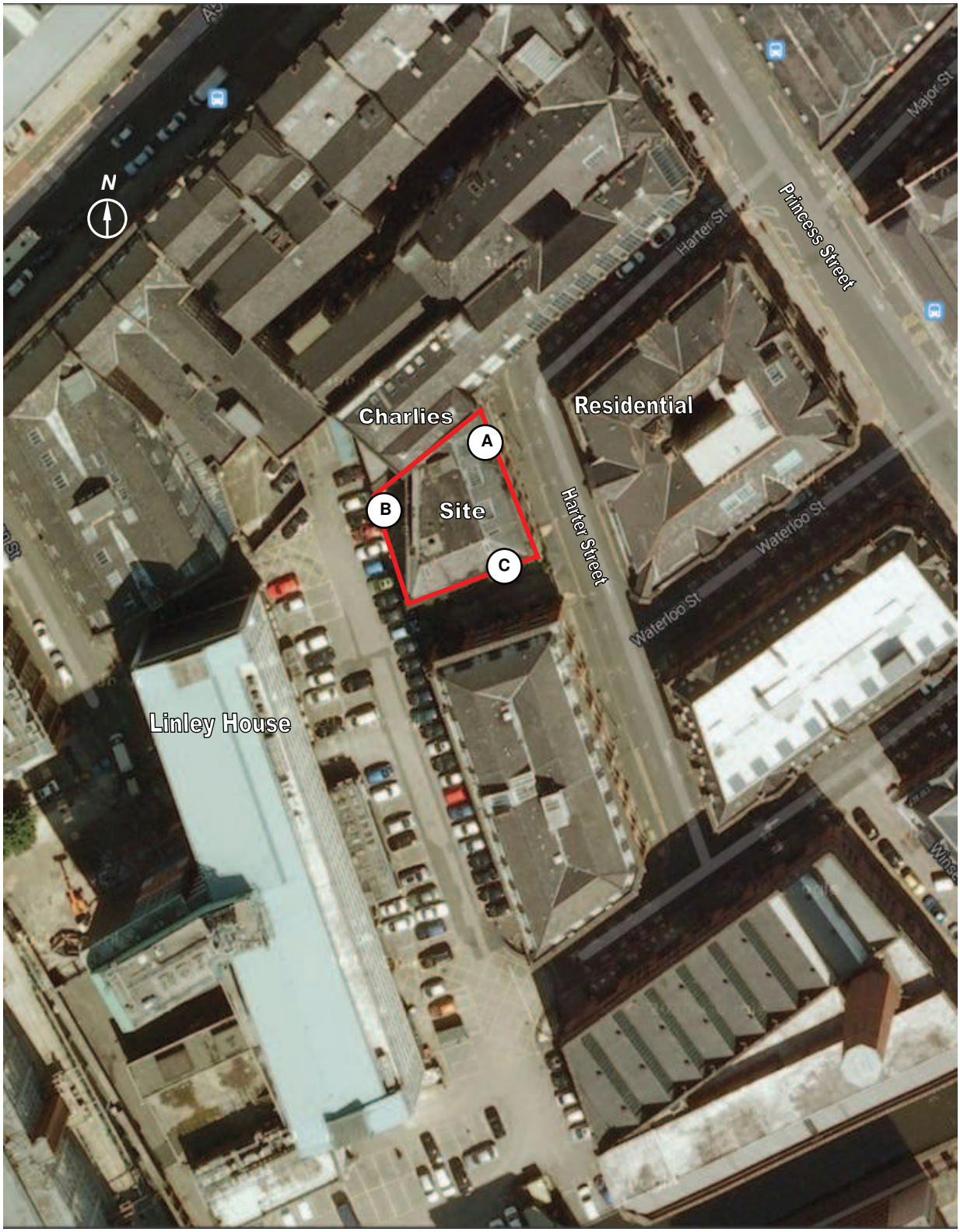


Table B1 – Measured Noise Levels

Position	Period	Measured Noise Level, dB			Notes
		L_{Aeq}	L_{Amax}	L_{A90}	
Night-time					
A	2335-2350	67.6	83.8	61.4	Noisy crowd external to window, road traffic, low frequency affected by wind. Max due to road traffic. Background due to traffic and building services plant (serving building opposite)
	2358-0013*	63.3	81.7	60.0	As above, crowd not as noisy. People smoking outside Harter Street. Max levels due to traffic and people.
	0154-0200*	62.0	75.5	79.1	As above.
	0217-0223*	66.0	77.7	61.5	
B	0016-1131*	57.8	69.4	55.5	Mainly due to traffic on surrounding roads, heavier rain during this measurement, background noise largely due to plant serving buildings in courtyard, Charlie's audible but not significantly adding to the noise climate although the LF noise is more affected.
C	0041-0057	57.0	71.3	54.1	Mainly road traffic noise with the odd pedestrian shouting also marginally adding to the overall climate.
Daytime					
A	0814-0828	62.6	74.6	59.6	Traffic on princess street and mechanical plant serving surrounding buildings. Significant bus pass-bys occurring on Princess Street.
	0914-0930	62.2	73.3	59.3	
	0959-1008	62.0	78.4	58.8	
B	0848-0903	61.0	76.6	60.0	Mechanical plant serving Linley House and traffic on surrounding roads.
	0931-0942	60.3	71.2	59.8	
C	0904-0914	60.7	83.4	55.9	Traffic on princess street and mechanical plant serving surrounding buildings. Max due to local traffic.
	0944-0954	57.6	65.6	55.8	Traffic on princess street and mechanical plant serving surrounding buildings.

*** 1 minute continuous data obtained for this period**

Table B2: Highest Measured Octave Band Music Noise Level Data*

Loc.	Details	Overall, L_{Amax}, dB	Noise Level, L_{max}, dB @ Octave Band Centre Frequency, Hz						
			63	125	250	500	1k	2k	4k
D	Internal (LG)	43*	65	54	47	-	-	-	-
E	Internal (1st Floor)	43*	64	55	48	-	-	-	-
C	External, Ground Floor	64	79	77	60	-	-	-	-

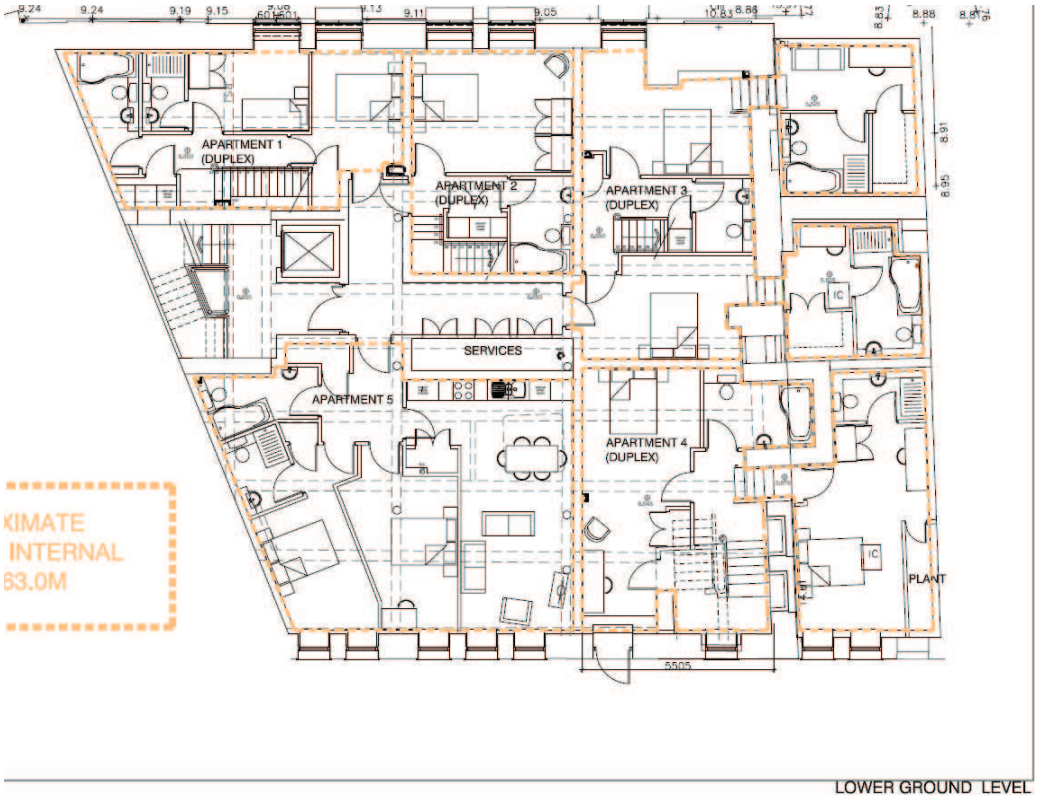
*** Music Noise Levels were continuously logged over 1 minute periods for around 25 minutes at LG level and 10 minutes at first floor level.**

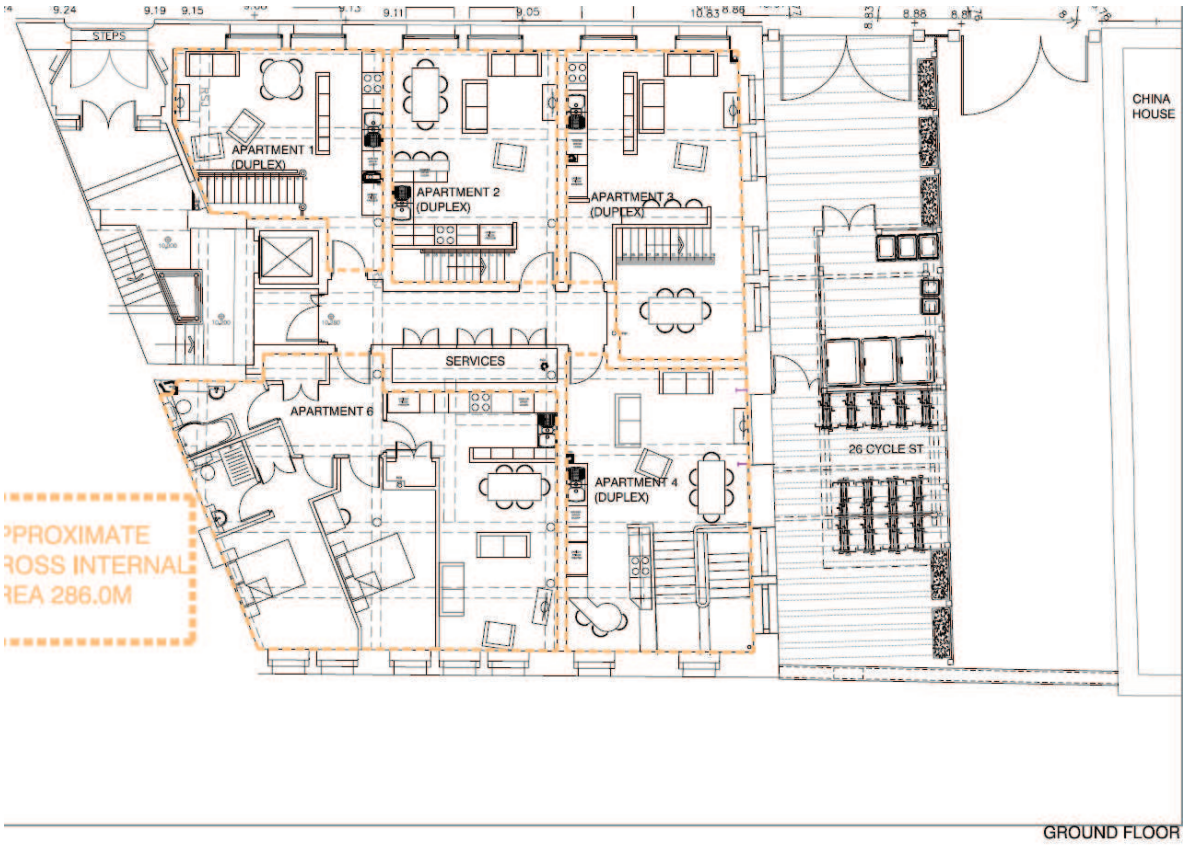
APPENDIX C – Example Outline Calculations Via the Party Wall

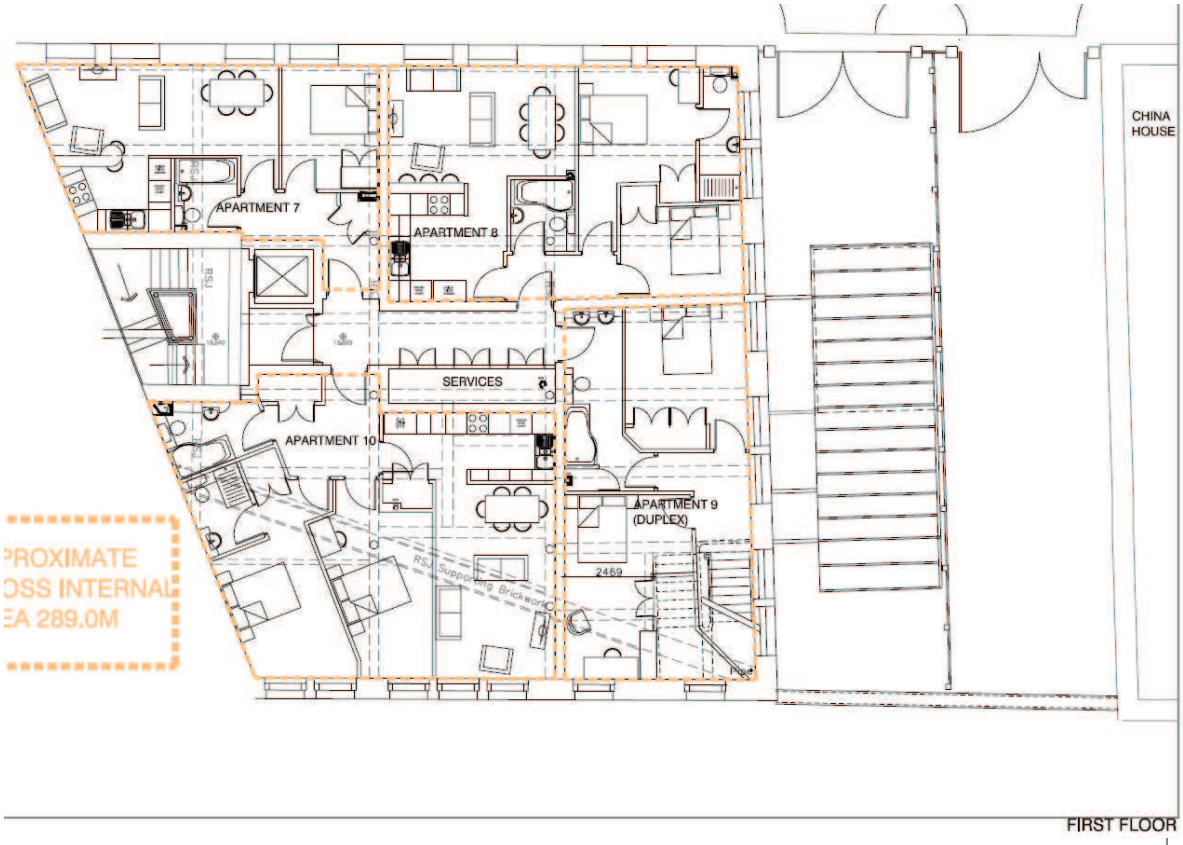
Details	Overall (A – weighted)	Noise Level, dB @ Octave Band Centre Frequency, Hz						
		63	125	250	500	1k	2k	4k
Measured Noise Levels								
Internal (LG) L_{max}	41dB	62	51	43	39	-	-	-
Internal (GF) L_{max}	46dB*	67*	56*	48*	44*	-	-	-
Reduction of Wall Lining (LG) – BLOCKWORK								
Blockwork Lining	- -	-22	-30	-33	-45	-	-	-
Increase due to Room reduction	- -	+5	+5	+5	+5	-	-	-
Resultant Internal Level	20dBL_{max} (NR12)	45	26	15	0	-	-	-
Proposed plant level	NR25	56	44	36	29	-	-	-
Reduction of Wall lining (GF) – PLASTERBOARD								
Plasterboard lining	- -	-22	-32	-35	-45	-	-	-
Increase due to Room reduction	- -	+5	+5	+5	+5	-	-	-
Resultant Internal Level	24dBL_{max} (NR18)	50	29	13	0	-	-	-
Proposed plant level	NR25	56	44	36	29	-	-	-

*** Anticipated worst case based on measurements at Ground and First Floor Level**

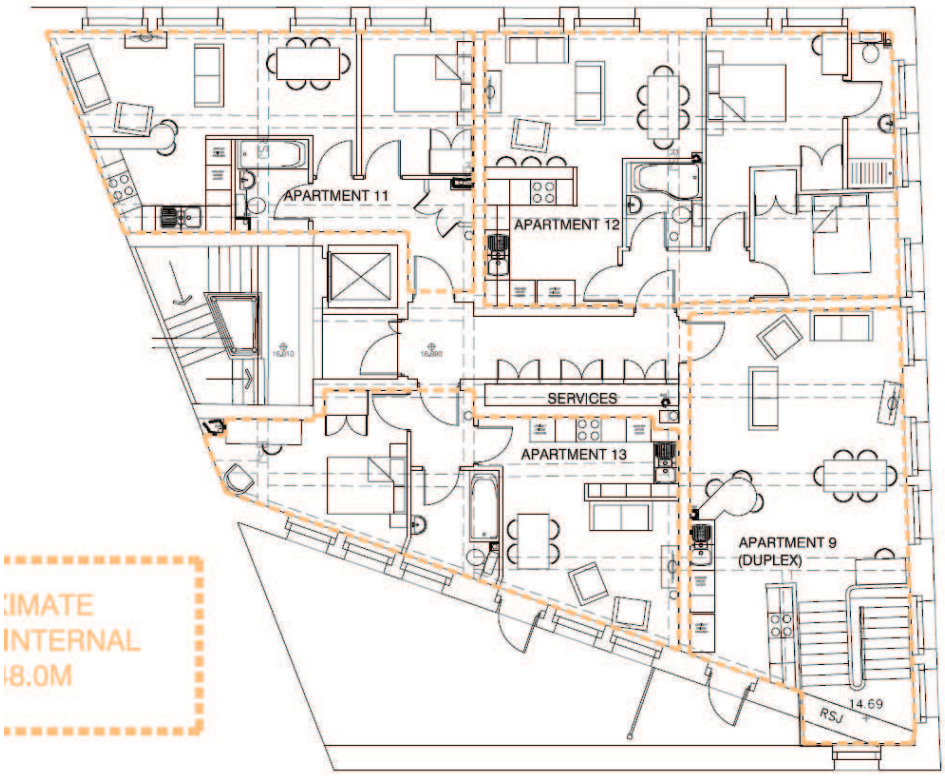
APPENDIX D – LG to 2nd FLOOR PLANS







FIRST FLOOR



SECOND FLOOR