



STUART WALL

174 PALATINE ROAD, MANCHESTER

NOISE ASSESSMENT FOR PLANNING PURPOSES

17 June 2022

AEC REPORT: P4601/R01b/PJK

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1.0 INTRODUCTION

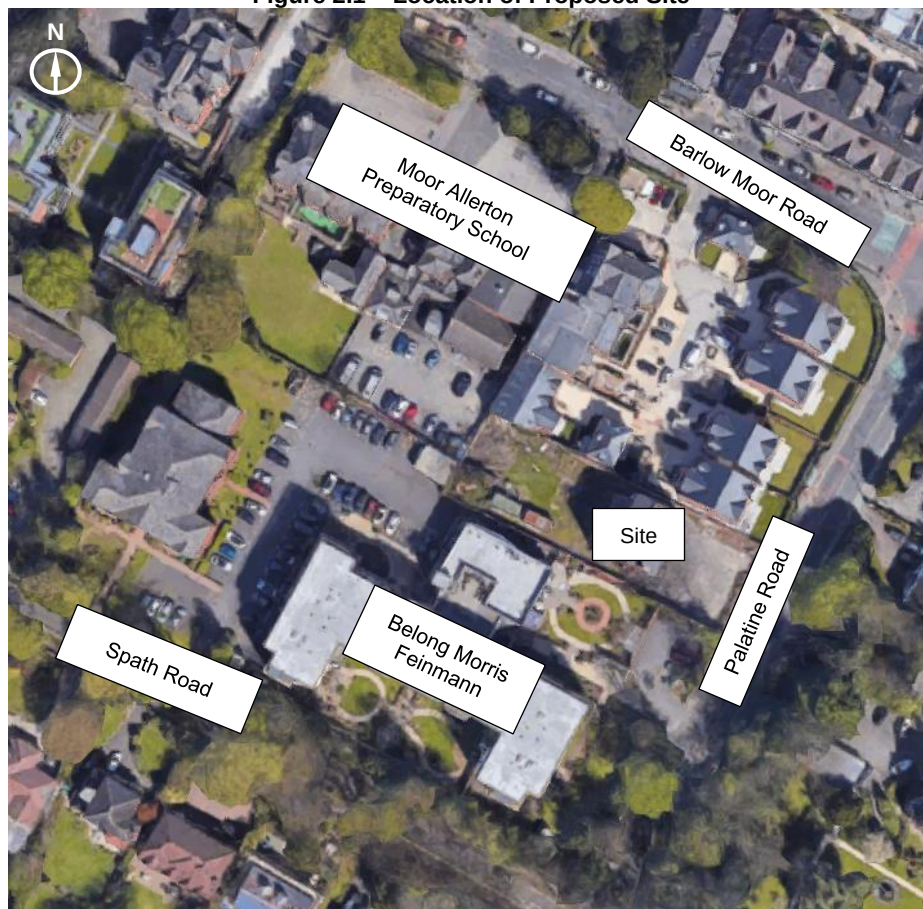
- 1.1 Acoustic & Engineering Consultants Limited (AEC) has been appointed by Stuart Wall, to undertake a noise assessment for the proposed residential scheme at 174 Palatine Road, Manchester.
- 1.2 This report details the baseline noise levels measured on site and discusses the implications on the building design to achieve the internal noise level limits presented in Planning Condition 4 of the Manchester City Council Notice of Planning Permission for Application Number 128895/FO/2020.
- 1.3 Acoustic terminology is discussed in brief in Appendix A.

2.0 SITE AND PROPOSED DEVELOPMENT DESCRIPTION

Existing Site Layout

- 2.1 The proposed development site currently consists of a 3-storey building and garden. The site is bound to the east by Palatine Road, to the north by a small residential estate, to the west by Moor Allerton Preparatory School and to the south by Belong Morris Feinmann residential care home. The site location is presented on Figure 2.1, below.

Figure 2.1 – Location of Proposed Site



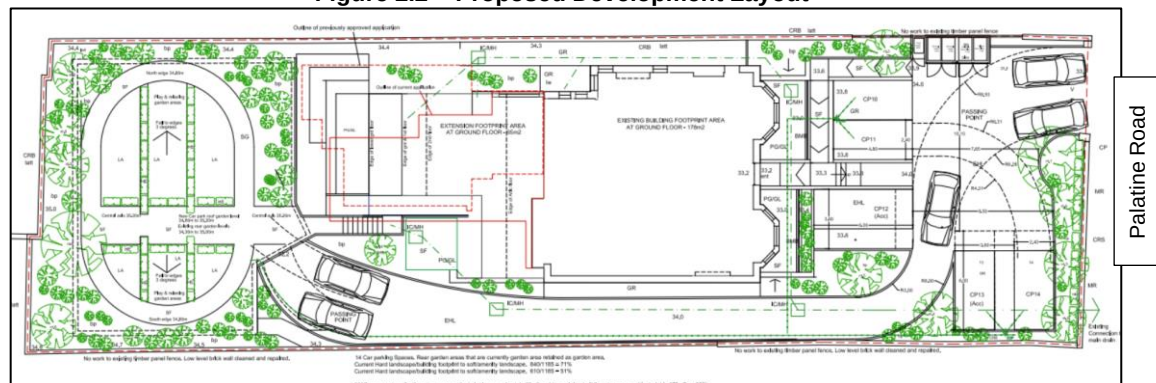
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- 2.2 Palatine Road is a major arterial road linking the M56 motorway and Didsbury and Withington.
- 2.3 Beyond the residential estate to the north is Barlow Moor Road, which links East and West Didsbury. On the opposite side of Barlow Moor Road is a row of commercial units, including a small café, a dog groomers and hair salons. During the night-time survey it was noted that none of the units were operating.
- 2.4 Moor Allerton Preparatory School has a small play area which is overlooked by the apartments to the rear of the development.
- 2.5 Belong Morris Feinmann is a four-storey residential care home. Adjacent to the rear of the 174 Palatine Road site is the Bistro and building services plant located in the a basement plant room and on the roof of the Bistro. To the south of Belong Morris Feinmann is Spath Road which is a quiet residential street.

Proposed Development

- 2.6 The proposed development will include the refurbishment and extension of 4 existing flats together with the addition of 5 new flats within an existing and extended converted block. Balconies will be provided to the apartments in the new extension and there will be a roof top garden located on top of the underground car park. The proposed site layout is presented in Figure 2.2, below.

Figure 2.2 – Proposed Development Layout



3.0 ACOUSTIC DESIGN CRITERIA

National Planning Policy Framework

- 3.1 Current national planning policies are set out in the National Planning Policy Framework (NPPF) published by the Department for Communities and Local Government, dated March 2012 and revised in February 2019.
- 3.2 The planning policies which relate specifically to noise, were updated in July 2021, and are presented in paragraphs 174, 185 and 187 which are reproduced below:
- “174. Planning policies and decisions should contribute to and enhance the natural and local environment by:*
- (e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.*
- 185. Planning policies and decisions should also 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;*
 - (b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*
- 187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”*
- 3.3 Further to the above, the Governments Planning Practice Guidance (PPG) published on 6 March 2014 and updated on 22 July 2019 states:
- ‘Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.’*

- 3.4 In addition, the guidance indicates that, whilst noise can override other planning concerns, it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surroundings, as these can have an important effect as to whether or not noise is likely to pose a concern.

Determining and Assessment of External Noise Levels

- 3.5 BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings' (BS8233) describes how noise levels can be determined and assessed from different sources in chapters 6.2 to 6.7.
- 3.6 In relation to road traffic noise, BS8233 states that the noise from road traffic can be determined using the Department of Transport, Welsh Office, document 'Calculation of Road Traffic Noise' (CRTN) issued in 1988. CRTN presents the shortened measurement procedure which can be used to convert the arithmetic mean of the measured $L_{A10,T}$ levels (measured over 3 consecutive hours during the period 1000h to 1700h) into an 18-hour L_{A10} level by subtracting 1dB.
- 3.7 BS8233 suggests that the conversion of the $L_{A10,18h}$ to $L_{Aeq,16h}$ can be achieved by the (approximate) relationship of $L_{Aeq,16h} = L_{A10,18h} - 2dB$. Therefore, the daytime ambient noise level can be determined by subtracting 3dB from the arithmetic mean of the $L_{A10,T}$ levels measured on-site over 3 consecutive hours (between 1000 and 1700h).

Planning Condition 4

- 3.8 Planning Permission was granted MCC for the proposed development, Application Number 128895/FO/2020, on 15 December 2020.
- 3.9 The only condition relating to noise is Planning Condition 4 which states:

Above-ground construction works shall not commence until a scheme for acoustically insulating the proposed residential accommodation against noise from Palatine Road and Barlow Moor Road shall be submitted to and approved in writing by the City Council as local planning authority. There may be other actual or potential sources of noise which require consideration on or near the site, including any local commercial/industrial premises. The approved noise insulation scheme shall be completed before any of the dwelling units are occupied.

Upon completion of the development and before first occupation of the residential units, a verification report will be required to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that the internal noise criteria has been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the internal noise criteria."

- 3.10 Further information is provided for Condition 4 and this is reproduced below:

"Noise survey data must include measurements taken during a rush-hour period and night time to determine the appropriate sound insulation measures necessary. The following noise criteria will be required to be achieved:

*Bedrooms (night time - 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events shall not exceed 45 dB $L_{Amax,F}$ by more than 15 times)
Living Rooms (daytime - 07.00 - 23.00) 35 dB L_{Aeq}
Gardens and terraces (daytime) 55 dB L_{Aeq} "*

- 3.11 The noise levels presented above are in accordance with guidance presented in BS8233 and the Association of Noise Consultants (ANC) document '*ProPG: Planning and Noise - New Residential Development*', 2017 (ProPG) for transportation noise sources.
- 3.12 Where noise sources have specific character, such as being intermittent in nature, containing a distinguishable, discrete, and continuous tone, is irregular enough to attract attention, or has a strong low-frequency content, BS8233 suggests that lower internal noise level limits may be appropriate.
- 3.13 Therefore, as the scheme includes a residential apartment block with no suitable mitigation measure options available (such as acoustic barriers) to control external noise levels from the plant associated with Belong Morris Feinmann, a-5dB correction has been applied to the internal noise levels presented in Planning Condition 4.

Ventilation and Control of Overheating

- 3.14 The ventilation specifications presented in BS8233 and ProPG are based on achieving the requirements of Approved Document F (ADF) '*Ventilation*' (2010) of the Building Regulations only.
- 3.15 ADF requires that continuous whole dwelling (background) ventilation be provided to limit the accumulation of moisture and other pollutants originating within a building. This is typically achieved either via a partially opened window, or by a whole building ventilation system through the provision of trickle ventilators or mechanical ventilators. ADF states that '*The ventilation provisions will not necessarily meet cooling needs*'.
- 3.16 ProPG notes that the attenuation of external to internal noise levels provided by a window partially open for whole dwelling ventilation is no more than 15dB.
- 3.17 Therefore, for rooms to have whole dwelling ventilation via a partially open window, external noise levels outside habitable rooms should not exceed 50dBL_{Aeq,16h} during the daytime, and 45dBL_{Aeq,8h} and 60dBL_{Amax,F} at night.
- 3.18 In relation to purge ventilation, ProPG suggests that as this should only occur occasionally (e.g., to remove odour from painting and decorating or from burnt food), the internal desired noise levels are not generally applicable. Therefore, internal noise levels due to windows being opened for purge ventilation has not been discussed further.
- 3.19 In order to provide guidance on the relationship between internal noise levels and the control of overheating in residential properties, the ANC issued '*Acoustic ventilation and Overheating – Residential Design Guide*' (AVO) in January 2020. It is important to note that this is a design guide only and not a statutory document and the Local Authority may have their own requirements.
- 3.20 At this stage AEC are unaware of any specific Local Authority requirements in relation to acceptable internal noise level limits in habitable rooms with windows open to aid with the control of overheating. Therefore, this indicative assessment is based on the guidance presented in AVO.
- 3.21 Table 3.3 of AVO presents guidance for allowable noise from transportation sources whilst windows are open for the control of overheating. With reference to this document AEC would propose that windows can be utilised in the control of overheating provided that the resultant internal ambient noise levels are below approximately 50dBL_{Aeq, 16h} during the daytime, and 42dBL_{Aeq,8h} and 65dBL_{Amax,F} during the night-time.

- 3.22 These internal noise levels are the upper end of the medium risk category for adverse effects. Where these internal noise levels would be exceeded, AVO states that “noise causes a material change in behaviour (e.g., having to keep windows closed most of the time)”. In this situation, AEC would suggest alternative means for the control of overheating are considered, which do not rely on open windows.
- 3.23 AVO states that where transportation is the main source of noise, “it is assumed that a partially open window will provide an outside-to-inside level difference of 13dB and is considered representative of typical domestic rooms with simple façade openings of around 2% of the floor area”.
- 3.24 Considering the above, it is considered acceptable to control summertime heating via opening windows where external free-field noise levels are no greater than those presented in the following Table 3.1. This is based on simple façade openings to around 2% of the floor area.

Table 3.1 – External Free-Field Noise Level Limits for the Control of Overheating via Openable Windows

Activity	Location	Noise Level Limit, dB		
		Daytime 0700 – 2300h	Night-Time 2300 – 0700h	
		L _{Aeq,16h}	L _{Aeq,8h}	L _{Amax,F}
Resting	Living Room	63	-	-
Dining	Dining Room/Area	63	-	-
Sleeping (daytime resting)	Bedroom	63	55	78

- 3.25 The limits presented in Table 3.1 are subject to agreement with the Local Authority and may be subject to change.

4.0 NOISE MEASUREMENTS

- 4.1 AEC undertook attended daytime noise level measurements on Wednesday 20 April 2022 between approximately 1430 and 1740h and night-time measurements between 2300 and 0000h on Thursday 07 April 2022. These attended measurements were undertaken at three locations around the development site, identified as A to C on the attached Figure B.1.
- 4.2 All measurements were undertaken under free-field conditions and in general accordance with British Standard (BS) 7445-1: 2003 ‘Description and measurement of environmental noise. Guide to quantities and procedures’.
- 4.3 A full measurement procedure is presented in Appendix B, Table B.1, and the measured data is presented in Tables B.2 and B.3.
- 4.4 A comment on the attended measurement locations and the main source of noise is presented below and a summary of the measured daytime and night-time noise levels are presented in Table 4.1.

- 4.5 Due to the location and the height of the hoarding around the site it was not possible to undertake representative noise level measurements of road traffic on Palatine Road on the development site. Therefore, noise levels were measured on Spath Road (Locations A and B) at a representative distance from Palatine Road. Noise due to car movements on Spath Road were paused out of the measurements.
- 4.6 Noise levels were measured at Location C during the daytime to measure noise from the plant associated with Belong Morris Feinmann and activities associated with Moor Allerton Preparatory School.
- 4.7 A summary of the daytime and night-time measured noise levels at each location is presented in Table 4.1.

Table 4.1 – A Summary of the Measured Free-Field External Noise Levels

Measurement Location	Noise Level, dB			
	Daytime		Night-time	
	$L_{Aeq,T}$	$L_{A10,F}$	$L_{Aeq,T}$	$L_{Amax,F}$
A	63	66	60	77
B	53	56	50	57
C	52	52	-	-

- 4.8 In addition to the above, spot check measurements were undertaken with line of sight of Barlow Moor Road. Daytime ambient noise levels at this location were around 55dB $L_{Aeq,T}$ with maximum noise levels no greater than 65dB $L_{Amax,F}$.

5.0 ASSESSMENT OF PROPOSED DEVELOPMENT

- 5.1 There are three noise sources affecting the development site, road traffic on the surrounding roads, building services plant associated with Belong Morris Feinmann and activities on the Moor Allerton Preparatory School site, and the daytime and night-time noise levels external to the different elevations are determined below.
- 5.2 Please note that in relation to night-time noise levels, it is generally agreed that the most critical periods for sleep disturbance are during the periods between 2300 and 0100h and 0500 and 0700h. In addition, based on AEC's experience, the ambient noise level generally reduces between 0100 to 0500h when there is less road traffic. The highest maximum noise level measured at each location during the night-time period has been used in the assessment.
- 5.3 The daytime and night-time noise levels affecting the eastern elevation of the development is dominated by road traffic on Palatine Road.
- 5.4 The daytime ambient noise level affecting the eastern elevation has been determined using the CRTN calculation method presented in Section 3 to convert the arithmetic average of the three L_{A10} noise levels measured at Location A into a 16-hour L_{Aeq} level.
- 5.5 The night-time ambient and maximum noise levels external to the elevation facing Palatine Road have been based on the highest noise level measured during the period 2300 to 0000h.

- 5.6 On the rear elevation, during both the daytime and night-time, the noise climate was a combination of road traffic on Palatine Road and noise from building services plant associated with Belong Morris Feinmann. Noise from activities on the Moor Allerton Preparatory School site were audible during the daytime but did not affect the ambient noise levels.

Determined External Noise Levels

- 5.7 Based on the noise levels measured on-site, distance attenuation and screening where applicable the determined noise levels external to the different facades of the development are presented on Figure 5.1 and in Table 5.1, below.

Figure 5.1 – Determined Free-Field External Noise Levels

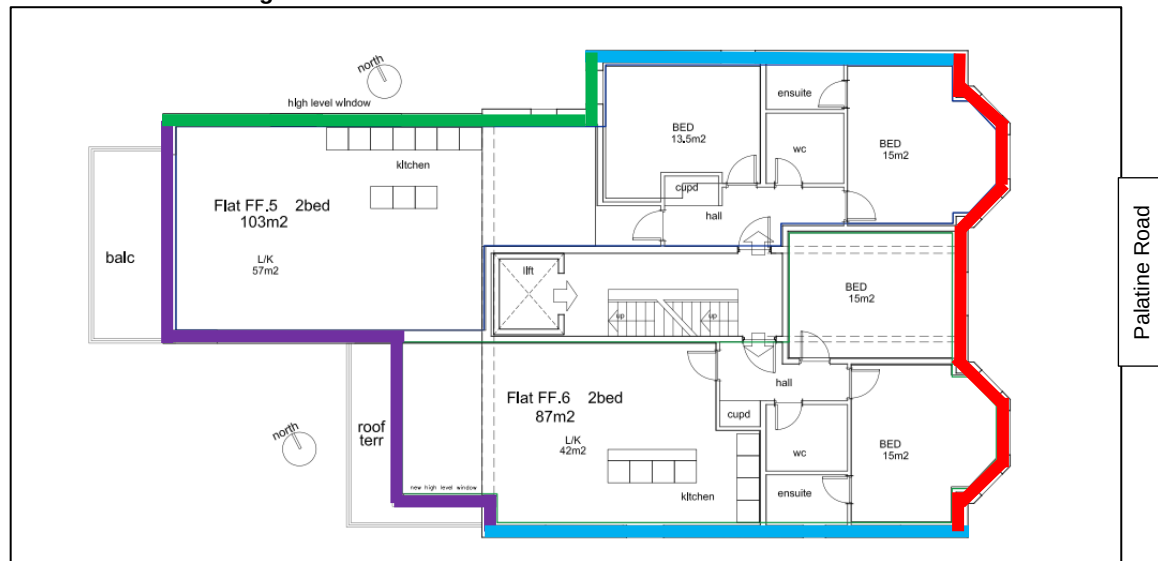


Table 5.1 – Determined Free-Field External Noise Levels

Elevation	Daytime Ambient Noise Level, dBL _{Aeq,16h}	Night-time Noise Level	
		dBL _{Aeq,8h}	dBL _{Amax,F}
Red	≤63	≤60	≤77
Blue	≤57	≤54	≤71
Purple*	≤55	-	-
Green*	≤55	≤53	≤65

*see Paragraph 5.8 below

- 5.8 There are no bedrooms on the elevation denoted as Purple and no living room on the elevation denoted as Green.

Glazing and Ventilation Requirements

- 5.9 As stated in Section 3.0, for habitable rooms to have whole dwelling ventilation provided via a window partially open, external noise levels should not exceed $50\text{dBL}_{\text{Aeq,T}}$ during the daytime and $45\text{dBL}_{\text{Aeq,T}}$ and $60\text{dBL}_{\text{Amax,F}}$ at night. A comparison between these levels and the determined noise levels presented in Table 5.1, indicates that windows would need to be closed to all habitable rooms and whole dwelling ventilation provided by an alternative means such as acoustic trickle ventilators.
- 5.10 The minimum sound insulation performances of the glazing and ventilators to meet the required internal noise level limits for each noise source have been calculated based on the measured noise spectra and the provided drawings. The minimum sound insulation performances are presented in Table 5.2, below.

Table 5.2 – Outline Requirements of Glazing and Ventilation to Achieve Internal Noise Levels in Habitable Rooms

Colour on Figure 5.1	Period	Sound Insulation Performance	
		Glazing	Ventilator
Red	Both	$35\text{dBR}_w / 29\text{dBR}_w + C_{tr}$	$38\text{dBD}_{n,e,w}$
Blue	Both	$32\text{dBR}_w / 28\text{dBR}_w + C_{tr}$	$33\text{dBD}_{n,e,w}$
Purple	Both	$32\text{dBR}_w / 28\text{dBR}_w + C_{tr}$	$33\text{dBD}_{n,e,w}$
Green	Both	$32\text{dBR}_w / 28\text{dBR}_w + C_{tr}$	$33\text{dBD}_{n,e,w}$

- 5.11 Example glazing build-ups, to achieve the required sound insulation performances presented in Table 5.2, are provided in Table 5.3 below. Please note that alternative systems can be installed, including secondary glazing. This will need to be developed prior to the system being specified.

Table 5.3 – Example Glazing Constructions

Sound Insulation Performance	Example Construction
$35\text{dBR}_w / 29\text{dBR}_w + C_{tr}$	8mm Glass / 6-16mm Thermal Cavity / 6mm Glass
$32\text{dBR}_w / 28\text{dBR}_w + C_{tr}$	6mm Glass / 6-16mm Thermal Cavity / 4mm Glass

- 5.12 Prior to any glazing being installed, octave band sound insulation performance data of the glazing build-ups and ventilators selected must be verified by AEC or others.
- 5.13 All background ventilation sound insulation requirements have been based on the use of a single ventilator per room. If more than one unit is required, such as may be required to satisfy Building Control requirements, the performance of each unit might need to be increased.
- 5.14 The above glazing specification would achieve the suggested criteria to control noise from plant noise from Belong Morris Feinmann to below $30\text{dBL}_{\text{Aeq,16h}}$ in living rooms, during the daytime.

Control of Overheating

- 5.15 If it is determined by others that there is a need to control overheating within the development, a comparison between the noise levels presented in Table 5.1 and those presented in Table 3.2, indicates that the control of overheating can be achieved in all habitable rooms via a partially opened window with the exception of the bedrooms denoted as Red.
- 5.16 In relation to the bedrooms on the elevation denoted as Red, if it is determined that there is the potential for overheating in these rooms, further discussions will be required with MCC.

External Envelope

- 5.17 To maintain the sound insulation performance of the external envelope the remainder of the façade construction should have a sound insulation performance of at least 10dB higher than the glazing. Therefore, the external walls and roof on the noisiest elevations would need achieve a sound insulation performance of at least around 45dB R'_{w} . This can be achieved with a traditional cavity masonry construction.

External Noise Levels

- 5.18 Noise levels on the balconies would be below 55dB $L_{Aeq,T}$ which complies with the noise level limit presented in the planning condition.

6.0 SUMMARY AND CONCLUSIONS

- 6.1 Acoustic & Engineering Consultants Limited (AEC) has been appointed by Stuart Wall, to undertake a noise assessment for the proposed two apartment blocks on 174 Palatine Road, Manchester.
- 6.2 The proposed development will include the refurbishment and extension of 4 existing flats together with the addition of 5 new flats within an existing and extended converted block. Balconies will be provided to the apartments in the new extension and there will be a roof top garden located on top of the underground car park.
- 6.3 The proposed development site currently consists of a 3-storey building and garden. The site is bound to the east by Palatine Road, to the north by a small residential estate, to the west by Moor Allerton Preparatory School and to the south by Belong Morris Feinmann residential care home.
- 6.4 Planning Permission was granted by Manchester City Council (MCC) for the proposed development, Application Number 128895/FO/2020, on 15 December 2020. The only condition relating to noise is Planning Condition 4 which states that internal noise levels in habitable rooms and external noise levels in gardens should achieve the following:

*“Bedrooms (night time - 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events shall not exceed 45 dB $LA_{max,F}$ by more than 15 times)
Living Rooms (daytime - 07.00 - 23.00) 35 dB L_{Aeq}
Gardens and terraces (daytime) 55 dB L_{Aeq} ”*

- 6.5 These levels are in accordance with guidance presented in BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings*' (BS8233) and the Association of Noise Consultants (ANC) document '*ProPG: Planning and Noise - New Residential Development*', 2017 (ProPG).
- 6.6 A daytime and night-time noise survey was undertaken by AEC in April 2022 and the noise climate was due to activities on local traffic on Palatine Road and plant associated with Belong Morris Feinmann.
- 6.7 The measured noise levels are presented in Section 4 and assessed in Section 5. In summary, the determined free-field ambient noise levels external to the different facades of the development due to all the different noise sources would be no greater than 63dBL_{Aeq,16h} and 60dBL_{Aeq,8h}, during the daytime and night-time respectively. Maximum noise levels were up to 77dBL_{Amax,F} due to vehicle movements on Palatine Road.
- 6.8 Based on the measured noise levels affecting the proposed development site, the sound insulation requirements of the building envelope and ventilation have been determined and are presented in Section 5. In brief, acoustically enhanced glazing is required to all habitable rooms, and ventilation can be provided by through the frame acoustic trickle vents.
- 6.9 Based on this assessment, the noise level limits presented in Planning Condition 4 should be achieved.

APPENDIX A – Acoustic Terminology in Brief

Sound Description

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 sound is made up of many different frequencies.

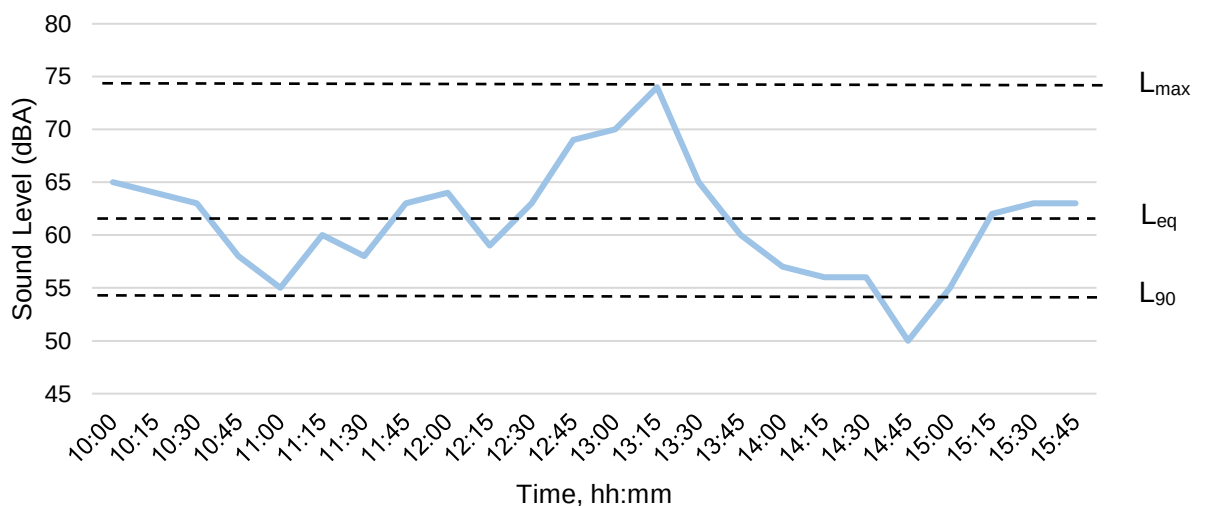
The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA*, normally used to assess the effect of noise on people. The *dBA* weighting emphasises or reduces the importance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

Sound Units

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 sound.

The figure below shows an example of sound level varying with time. Because of this time variation, the same period of sound can be described by several different levels. The most common of these are described below. It should be noted that in many instances in the main body of text, the unit will be preceded by a *dB* descriptor in the report e.g., $L_{Aeq,T}$ could be written $dBL_{Aeq,T}$.

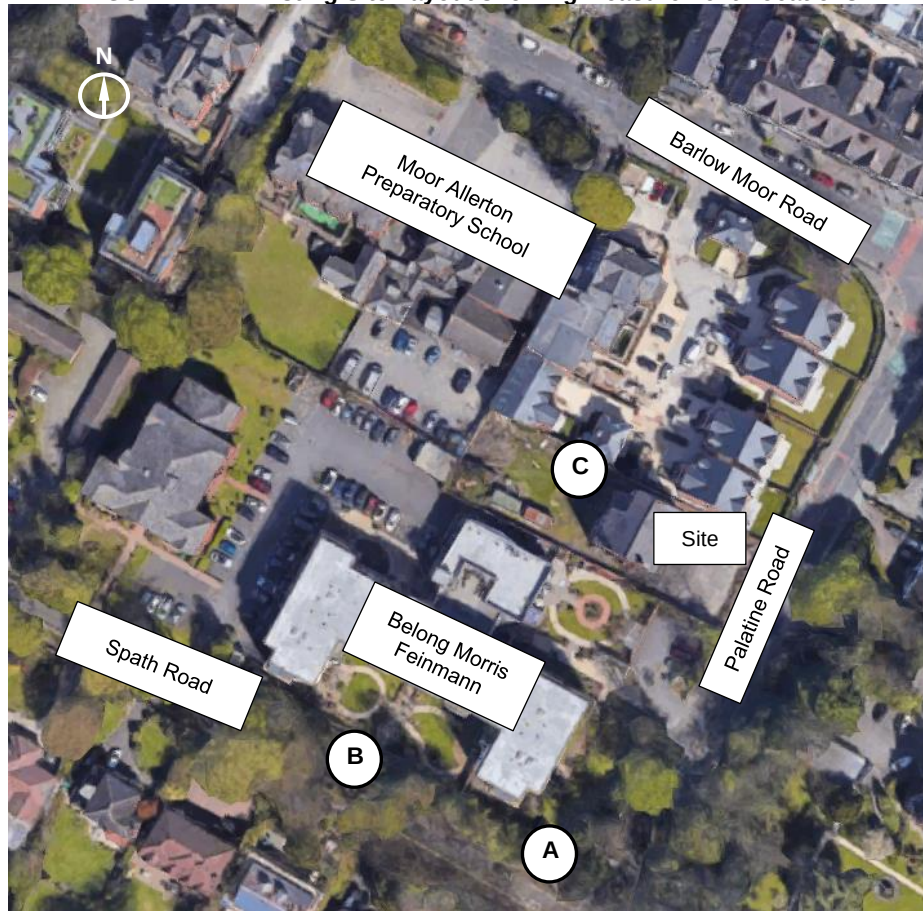
Example of Sound Varying with Time



Unit Type	Acoustic Unit	Description
Ambient Sound Level	$L_{Aeq, T}$	The equivalent continuous (A-weighted) sound level. It may be thought of as the “average” sound level over a given time, T. It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises and can be considered as the “ambient” noise level.
Percentile Level	L_{A10}	The (A-weighted) sound level exceeded for 10% of a measurement period. It is the value often used to describe traffic noise.
	L_{A90}	The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value often used to describe background noise.
Maximum Sound level	L_{Amax}	The maximum (A-weighted) sound level measured during a given time. ‘Fast’ or ‘Slow’ meter response should be cited.
Free-field Level	-	This refers to the sound level measured outside, away from reflecting surfaces.
Sound reduction index	R_w	Single number rating used to describe the <u>laboratory</u> airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
A road traffic spectrum adaptation term	C_{tr}	Referenced to demonstrate the to the low frequency sound insulation performance of building elements. Makes reference to the A-weighted urban traffic noise spectrum.
Element normalized level difference	$D_{n,e,w}$	Single number rating used to describe the sound insulation performance of small elements.

APPENDIX B – Noise Survey Details

FIGURE B.1 – Existing Site Layout showing Measurement Locations



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Table B.1 – Measurement Procedure

Date & Time of Survey:	Daytime: 1430 to 1740h on Wednesday 20 April 2022. Night-time: 2300 to 0000h on Thursday 07 April 2022.					
Personnel:	Paul Knowles (AEC).					
Equipment Used:	Cirrus CR:171B Real Time Analyser (AEC Kit 3).					
Calibration:	The sound level analysers, which conform to BS EN 61672-1: 2013 ' <i>Electroacoustics – Sound level meters - Part 1 Specifications</i> ' 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.					
Weather Conditions:	Date	Period	Wet/Dry	Temp°C	Wind Speed & Direction	Cloud Cover
	20.04.22	Day	Dry	12°C	Calm	25%
	07.04.22	Night	Dry	06°C	Calm	50%
Measurement Locations:	Measurements were undertaken at 3 locations around the development site. Identified as A, B and C on Figure B.1 and described below. A – 20m from nearest carriageway of Palatine Road on Spath Road. B – 50m from nearest carriageway of Palatine Road on Spath Road. C – 5m to the rear of 174 Palatine Road.					
Measurement Details:	Measurements were undertaken over various periods in terms of L_{eq} , L_{10} , L_{90} , and L_{max} .					
Façade / Free-Field:	A and B – free-field.					
	Full results for the attended measurements are given in Tables B2 and B3.					
Measured Data:	Full octave band center frequency data was obtained for all measurements.					

Table B.2 – Measured Daytime Noise Levels

Location	Period, h	Noise Level, dB				Comments
		L_{Aeq}	L_{A10}	L_{A90}	$L_{Amax, F}$	
A	1432-1447	62.8	66	50.4	81.9	Noise climate dominated by traffic on Palatine Road.
	1533-1548	62.1	65.1	51.1	83.6	
	1629-1644	60.4	63.6	52.8	76.8	
	1719-1734	63.4	66.3	51.8	82.2	
B	1449-1504	53.4	56.0	43.8	71.2	Noise climate dominated by traffic on Palatine Road.
C	1512-1527	49.8	51.2	47.7	61.2	Noise climate due to a combination of road traffic on Palatine Road and, plant from Belong Morris Feinmann. Noise from children playing was audible but did not affect the ambient noise level. Highest maximum noise levels due to construction activities to the west.
	1646-1701	50.3	52.0	47.2	72.4	
	1702-1717	51.8	51.9	47.5	70.5	

Table B.3 – Measured Night-Time Noise Levels

Location	Period, h	Noise Level, dB			Comments
		L _{Aeq}	L _{A90}	L _{Amax, F}	
A	2302-2312	60.1	45.4	81.6	Noise climate dominated by traffic on Palatine Road.
	2324-2334	59.7	45.9	77.1	
	2337-2347	58.0	43.5	75.4	
B	2313-2323	49.6	46.3	62.7	Noise climate dominated by traffic on Palatine Road.
	2335-2345	48.1	44.6	61.6	