



PINNACLE ESTATES

2 SWALLOW STREET, MANCHESTER

NOISE ASSESSMENT FOR PLANNING PURPOSES

07 June 2022

AEC REPORT: P4589/R01a/RDC

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CONTENTS

	Page
1.0 INTRODUCTION	3
2.0 BACKGROUND AND SITE DESCRIPTION	3
3.0 NOISE MEASUREMENTS	4
4.0 BASIS OF ASSESSMENT	6
5.0 ASSESSMENT OF PROPOSED DEVELOPMENT	11
6.0 SUMMARY AND CONCLUSIONS	17
APPENDIX A – Acoustic Terminology in Brief	19
APPENDIX B – Noise Survey Details	21
FIGURE B.1 – Site Location Plan Identifying Monitoring Locations	21

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1.0 INTRODUCTION

- 1.1 Acoustic & Engineering Consultants Limited (AEC) has been instructed by Pinnacle Estates to prepare a noise assessment in relation to the proposed residential development located at 2 Swallow Street, Manchester.
- 1.2 This report details the baseline noise levels used for the assessment of the proposed site, and presents the assessment criteria and discusses the implications on the building design, to achieve acceptable internal noise levels as required by the Local Authority.
- 1.3 Acoustic terminology is discussed in brief in Appendix A.

2.0 BACKGROUND AND SITE DESCRIPTION

- 2.1 The proposed development includes the conversion of the existing building at 2 Swallow Street, Manchester into apartments with ground floor offices, meeting areas, a bin store and plant room. A site location plan is presented on Figure 2.1, below.

Figure 2.1 – Proposed Site Location



- 2.2 Access to the apartments will be gained from a gated entrance that is located off Swallow Street which forms the southern boundary of the site. Swallow Street provides access to Stockport Road (A6) further to the east which is the main road in the area.
- 2.3 At the junction where Swallow Street meets the A6 (approx. 50m away) is The Waterworx Car Wash and the Tyreworx Tyre store. It is understood that the car wash operates 0700 – 1900h, Monday to Sunday and the tyre store operates 0900 – 1900h, Monday to Sunday.

- 2.4 The northern and eastern elevations of the site are bound by existing properties in the area that back onto the site. The western elevation is bound by Siddall Street.
- 2.5 Further to the west of the site (approx. 90m) is the Manchester Piccadilly – Levenshulme railway line. Following a review of the timetable for the lines, during a typical 24-hour period around 132 trains pass by the site (as identified on www.realtimetrains.co.uk). These included intercity trains, local trains, and freight trains. Typically, around 25 – 30 trains pass by the development per hour. Between 2300 – 0600h, typically no more than 10 trains pass the development per hour.
- 2.6 The building is currently spread over three floors; however, it is understood that lower and upper levels will be incorporated into the ground floor and the current second floor will be split into a second and third floor. Across these top four floors (excluding the lower ground), the building will be formed into 14 apartments. A proposed site layout is presented on Figure B1, at the back of this report.
- 2.7 It is understood that there will be no external amenity areas for any of the apartments.
- 2.8 In relation to the offices and meeting room, as there is no formal kitchen associated with the scheme, noise breaking out of the external envelope serving these areas has not been assessed further. Any plant serving the development will be located in a ground floor plant room.

3.0 NOISE CLIMATE

- 3.1 In order to determine the noise levels affecting the site across the different floors of the building, unattended and attended noise level surveys were undertaken at second and ground floor levels, respectively. Details of each survey are discussed below.
- 3.2 All measurements, both unattended and attended, were undertaken in general accordance with BS7445-1: 2003 '*Description and measurement of environmental noise. Guide to quantities and procedures*'. Noise levels were measured both under façade and free-field conditions and these are identified below. Please note that where measurements have been undertaken under façade conditions, these have been corrected by -2.5dB to convert to a free-field level.

Unattended Noise Level Survey

- 3.3 An unattended noise level survey was undertaken at two locations; at 1m from the eastern and western facades at 2nd floor level. These are identified as L₁ and L₂, respectively, on Figure B.1. Measurements were carried out from 1530h on Tuesday 19 April 2022 to 1030h on Wednesday 20 April 2022.
- 3.4 Full logged data over 15-minute periods is held on file by AEC and is available on request. Full noise level data measured during the survey are presented in Graphs B1 and B2 for position L₁ and L₂, respectively, in Appendix B.
- 3.5 A summary of the measure free-field ambient and maximum noise levels during the daytime and night-time periods is presented in Table 3.1, below. In relation to night-time

maximum noise levels at Location L₁, the tenth highest maximum noise level is presented in brackets in order to remove any erroneous noise events. It should be noted that measurements at Location L₂ were only measured up until approximately 0000h on Wednesday 20 April 2022.

Table 3.1 – Summary of Measured Free-field Noise Levels

Period	Time, h	Noise Levels, dB			
		Location L ₁ (Eastern Facade)		Location L ₂ (Western Facade)	
		Ambient, L _{Aeq}	Maximum, L _{Amax,F}	Ambient, L _{Aeq}	Maximum, L _{Amax,F}
19.04.22	1530 – 2300	60	-	55	-
19.04.22 – 20.04.22	2300 – 0700	56	77 (70)	50 ¹	74 ¹
20.04.22	0700 - 1030	60	-	-	-

¹Not full night-time period. Only 1-hour measurement.

- 3.6 At Location L₁, ambient noise levels during the daytime periods were dominated by road traffic on the A6. While noise from the car wash was audible at times, it did not affect the climate and therefore, has not been discussed further. At night, ambient and maximum noise levels were solely due to road traffic on the A6.
- 3.7 At Location L₂ during both the daytime and night-time, ambient noise levels were due to railway activities, intermittent car pass bys on Siddall Street and Swallow Street and distant road traffic on the A6. Daytime maximum noise levels were no higher than 76dB L_{Amax,F} (after exclusion of top 10 erroneous noise events). Therefore, as the night-time maximum noise level in Table 3.1 (74dB L_{Amax,F}) is only 2dB less than this figure, it would suggest that a large enough sample of night-time maximum noise events have occurred within the one hour period to provide a suitable noise level for use within the assessment.
- 3.8 Background noise levels at both locations were caused by distant road traffic.

Attended Noise Level Survey

- 3.9 Supplementary attended noise measurements were also carried out by AEC on Wednesday 20 April 2022, between approximately 0940 and 1030h. These measurements were carried out at two locations, identified as A and B on the attached Figure B.1, and were done so in order to measure the noise levels affecting the ground floor rooms within the proposed development.
- 3.10 Free-field ambient noise levels at Location A were approximately 59dB L_{Aeq,T} and were dominated by road traffic on the A6 and intermittent car pass bys on Swallow Street.
- 3.11 At Location B, the free-field ambient noise levels were approximately 50dB L_{Aeq,T} and were due to road traffic on the A6. intermittent car pass bys on Swallow Street and train pass.
- 3.12 Background noise levels at both locations were caused by distant road traffic.

4.0 BASIS OF ASSESSMENT

National Planning Policy Framework

- 4.1 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.
- 4.2 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.”

- 4.3 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.'

- 4.4 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.

Local Authority Requirements

- 4.5 Manchester City Council (MCC) has outlined their requirements for noise assessments to accompany planning applications in '*Planning & Noise – Technical Guidance*' (2015) (PNTG).
- 4.6 Section 3.6.1.1 of this document states "*Manchester City Council has adopted the following internal limits for residential properties:*
- *Bedroom (night-time – 23.00 – 07.00) 30dB_{LAeq} (individual noise events should not normally exceed 45dB_{LAmax,F} by more than 15 times);*
 - *Living Rooms (daytime – 07.00 – 23.00) 35dB_{LAeq}."*
- 4.7 In addition to the PNTG, these noise level limits are also based on 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).
- 4.8 It should be noted that Paragraph A.11 of ProPG does state that "*It is generally accepted, however, that the smaller the number of the noise events, the higher the maximum levels that can be withstood without adverse effects on sleep (up to an upper limit, and providing the overarching noise level during the overall sleep period e.g. L_{Aeq,T} does not exceed a suitable threshold)*".
- 4.9 In addition to the above, ProPG assumes that the attenuation of free-field external noise levels to internal noise levels provided by a window partially open for ventilation is up to 15dB. Therefore, to ensure that whole dwelling (background) ventilation can be provided via a partially open window at the nearby properties, AEC would propose that the external noise levels outside habitable rooms should not exceed 50dB_{LAeq,T} during the daytime, and 45dB_{LAeq,T} and 60dB_{LAmax,F} at night.

Office & Meeting Room

- 4.10 The required internal noise level limits for spaces within these rooms are based on Section 7 of BS8233 and guidance presented in the British Council for Offices (BCO) document '*Acoustics*' issued in 2019. Based on these documents the noise level limits for noise breaking in from external sources (dB_{LAeq,T}) and noise from mechanical services plant (NR) should ideally not exceed those presented in Table 4.1, below.

Table 4.1 – Maximum Allowable Internal Noise Levels

Room Type	External Sources, (dBL _{Aeq,1h})	Mechanical Services Noise (NR)
Open Plan Office/Co-Working	45-50	40
Meeting Room	35-40	35

Ventilation and Control of Overheating

- 4.11 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.
- 4.12 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*’.
- 4.13 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.
- 4.14 Therefore, for habitable 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.
- 4.15 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.
- 4.16 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.
- 4.17 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.
- 4.18 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.

- 4.19 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.
- 4.20 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”. Based on AEC’s experience, this is also applicable to sources such as aircraft movements.
- 4.21 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 4.2. This is based on simple façade openings to around 2% of the floor area.

Table 4.2 – 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

- 4.22 The limits presented in Table 4.2 are subject to agreement with the Local Authority and may be subject to change.

Offices & Meeting Room

- 4.23 As stated above, 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. Therefore, provided that external noise levels are no greater than 65dBL_{Aeq,T} to Open Plan Offices and 55dBL_{Aeq,T} to the Meeting Room, the recommended internal noise levels shown in Table 4.1 should not be exceeded.

Noise Associated with Ground Floor Uses

- 4.24 Based on the provided drawings, the offices, meeting room, plantroom and bin store are spaces that could potentially have an adverse noise impact on apartments above (and vice versa). How each of these areas will be assessed is presented separately, below.

Offices & Meeting Room

- 4.25 In order to comply with the 2010 Building Regulations, the separating walls and floors between these spaces and the adjacent apartments should comply with the minimum sound insulation performance requirements of Approved Document E (ADE). However, based on AEC's experience, it is recommended that noise from these spaces is controlled so as to not exceed an 'average' dBL_{eq} noise of no greater than NR25_{Leq} during the daytime in the adjacent apartments.

Plantrooms

- 4.26 In terms of the plant rooms, it is suggested that 'average' dBL_{eq} noise from these areas should be controlled to no greater than NR20 in the rooms above for continuous plant noise. A relaxation would be appropriate for emergency plant.

Refuse Store

- 4.27 Controlling noise from the refuse store to a limit of $40\text{dBL}_{\text{Amax}}$ in lounges and $35\text{dBL}_{\text{Amax}}$ in bedrooms is considered appropriate.

Atmospheric Plant Noise Limits

- 4.28 MCC's document PNTG, states the following in relation to setting noise level limits for industrial sources, such as external services plant, at noise sensitive premises:

"Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LA_{eq}) below the typical background (LA_{90}) level at the nearest noise sensitive location."

- 4.29 The above is also based on the requirements of BS 4142:2014+A1:2019: *Methods for rating and assessing industrial and commercial sound* (BS4142).
- 4.30 Whilst it is understood that all mechanical services plant serving the development will be housed within the ground floor plant room, it is still proposed that this limit is met for any noise breaking out from this space.

5.0 ASSESSMENT OF PROPOSED DEVELOPMENT

- 5.1 As stated in AEC's noise level survey, the two dominating noise sources affecting the development are road traffic on the A6 and railway activities from the west.
- 5.2 The noise levels affecting the different façades (and floors) of the development, from these noise sources, is discussed below. As previously stated, the façades that are most adversely affected by noise sources in the area are the eastern and western ones and these are discussed initially below, followed by discussion on the noise levels affecting the northern and southern façades.

Eastern Façade – Facing A6

- 5.3 As per the layout of the development, noise levels at Location L₁ were undertaken on the second floor (top floor) of the development. Measurements were also undertaken at Location A to determine if noise levels varied up the building. A summary of this comparison is presented in Table 5.1, below.

Table 5.1 – Comparison of Measurement Locations

Measurement Period	Measurement Location	Noise Levels, dB	
		Ambient, L _{Aeq}	Maximum, L _{AFmax}
0940 – 0950	Second Floor (L ₁)	59	71
	Ground Floor (A)	60	74
1000 – 1015	Second Floor (L ₁)	58	74
	Ground Floor (A)	60	78

- 5.4 As per Table 5.1, ambient noise levels at both locations are broadly similar. Maximum noise levels are slightly higher at ground floor, however, as this is due to closer proximity to individual car pass bys on Swallow Street. Based on this, it is proposed that noise levels are also similar on all floors of the development on the eastern façade of the development.
- 5.5 A summary of the ambient and maximum noise levels affecting this façade are presented on Figure 5.1 and in Table 5.2, below. These have been corrected for distance and screening attenuation where applicable.

Western Façade – Facing Railway Line

- 5.6 Noise levels affecting the Western Façade will be based on the measurements carried out at Location B and at Location L₂. These are also presented on Figure 5.1 and in Table 5.2, below.

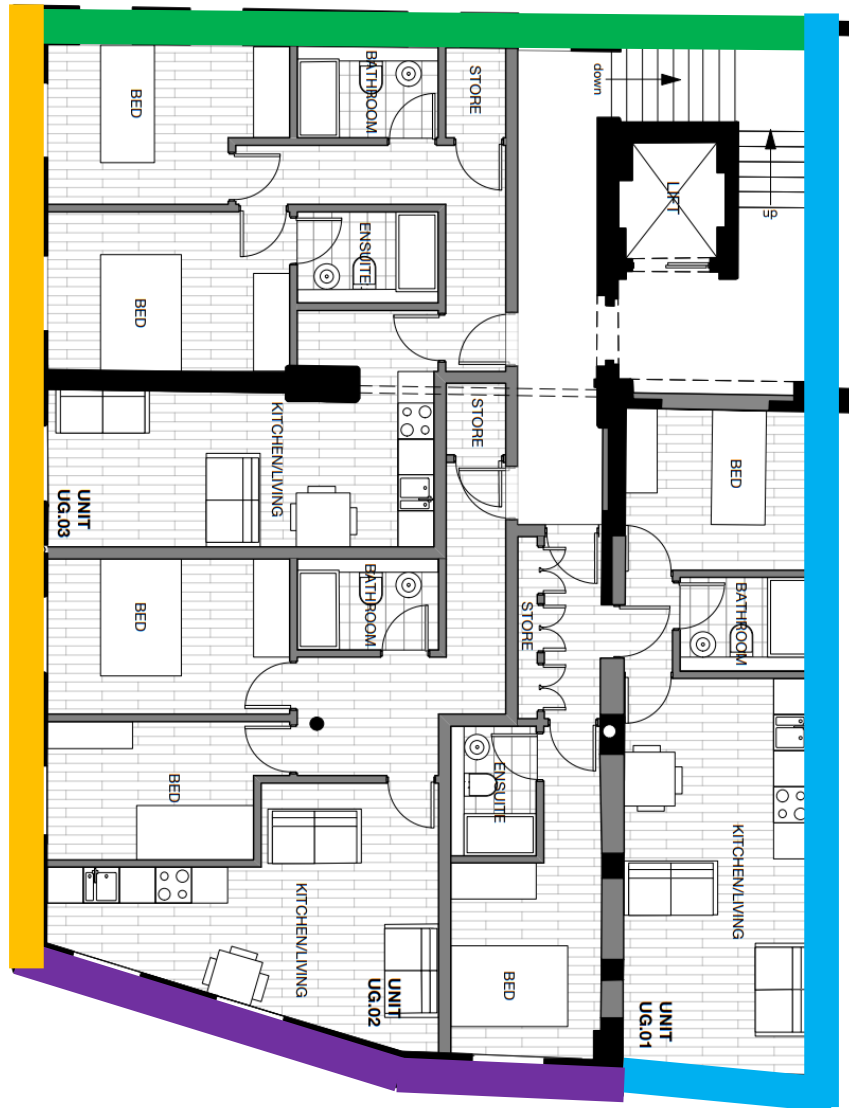
Northern & Southern Façades

- 5.7 The northern and southern façade will be based off the highest noise levels measured on either the eastern or western façade and corrections for distance and screening attenuation will be applied accordingly. This is also presented on Figure 5.1 and in Table 5.2, below.

Determined Free-Field External Noise Levels

- 5.8 Based on the noise levels determined above, as well as distance and screening attenuation where applicable, the 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



Note: Please note that while Figure 5.1 shows the proposed upper ground floor layout, the noise levels are representative of each floor of the development.

Table 5.1 – Determined Free-Field External Noise Levels

Colour on Figure 5.1	Floor	Noise Levels, dB		
		Daytime	Night-time	
		Ambient, $L_{Aeq,16h}$	Ambient, $L_{Aeq,8h}$	Maximum, $L_{Amax,F}$
Blue (Eastern)	All	≤ 60	≤ 55	≤ 70
Purple (Southern)	All			
Orange (Western)	Lower Ground / Upper Ground	≤ 55	≤ 50	≤ 70
	First			
	Second / Third			≤ 74
Green (Northern)	All	≤ 50	≤ 45	≤ 60

Glazing and Ventilation Requirements

- 5.13 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 $50dB_{LAeq,T}$ during the daytime and $45dB_{LAeq,T}$ and $60dB_{LAmax,F}$ at night.
- 5.14 A comparison between these levels and the determined noise levels presented in Table 5.1, indicates that alternate means of whole dwelling (background) ventilation would need to be provided to all habitable rooms in the development apart from on those on the green (northern) elevation.
- 5.15 The minimum sound insulation performances of the glazing and ventilators to meet the required internal noise levels limits for each noise source have been calculated based on the source noise levels and the glazing and room sizes stated on 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	Floor	Sound Insulation Performance			
		Daytime		Night-time	
		Glazing	Ventilator	Glazing	Ventilator
Blue / Purple	All	$29dB_{RW} / 25dB_{RW} + C_{tr}$	$38dB_{Dn,e,w}$	$37dB_{RW} / 32dB_{RW} + C_{tr}$	$41dB_{Dn,e,w}$
Orange	2 nd (top)			$41dB_{RW} / 35dB_{RW} + C_{tr}$	$41dB_{Dn,e,w}$
	Ground & First			$37dB_{RW} / 32dB_{RW} + C_{tr}$	$41dB_{Dn,e,w}$
Green	All			$29dB_{RW} / 25dB_{RW} + C_{tr}$	N.A.

- 5.14 Example glazing build-ups to achieve the required sound insulation performances are presented in Table 5.3, below.

Table 5.3 – Example Glazing Constructions

Sound Insulation Performance	Example Construction
41dBR _w / 35dBR _w + C _{tr}	6mm Glass / 16mm Argon / 8.8mm Optiphon Glass
37dBR _w / 32dBR _w + C _{tr}	6mm Glass / 6-16mm TC / 10mm Lam. Glass
29dBR _w / 25dBR _w + C _{tr}	4mm Glass / 6-16mm TC / 4mm Glass

- 5.15 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.
- 5.16 Windows can be openable for purge ventilation providing that they are effectively acoustically sealed when closed and it is important that any frames and seals do not downgrade the sound insulation performance of the glazing.
- 5.17 All ventilation requirements have been based on the use of a single vent 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 increase.

Control of Overheating

- 5.18 If it is determined by others that there is a need to control overheating within this development, based on the noise level limits presented in Table 4.2, and the determined external noise levels presented in Table 5.1, all rooms can have windows open to provide comfort cooling for the control of overheating.

External Envelope

- 5.19 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.
- 5.20 On-site observations indicated that the existing external wall was constructed from two leaves of brick, however, it is unknown whether they are separated by a cavity or not. Assuming they are, this would be sufficient and no additional works would be required.
- 5.21 If there was no cavity, an internal wall lining may need to be constructed and further details would be confirmed during the design stages of the site once the existing external wall build up has been confirmed.
- 5.22 In either case, it was noted that the building was in generally poor condition and any gaps within the external wall should be appropriately sealed to ensure that the performance of the external envelope is not downgraded. The appropriate mitigation measures for any gaps would be confirmed during the design stages.

- 5.23 In relation to the roof, the above glazing and ventilation requirements have been based on a roof with a minimum sound insulation performance of 46dBR_w. This is a standard construction comprised of a tiled roof with a void filled with mineral wool insulation and a plasterboard ceiling. Any changes to this specification should be confirmed with AEC prior to installation.

Noise Associated with Ground Floor Uses

Offices & Meeting Room

- 5.24 As previously stated, in order to comply with the 2010 Building Regulations, the separating walls and floors between these spaces and the adjacent apartments should comply with the minimum sound insulation performance requirements of Approved Document E (ADE). However, based on AEC's experience, it is recommended that noise from these spaces is controlled so as to not exceed an 'average' dBL_{eq} noise of no greater than NR25_{Leq} during the daytime in the adjacent apartments.
- 5.25 It is understood that the existing floor is comprised of existing timber floorboards located over timber joists. In order to ensure the above requirements are met, it is likely that a floating floor system would need to be installed as well as a sacrificial metal frame ceiling system installed underneath and finished with two layers of 12.5mm Gyproc SoundBloc. 100mm mineral wool would then need to be installed in the cavity.
- 5.26 Once confirmation of how the external walls will be lined, this may require further development and will be confirmed during the design stages of the development.
- 5.27 Exact confirmation of the above construction would be confirmed during the design stages.

Plantrooms & Refuse Store

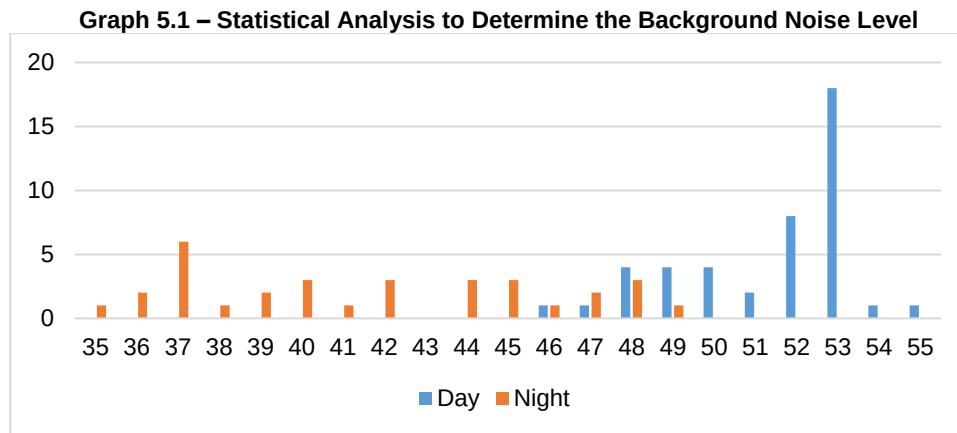
- 5.28 At this stage, the floor construction in these areas is unknown. In order to meet the requirements for controlling noise breakout from these spaces, as stated in Section 4.0, it is likely that mitigation measures will be required.
- 5.29 Exact confirmation of the required mitigation measures will be provided during the design stages of the development, once the existing construction is confirmed.

Offices & Meeting Room

- 5.30 As stated in Section 4, ventilation can be provided to the Offices and Meeting Room via partially open windows, provided external noise levels are no greater than 65dBL_{Aeq,T} and 55dBL_{Aeq,T}, respectively.
- 5.31 A comparison between the noise levels presented in Table 5.1 and the allowable external noise level limits presented above, indicate that that the Office can be naturally ventilated. In relation to the meeting room, standard double glazing with a sound insulation performance of 29dBR_w would be required as well as trickle vents with a sound insulation performance of 38dBD_{n,e,w}.

Atmospheric Plant Noise Limits

- 5.32 As previously stated, it is understood that all mechanical plant serving the development will be installed internally within the ground floor plant room. However, it is proposed that noise breaking out from this area should be controlled to not exceed 5dB below the existing typical background noise level at the nearest noise sensitive receptor. Based on the layout of the development, the nearest noise sensitive receptor to this room will be the first-floor apartment rooms themselves.
- 5.33 In order to determine the typical background noise level, as per BS4142, a statistical analysis of the noise levels measured during the survey has been carried out and this is presented in Graph 5.1, below.



- 5.34 Based on the above dataset, the typical daytime and night-time typical background noise level that has been considered representative is 53dBL_{A90,15min} and 37dBL_{A90,15min}, respectively.
- 5.35 Therefore, in order to comply with MCC's proposed criteria, the combined rating level from all external plant operating simultaneously should not exceed 48dBL_{A_r, Tr} during the daytime period and 32dBL_{A_r, Tr} during the night-time period at the nearest noise sensitive receptor. AEC would need to be issued with any plant data prior to installation to confirm that the noise level limit would not be exceeded.

6.0 SUMMARY AND CONCLUSIONS

- 6.1 Acoustic & Engineering Consultants Limited has been appointed by Pinnacle Estates to undertake a noise assessment of the proposed development to be located at 2 Swallow Street, Manchester.
- 6.2 In order to determine the noise levels affecting the site across the different floors of the building, an unattended and attended noise level survey was done on the second floor and ground floor levels, respectively.
- 6.3 An unattended noise level survey was undertaken at two locations; 1m from the 2nd floor façade of the existing building on the eastern and western elevations. These are identified as L₁ and L₂, respectively, on Figure B1. Measurements were carried out from 1530h on Tuesday 19 April 2022 to 1030h on Wednesday 20 April 2022.
- 6.4 These measurement locations were chosen to measure noise levels impacting the site from road traffic, particularly on the A6, at Location L₁ and noise levels from railway activities at Location L₂. A summary of the measured noise levels is presented in Table 3.1 and full details of the noise level survey is presented in Appendix B and in Graphs B1 and B2.
- 6.5 Supplementary attended measurements were also carried out by AEC on Wednesday 20 April 2022, between approximately 0940 and 1030h. These measurements were carried out at two locations, identified as A and B on the attached Figure B.1, and were done in order to measure the noise levels affecting the ground floor rooms within the proposed development. Further details of the noise levels measured are presented in Section 3.0.
- 6.6 During the measurement periods at all survey locations, railway noise, road traffic from the A6 and distant roads in the area were the dominating noise sources affecting the development.
- 6.7 Based on the rooms within the development, a basis of assessment has been presented which includes the assessment of the ground floor rooms.
- 6.8 Based on the measured noise level, an assessment has been carried out to determine the noise levels impacting each façade of the residential properties within the development.
- 6.9 These measured noise levels were determined in accordance with the Manchester City Council document '*Planning and Noise Technical Guidance*'. The resultant noise levels external to the different elevations consider screening, distance attenuation, where applicable, and the results are presented in Table 5.2 of Section 5.
- 6.10 Based on the calculated external noise levels presented in Table 5.1, it was determined that alternative means of ventilation (to opening windows) would need to be provided to all habitable rooms except to those on the norther elevation of the site.
- 6.11 Based on this, a glazing and ventilation specification for the site is presented in Table 5.2 and are presented in the form of enhanced glazing and acoustic trickle vents.
- 6.12 As per the basis of assessment, mitigation measures are likely to be required to the floor and wall structures separating the ground floor rooms from the first-floor apartments and this will be confirmed during the design stages of the development.

- 6.13 Based on this assessment and by ensuring that the proposals stated in this report are adhered to, AEC can confirm that noise should not be considered a determining factor in relation to any planning permission being sought.

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 discrete frequency - a 'pure tone' - most sound is made up of many different frequencies.

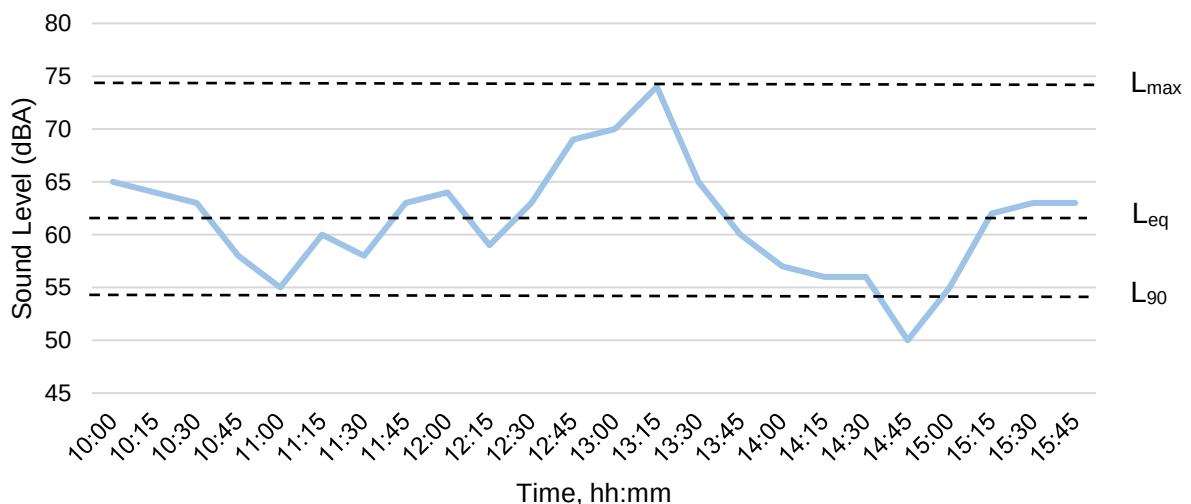
The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA*, normally used to assess the effect of noise on people. The *dBA* weighting emphasises or reduces the importance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

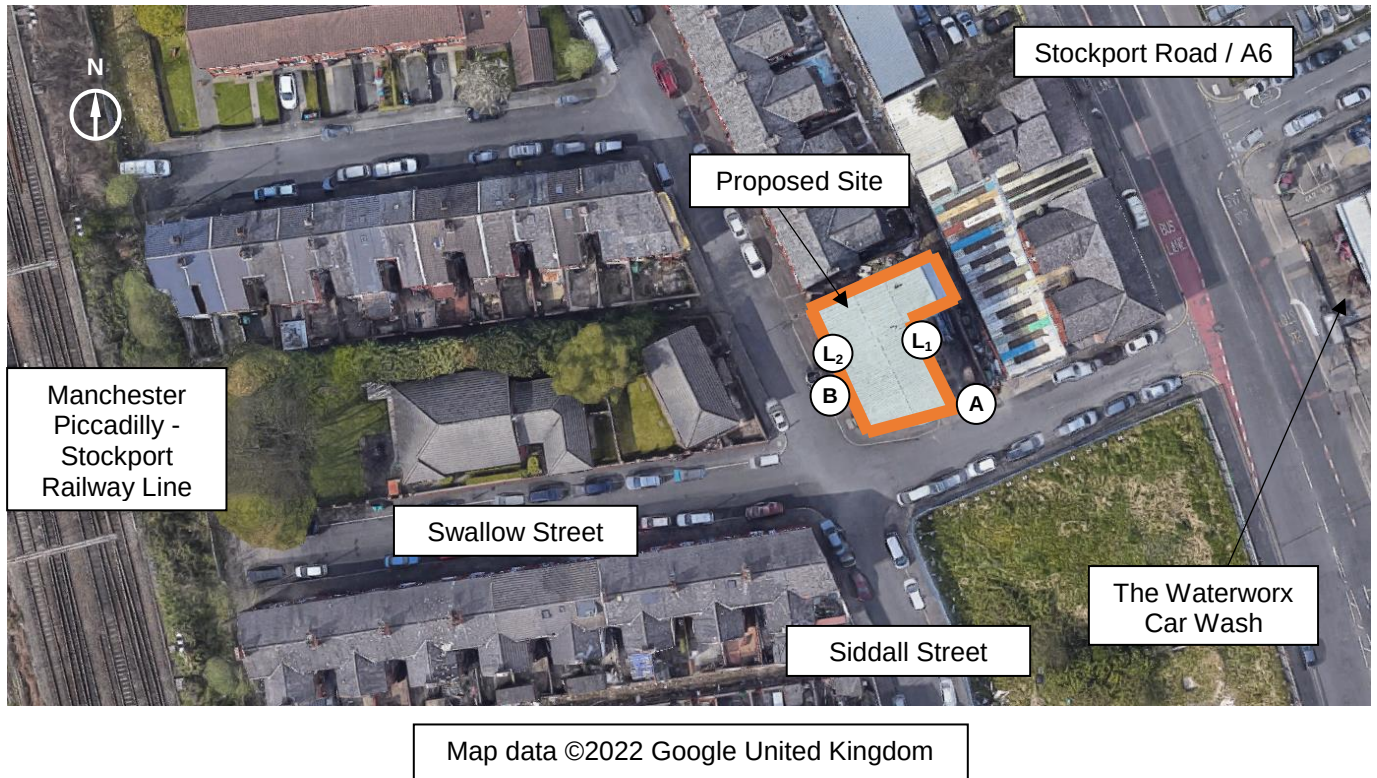
Example of Sound Varying with Time



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.
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.
Noise Rating	NR	A graphical method for assigning a single number rating to a noise spectrum and is often use to specify noise level limits for mechanical services.
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.
Weighted standardized level difference	$D_{nT,w}$	Single number rating used to describe the on-site airborne sound insulation performance properties of a material or building element over a range of frequencies, typically 100-3150Hz, which is calculated in terms of a standardized reverberation time of 0.5 seconds.
Element normalized level difference	$D_{n,e,w}$	Single number rating used to describe the sound insulation performance of small elements.
Background Sound Level	L_{A90}	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting, F, and quoted to the nearest whole number of decibels.

APPENDIX B – Noise Survey Details

FIGURE B.1 – Site Location Plan Identifying Monitoring Locations

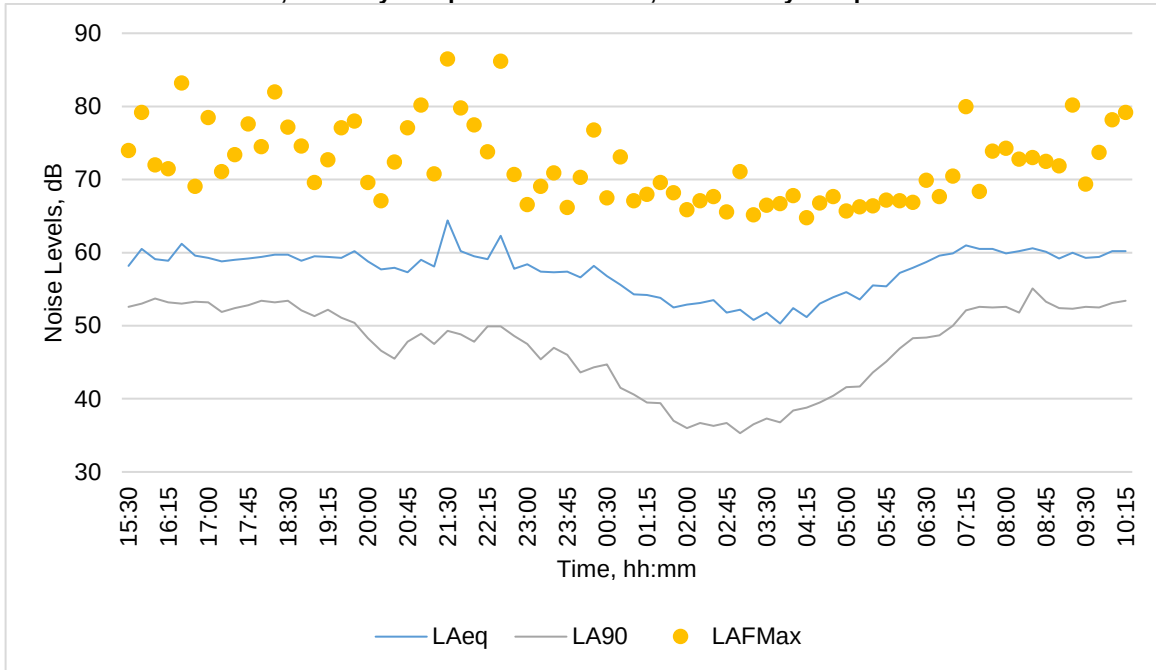


Date & Time of Survey:	Unattended: Tuesday 19 April 2022, 1530h to Wednesday 20 April 2022, 1030h.					
	Attended: Wednesday 20 April 2022, 0940 – 1030h.					
Personnel:	Ross Chamberlain (AEC).					
Equipment Used:	Unattended: Cirrus CR:171B Real Time Analyser (AEC Kit 3) Cirrus CR:171B Real Time Analyser (AEC Kit 5)					
	Attended: B&K 2250 Real Time Analyser (AEC Kit 1).					
Calibration:	The sound level analysers, which conforms 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:	Unattended:					
	Date	Period	Wet/Dry	Temp°C	Wind Speed & Direction	Cloud Cover
	19/04/22	Day	Dry	15°C	Negligible	20%
	19/04/22 – 20/04/22	Night		05°C		40%
	20/04/22	Day		12°C		50%
	Attended:					
	Date	Period	Wet/Dry	Temp°C	Wind Speed & Direction	Cloud Cover
	20/04/22	Day	Dry	12°C	Negligible	50%
Measurement Locations:	Unattended: Two microphones were connected via extension cables and fixed externally at locations 1m from the eastern and western facades of the building at second floor level, identified as L ₁ and L ₂ , respectively, on Figure B.1.					
	Attended: Measurements were undertaken at two locations around the development site. Identified as A and B on Figure B.1 and described below. A – 1m away from the edge of Swallow Street in front of the open fence. B – 1m away from the western façade of the existing building.					
Measurement Details:	Unattended: Measurements were logged continuously over 1s for post processing and assessment.					
	Attended: Measurements were undertaken over various periods in terms of L _{eq} , L ₁₀ , L ₉₀ , and L _{max} .					
Façade / Free-Field:	Unattended: Façade level					
	Attended: A - free-field, B – façade.					
	Full results for the attended measurements are given in Table B1. The measured daytime and night-time periods for the unattended survey is presented on Graphs B1 and B2.					
Measured Data:	Full octave band centre frequency data was obtained for all measurements.					

TABLE B1 – Measured Daytime Noise Levels

Location	Period, h	Noise Level, dB				Comments
		L _{Aeq}	L _{A10}	L _{A90}	L _{Amax, F}	
A	0940 – 0950	58.6	61.7	51.8	70.8	Ambient noise levels due to road traffic on A6 and intermittent car pass bys on Swallow Street and occasional train pass bys. Maximum noise levels due car pass bys on Swallow Street.
	1000 – 1015	58.4	60.6	50.9	74.4	
B	0950 – 1000	52.8	51.9	43.9	69.9	Ambient noise levels due to road traffic on A6 and intermittent car pass bys on Siddall Street and occasional train pass bys Maximum noise levels due car pass bys on Siddall Street.
	1015 – 1030	51.9	52.7	43.2	73.5	

GRAPH B1 – Measured Noise Levels @ Location L1
1530h, Tuesday 19 April 2022 to 1030h, Wednesday 20 April 2022



GRAPH B2 – Measured Noise Levels @ Location L2
1530h, Tuesday 19 April 2022 to 0000h, Wednesday 20 April 2022

