



232-236 Palatine Rd, Didsbury, M20 2WF

Noise Impact Assessment

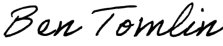
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Date: 29/10/2024

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REVISION HISTORY

Revision	Date	Revision Details	Author	Checked
R01	25/10/2024	Original Issue	Simon Fuller BEng	Ben Tomlin Bsc MIOA
R01A	29/10/2024	Revised based client's comments	 <small>Simon Fuller (Oct 29, 2024 16:47 GMT)</small> Simon Fuller BEng	 Ben Tomlin Bsc MIOA

1 INTRODUCTION

- 1.1 dBx Acoustics Ltd has been appointed by Marco Living to carry out a noise survey, and to undertake a noise impact assessment for a proposed residential development at 232-236 Palatine Road, Didsbury, Manchester, M20 2WF.
- 1.2 It is proposed to construct a new build apartment block fronting Palatine Road, with a mixture of new build semi-detached houses and townhouses after demolishing the existing dwellings.
- 1.3 Planning permission is sought from Manchester City Council, and a noise impact assessment is required to support the planning permission application.
- 1.4 The intent of this report is to present the results of a noise survey undertaken at the site, to detail the subsequent noise impact assessment, and to provide outline guidance on appropriate acoustic requirements for façade glazing and ventilation build-ups to control noise intrusion in line with Manchester City Council's standard planning conditions.
- 1.5 A glossary of acoustic terminology has been supplied in Appendix A in order to assist the reader.

2 ACOUSTIC DESIGN CRITERIA

Local Authority Criteria

- 2.1 This site falls under the jurisdiction of Manchester City Council (MCC).
- 2.2 Manchester City Council's Planning & Noise Technical Guidance (October 2022) sets out Manchester City Council's requirements with regard to current guidance and policy. The guidance refers to the WHO Guidelines for Community Noise 1999, BS 8233:2014, BS 4142:2014, NPPF and NPSE as described below.
- 2.3 MCC has adopted the following internal noise limits for residential properties:
- Bedrooms (night time 23:00-07:00h) 30dBL_{Aeq, 8h} (individual noise events should not normally exceed 45dBL_{Amax, F} more than 10 times);
 - Living Rooms (daytime – 07:00-23:00h) 35dBL_{Aeq, 16h}.
 - Gardens and terraces (daytime) 55dBL_{Aeq, 16h}.
- 2.4 MCC also requires that externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB below the typical background noise level at the nearest noise sensitive location.

National Planning Policy Framework

- 2.5 The revised National Planning Policy Framework (NPPF, last updated December 2023) supersedes the 2012, 2018 and 2019 versions of the NPPF. The purpose of the planning system is to contribute to the achievement of sustainable development. There are three dimensions to sustainable development: economic, social and environmental. The environmental role is to contribute to protecting and enhancing our natural, built and historic environment; and as part of this, make effective use of land, help to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate to adapt to climate change including moving to a low carbon economy.
- 2.6 One of the core planning principles is to contribute to conserving and enhancing the natural environment. Allocations of land for development should prefer land of lesser environmental or amenity value, where consistent with other policies in the Framework (Paragraph 181). The planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability (Paragraph 180).
- 2.7 Paragraph 191 of the NPPF states:
- “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:*
- *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 (see Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food and Rural Affairs, 2010));*
 - *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”*
- 2.8 Additionally, Paragraph 193 states:
- “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.”*

Noise Policy Statement for England

- 2.9 The Noise Policy Statement for England (NPSE) aims to “through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:
- *Avoid significant adverse impacts on health and quality of life;*
 - *Mitigate and minimise adverse impacts on health and quality of life; and*
 - *Where possible, contribute to the improvement of health and quality of life”.*
- 2.10 Based on concepts from toxicology, it introduces three ‘Effect Levels’ relevant to the assessment of noise. These are:
- NOEL: No Observed Effect Level: This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise;
 - LOAEL: Lowest Observed Adverse Effect Level: This is the level above which adverse effects on health and quality of life can be detected; and
 - SOAEL: Significant Observed Adverse Effect Level: This is the level above which significant adverse effects on health and quality of life occur.

Planning Practice Guidance

- 2.11 The Planning Practice Guidance for Noise (PPG-N) was published in March 2014 and most recently updated in September 2023. The PPG-N suggests that the most appropriate and cost-effective solutions to potential noise issues are best identified when good acoustic design needs to be considered early in the planning process.
- 2.12 The PPG-N provides the following advice on how to determine the noise impact on development:
- “Plan-making and decision making need to take account of the acoustic environment and in doing so consider:*
- *Whether or not a significant adverse effect is occurring or likely to occur;*
 - *Whether or not an adverse effect is occurring or likely to occur; and*
 - *Whether or not a good standard of amenity can be achieved.”*
- In line with the Explanatory note of the noise policy statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.” (Paragraph 003 Reference ID 30-003-20190722).*
- 2.13 The document goes on to acknowledge the levels of noise exposure at which an effect may occur as provided in the NPSE and introduces a fourth effect level:
- UAE: Unacceptable Adverse Effect: Extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise lead to psychological stress or physical effects.
- 2.14 Where residential development is proposed in the vicinity of existing businesses, community facilities or other activities that produce noise, the PPG-N advises that the applicant (or ‘agent of

change') will need to clearly identify the effects of the existing businesses that may cause a nuisance (including noise) and clearly define the mitigation measures being proposed to address any potential significant adverse effects that are identified. The agent of change needs to not only consider the current activities of the business, but the permitted activities too, even if they are not occurring at the time of the application being made. The PPG-N acknowledges that *"It can be helpful for developers to provide information to prospective purchasers or occupants about mitigation measures that have been put in place, to raise awareness and reduce the risk of post-purchase/occupancy complaints."* (Paragraph 009 Reference ID 30-009-20190722).

- 2.15 It is important to understand that as the PPG-N does not specifically provide any advice with respect to noise levels/limits for different sources of noise, it is appropriate to consider other sources of advice and guidance documents when considering whether new developments would be sensitive to the prevailing acoustic environment and the PPG-N signposts a number of appropriate guidance documents.

BS 8233:2014: 'Guidance on sound insulation and noise reduction for buildings'

- 2.16 BS 8233:2014 gives guidance for noise levels within residential properties. It discusses appropriate criteria for reasonable rest and sleep conditions and provides noise levels which are considered to provide appropriate conditions in accordance with WHO guidelines. The guidance on limits from the standard is reproduced in Table 1, below.

Table 1: Internal Ambient Noise Limits (BS8233)

Activity	Location	07:00h – 23:00h	23:00h – 07:00h
Resting	Living room	35dBL _{Aeq,16h}	-
Dining	Dining room/area	40dBL _{Aeq,16h}	-
Sleeping (daytime resting)	Bedroom	35dBL _{Aeq,16h}	30dBL _{Aeq,8h}

- 2.17 It should be noted that these limits represent the average noise level over the 16-hour day or 8-hour night period. This potentially means that higher noise levels may be experienced internally over a shorter period (e.g., individual passing trams or vehicles). These equivalent noise levels, over a period of time, are the best representation of the average noise level and are generally the main focus when it comes to evaluating noise exposure.
- 2.18 Under the updates to BS 8233 in 2014, for both day and night-time cases, a relaxation of up to 5dB is considered to provide "reasonable internal conditions" where development is considered necessary or desirable.
- 2.19 To assess the maximum noise levels, the World Health Organisation (WHO) document "Guidelines for Community Noise: 1999" recommends that maximum noise levels (dBL_{Amax,F}) do not exceed 45dBL_{Amax,F} more than 10-15 times a night.

Outdoor Noise Levels in External Amenity Areas

- 2.20 BS 8233: 2014 and the World Health Organisation (WHO) document 'Guidelines for Community Noise: 1999' present guidance for external noise levels within outdoor amenity areas of residential properties to be within 55dBL_{Aeq,16h}.
- 2.21 It is, however, noted that compliance with these levels may not always be practical, and that the benefits of a development in other areas may take precedence over achieving external amenity noise levels.

The Building Regulations 2010: Overheating: Approved Document O

- 2.22 Section 3 of Overheating: Approved Document O (ADO) states the following;

“3.2 In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

3.3 Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

A. 40dB_{LAeq,T}, averaged over 8 hours (between 11pm and 7am).

B. 55dB_{LAFmax}, more than 10 times a night (between 11pm and 7am).

3.4 Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants’ Measurement of Sound Levels in Buildings with the overheating mitigation strategy in use.”

- 2.23 It is also highlighted that guidance on reducing the passage of external noise into buildings can be found in the Association of Noise Consultants’ ‘Acoustics, Ventilation and Overheating: Residential Design Guide’ (2020).

Ventilation and Overheating: Residential Design Guide 2020 (AVO)

- 2.24 AVO outlines a two-level procedure to estimate the potential impact on occupants in the case of the overheating condition.
- 2.25 The AVO Level 1 assessment is used to determine the ‘Potential Effect without Mitigation’ and to establish if there is a requirement for a Level 2 Assessment.
- 2.26 A level 1 assessment is undertaken by comparing the external noise levels measure to the values shown on Table 3-2 of AVO, reproduced as Figure 1, below.

Figure 1: AVO Table 3-2, Guidance for Level 1 Site Risk Assessment

Table 3-2 Guidance for Level 1 site risk assessment of noise from transport noise sources ^[Note 1] relating to overheating condition

Risk category for Level 1 assessment ^[Note 5]	Potential Effect without Mitigation	Recommendation for Level 2 assessment
<p> ^[Note 2] $L_{Aeq, T}$ during 07:00 - 23:00 $L_{Aeq, 8hr}$ during 23:00 - 07:00 65 dB 60 dB 55 dB 50 dB High Medium Low Negligible 55 dB 50 dB 45 dB </p>	<p>↑</p> <p>Increasing risk of adverse effect</p> <p>Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect</p>	<p>Recommended</p> <p>Optional</p> <p>Not required</p>

2.27 If required, a Level 2 assessment is then undertaken by comparing the predicted internal noise levels to Table 3-3 of AVO, reproduced as Figure 2, below.

Figure 2: AVO Table 3-3, Guidance for Level 2 Assessment

Table 3-3 Guidance for Level 2 assessment of noise from transport noise sources^[Note 1] relating to overheating condition

Internal ambient noise level ^[Note 2]			Examples of Outcomes ^[Note 3]	
$L_{Aeq,T}$ ^[Note 4] during 07:00 – 23:00 ^[Note 5]	$L_{Aeq,8h}$ during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 ^[Note 6]		
> 50 dB	> 42 dB	Normally exceeds 65 dB L_{Amax}	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time	Avoiding certain activities during periods of intrusion. Having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.
 Increasing noise level			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods. As noise levels increase, small behaviour changes are expected e.g. turning up the volume on the television; speaking a little more loudly; having to close windows for certain activities, for example ones which require a high level of concentration. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in quality of life. At lower noise levels, limited behavioural change is expected unless conditions are prevalent for most of the time. ^[Note 4]
≤ 35 dB	≤ 30 dB	Do not normally exceed L_{Amax} 45 dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response ^[Note 4] . Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

- 2.28 It can be seen from the figures above that there are no strict numerical limits for an acceptable level of noise within residences during the overheating condition.
- 2.29 Table 3-3, however, does suggest that night-time noise levels of $\geq 42 \text{ dB}_{L_{Aeq,8\text{hour}}}$ or $65 \text{ dB}_{L_{Amax,F}}$ can be considered upper limits for acceptable noise levels in rooms in which overheating is controlled by the use of open windows.

BS 4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound'

- 2.30 BS 4142:2014 sets out a procedure for assessing noise impact whereby a Noise Rating is determined and compared with the existing local Background Sound Level.
- 2.31 The Rating Level ($\text{dBL}_{A_r,Tr}$) is evaluated from the Specific Noise Level by including several, cumulative corrections to account for factors such as distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristics.
- 2.32 The assessment of the impact depends upon the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level. An initial estimate of the impact of the specific sound is made by subtracting the Background Sound Level from the Rating Level, while considering the following points:
- a) Typically, the greater this difference, the greater the magnitude of the impact.
 - b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
 - d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

3 SITE DESCRIPTION

- 3.1 The proposed site is located at 232-236 Palatine Road and at the time of the survey, comprised of 3 no. houses. Figure 3, below, illustrates the site.
- 3.2 The site is located approximately 23m from Palatine Road (B5167).
- 3.3 A hotel is approximately 35m from the northern site boundary, and the Brookside apartments building is approximately 15-20m from the southern site boundary.
- 3.4 There is an access road to the hotel approximately 85m from the existing rear facing facades.

Figure 3: Site Location Plan



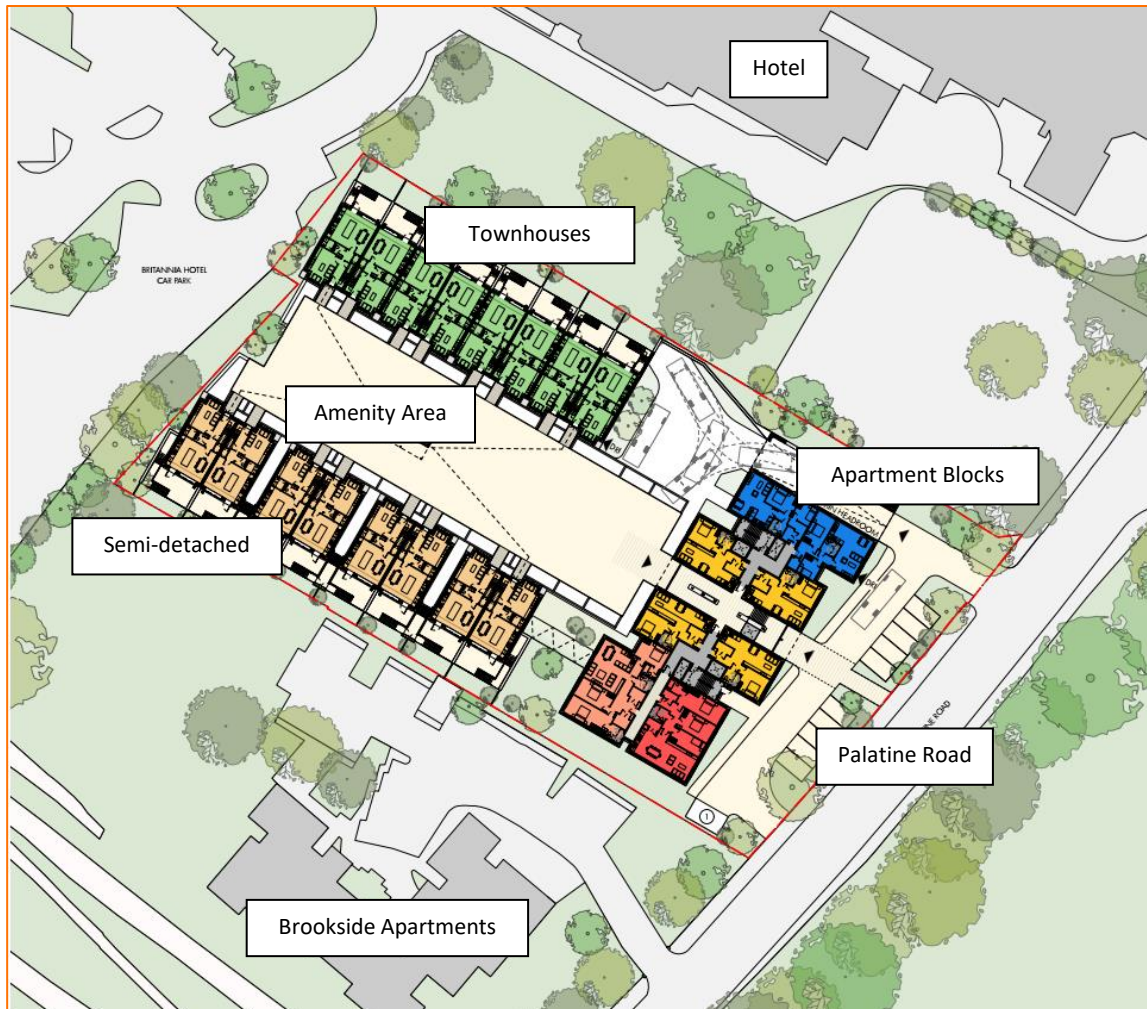
Noise Sources

- 3.5 Noise levels at the site are dominated by road traffic noise (RTN) from Palatine Road. Brookside apartments plant operation, hotel guest activity, and distant motorway RTN also contribute to the noise climate.

Proposed Development

- 3.6 The development will consist of new build apartments fronting Palatine Road, with a mixture of new build semi-detached houses and Townhouses to the rear.
- 3.7 It is understood the Palatine Road fronting apartments will be 5-storeys high, and contain 54 apartments.
- 3.8 Figure 4, below, shows the proposed site layout of the ground floor.

Figure 4: Proposed Site Layout



Noise Sensitive Receptors

- 3.9 The nearest noise sensitive receptor is Brookside apartments building, approximately 15-20m to the south.

4 ENVIRONMENTAL NOISE SURVEY

Site Activity

- 4.1 dBx Acoustics attended site from around 11:00h on Wednesday 2nd October 2024.
- 4.2 Tree surgery work was taking place from around 09:00h on Wednesday 2nd October until around 16:00h on Thursday 3rd October 2024.

Methodology

- 4.3 Long term unattended monitoring was undertaken from around 12:00h on Wednesday 2nd October 2024 to around 14:30 on Friday 4th October 2024. Noise levels were measured continuously throughout, in 15-minute periods.
- 4.4 Monitoring was undertaken out of the front room second floor window facing Palatine Road (LT1), and out of the rear room of the property (LT2). The microphone was positioned at around 0.5m from the building, and long-term measurements are hence façade measurements.
- 4.5 Short term attended measurements (ST) were also undertaken from around 14:00h on Friday 4th October 2024 at the rear to establish noise level contributions on the site from the hotel and Brookside apartments.
- 4.6 Figure 5, below, illustrates the monitoring locations.

Figure 5: Monitoring Locations



Equipment

4.7 The equipment used during the environmental noise survey is detailed in Table 2, below.

Table 2: Equipment Used in the Environmental Noise Survey

Location	Equipment	(Manufacturer & Part No./ Serial Number)	Serial Number
LT1	Meter	CR:171B	G300741
	Pre-Amp	MV:200F	9082F
	Microphone	MK:224	211753D
	Calibrator	CR:515	87160
LT2	Meter	CR:171C	G300656
	Pre-Amp	MV:200F	9136F
	Microphone	MK:224	215619A
	Calibrator	CR:515	87921
ST1, ST2, ST3	Meter	NOR 140	1405619
	Pre-Amp	NOR 1209	15526
	Microphone	NOR 1225	168247
	Calibrator	NOR 1251	33827

4.8 The sound level meters were calibrated before and after measurements, with no significant drift recorded. An accredited laboratory calibrated the equipment not more than two years prior to the measurements being made, except for the calibrator, which had been calibrated not more than one year prior to the survey.

Weather Conditions

4.9 Weather conditions during noise monitoring were generally cool and dry with scattered clouds throughout the daytime and night-time measurements.

4.10 Wind speeds were within suitable parameters for the measurement of environmental noise (i.e., generally under 5 ms^{-1}). The measurement microphone was protected with a windshield for the duration of the survey.

5 SURVEY RESULTS

Long Term Monitoring Results

5.1 A summary of the noise levels measured are presented in Figures 6 and 7, and Tables 3 and 4, below.

Figure 6: LT1 Façade Monitoring Results

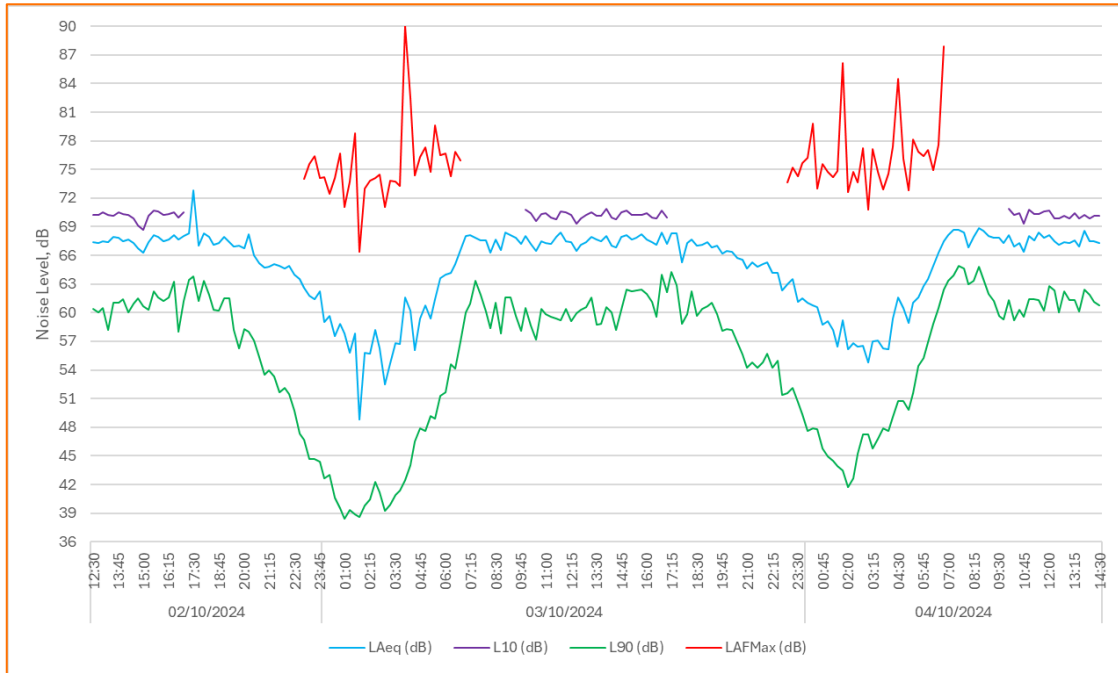


Figure 7: LT2 Façade Monitoring Results

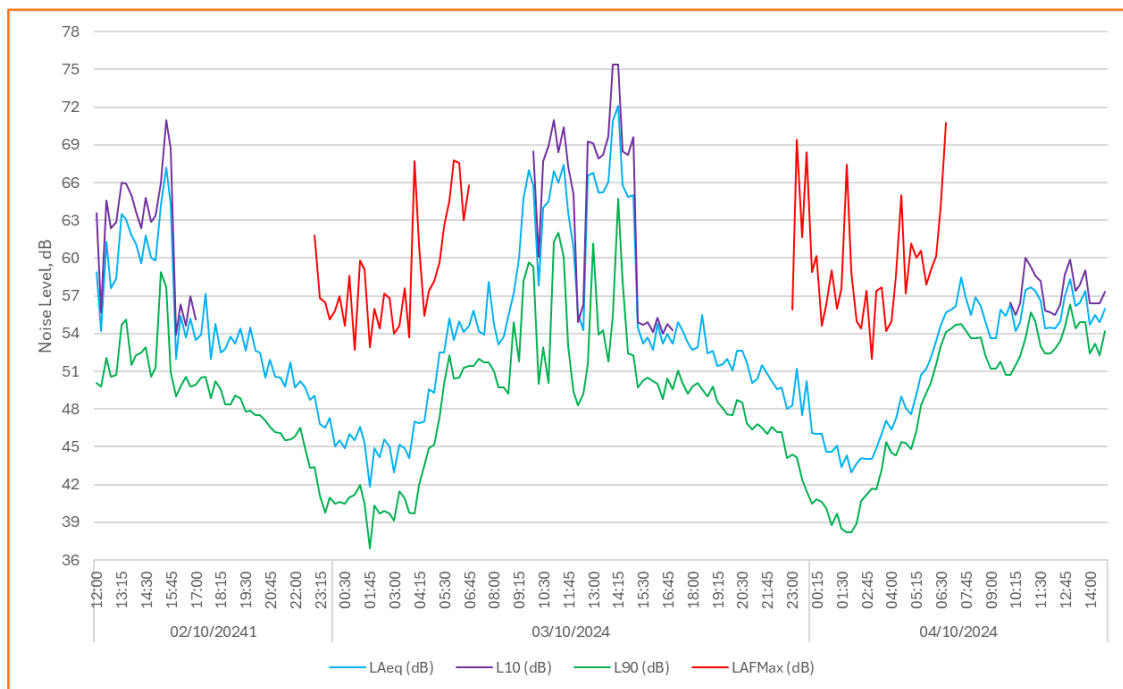


Table 3: Summary of Façade Measured Noise Levels for LT1

Start	End	Period	Ambient Noise Level, $\text{dBL}_{\text{Aeq,T}}$	Typical Maximum Noise Level, $\text{dBL}_{\text{Amax,F}}$	Background Noise Level, $\text{dBL}_{\text{A90,T}}$
02/10/24 12:00	02/10/24 23:00h	Day	67	--	47
02/10/24 23:00	03/10/24 07:00h	Night	61	80	38
03/10/24 07:00h	03/10/24 23:00h	Day	67	--	51
03/10/24 23:00h	04/10/24 07:00h	Night	61	80	42
04/10/24 07:00h	04/10/24 14:00h	Day	68	--	59

Table 4: Summary of Façade Measured Noise Levels for LT2

Start	End	Period	Ambient Noise Level, $\text{dBL}_{\text{Aeq,T}}$	Typical Maximum Noise Level, $\text{dBL}_{\text{Amax,F}}$	Background Noise Level, $\text{dBL}_{\text{A90,T}}$
02/10/24 12:00	02/10/24 23:00h	Day	59	--	43
02/10/24 23:00	03/10/24 07:00h	Night	50	69	37
03/10/24 07:00h	03/10/24 23:00h	Day	62	--	44
03/10/24 23:00h	04/10/24 07:00h	Night	49	71	38
04/10/24 07:00h	04/10/24 14:30h	Day	55	--	51

- 5.2 The ambient noise levels are the logarithmic average of all measurements taken in each day or night-time period, 16 hours and 8 hours, respectively.
- 5.3 The typical maximum noise levels consider the highest values measured, excluding one off atypical events.
- 5.4 In terms of the background noise levels, the typical daytime and night-time background noise levels have been determined using the statistical analysis methodology described in *BS 4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound'* (BS4142).

Short Term Measurement Results

- 5.5 A summary of the short-term daytime noise levels measured are presented Table 5, below.
- 5.6 ST1 is representative of the proposed terraces nearest the hotel.
- 5.7 ST2 is representative of the proposed terraces nearest the rear side of Brookside apartments.
- 5.8 ST3 is representative of noise levels at the rear of the existing dwellings without the tree surgery work in operation.

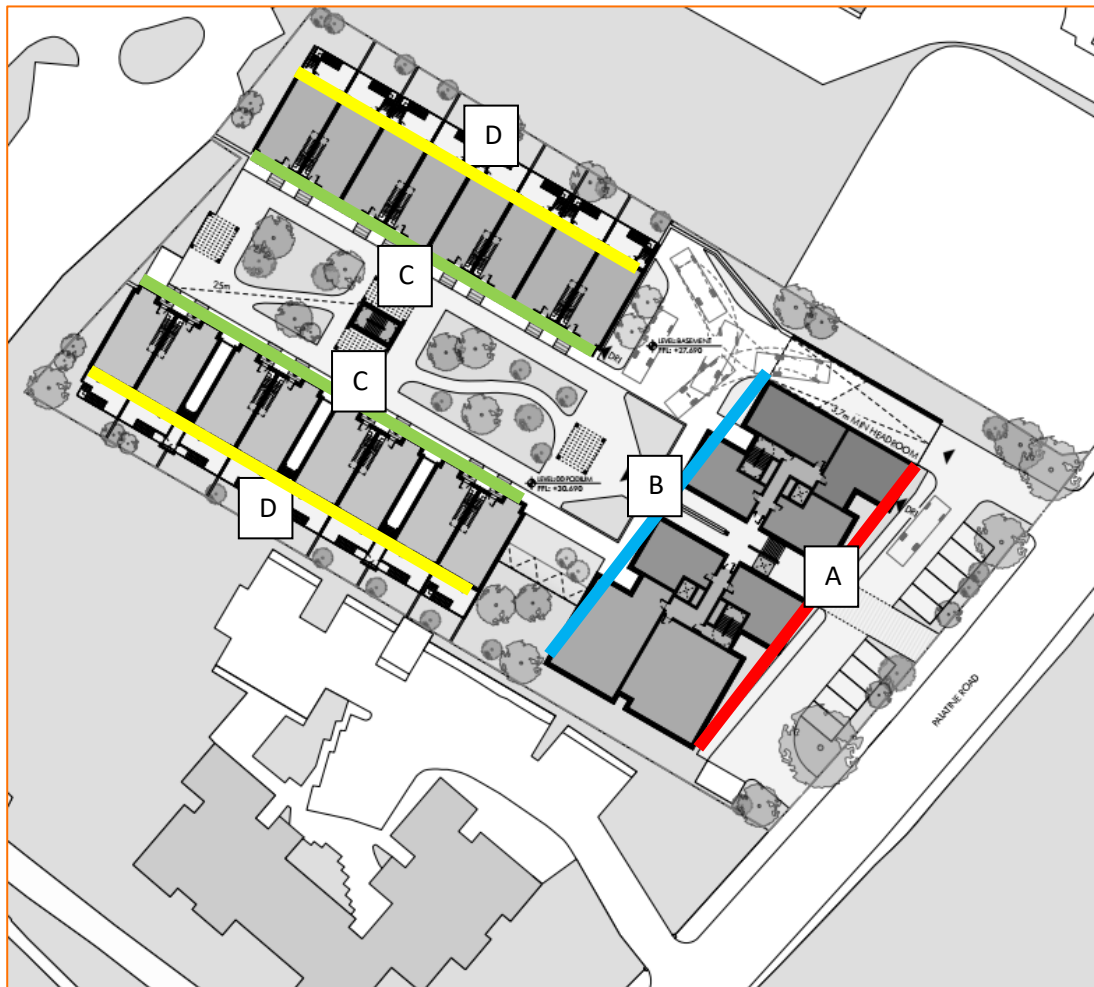
Table 5: Short Term Measurement Results

Date	Monitoring Location	Start Time	End Time	Ambient Noise Level, dBL _{Aeq,5minutes}	Background Noise Level, dBL _{A90,5minutes}
04/10/24	ST1	14:12h	14:17h	54	53
	ST1	14:18h	14:23h	55	54
	ST2	14:28h	14:33h	52	50
	ST2	14:33h	14:38h	52	50
	ST3	14:38h	14:41h	55	54
	ST3	14:41h	14:44h	55	52

Façade Noise Levels

- 5.9 Based on the measured noise levels, calculations have been undertaken to determine the noise levels affecting all façades of the proposed development, based on distance and screening corrections.
- 5.10 These calculations separate the façade noise levels to 4 distinct categories.
- 5.11 Façade A is representative of the front of the apartment block facing Palatine Road, and façade B for the rear. Facades C is representative of the amenity facing façades for the semi-detached houses and townhouses, with Façade D for the rear.
- 5.12 Figure 8, below, identifies the façade positions of the proposed site.

Figure 8: Façade positions



- 5.13 On the basis of the above, Table 6, below, presents a summary of the free-field noise levels used to calculate noise ingress.

Table 6: Noise Levels Used in Assessment

Façade	Daytime Ambient Noise Level, $dB_{LAeq,16hour}$	Night-Time Ambient Noise Level, $dB_{LAeq,8hour}$	Night Time Maximum Noise Level, $dB_{LAmax,F}$	Daytime Background Noise Level, $dB_{LA90,1hour}$	Night-Time Background Noise Level, $dB_{LAeq,15min}$
A	65	58	77	44	35
B	59	47	68	40	34
C	55	40	68	40	34
D	55	37	68	40	34

6 BUILDING ENVELOPE SOUND INSULATION

External Noise Break-In Assessment

- 6.1 An external noise break-in assessment has been undertaken to assess the suitability of the site for residential development and to specify the minimum sound insulation performance of the façades required to meet the internal noise criteria.
- 6.2 The results of the noise survey have been used to categorise the facades of the proposed residential dwellings in terms of their noise exposure.
- 6.3 Based on a typical reduction in external noise levels to indoor noise levels of 15dB for a partially opened window (based on WHO guidance), allowable external noise levels for compliance with BS8233:2014 (Table 1, above) are therefore $50\text{dB}_{\text{L}_{\text{Aeq,T}}}$ outside living rooms in the day, and $45\text{dB}_{\text{L}_{\text{Aeq,T}}}$ and $60\text{dB}_{\text{L}_{\text{Amax,F}}}$ outside bedrooms at night.
- 6.4 With reference to Table 6, and the allowable external noise levels detailed above, it can be seen the required indoor noise levels can only be achieved with closed windows.
- 6.5 Calculations have therefore been undertaken, based on the noise levels detailed in Table 6, above, and the sizes of the rooms and windows provided, to determine the sound insulation performance of the glazing required to achieve the BS8233 noise limits, as detailed in Table 7, below.

Table 7: Glazing Sound Insulation Requirements

Facade	Room	Glazing Sound Insulation Performance, dB R_w (+ C_{tr})	Example Glazing Construction, mm	Ventilator Sound Insulation Performance, dB $D_{n,e,w}$	Example Ventilator
A	Bedrooms	38(-6)	10/TC/6mm	41	Renson AK80/3
	Living Rooms	36(-7)	10/TC/4mm	41	Renson AK80/3
B	Bedrooms	36-7	10/TC/4mm	33	Simons Acoustic Frame Vent
	Living room	31(-6)	4/TC/4mm	33	Simons Acoustic Frame Vent
C and D	Bedrooms	36(-7)	10/TC/4mm	33	Simons Acoustic Frame Vent
	Living Rooms	31(-6)	4/TC/4mm	26	Standard Trickle Vent
	Dining Rooms with patio	31(-6)	4/TC/4mm	26	Standard Trickle Vent

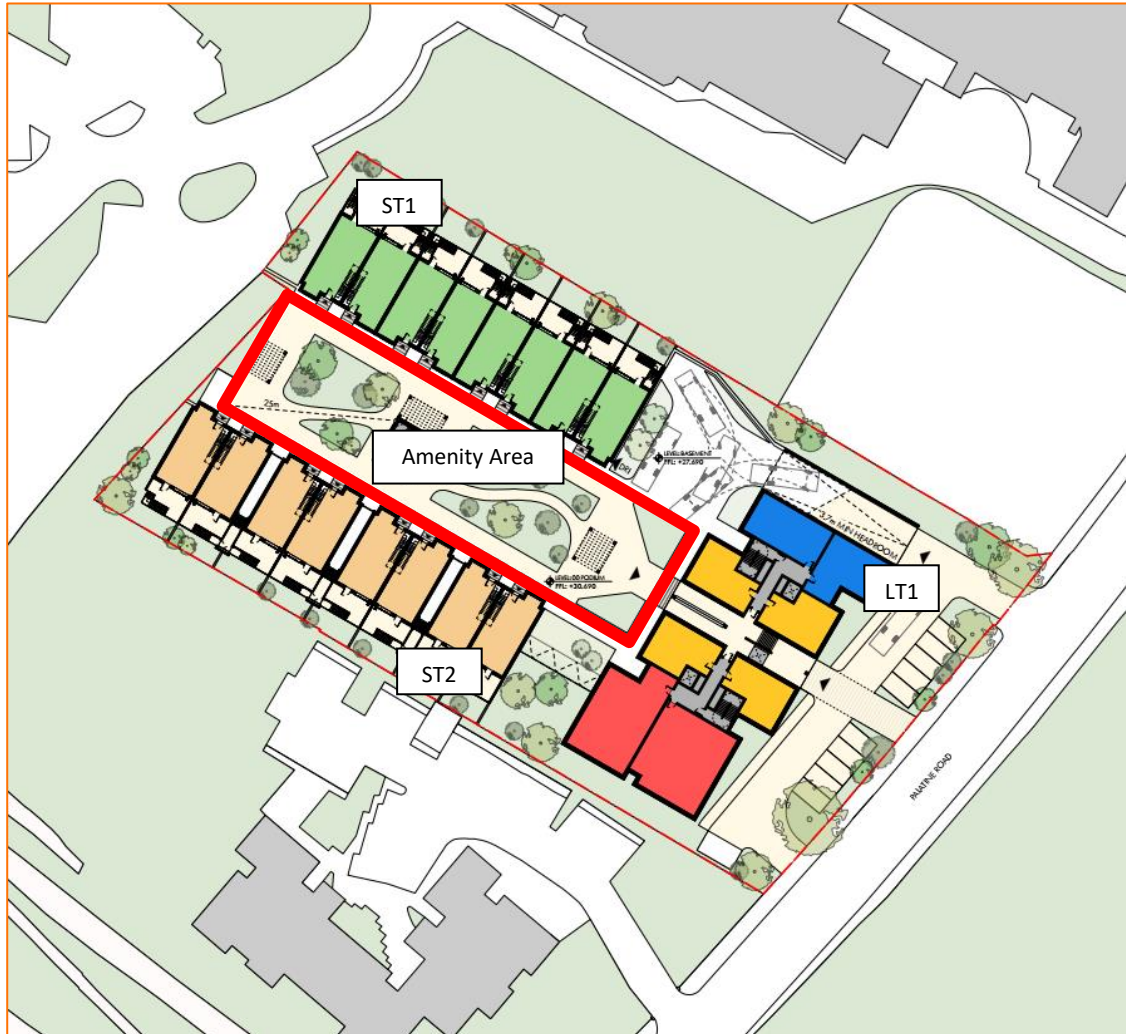
TC = Thermal Cavity

- 6.6 The sound insulation performances detailed must be achieved by the glazing unit as a whole, including frames, seals, opening lights etc, as opposed to the glass panels alone.
- 6.7 The glazing configurations shown above are a suggestion only, and alternative configurations may be acoustically suitable.
- 6.8 The external wall and roof should achieve a sound insulation performance at least 10dB greater than the glazing. This would be achieved with cavity masonry walls and a tiled roof for the semi-detached houses and townhouses, and the concrete roof for the apartments
- 6.9 Windows can be openable at occupant discretion (e.g. for purge ventilation) but must be well sealed when closed.

7 OUTDOOR NOISE LEVELS IN EXTERNAL AMENITY AREAS

- 7.1 Based on noise measurements at locations ST1 and ST2, noise levels at the rear of the existing building was no higher than $55\text{dBL}_{\text{Aeq},5\text{mins}}$, which was measured outside of the tree surgery work hours.
- 7.2 Noise at the rear is completely dominated by road traffic on Palatine Road.
- 7.3 Figure 9, below illustrates the monitoring locations relative to the amenity area boundary.

Figure 9: Monitoring Positions to the Amenity Area



- 7.4 The new houses and garden fences will provide acoustic attenuation of at least 5-10dB.
- 7.5 On this basis, noise levels in external amenity areas will no higher than $45\text{-}50\text{dBL}_{\text{Aeq},16\text{hour}}$, and hence achieve the recommended noise limits in BS 8233: 2014 and the World Health Organisation (WHO) document 'Guidelines for Community Noise: 1999'.

8 OVERHEATING

- 8.1 At this stage, an overheating assessment has not been completed. This initial guidance is therefore presented on the basis that an overheating condition may arise, but will need to be reviewed as the scheme progresses.
- 8.2 MCC require that an assessment is made in accordance with Approved Document O.
- 8.3 Approved Document O is based on guidance in the Association of Noise Consultants' document '*Acoustics, Ventilation and Overheating Guide*' (2020) (AVO).

AVO Level 1 Assessment

- 8.4 The AVO Level 1 Assessment is used to determine the 'Potential Effect without Mitigation' and to establish if there is a requirement for a Level 2 Assessment.
- 8.5 AVO indicates that a Level 2 assessment is 'recommended' when $65\text{dB}_{\text{LAeq},16\text{hour}}$ (daytime) and $55\text{dB}_{\text{LAeq},8\text{hour}}$ (night-time) is exceeded.
- 8.6 Furthermore, AVO mentions that 'where $78\text{dB}_{\text{LA}_{\text{F,max}}}$ is normally exceeded during the night-time period, a Level 2 assessment is recommended'.
- 8.7 The Level 1 Assessment is summarised in Table 8, below.

Table 8: Level 1 Assessment

Façade Location	Typical Daytime Noise Levels ($\text{dB}_{\text{LAeq,T}}$)	Typical Night-time Noise Levels ($\text{dB}_{\text{LAeq,T}}$)	Typical Maximum Noise Level ($\text{dB}_{\text{LA}_{\text{Fmax}}}$)	Risk Category (day/night)
A	65	58	77	Medium / High
B	59	47	68	Low / Medium
C and D	55	47	68	Low / Medium

- 8.8 On this basis, a Level 2 Assessment for these dwellings is presented below.

AVO Level 2 Assessment

- 8.9 For the Level 2 assessment, there are no definitive criteria proposed, only a sliding scale of 'Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night'.
- 8.10 However, internal noise level limits of $50\text{dBL}_{\text{Aeq},16\text{hour}}$ in the day, and $42\text{dBL}_{\text{Aeq},8\text{hour}}$ and $65\text{dBL}_{\text{Amax},F}$ at night are the limits at which 'Noise causes a material change in behaviour e.g. having to keep windows closed most of the time....Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep.'
- 8.11 These limits would therefore appear to be a worst-case upper limit. Furthermore, any adverse effects relating to noise are affected by both the noise level itself, and the duration (how long overheating occurs) and frequency (how many times per year/month) the overheating condition occurs.
- 8.12 AVO specifies an expected reduction from external to internal noise levels of -13dB when a window is open. On this basis, the predicted indoor ambient noise levels (IANL) assuming windows open for the control of overheating during daytime is shown in Table 9, below and for night-time is shown in Table 10.

Table 9: AVO Level 2 Assessment - Daytime

Parameter	Façade A	Façade B	Façade C and D
External Ambient Noise Level, $\text{dBL}_{\text{Aeq},8\text{hr}}$	65	59	55
Reduction, open window, dB	-13	-13	-13
IANL Day-time ($\text{dBL}_{\text{Aeq},16\text{hr}}$)	52	46	42
Upper Limit Outlined in AVO	$>50\text{dBL}_{\text{Aeq},16\text{h}}$	$>50\text{dBL}_{\text{Aeq},16\text{h}}$	$>50\text{dBL}_{\text{Aeq},16\text{h}}$
Exceedance	+2	-4	-8

Table 10: AVO Level 2 Assessment - Nighttime

Parameter	Façade A	Façade B	Façade C and D
External Ambient Noise Level, $dB_{Aeq,8hr}$	58	47	47
Reduction, open window, dB	-13	-13	-13
IANL Night-time ($dB_{Aeq,8hr}$)	45	34	34
Upper Limit Outlined in AVO	$>42dB_{Aeq,8h}$	$>42dB_{Aeq,8h}$	$>42dB_{Aeq,8h}$
Exceedance	+3	-8	-8
External Maximum Noise Level, $dB_{Amax,F}$	77	68	68
Reduction, open window, dB	-13	-13	-13
IANL Night-time ($dB_{Amax,F}$)	64	55	55
Upper Limit Outlined in AVO	65	65	65
Exceedance	-1	-10	-10

- 8.13 It can be seen that during the daytime and night-time periods, the IANL with windows open to control overheating are within the upper limits suggested by AVO for Facades B to D.
- 8.14 However, the IANL with windows open to control overheating marginally exceeds the upper limit suggested by AVO during the night and daytime periods for Façade A.
- 8.15 An exceedance of 2-3dB is unlikely to be noticeable. However, a material change in occupant behaviour due to noise on façade A may occur.
- 8.16 Alternative means of overheating mitigation could therefore be considered, such as mechanical or hybrid ventilation, if the overheating condition actually occurs.
- 8.17 This will need to be confirmed by the mechanical services consultant.

9 BUILDING SERVICES NOISE EMISSIONS

- 9.1 It is proposed that new items of building services plant should cumulatively achieve a Rating Level of at least 5dB below the typical background noise level at the nearest noise sensitive receptors when assessed in accordance with BS 4142:2014.
- 9.2 Based on the background noise levels detailed in Table 5, suitable limits to which the cumulative plant noise level should adhere are set in Table 11, below.

Table 11: Plant Noise Emission Limits

Building Services Plant Noise Emission Limit	
dBL _{A,r,Tr}	
Daytime Period (07:00 – 23:00)	Night-time Period (23:00 – 07:00)
35	29

10 CONCLUSION

- 10.1 dBx Acoustics Ltd has been appointed by Marco Living to carry out a noise survey, and to undertake a noise impact assessment for a proposed residential development at 232-236 Palatine Road, Didsbury, Manchester, M20 2WF.
- 10.2 It is proposed to construct new build apartments fronting Palatine Road, with a mixture of semi-detached houses and Townhouses.
- 10.3 A planning application has been made with Manchester City Council and a noise impact assessment is required.
- 10.4 To assess the noise environment at the site, long-term unattended and short term attended noise surveys were undertaken to determine prevailing noise across the site at the most likely noise sensitive proposed residential dwellings.
- 10.5 Using these noise levels, calculations have been undertaken to determine the requirements for façade glazing and ventilation, to achieve internal noise level limits in compliance with BS8233:2014.
- 10.6 At the rear of the property, noise levels in external amenity areas will be around 45-50dB_{L_{Aeq,T}}, meeting the requirements of BS 8233: 2014 and the World Health Organisation (WHO) document 'Guidelines for Community Noise: 1999'.
- 10.7 It is not known at this stage whether the overheating condition will occur. However, an indicative AVO assessment of noise levels has been undertaken assuming that it may occur.
- 10.8 The AVO suggested criteria would be met in all rooms with windows open to control overheating for the rear of the apartments, the semi-detached houses, and the town houses.
- 10.9 The AVO suggested criteria would recommend that alternative means of overheating mitigation are provided for the front facing apartment block, such as mechanical or hybrid ventilation.
- 10.10 Plant noise limits have been set such that plant noise at the nearest noise sensitive properties would not be expected to affect residential amenity.
- 10.11 On this basis, noise should not therefore be a limiting factor in any planning application.

APPENDIX A – GLOSSARY OF ACOUSTIC TERMINOLOGY

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (L_p) the reference quantity is 2×10^{-5} N/m ² . The sound pressure level existing when microphone measured pressure is 2×10^{-5} N/m ² is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (L_p) or Sound Power Level (L_w).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A-weighting	Arithmetic corrections applied to values of L_p according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of L_p actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of L_p actually measured.
$L_{n,T}$	L_p which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
L_{Fmax}	The instantaneous maximum sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
L_{AFmax}	The instantaneous maximum A weighted sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
$L_{Ar,Tr}$	The rating level: the equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise.
Reverberation Time, T	The time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped. The descriptor T, often includes other nomenclature to describe the type of reverberation time measurement or if the reverberation time is an average taken for specific frequencies. For example, a T_{mf} is the mid-frequency reverberation time.
Absorption Coefficient, α	The fraction of reverberant sound energy absorbed by a material. It is expressed as a value between 1.0 which equates to perfect absorption and 0 which equates to zero absorption.
Acoustic Class, A - E	Classification of sound absorbers into Sound Absorption Classes A-E, according to BS EN ISO 11654, including frequencies 200-5000 Hz
NRC	A single-number rating system used to compare the sound-absorbing characteristics of building materials. A measurement of the acoustical absorption performance of a material, calculated by averaging its Sound Absorption Coefficients at 250, 500, 1000 and 2000 Hz
STI	Speech Transmission Index , Metric ranging between 0 and 1 representing the transmission quality of speech with respect to intelligibility by a speech transmission channel
R	Sound Reduction Index , the laboratory measured sound insulation properties of a material or building element in octave or third octave bands.
R_w	Weighted Sound Reduction Index , a single number which represents the sound reduction of a material. It is derived by plotting the sound reduction index against a set of reference curves. The curves are shifted until a best-fit is established and the curve which best fits the sound reduction spectrum is used to represent the single figure value.
D_w	Weighted Level Difference , the weighted level difference between a pair of rooms, stated as a single figure.
D_{nT}	Standardised Level Difference , a frequency-dependent measurement of airborne sound insulation, calculated using the following formula: $D_{nT} = L_1 - L_2 + 10 \log(T/T_0) \text{ dB}$ Where: L_1 is the energy-averaged sound pressure level due to the pink noise source measured in the source room using a sweep technique. L_2 is the energy-averaged sound pressure level measured in the receiving room using a sweep technique.

	<p>T is the mean receiving room reverberation time (derived from T_{30} measured in seconds). T_0 is the reference reverberation time (= 0.5s for dwellings).</p> <p>Weighted Standardised Level Difference, a single-figure value of airborne sound insulation performance, derived according to procedures in BS EN ISO 717-1, based on the D_{nT} values at different frequencies (100-3150 Hz third octave bands).</p>
$D_{nT,w}$	
	<p>Weighted, Normalised Flanking Level Difference, the normalised, weighted difference in sound level between a pair of rooms via a flanking element, such as mullion or ceiling detail. The level difference in octave bands is first normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.</p>
D_{nFw}	
	<p>Normalised Element Level Difference, The normalised difference in sound level between a pair of rooms via a small element such as a trickle ventilator. The level difference in octave bands is normalized to a reference amount of absorption.</p>
D_{ne}	
	<p>Weighted, Normalised Element Level Difference, The normalised, weighted difference in sound level between a pair of rooms via a small element such as a trickle ventilator, stated as a single figure. The level difference in octave bands is normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.</p>
D_{new}	
	<p>Spectrum Adaptation Term, a correction term applied to the sound insulation single-number values (R_w, D_w, and $D_{nT,w}$) in accordance with BS EN ISO 717-1. Applying the C_{tr} penalises a construction's performance if its low frequency performance is poor in relation to its performance at higher frequencies.</p>
C_{tr}	
Impact Sound	<p>The noise generated by an impact on a structure. This is normally used to describe the noise created by people walking or moving furniture on a floor structure.</p> <p>Standardised Impact Sound Pressure Level, a frequency dependent measurement of impact sound insulation, calculated using the following formula:</p> $L_{nT} = L_1 + 10 \log(T/T_0) \text{ dB}$
L_{nT}	<p>Where: L_1 is the mean sound pressure level due to the tapping machine measured in the receiving room using a sweep technique.</p> <p>T is the mean receiving room reverberation time (derived from T_{30} measured in seconds). T_0 is the reference reverberation time (0.5s for dwellings)</p>
	<p>Weighted Standardised Impact Sound Pressure Level, a single-figure value (@ 500 Hz) of impact sound insulation, performance, derived according to BS EN ISO 717-2, based on the L_{nT} values at different frequencies (100Hz- 3150 Hz third octave bands).</p>
$L'_{nT,w}$	
Insertion Loss, IL	<p>The reduction of noise level due to the presence of a noise control device such as an attenuator, excluding any regeneration noise created by its presence.</p>
NR	<p>The Noise Rating level. This is a single figure value derived by plotting a noise spectrum against a set of curves. The curve under which the spectrum fits is the resulting NR level.</p>

24084-R01A-SF 232-236 Palatine Road, Didsbury, M20 2WF

Final Audit Report

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