Condition Discharge Report
Conditions 16a and 17a

C2 The Birtles

Muse Places and Wythenshawe

Community Housing Group Limited

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Executive Summary

Muse Places and Wythenshawe Community Housing Group Limited are seeking approval of details pursuant to Conditions 16a and 17a attached to the planning permission for the redevelopment of C2 The Birtles, Wythenshawe. The development comprises 81 residential apartments with ground-floor commercial units and associated external works.

This report presents the acoustic treatment and noise insulation scheme for the development. Environmental noise and vibration surveys have been undertaken to quantify the existing acoustic environment, including the influence of road traffic, the Metrolink network and nearby commercial activities. The survey data has been used to inform acoustic modelling and assessments of noise ingress, vibration and ground-borne noise.

The assessment demonstrates that suitable internal noise levels can be achieved throughout the residential accommodation in accordance with BS 8233:2014, WHO guidance and Manchester City Council requirements through the use of appropriate glazing, façade constructions and mechanical ventilation. The proposed ventilation strategy also provides a suitable means of maintaining thermal comfort whilst controlling noise intrusion during periods of overheating.

Ground-borne vibration and noise associated with Metrolink operations have also been assessed and are predicted to be acceptable without the need for specific mitigation measures beyond normal good-practice building design.

The development does not comprise any inherently noisy uses. Appropriate acoustic separation has been specified between the commercial and residential elements of the scheme, together with robust external façade constructions, to control potential noise breakout.

On the basis of the assessments undertaken and the measures described within this report, the proposed acoustic treatment, noise insulation and ventilation strategy are considered sufficient to satisfy the requirements of Conditions 16a and 17a.

1. Introduction

Planning permission has been conditionally granted for the proposed development of C2 The Birtles, Civic Centre, Wythenshawe, Manchester M22 5RE ('the Site'). The proposal includes the erection of 81 no. residential apartments (Use Class C3a) with retail uses at ground floor (Use Class E), associated landscaping, servicing, car and cycle parking and other associated works following demolition of the existing buildings ('the Proposed Development').

Noise breakout from the Proposed Development is subject to the requirements of Condition 16. Noise intrusion to the residential areas of the Proposed Development is subject to the requirements of Condition 17.

This acoustic report is provided to present the noise breakout and intrusion from/to the Proposed Development and show compliance with the requirements of part a) of both Conditions 16 and 17.

As part of this assessment the following works have been carried out:

- A baseline environmental noise survey was undertaken to quantify the existing noise climate affecting the Site and NSRs.
- Measurements of ground-borne vibration were undertaken in multiple locations around the Site, including within the existing on-site building, to capture a representative sample of tram movements.
- Assessment of noise breakout from the uses within the Proposed Development, both to sensitive areas of the Proposed Development itself, and to nearby sensitive receptors.
- Calculations of internal noise levels within the residential dwellings have been undertaken to inform the façade sound insulation requirements and the design of appropriate ventilation strategies (with reference to BS 8233:2014 and WHO, 1999), which have been detailed..
- Assessment of noise impacts during controls implemented to address overheating.
- Calculations of tactile vibration and re-radiated noise levels during tram movements in the completed development have been conducted.

The language in this report is necessarily technical in nature. A glossary of the acoustic terminology used in this report is presented in Appendix A to aid the reader.

2. The Site and Proposed Development

2.1. Site Description

The Site is situated to the north of The Birtles, within Wythenshawe Town Centre. It currently comprises a vacant part-two, part-three-storey building with office space and storage uses and ground-floor retail. Directly to the north is public realm (used for the outdoor market); beyond that, a public footpath, Metrolink line and Poundswick Lane. To the west, the Site is bounded by a servicing area, beyond which runs the Metrolink line. To the south, it is bounded by a servicing area, electricity sub-station and existing retail units. To the east, the boundary adjoins The Birtles and further retail units.

A site location plan is provided as Figure 2-1, showing the Site's location and orientation with respect to other existing developments, transport links and noise survey measurement locations.

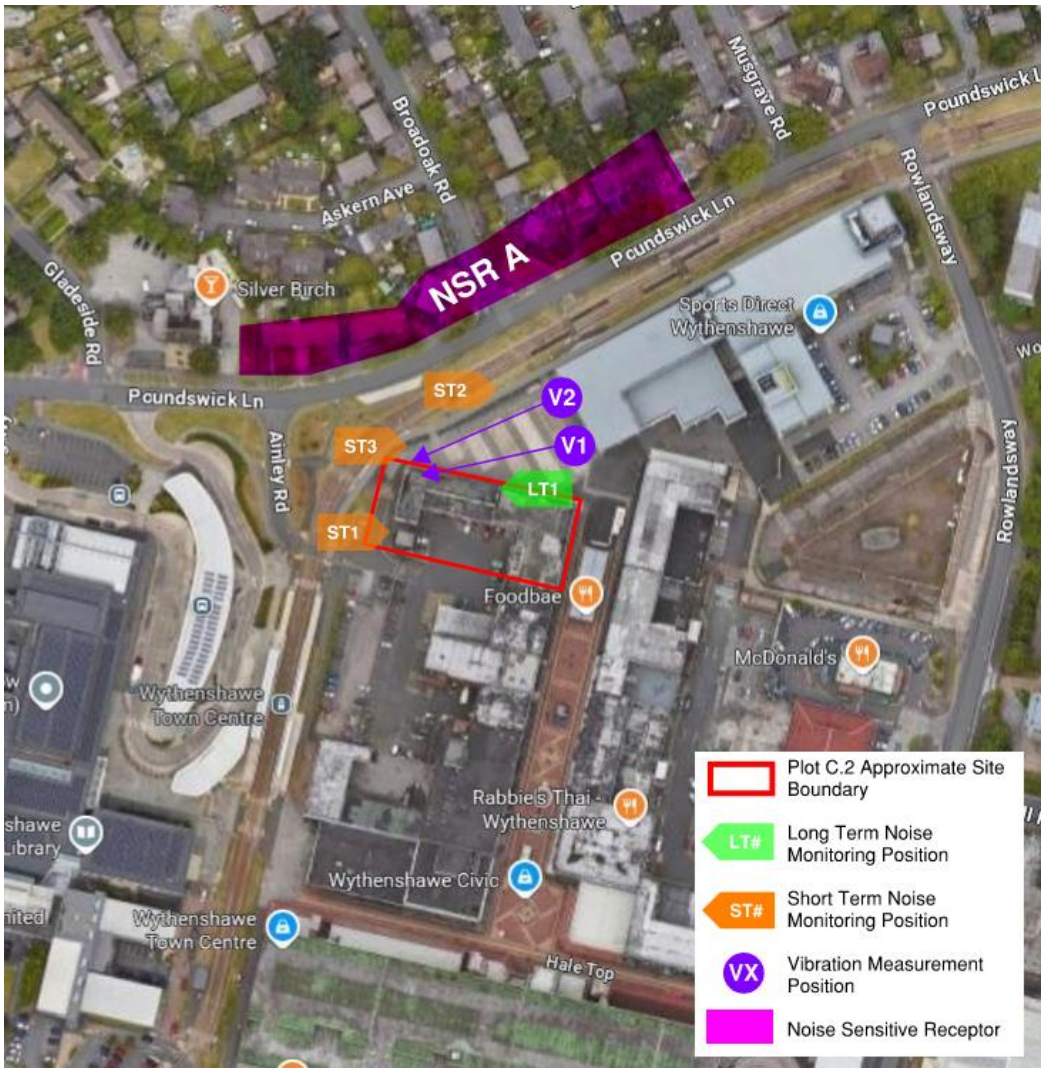


Figure 2-1: Site, Noise Sensitive Receptors and Measurement Locations

2.2. Noise Sensitive Receptors

The closest NSRs to the Site are described in Table 2-1 below and illustrated on the Site plan in Figure 2-1. Where a number of receptors are located close to each other, the nearest receptor to the Site is given to represent the immediate area.

Table 2-1: Noise Sensitive Receptors

Receptor Identifier (Figure 2-1)	Name	Type of Receptor	Approximate Distance from Site Boundary
NSR A	Properties north of Poundswick Lane	Residential	40m north

2.3. Proposed Development

The description of the Proposed Development is as follows:

"Erection of 81 no. residential apartments (Use Class C3a) with retail uses at ground floor (Use Class E), associated landscaping, servicing, car and cycle parking and other associated works following demolition of the existing buildings".

3. Planning Conditions

3.1. Condition 16

Planning condition 16 refers to breakout noise from the Proposed Development and reads as follows:

"*Notwithstanding the submitted noise impact assessment:*

a) Prior to the commencement of above ground works, the development hereby approved shall be acoustically insulated and treated to limit the break out of noise in accordance with a noise study of the buildings and a scheme of acoustic treatment that has been submitted to and approved in writing by the City Council as Local Planning Authority. The scheme shall be implemented in full before the buildings are occupied.

b) Prior to first occupation of the residential units, a verification report shall be submitted to validate that the work undertaken throughout the development conforms to the recommendations and requirements approved as part a) of this condition. The validation report shall also undertake post completion testing to confirm that the internal noise criteria have been met.

c) In the event of any non-conformity with the approved acoustic insulation scheme, then any further measures that are required to ensure conformity shall be carried out. Any required measures/mitigation shall continue until conformity has been achieved and agreed in writing by the City Council as local planning authority, prior to first occupation of the development."

The intention of this report is to provide the scheme of acoustic treatment in accordance with part a) of Condition 16.

3.2. Condition 17

Planning condition 17 refers to noise ingress from nearby environmental noise sources, and reads as follows:

"*Notwithstanding the submitted noise impact assessment:*

a) Prior to the commencement of above ground works a scheme for acoustically insulating the proposed residential accommodation against noise from the local traffic, nearby commercial units and Metrolink line 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 other local commercial/industrial premises.

The potential for overheating shall also be assessed and the noise insulation scheme shall take this into account. The approved noise insulation and ventilation scheme shall be completed before any of the dwelling units are occupied. Noise

survey data shall include measurements taken during a rush-hour period and night time to determine the appropriate sound insulation measures necessary.

b) Prior to first occupation of the residential units, a verification report shall be submitted to validate that the work undertaken throughout the development conforms to the recommendations and requirements approved as part a) of this condition. The validation report shall also undertake post completion testing to confirm that the internal noise criteria have been met.

c) In the event of any non-conformity with the approved acoustic insulation scheme, then any further measures that are required to ensure conformity shall be carried out. Any required measures/mitigation shall continue until conformity has been achieved and agreed in writing by the City Council as local planning authority, prior to first occupation of the development."

The intention of this report is to provide the scheme of acoustic treatment in accordance with part a) of Condition 17.

4. Assessment Criteria

When selecting appropriate criteria for assessment considering the requirements of Conditions 16 and 17, which don't refer to specific criteria, consideration was given to relevant planning policy and regulations, as follows:

- The National Planning Policy Framework (NPPF)[1];
- The Noise Policy Statement for England (NPSE)[2];
- The Noise Planning Practice Guidance[3];
- Places for Everyone Joint Development Plan[4];
- Manchester Core Strategy[5]; and
- MCC's Planning & Noise Technical Guidance document[6].

It should be noted that no specific numerical noise criteria are detailed in these documents.

With regard to acoustic design and noise control, the NPPF provides a set of overarching aims, broadly reflecting those already contained in the NPSE. They are directed towards the avoidance of significant adverse impacts and reduction of other adverse impacts on health and quality of life; set within the context of the Government's policy on sustainable development. The Places for Everyone Joint Development Plan Document is a long-term strategic spatial plan adopted by nine Greater Manchester local authorities to guide sustainable growth, housing, employment, and infrastructure development across the region up to 2039. MCC's Core Strategy says that all developments should have regard to noise and points to more detailed guidance that is provided in supplementary planning documents. These documents are described in further detail in Appendix B.

4.1. Residential Amenity – Internal Noise Levels

Internal noise levels throughout the development shall be designed to achieve the levels given in MCC's Technical Guidance, British Standard (BS) 8233:2014 'Guidance on sound insulation and Noise Reduction for Buildings'[7] and the World Health Organisation (WHO), 1999 'Guidelines for Community Noise'[8].

These levels form the basis of the assessment of site suitability for residential use. A summary of the guideline noise levels relevant to the Proposed Development

[1] Department for Communities and Local Government (DCLG) (2025); '*The National Planning Policy Framework*', TSO.
[2] Department for Environment, Food and Rural Affairs (DEFRA) (2010); '*Noise Policy Statement for England*', DEFRA.
[3] DCLG (2014); '*Planning Practice Guidance website*', DCLG. (http://planningguidance.planningportal.gov.uk/).
[4] Greater Manchester Combined Authority (GMCA) (Adopted March 2024); *'Places for Everyone Joint Development Plan Document'*, GMCA.
[5] Manchester City Council (MCC) (Adopted July 2012) '*Core Strategy Development Plan Document'*, MCS.
[6] Environmental Protection (2015); '*Planning & Noise Technical Guidance*', MCC.
[7] BSI (2014) '*BS 8233:2014 Guidance on sound insulation and noise reduction for buildings*', BSI.
[8] WHO (1999); '*Guidelines for Community Noise*', WHO, Geneva.

are presented in Table 4-1, whilst the guideline advice is described in detail in Appendix B.

Table 4-1: Internal Ambient Noise Level Limits

Location	Noise Level (dB $L_{Aeq,T}$)	
	Daytime	Night-time
Living Rooms	35	-
Dining Rooms	40	-
Bedrooms	35	30 & 45[1]

Notes: [1] The MCC Technical Guidance states that individual noise events should not normally exceed 45 dB L_{AFmax} by more than 10 times at night.

4.1.1. Noise Intrusion During Overheating Controls

In residential developments, industry best practice dictates that impacts on people's health from often-elevated noise levels during the use of thermal control measures, such as open windows, should be considered in design and mitigated against. This is recognised in the UK Building Regulations (Approved Document O - ADO), which provides statutory guidance with regards to overheating in residential developments. As part of the requirements, ADO specifies noise thresholds for bedrooms at night, above which windows are likely to be closed to provide suitable sleeping conditions. It can therefore be reasoned that a cooling strategy relying on open windows during the night-time would provide unsuitable living conditions in areas where these thresholds are exceeded.

The ADO noise threshold values are therefore adopted as limiting values where, if predicted to be exceeded with open windows, an alternative means of controlling thermal comfort will be required. These limits are presented below:

- 40 dB $L_{Aeq,8hr}$ (between 23:00 and 07:00)
- 55 dB L_{AFmax} more than 10 times a night (between 23:00 and 07:00).

The Acoustics, Ventilation and Overheating Guidance (AVO)[9] is not a statutory document, and is in some ways superseded by ADO, however it is understood that MCC do require the AVO guidance to be followed. AVO provides a risk-based approach in establishing likely impacts on building occupants from noise during periods of overheating. AVO has been considered in the definition of control measures, but only in the assessment of daytime noise impacts as these are not covered by ADO.

[9] ANC, IoA (2020); '*Acoustics Ventilation and Overheating - Residential Design Guide*' ANC.

4.2. Residential Amenity – Internal Vibration Levels

Assessment of site suitability in terms of residential amenity to vibration has been undertaken considering criteria defined within the MCC Technical Guidance, and using methodologies defined by BS 6472-1[10] and ANC Guidelines[11] on ground-borne noise. The MCC Technical Guidance refers to BS 6472-1 with regards to vibration.

To quantify the level of vibration and related effects on the Proposed Development correction factors were applied to measured baseline vibration levels to account for propagation of vibration from the ground to the proposed building and into apartments.

Ground-borne vibration from trams can manifest itself in buildings as both tactile vibration (vibration you can feel) and ground-borne noise (vibration you can hear). Both of these effects require consideration in the assessment of the suitability of a site for residential use.

4.2.1. Tactile Vibration

Tactile vibration can be assessed in accordance with the methodology in BS 6472-1, which provides procedures for assessing the potential human response to tactile vibration.

Vibration is assessed in terms of the equivalent vibration dose value (VDV in $m/s^{1.75}$). The guide VDVs set out in BS 6472-1 for evaluating the various probabilities of adverse comment within residential properties are presented in Table 4-2.

Table 4-2: Internal Ambient Noise Level Limits

Period	VDV Levels ($m/s^{1.75}$) Above Which Adverse Comment May Occur			
	Adverse Comment Not Expected	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable
Daytime (07:00 to 23:00)	≤0.2	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Night-time (23:00 to 07:00)	≤0.1	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

[10] BSI (2008); BS 6472-1 '*Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting*', BSI, London.

[11] Association of Noise Consultants (ANC) (2012); '*Measurement and assessment of ground-borne noise and vibration*', ANC.

4.2.2. Ground-borne Noise

There is currently no international or British Standard which provides guidance for assessing the impact of ground-borne noise from railways on the occupants of a building. The MCC Technical Guidance highlights that ground-borne noise may need to be considered but stops short in providing criteria.

The ANC Guidelines on ground-borne noise and vibration are generally used as the basis of assessments such as this. The ANC Guidelines provide discussion on the relevant research that has been carried out, and a summary of typically adopted criteria. It should be noted that most of this research relates to residential accommodation, and is aimed at providing good sleeping/resting conditions.

Considering the regularity of tram passes (approximately every 10 minutes in each direction), and the likely sensitivity of occupants, structure-borne noise is limited to a level less than 40 dB L_{ASmax} for apartments.

5. Baseline Conditions

5.1. Environmental Noise Survey

In support of the planning application for the Proposed Development, a comprehensive baseline noise survey was undertaken at the Site to establish and quantify the existing noise climate at, and within the vicinity of, the Site.

Long-term unmanned environmental noise measurements were undertaken at a single, fixed monitoring position around the Site between Friday 12th and Wednesday 17th September 2025. The survey period was considered to be appropriate in capturing typical noise conditions around the Site and surrounding areas. Attended, short-term environmental noise measurements were undertaken on Friday 12th September 2025 to determine the variation of noise around the Site from dominant sources of noise.

The measurement positions are shown on Figure 2-1 and described in Table 5-1.

Table 5-1: Description of Noise Measurement Positions

Position	Description	Observations and Predominant Noise Sources
LT1	Façade position, sound level meter located on north façade of the current building out of the 2nd floor window.	Daytime noise climate noted to be dominated by tram noise from the Metrolink line to the north-west, and road traffic noise on Poundswick Lane. Occasional aircraft movements to and from Manchester Airport were audible, as well as noise from passing pedestrians.
ST1	Free-field position at southwest corner of the Site adjacent to the entrance of The Birtles' service yard.	Daytime noise climate noted to be dominated by tram noise and noise from buses passing through the nearby bus station to the west. Distant road traffic noise from the local road network, pedestrians and occasional aircraft movements to and from Manchester Airport were audible. Noise from the service yard was minimal, and the servicing will be significantly reduced from the current size following the introduction of the Proposed Development.
ST2	Free-field position north of the Site boundary next to the tram tracks.	Daytime noise climate noted to be dominated by tram and road traffic noise on Poundswick Lane. Occasional aircraft movements to and from Manchester Airport were audible, as well as noise from passing pedestrians.

ST3	Free-field position at northwest corner of the Site boundary.	Daytime noise climate noted to be dominated by tram and road traffic noise on Poundswick Lane. Occasional aircraft movements to and from Manchester Airport were audible, as well as noise from passing pedestrians.

All noise measurements were taken with calibrated precision grade (Class 1) frequency (one-third- octave band) sound level meters to provide a detailed description of the prevailing environmental noise characteristics. The sound level meters were set-up to record over consecutive 15-minute periods the L_{eq}, L_{90}, L_{10} and L_{max} noise indices in the A-weighting network over a 125 ms fast response time constant interval for the duration of the survey. The indices are described in Appendix A, but roughly translated they describe in turn the average, background, road traffic and maximum noise level.

Full details of the instrumentation used for the noise measurements, including calibration certificates are available on request.

Weather conditions, whilst not actively measured during the survey period, were monitored remotely throughout. Weather conditions were ideal for the measurement of noise except for on the 15th September between 6am-7pm, where high wind speeds (up to 13 ms^{-1}) occurred. Data from these periods was reviewed and still considered suitable for inclusion in the dataset.

5.1.1. Noise Survey Results

The full results of the long-term noise measurements are displayed graphically in time-history format in Appendix C, whilst a summary of the measured daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) noise levels for the survey periods is provided in Table 5-2.

Table 5-2: Summary of Baseline Noise Monitoring Results

Position	Period	Duration	$L_{Aeq,T}$ dB	$L_{A10,15min}$ dB	$L_{A90,15min}$ dB	$L_{AFmax,30s}$ dB
			Ave[1]	Ave[2]	10th %ile[3]	10th highest[4]
LT1[5]	Day	16 hours	59	61	47	83
	Night	8 hours	54	55	40	77
ST1	Day	20 minutes	62	60	54	72[6]
ST2	Day	20 minutes	63	63	54	76[6]
ST3	Day	20 minutes	64	63	54	83[6]

Notes: [1] Logarithmic average over the day/night survey periods; [2] Arithmetic average over the day/night survey periods; [3] 10th percentile L_{A90} noise levels considered to represent typical lowest background levels, whilst discounting absolute minima. [4] Highest L_{AFmax} value that occurs between 10-15 times in a single night-time period. All figures rounded to nearest whole decibel. [5] Measured façade noise levels have been reduced by 2 dB in accordance with BS 8233:2014 to correct for reflections from the existing façade and provide free-field results; [6] 95th percentile L_{AFmax} noise level provided to represent typical maximum noise from discrete events, whilst discounting absolute maxima. This is provided for information only.

5.2. Vibration Survey

Attended vibration measurements were undertaken on Friday 12th September 2025 at two positions on the Site. The purpose of the measurements was to determine the spatial variation of tram-induced ground-borne vibration from trams which run on the Metrolink line directly north and west of the Site. The vibration measurement locations are indicated on Figure 2-1.

Position V1 was located inside the existing building at first-floor level, and therefore is considered representative of the likely vibration intrusion expected in the new proposed building. Position V2 was at ground level, external to the building to give an indication of the external level before transfer into the building structures.

Vibration measurements were taken over 50-minute periods at each location to quantify the magnitude of ground-borne vibration from a representative sample of tram events (5 at each position in each direction). Measurements were taken using a calibrated RION VM-56 vibration meter (SN 680015) with a tri-axial accelerometer fixed to a DIN plate. The meter was set-up to continuously record vibration levels for each axis every 100 ms to enable the measurement data to be analysed and individual tram events to be isolated.

5.2.1. Vibration Survey Results

The highest measured RMS acceleration levels at each measurement position are presented in Figure 5-1 below. Data analysis shows vibration in the vertical (z-axis) is notably higher than in the horizontal axis (x & y), which is typical for vibration caused by tram movements. Consequently, only results from the z-axis results are presented.

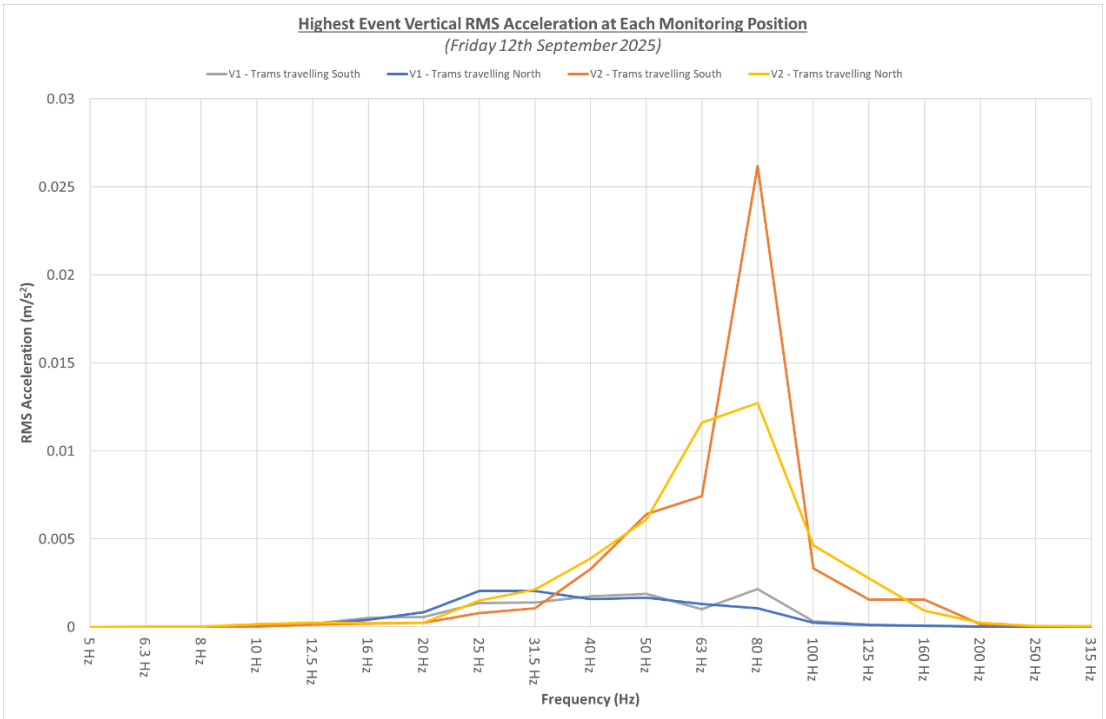


Figure 5-1: Highest Event Vertical (Z-Axis) RMS Acceleration at Each Monitoring Position

6. Condition 16a – Breakout Noise

The Proposed Development does not comprise any inherently noisy uses. Potential noise breakout sources are limited to the ground floor retail units.

As the proposed commercial units are currently shell-and-core and future occupiers have not yet been identified, it is not possible at this stage to undertake a detailed assessment of operational noise emissions associated with specific tenant activities. A precautionary acoustic design approach has therefore been adopted.

6.1. Retail Units to Apartments within the Proposed Development

The design specifies a minimum airborne sound insulation performance of 50 dB $D_{nT,w}+C_{tr}$ between retail units and residential accommodation together with enhanced floor constructions and façade flanking requirements. The performance requirement has been selected to provide robust separation between the commercial and residential uses and is consistent with the level of performance typically adopted where commercial premises are located directly beneath residential accommodation. This level of performance is expected to control speech, customer activity and normal operational noise from future retail occupiers.

The acoustic design has also established indicative operational noise limits for future retail occupiers. Any tenant proposing activities with higher noise emissions would be required to provide additional acoustic mitigation as part of their fit-out works.

6.2. Retail Units to Sensitive Receptors

The non-glazed façade to retail units is specified to achieve 60 dB R_w+C_{tr}, with glazing and external doorsets achieving 35 R_w+C_{tr}.

The combination of the specified façade constructions and future tenant noise control requirements is expected to be sufficient to minimise noise breakout from the development and protect existing nearby NSRs. Any future retail occupier proposing plant, amplified sound, music or other potentially significant noise sources will be required to demonstrate compliance with relevant acoustic criteria and implement additional mitigation where necessary.

6.3. Residential Noise

The residential accommodation itself is not expected to generate significant environmental noise and the proposed façade constructions would provide substantial attenuation of normal residential activity.

6.4. Condition 16a Summary

Accordingly, the measures described above comprise the acoustic treatment scheme for the Proposed Development and are considered sufficient to limit noise breakout from the approved uses in accordance with the requirements of Condition 16a.

7. Condition 17a – Noise Intrusion

7.1. Noise Model

Owing to the complexity of the interaction between the Proposed Development, existing building structures and existing and future noise sources, a three-dimensional noise model of the Site has been prepared using the acoustic software package CadnaA. The model has been used to predict and help illustrate the levels of noise at the different residential building façades of the Development. The model was constructed using architectural plans, elevations and section drawings. The results of the model were calibrated by comparing modelled results with monitored noise levels to give confidence in the accuracy of the modelling results.

The model was first calibrated using the existing Site layout and baseline measured noise levels. The expected noise levels on the Proposed Development were then assessed by adding in the proposed building.

Modelled noise contour plots showing predicted ambient (L_{Aeq}) daytime (07:00-23:00) and night-time (23:00-07:00) noise levels across the Proposed Development are presented in Appendix D. The different coloured noise contours correspond to different levels of noise exposure, with the highest exposures relating to where the Proposed Development faces north-west adjacent to the Metrolink tram tracks.

7.2. Environmental Noise Intrusion

The degree of environmental noise intrusion to residential areas depends on the acoustic performance of all elements of the façade but is generally determined by the components providing the least airborne sound insulation, in this case the glazing.

The glazing performance requirements are dependent on the use type, what percentage of the façade is glazed, the frequency composition of noise incident on the façade and the ventilation strategy.

Calculations have been undertaken to determine the sound insulation performance requirements of the glazing for the residential façades exposed to the highest noise levels. The calculations adopt the detailed methodology set out in BS 8233:2014 and are based on the following assumptions:

- The determined $L_{Aeq,16hr}$ daytime, and $L_{Aeq,8hr}$ and L_{AFmax} night-time (10^{th} highest) values incident on the façades. While noise levels during rush hour were considered, it is important to note that it was the night-time L_{AFmax} level that dictated the façade performance, rather than diurnal variations in traffic noise.

- The internal finishes of the room will affect the reverberant component of the overall noise level, with a degree of soft furnishing assumed in the calculations. All walls and ceilings are assumed to be plastered and painted.
- The external wall achieves a minimum required performance of R_w+C_{tr} 40 dB. Note, this performance would also apply to the roof of the building.
- Room dimensions, opaque external wall areas, and glazing areas have been taken from the latest drawings provided by the Architect.
- It is understood that mechanical ventilation is proposed.

Table 7-1 below presents the minimum façade sound insulation specifications for the glazed areas of the external façades. This is included within Contractual documents and represents a requirement for the glazing sub-contractor to achieve in their selection.

Table 7-1: Façade Sound Insulation Performance of Glazing

Elevation	Minimum Sound Reduction (R) per Octave Band Freq (Hz)								R_w+C_{tr} (dB)	Example Glazing (mm)
	63	125	250	500	1k	2k	4k	8k		
South, West and North	19	27	29	36	41	42	52	52	35	10/12/6.4 Laminated
East	19	25	22	33	40	43	44	44	30	10/12/4

Provided that the glazing system as a whole (including framing, seals, openable lights etc.) meets or exceeds the stipulated 1/1 octave band spectrum performance specified in Table 7-1 then the noise ingress requirements of MCC are expected to be met.

7.2.1. Non-Glazed Façade

The apartment façades are proposed to comprise the following:

102.5 mm brickwork (assumed minimum density 1,600 kg/m³), 50 to 162.5 mm cavity, breather membrane, 100 mm rainscreen insulation, 12 mm sheathing board (assumed minimum mass 7 kg/m²), 150 mm stud with full filled insulation, 2x12.5 mm plasterboard (assumed minimum mass 8 kg/m² per board)

This has been assessed using acoustic software Insul to predict the performance, showing a performance of at least R_w+C_{tr} 60 dB to be achieved, which would meet the required performance.

7.2.2. Internal Noise Levels

Following implementation of the above scheme of façade design measures, the noise levels in Table 7-2 are expected within the apartments. These are all within the residential design requirements.

Table 7-2: Expected Noise Intrusion Levels

Elevation	Room	Parameter	Highest Expected Noise Level at Façade	Target	Expected Internal Noise Level
South, West and North	Living / Dining	Daytime $L_{Aeq,16hr}$	63 dB	≤35 dB	29 dB
	Bedroom	Daytime $L_{Aeq,16hr}$	63 dB	≤35 dB	26 dB
		Night-time $L_{Aeq,8hr}$	59 dB	≤30 dB	21 dB
		Night-time L_{AFmax}	82 dB	≤45 dB	43 dB
East	Living / Dining	Daytime $L_{Aeq,16hr}$	43 dB	≤35 dB	10 dB [1]
	Bedroom	Daytime $L_{Aeq,16hr}$	43 dB	≤35 dB	9 dB [1]
		Night-time $L_{Aeq,8hr}$	37 dB	≤30 dB	3 dB [1]
		Night-time L_{AFmax}	75 dB	≤45 dB	39 dB

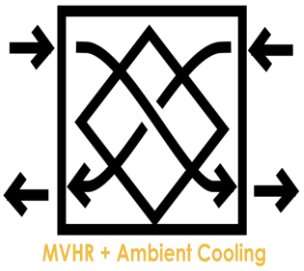
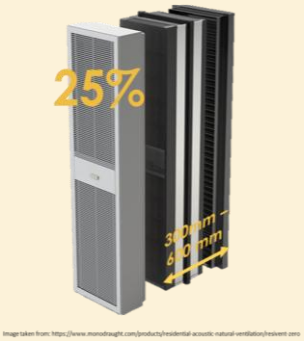
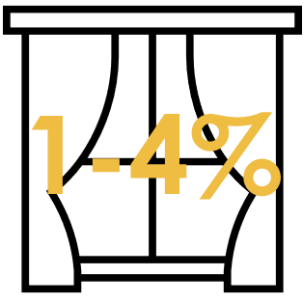
Notes: [1] While the assessment based on noise modelling alone shows ambient levels to be particularly low in apartments at the eastern façade, it is considered that the façade performance specified is high enough so as to provide occupants with a robust base level of sound insulation from transitory noise sources (e.g. passing pedestrians) that were not able to be captured within the modelling due their irregular and inconsistent nature.

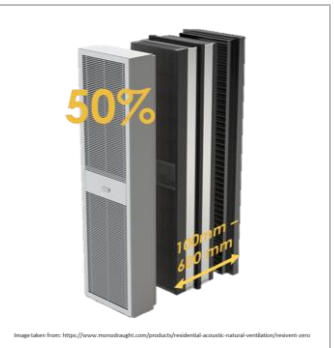
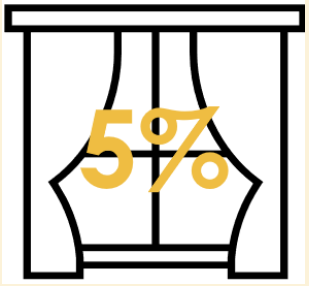
7.2.3. Noise Intrusion During Overheating Controls

To assess the suitability of cooling controls with respect to their potential to control noise ingress, categories have been developed for external façade noise levels at which different overheating control options are likely to be suitable. These thresholds consider the guidance in ADO and AVO, with ADO taking precedence where appropriate. Table 7-3 presents the noise risk categories and

associated recommendations. The values are based on the Site being in a 'Medium' risk of overheating location, as per the definitions in ADO.

Table 7-3: Noise Risk Categories - Periods of Overheating

HM Risk Rating	External Noise Levels (dB)[1 + 2]	Guidance	
High	>65 $L_{Aeq,16hr}$ Daytime >60 $L_{Aeq,8hr}$ Night-time >75 L_{AFmax} Night-time	Overheating controls will require active systems, such as ambient or comfort cooling. This is because passive ventilators are unlikely to provide sufficient noise reduction whilst allowing enough airflow to control overheating.	
Moderate	61 – 65 $L_{Aeq,16hr}$ Daytime 56 – 60 $L_{Aeq,8hr}$ Night-time 71 – 75 L_{AFmax} Night-time	Overheating controls likely to require high-performing acoustic vent panels with circa 25% free area with 300mm to 600mm long internal attenuator. Mechanical system should be considered. Detailed analysis recommended if passive measures are desirable.	
Low	55 – 60 $L_{Aeq,16hr}$ Daytime 50 – 55 LAeq,8hr Night-time 65 – 70 L_{AFmax} Night-time	Ventilation panels with circa 50% free area likely to be acceptable, with a 100mm to 600mm long internal attenuator. Detailed analysis recommended if passive measures are desirable. Alternatively, an open window strategy can be used if the window opening area assumed	

		in calculation is limited to be 'slightly open'[3].	
Negligible	<55 $L_{Aeq,16hr}$ Daytime <50 $L_{Aeq,8hr}$ Night-time <65 L_{AFmax} Night-time	No action required, noise levels with openable window strategy expected to be suitable, assuming overheating can be controlled through a window opening of no more than 5% of the floor area.	

Notes: [1] The assumptions made to give the assumed outside-to-inside level difference are: 2.4m bedroom height; 0.5s bedroom reverberation time; simple hole in the façade of area sufficient to provide the required equivalent area; no sound transmission other than via the opening. [2] Where L_{AFmax} noise levels are referenced, these limits shall not be exceeded more than 10-15 times per night. [3] Slightly open is defined as an area of window opening to provide a 10-15 dB outside-to-inside reduction, typically achieved by an equivalent open area of 1-4% of the room's floor area.

7.2.3.1. Overheating Control Findings

The results of the environmental noise modelling have been used to assess the Proposed Development against the categories in Table 7-3. A risk rating markup for each façade is provided in the figure in Appendix E.

The majority of the façades of the Proposed Development are in the high (red) or moderate (orange) category, meaning that active systems will be required for the control of overheating. The eastern façade is in the negligible category however, so if desirable air could be drawn in naturally via this façade to service apartments, but there is limited area available.

7.2.3.2. Overheating Control Strategy

A detailed overheating assessment was undertaken by TACE in accordance with CIBSE TM59 using dynamic thermal modelling, which demonstrated that the Proposed Development achieves compliance with TM59 overheating criteria.

The assessment considered the proposed building fabric performance, glazing specification, solar gains, internal heat gains, occupancy patterns and ventilation strategy using the mandatory Manchester DSY1 2020 High Emissions 50% percentile weather file.

The overheating assessment was undertaken in conjunction with the acoustic assessment, which identified that the majority of residential façades are exposed to environmental noise levels falling within the "Moderate" or "High" overheating noise-risk categories. As a consequence, reliance on unrestricted open windows during periods of overheating would not provide acceptable internal acoustic conditions.

The design therefore adopts a mechanical ventilation strategy to ensure that overheating can be controlled whilst maintaining acceptable internal noise levels.

The approved overheating mitigation strategy comprises:

- Whole-dwelling MVHR systems serving all apartments.
- Mechanical supply ventilation to bedrooms.
- Additional bedroom extract ventilation where required by the TM59 assessment.
- Restriction of night-time window opening on acoustically exposed elevations.

Specifically, the TM59 assessment assumes that windows to the north, south and west elevations remain closed during night-time periods due to environmental noise exposure. Thermal comfort is maintained through the mechanical ventilation strategy, including supplementary bedroom extract ventilation where required.

7.3. Vibration

To assess the possibility of vibration being of issue the measured baseline survey results (presented in Section 5.2) have been used to predict vibration effects based on amplification factors taken from ANC Guidelines, applied as appropriate to the external and internal measurement data. The transfer functions take into account the coupling of the soil to building foundations, the vertical attenuation through the structure and the resonance of the floor system in 1/3 octave frequency bands, as appropriate to the measurement location in comparison to the receiver.

The worst-affected apartments would be expected to be at first floor, due to the amplification potential of a suspended slab, where vibration was measured in the existing building.

7.3.1. Tactile Vibration

The overall estimated Vibration Dose Value (eVDV) for the 16-hour daytime period ($eVDV_{day}$) and 8-hour night-time ($eVDV_{night}$) period has been predicted within the closest residential room spaces (Ground floor apartments) to the source (the Metrolink Line), and at the first suspended floor slab (Level 1 apartments).

The calculations account for the following regularity of trams, which are based on tram timetables reviewed on 22nd September 2025:

- Daytime (07:00 to 23:00) – 96 tram passes (assumed 10 second pass-by time)
- Night-time (23:00 to 07:00) – 22 tram passes (assumed 10 second pass-by time)

The predicted eVDVs have been compared to the BS 6472-1 likelihood of adverse comment criteria. The assessment results are presented in Table 7-4.

Table 7-4: Predicted Vibration Dose Values and Corresponding Effect

Location	Period	Predicted eVDV ($m/s^{1.75}$)	BS 6472-1:2008 Semantic Rating
Ground Floor Apartments	Daytime	0.053	Adverse Comment Not Expected
	Night-time	0.036	Adverse Comment Not Expected
Level 1 Apartments	Daytime	0.038	Adverse Comment Not Expected
	Night-time	0.026	Adverse Comment Not Expected

Vibration levels as detailed in Table 7-4 in the worst affected apartments fall below the threshold criteria for 'low probability of adverse comment' set out in BS 6472-1. No specific mitigation is therefore necessary to control tactile vibration.

7.3.2. Ground-borne Noise

Predictions of the ground-borne noise within the worst affected residential apartments of the Proposed Development have been made using guidance provided by the ANC Guidelines, and transfer functions as detailed above.

The predicted ground-borne noise levels during the highest measured tram passes within the existing building, with the worst-case transfer functions applied, are a maximum of 22 dB L_{ASmax} and 26 dB L_{ASmax} at Ground Floor and Level 1 apartments respectively. This is a worst-case of 19 dB below the adopted criteria of 40 dB L_{ASmax} in residential properties.

The predicted ground-borne noise levels during the highest measured tram passes external to the existing building, with the worst-case transfer functions applied, are a maximum of 32 dB L_{ASmax} and 40 dB L_{ASmax} at Ground Floor and Level 1 apartments respectively. This is equal to the limit set for ground-borne noise in apartments, and considering that the proposed building is set further back from the tramlines than the measurement position by 4 m, and considering the significantly lower actual levels measured in the existing building, no mitigation to control ground-borne noise is considered necessary.

Considering that there is a significant reduction in level once the vibration has entered the existing building and transferred to first floor, the design of the new building has therefore considered the structural response of the existing building and has been designed to align with this to attenuate vibration through good design.

The structural engineer has stated the following:

"The existing structure is understood to comprise a reinforced concrete frame. Upper floor and roof slabs comprise precast concrete planks supported on reinforced concrete beams, which are in turn supported by reinforced concrete columns.

The new building structure is to comprise reinforced concrete framed construction with insitu flat upper floor and roof slabs supported by columns – this structure is to be separated from the existing [retail] unit which is to be retained. As such, the new structure should not induce any level of vibration response which is significantly dissimilar to that of the existing building."

7.4. Condition 17a Summary

The assessment demonstrates that the proposed acoustic insulation, glazing and ventilation specifications are capable of controlling noise intrusion from road traffic, the Metrolink line, nearby commercial uses and other environmental noise sources affecting the Site. Accordingly, the measures described above comprise the noise insulation and ventilation scheme for the Proposed Development and are considered sufficient to satisfy the requirements of Condition 17a.

Appendix A – Acoustic Terminology

The table below provides a layperson's explanation of the acoustics terms that commonly appear in reports. It is not intended to give full scientific definitions and explanations or go into detail on how and why things are as they are. Some obsolete terms and abbreviations have been included as they still appear in documents from time to time.

Term	Description
Decibel, dB	The decibel is a logarithmic unit of measurement used for quantifying sound. It is derived from the logarithm to base 10 of the ratio of two quantities. Use of a logarithmic scale has the advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers.
Frequency, Hz	In sound, the number of cycles per second of a pressure fluctuation and frequency in sound is proportional to its pitch. Different frequencies are divided into octave and one third octave bands.
Sound Pressure Level, *Lp*	This is the unweighted or linear level which is measured prior to any weightings being applied. The sound pressure level is 20 times the logarithm to base 10 of the ratio of the reference sound pressure ($2x10^{-5}$) and the measured sound pressure.
Sound Power Level, L_W	This is the total sound energy radiated from a given source. The sound power Level is 10 times the logarithm to base 10 of the ratio of the reference sound power level ($1x10^{-12}$) and the measured power.
Frequency Weightings	Weightings can be applied to a spectrum of sound and act as a filter to account for different sensitivities and conditions.
Time Weightings	A time weighting to denote the response of the sound level meter. For most measurements the Fast time weighting is selected (F) however, a slow time weighting (S) is often used to for the measurement train noise and vibration.
A-weighted sound pressure level, L_{pA}	The sound pressure level with the A-weighting applied. The A-weighting is used for most environmental noise measurements and is used to weight a spectrum of sound to match the sensitivity of the human ear.
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	The L_{Aeq} is an energy average and defined as the level of sound which, over a given period of time, would equate to the same A-weighted sound energy as the actual fluctuating sound.
Octave Bands	A band of frequencies in which the upper limit of the band is twice the frequency of the lower limit.
Maximum noise Level, L_{AFmax}	The maximum instantaneous noise level measured during a given period of time. The time weighting to which the meter is set for this measurement parameter is always indicated by either an F or S.
Minimum Noise level, L_{AFmin}	The minimum instantaneous noise level measured during a given period of time. The time weighting to which the meter is set for this measurement parameter is always indicated by either an F or S.
Percentile level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting F, which is exceeded for N% of a specified time interval. An example of this is background noise which is quantified with the L_{A90} descriptor, which is the A-weighted level which is exceeded for 90% of the measurement period.
Sound exposure level L_{AE}	A level of a sound, of 1 s duration, that has the same sound energy as the actual noise event considered.

Term	Description
Rating Level, $L_{Ar,Tr}$	The equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise.
Ambient Noise Level	The noise level in a given environment whilst it is subject to all of its normal sources of noise.
Background Sound / Noise Level, L_{A90}	These are amongst the lowest noise levels measured over a given period of time and exclude short term, intermittent noise sources. The background noise level is quantified by the L_{A90} descriptor and is therefore the level which is exceeded for 90% of a given period of time.
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.
Absorption, A	The acoustic absorption derived from the multiplication of the absorption coefficient by the surface area of a given material.
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
Sound Reduction Index, R	The laboratory measured sound insulation properties of a material or building element in octave or third octave bands.
Weighted Sound Reduction Index, R_w	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.
Weighted Level Difference, D_w	The weighted level difference between a pair of rooms, stated as a single figure.
Standardized Weighted Level Difference, $D_{nT,w}$	The standardized, weighted difference in sound level between a pair of rooms, stated as a single figure. The level difference in octave bands is first normalized to a reference reverberation time and then plotted against a set of reference curves to establish a single figure value.
Weighted, Normalised Flanking Level Difference, D_{nFw}	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.
Normalised Element Level Difference D_{ne}	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.
Weighted, Normalised Element Level Difference, D_{new}	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.
C_{tr}	A correction term applied to the sound insulation single-number values (R_w, D_w, and $D_{nT,w}$). Applying the C_{tr} penalises a construction's performance if its low

Term	Description
	frequency performance is poor in relation its performance at higher frequencies.
Impact Sound	The noise generated by an impact on a structure. This is normally used to describe the noise created by people walking on a floor structure.
Weighted standardized impact sound pressure level, $L_{nT,w}$	A single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Cross-talk	Noise transmission between one room and another room or space via a duct or other path.
Insertion Loss, IL	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.
Dynamic Insertion Loss, DIL	The reduction of noise level due to the presence of a noise control device such as an attenuator, including any regeneration noise created by its presence.
NR	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.
Vibration	The vibratory motion of a surface can be characterised by: (a) displacement (m), (b) velocity (m/s), or (c) acceleration (m/s^2). The magnitude of the vibration can be quantified in several ways: **Peak to Peak** - The total excursion of the oscillation about the zero datum. **Peak** - This value gives the maximum excursion of the oscillation above or below the zero datum. **r.m.s.** - This value gives the root mean square of the time history over a specific time interval (time constant). **dB** - Vibration levels can be expressed in dB. A reference level of 10-6 m/s^2 r.m.s. is usually used for acceleration.
Ground-borne noise	Audible noise caused by the vibration of elements of a structure, for which the vibration propagation path from the source is partially or wholly through the ground
Structure borne noise	Audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements.
V.D.V,	The VDV is the Vibration Dose a person is expected to be exposed to over the course of the day or night. The VDV is given by the fourth root of the time integral of the fourth power of the acceleration after it has been frequency-weighted.
eVDV	The estimated vibration dose value based on short duration measurements of transients with known durations and occurrences

Appendix B – Planning Policy and Noise Guidelines

The various policies and guidelines which have been consulted in this report are summarised below. These have been used for the purposes of establishing the impact of the Site on the existing environment and amenity of residents in the local area.

Control of Pollution Act 1974

The Control of Pollution Act 1974[12] gives local authorities special powers for controlling noise and vibration arising from construction and demolition works. These powers may be exercised either before or after works have been started.

Section 60 enables the local authority of an area in which works are scheduled or currently underway, to serve a notice of its requirements for the control of construction site noise/vibration on the person who appears to the local authority to be undertaking the works.

Section 61 provides a mechanism for the contractor or developer to take the initiative in approaching the local authority to ascertain its noise/vibration requirements before construction work starts.

The Act also covers Noise Abatement Zones, Codes of Practice and Best Practicable Means (BPM) regarding noise pollution.

Environmental Protection Act 1990, Part III

Section 79 of the Environmental Protection Act 1990[13] defines statutory nuisances and the requirement for local authorities to inspect their area for statutory nuisances, taking such steps as are reasonably practicable to investigate any complaint of a statutory nuisance.

Section 80 of the act gives local authorities the right, where a statutory nuisance exists or is likely to be caused, to serve an abatement notice requiring the abatement, prohibition or restriction of the nuisance.

Section 82 of the act allows a person aggrieved by a statutory nuisance to make a complaint to a Magistrates Court in an attempt to seek an abatement notice served on the person responsible for the nuisance.

Planning Policy

Planning policy at the national, regional, county and local level relevant to the Proposed Development is discussed below.

National Policy

National Planning Policy Framework

The National Planning Policy Framework (NPPF) seeks to contribute to and enhance the natural and local environment, including preventing new and existing developments from

[12] Her Majesty's Stationery Office (1974); '*Control of Pollution Act 1974*', HMSO, London.
[13] DEFRA (1990); '*Environmental Protection Act Part III*', DEFRA, 1990.

contributing to, and/or, being put at an unacceptable risk from noise pollution. In support of this, paragraph 191 of the NPPF states that:

"*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*".

Noise Policy Statement for England, March

The Noise Policy Statement for England (NPSE) was published in March 2010 by the Department for Environment, Food and Rural Affairs (DEFRA) and forms the overarching statement of noise policy for England. It sets out the long-term vision of Government noise policy, which is to:

"*Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.*"

The policy aims, through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development, to:

- Avoid significant adverse effects on health and quality of life;
- Mitigate and minimise adverse effects on health and quality of life; and
- Where possible, contribute to the improvement of health and quality of life.

The NPSE sets out three terms with regard to noise effects:

- No Observed Effect Level (NOEL) – the level below which no effect can be detected and below which no detectable effect on health and quality of life due to noise can be established;
- Lowest Observed Adverse Effect Level (LOAEL) – the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL) – the level above which significant adverse effects on health and quality of life occur.

The above terms are not defined numerically in terms of absolute levels within the NPSE which acknowledges that these will change depending on, but not limited to, the noise source, the receiver type and the time of day/day of week.

Local Policy

Planning Consultation Guidance Note

MCC provide the Planning Consultation Guidance Note – Noise and Vibration document, which provides guidance to MCC environmental control and protection officers on what to consider when reviewing planning applications and making recommendations related to noise and vibration. This includes specific criteria relevant to the Proposed Development, which is referenced in this Report.

Guidance

Where detailed guidance is not contained in the documents described above, the most appropriate Standards and guidance have been adopted in the prediction and assessment of noise and vibration impacts.

The following documents are appropriate to the measurement of baseline noise levels and assessing noise of an industrial nature emanating from existing, new or proposed commercial premises:

- BS 7445-1:2003 'Description and Measurement of Environmental Noise'[14], defines parameters, procedures and instrumentation required for noise measurement and analysis.
- British Standard 4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound' describes methods for rating and assessing sound of an industrial and/or commercial nature for the purposes of: (a) investigating complaints, (b) assessing sound from proposed, new, modified or additional sources of sound of an industrial/commercial nature, and, (c) assessing sound at proposed new residential premises, with a view to determining the likelihood and degree of adverse impact, having regard to the context in which the sound occurs.

The following documents are appropriate when assessing noise affecting proposed new and existing development:

- National Planning Practice Guidance (NPPG) was released in March 2014 by the Department for Communities and Local Government (DCLG) and is a web-based resource to support the NPPF. NPPG 'Noise' outlines qualitatively when noise could be a concern, stating: "*Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment...*".

[14] British Standards Institution (2003); '*BS 7445-1:2003 Description and Measurement of Environmental Noise*', BSI Standards Limited, London.

Advice is provided concerning noise exposure and its effects and puts into context the advice stated within the NPSE. Table B.1 presents the qualitative guidance concerning the Noise Exposure Hierarchy, based on the likely average response, as set out in NPPG and with reference to the NPSE.

Table B.1: Noise Exposure Hierarchy Based on the Likely Average Response

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level (LOAEL)	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television, speaking more loudly; where there is no alternative, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during noticeable periods of intrusion, where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep; disruptive/premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect (SOAEL)	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically	Unacceptable Adverse Effect	Prevent

Perception	Examples of Outcomes	Increasing Effect Level	Action
	definable harm, e.g. auditory and non-auditory.		

- The Institute of Environmental Management and Assessment (IEMA) 'Guidelines for Environmental Noise Assessment' 2014[15] addresses the key principles of assessing noise effects and are applicable to all development proposals where noise effects may occur.
- The guidance provides advice with regards to the collection of baseline noise data, prediction of noise levels and how noise should be assessed. The guidance recognises that the effect associated with a particular noise source will be dependent on a number of factors including, but not limited to, the sensitivity of the receptor, frequency and duration of the noise source and time of day. However, it stops short of providing specific assessment criteria which developments should achieve but instead suggests that the methodology adopted should be selected on a site by site basis with reference to relevant national and local standards.
- World Health Organisation (1999) 'Guidelines for Community Noise' provides guidance on desirable levels of noise structured according to specific environments to ensure the critical effects of noise on sleep, annoyance and speech interference are guarded against. One of the tenets of the WHO guidelines is the protection of the most vulnerable and sensitive of the population, with the WHO guideline values for environmental noise set at the level of the lowest adverse health effect below which the occurrence rates of particular 'effects' can be assumed to be negligible.
- The WHO recommends specific internal noise levels that will provide an acoustic environment that is conducive to uninterrupted speech and sleep, whilst daytime external noise limits aim to prevent the majority of the population being moderately or seriously annoyed by noise. Table B.2 presents a summary of the WHO guideline values.

Table B.2: Summary of WHO Recommended Environmental Noise Levels

Environment	Critical Health Effects	dB L_{Aeq}	Time Base (hours)	dB L_{AFmax}
Outdoor living area	Serious annoyance (daytime and evening)	55	16	n/a
	Moderate annoyance (daytime and evening)	50	16	n/a

[15] Institute of Environmental Management & Assessment (2014); '*Guidelines for Environmental Noise Impact Assessment*', IEMA.

Environment	Critical Health Effects	dB L_{Aeq}	Time Base (hours)	dB L_{AFmax}
Dwelling, indoors	Speech intelligibility and moderate annoyance (daytime and evening)	35	16	n/a
Inside bedrooms	Sleep disturbance, night-time	30	8	45[1]
Outside bedrooms	Sleep disturbance, window open	45	8	60

Notes: [1] For a reasonable standard in bedrooms at night, the WHO,1999 guidelines recommend that individual noise events (measured with F time-weighting) should not normally exceed 45 dB L_{AFmax}. The WHO guidelines refer to research that identifies that 10-15 occurrences per night of the limiting maximum noise level may be considered acceptable.

- British Standard 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' builds on the WHO guidelines, providing guidance for the control of noise in and around both new and refurbished buildings. The guidelines recommend internal ambient noise criteria for a range of indoor spaces including residential land uses. The indoor ambient noise levels for unoccupied spaces relevant to this assessment are presented in Table B.3.

Table B.3: BS 8233 Guideline Noise Levels for Residential Spaces

Activity	Location	Daytime dB $L_{Aeq,16hr}$ (07:00 to 23:00)	Night-time dB $L_{Aeq,8hr}$ (23:00 to 07:00)
Resting	Living room	35	n/a
Dining	Dining room	40	n/a
Sleeping (daytime resting)	Bedroom	35	30

Unlike the previous version, BS 8233:2014 does not provide recommendations in relation to maximum noise levels in residential bedrooms at night from individual noise events such as vehicle or aircraft movements. Instead, it advises:

"Regular individual noise events…can cause sleep disturbance. A guideline value may be set in terms of SEL (Sound Exposure Level) or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values."

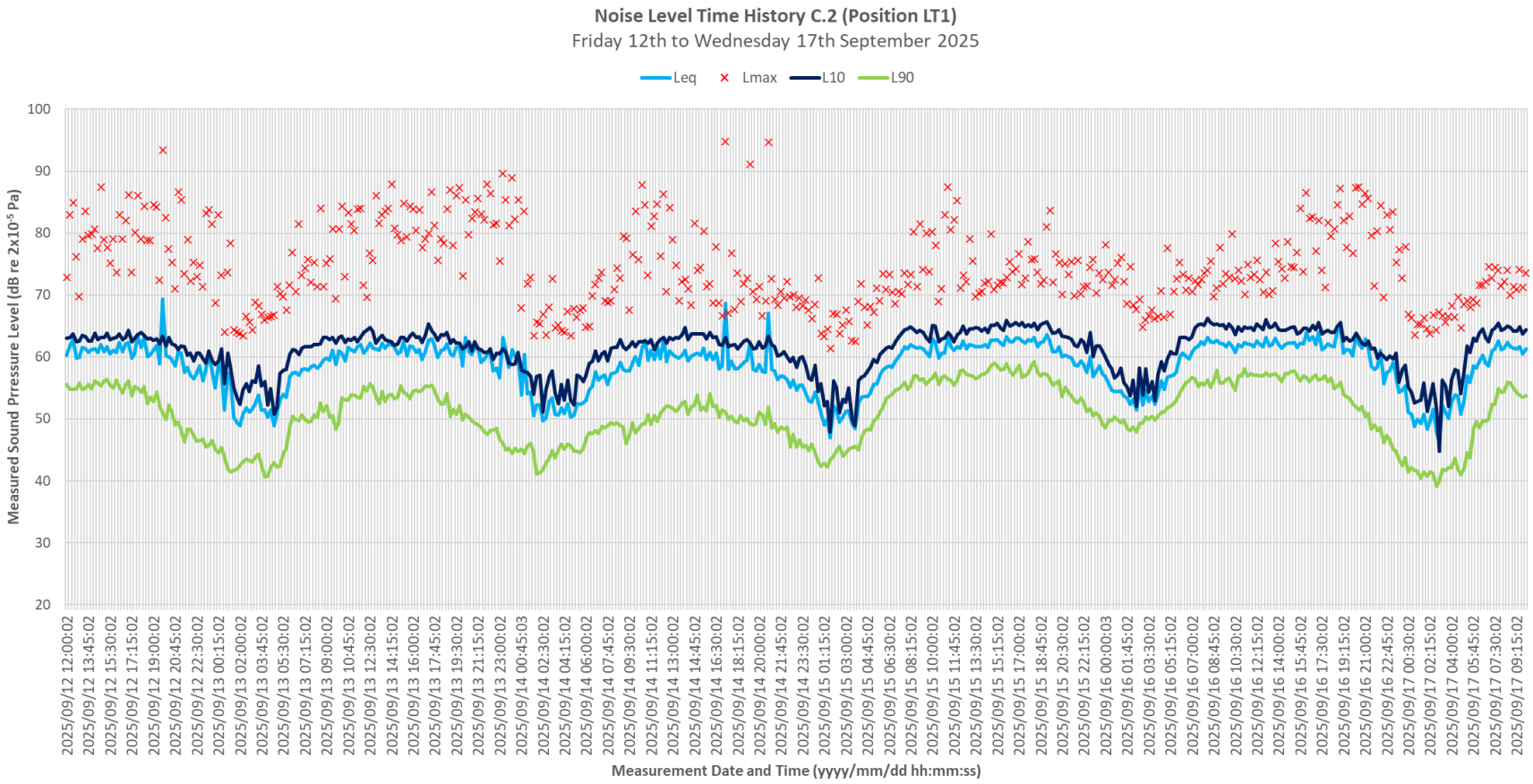
- ProPG: Planning & Noise – New Residential Development, May 2017 provides guidance on a recommended approach to the management of noise within the planning system in England. The aim of ProPG is to ensure good acoustic design forms part of a holistic design process that creates places that are both comfortable and attractive to live in, where acoustics is considered integral to the living environment.
- The Acoustics, Ventilation and Overheating guide (AVO) aims to help better co-ordinate the design of acoustics and ventilation within residential development. It is

a common occurrence that modern buildings overheat, due to a focus on thermal efficiency in the past decade. During mitigation against overheating, people may be subjected to high noise levels for long periods of time, for example from noise ingress via opened windows or other façade openings. The guide provides a method of assessing risk of adverse noise impact during periods of overheating, when cooling measures are relied upon. The document does not provide design solutions that could be adopted to mitigate noise impact where required.

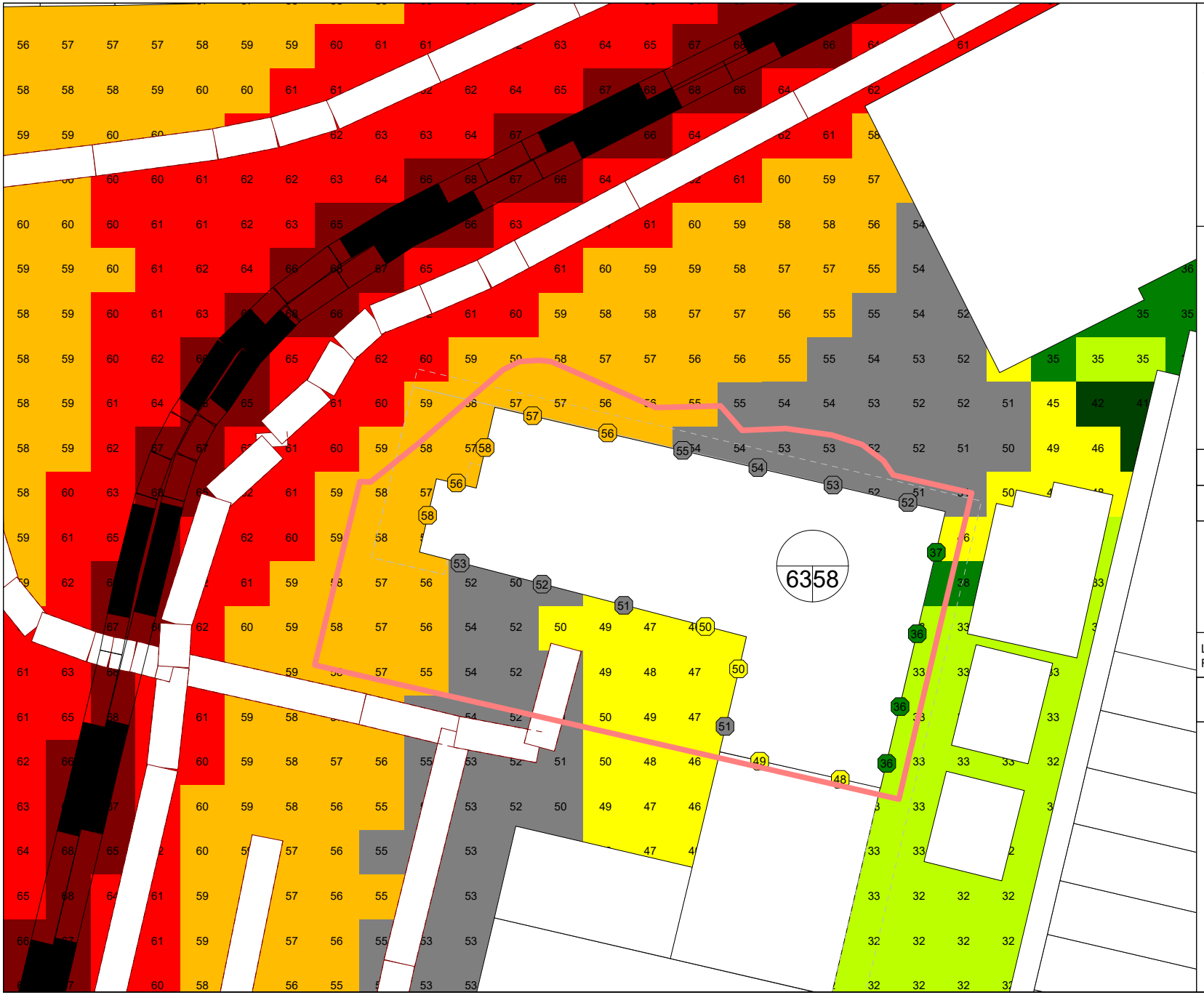
- Building Regulations Approved Document O gives requirements for mitigating overheating in residential buildings. It also requires consideration of the impact of controlling overheating in terms of night-time noise ingress and gives limits to achieve during periods of overheating control.
- BS 6472-1:2008 'Guide to Evaluation of Human Exposure to Vibration in Buildings. Part 1: Vibration Sources other than Blasting' provides guidance on the measurement and assessment of vibration levels affecting humans in buildings resulting from sources such as road and rail traffic or building services systems. The probability of adverse comment is assessed by considering the vibration dose value (VDV), which quantifies the total exposure to vibration over a specified period.

Appendix C – Baseline Noise Levels

Figure C.1: Noise Level Time History at Position LT1



Appendix D – Modelled Noise Levels



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Modelled Noise Contours and Facade Noise Levels - Night-time

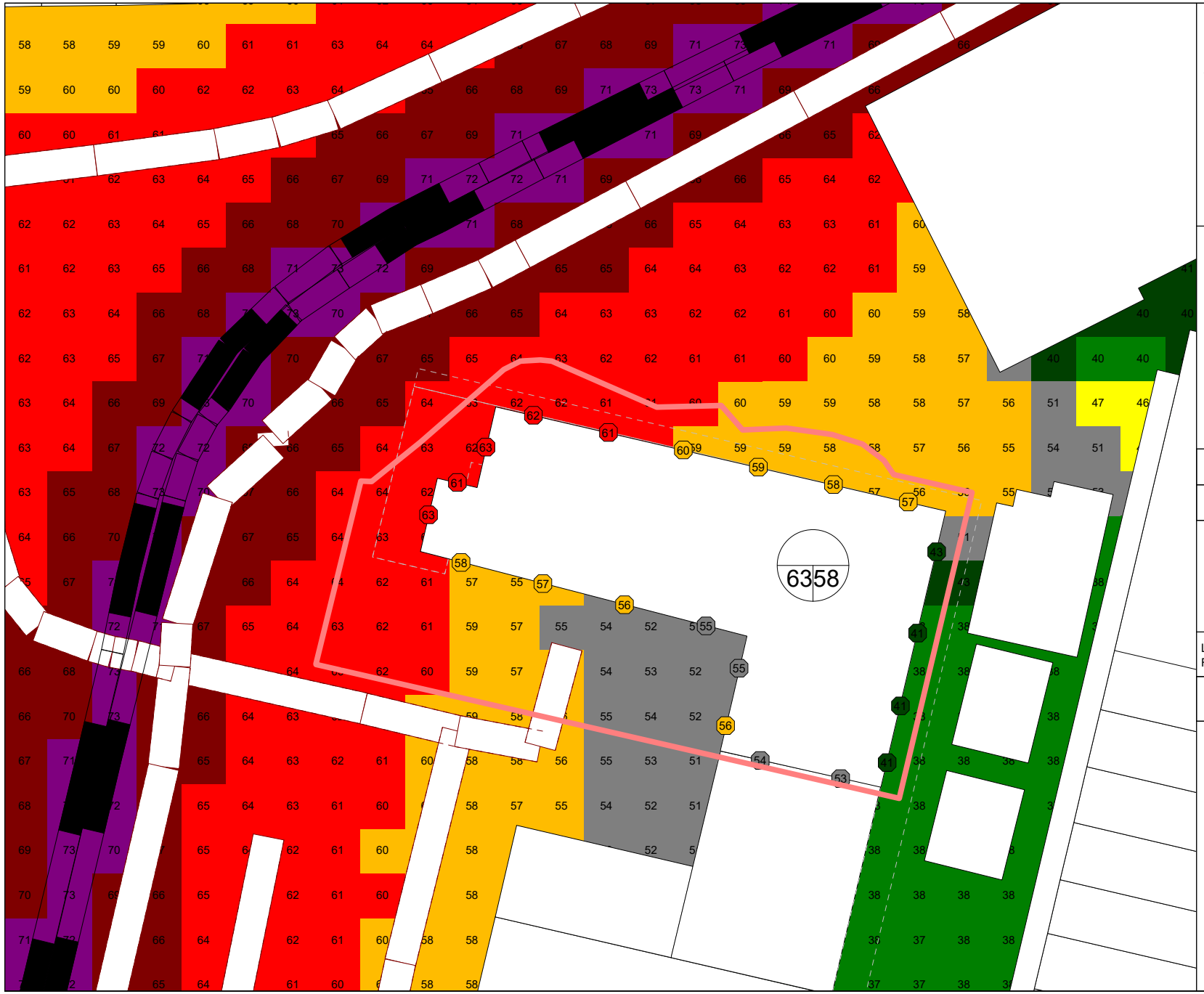
Version	Date	Name
01	20/10/2025	MB

H|M

LAeq in dB
Facade Noise Levels at Maximum

Approximate Site Boundary

- > -99.0 dB
- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB



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Modelled Noise Contours and Facade Noise Levels - Daytime

Version	Date	Name
01	20/10/2025	MB

H|M

LAeq in dB
Facade Noise Levels at Maximum

Approximate Site Boundary

- > -99.0 dB
- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB

Appendix E – Overheating Control Façade Categories



Do not scale from this drawing.
Verify dimensions by site measurement.
Read this drawing in conjunction with the latest architectural and structural drawings.

This drawing is based on the following information:-

Symbol	Overheating Risk Rating
	High
	Moderate
	Low
	Negligible

Rev	Date	Description	Checked	Approved

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Client
Muse Places Limited

Project
Wythenshawe Civic
Plot C.2

Drawing Title
Acoustics
Overheating Noise Categories

Scale	Sheet Size	Designed	Checked
NTS	A1	MB	JKR

Project Status	Suitability	HM Project No.
FOR INFORMATION	S0	37880

Drawing No. Rev

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