

Ambient Noise and Vibration Assessment (Planning Condition 9A)

Dundonald Road, Didsbury

REPORT REFERENCE NO. J004101-5856-01-CW

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This report has been prepared based upon a scope of works and associated resources agreed between the client and Philip Dunbavin Acoustics Ltd (PDA). This report has been prepared with all reasonable skill, care and diligence and has been based upon the interpretation of data collected. This has been accepted in good faith as being accurate and valid at the time of the collection. This report has been based solely on the specific design assumptions and criteria stated herein.



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1.0 SUMMARY

PDA Ltd have been commissioned by Brenmall Ltd to carry out an ambient noise and vibration assessment for the proposed residential development on the land off Dundonald Road in Didsbury, South Manchester, M20 6RU to satisfy the requirements of Planning Condition 9A (130057/FO/2021) which states that:

“a) Before the development commences a scheme for acoustically insulating the proposed residential accommodation against noise and vibration from the Metrolink line shall be submitted to and approved in writing by the City Council as local planning authority. The approved noise insulation scheme shall be completed before any of the dwelling units are occupied.”

The proposal is to develop the site and construct 3 no. 2.5 storey dwelling houses with associated car parking and land scaping. The immediate surrounding area comprises of existing residential dwellings with the metro link tram line running immediately to the south of the site.

A noise and vibration survey was undertaken in the vicinity of the site to determine the existing ambient noise climate and magnitude of ground borne vibration in the vicinity of the site. Measurements were undertaken from a single position on the southern boundary overlooking the Metro Link tramline deemed to be worst-case in terms of both noise and vibration.

The measured vibration levels achieve the 'low probability of adverse comment' criteria of BS 6472-1:2008 for both day and night time periods and as such, are considered to be acceptable. The noise climate in the vicinity of the site is dominated by distant traffic noise in addition, tram movements on the adjacent metro link line had an intermittent contribution between 06:00 – 00:00 hours.

The results of the noise survey were used to inform a SoundPLAN noise model such that the noise propagation across the proposed development site can be predicted. Based on the predicted façade noise levels recommendations are given for the glazing, ventilation and building façade elements that will be required to achieve the internal noise level requirements.

Our calculations suggest that the noise criteria of BS8233:2014 and WHO Guidelines can be achieved both within the dwellings and for majority of the external amenity spaces and is therefore, in accordance with the requirements of the National Planning Policy Framework. Further, our assessment suggests that in accordance with The Building Regulations Approved Document O, open windows are unlikely to be suitable as a means to mitigate against overheating as such, an alternative strategy will be required to mitigate overheating.

2.0 SITE DESCRIPTION

The site is located at the currently vacant land to the south of Dundonald Road in Didsbury, South Manchester M20 6RU. The immediate surrounding area comprises of existing residential dwellings with the metro link tram line running immediately to the south of the site.

The proposal is to develop the site and construct 3 no. 2.5 storey dwelling houses with associated car parking and land scaping.

The site location and its surroundings can be seen in Figure 1 below:

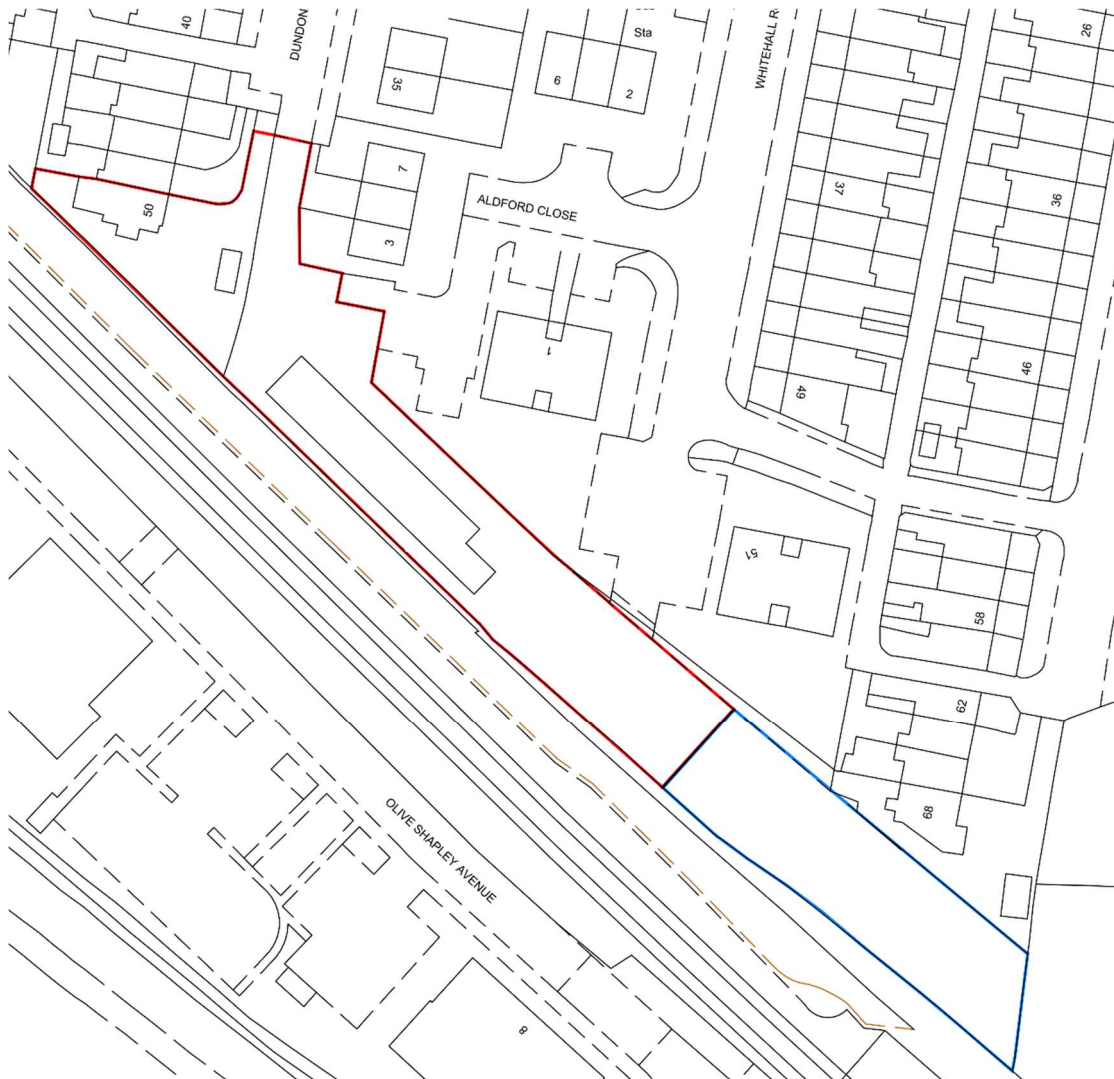


Figure 1 – Site location and surroundings

3.0 ASSESSMENT CRITERIA

3.1 Planning Condition 9 (130057/FO/2021)

Manchester City Council have granted the development Planning Permission subject to conditions. Condition 9 relates the noise and vibration stating that:

“a) Before the development commences a scheme for acoustically insulating the proposed residential accommodation against noise and vibration from the Metrolink line shall be submitted to and approved in writing by the City Council as local planning authority. The approved noise insulation scheme shall be completed before any of the dwelling units are occupied.

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

This report deals with part A of the condition, the relevant guidance and criteria are summarised in the following sections.

3.2 BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

British Standard 8233:2014, *Guidance on Sound Insulation and noise reduction for buildings*, gives guidance on internal noise levels within dwellings, flats and rooms in residential use when unoccupied. The following criteria are for Living and Dining Rooms for daytime use and Bedrooms for night time.

Table 1: BS8233 Recommended Indoor Ambient Noise Levels

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 L _{Aeq,16hour}	—
Dining	Dining room/area	40 L _{Aeq,16hour}	—
Sleeping (daytime resting)	Bedrooms	35 L _{Aeq,16hour}	30 L _{Aeq,8hour}

It should however be stressed that the above criterion relates to steady noise, in this case from road traffic etc., excluding unusual noise events departing from the typical noise character of the area.

In addition, BS 8233 suggests, *‘regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or L_{Amax,F}, depending on the character and number of events per night. Sporadic noise events could require separate values’*.

With regard to gardens and external areas, BS 8233:2014 (Section 7.7.3.2) gives the following advice:

For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB L_{Aeq,T}, with an upper guideline value of 55dB L_{Aeq,T} which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met,

might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

3.3 WHO Guidelines for Community Noise

In 1999, the WHO (World Health Organisation) published Guidelines for Community Noise, stating the following noise levels are applicable to residential dwellings.

Table 2: WHO Guidelines for Community Noise Criteria

Specific Environment	Critical Health Effect(s)	L_{Aeq} dB	Time Base (hours) *	L_{AFMAX} dB
Dwelling, indoors	Speech intelligibility & moderate annoyance, daytime & evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45

* Typically taken to be daytime/evening - 07:00 – 23:00 hours and night time 23:00 – 07:00 hours.

The WHO guidelines state that, “*it is recommended that $L_{Aeq,T}$ be used to evaluate more-or-less continuous environmental noises. Where the noise is principally composed of a small number of discrete events, the additional use of L_{Amax} or SEL is recommended.*” The guidelines recommend that for a good sleep, the indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10 – 15 times.

3.4 BS6472:2008 Guide to Evaluation of Human Exposure to Vibration in Buildings

BS6472:2008 develops guideline limiting vibration criteria for residential use and other premises. BS6472 uses the Vibration Dose Value (VDV) parameter to assess the probability of adverse comments when human subjects are exposed to vibration from typical environmental sources of vibration (e.g. rail traffic). BS6472 gives the following envelope limiting values to describe varying degrees of perception:

Table 3: BS6472 Guideline Vibration Limiting Criteria for Residential Use

VDV Period	VDV $ms^{-1.75}$		
	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable
Residential Buildings 16hr day 07:00 – 23:00 hours	0.2 – 0.4	0.4 – 0.8	0.8 – 1.6
Residential Buildings 8hr night 23:00 - 07:00 hours	0.1 – 0.2	0.2 – 0.4	0.4 – 0.8

BS 6472 states that for levels below the ranges in the table above, adverse comment is not expected.

3.5 Approved Document O (ADO)

Approved Document O (APO) 2021, provides guidance on meeting the requirements of the Building Regulations 2010, part ‘O1 Overheating mitigation’. The aim of the Building Regulations part O1 is to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures.

Building Regulations part O1 requires that dwellings, institutions or any other buildings containing one or more rooms for residential purposes (other than a room in a hotel) to:

- (a) *Limit unwanted solar gains in summer:*
- (b) *Provide an adequate means to remove heat from the indoor environment*

However in meeting the obligations of ADO the buildings overheating mitigation strategy for use by occupants must consider 'Noise at night' in addition to other non-noise related considerations.

In regards to 'Noise at night', ADO stipulates the following.

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).

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

- (a) *40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).*
- (b) *55dB L_{AFmax} , more than 10 times a night (between 11pm and 7am)*

It should be noted that the above noise limits are with reference to internal noise levels within a bedroom. BS 8233 advises that based on a partially opened window noise at the external façade of the building will reduced by approximately 15 dB. Therefore ADO infers that windows will be required to remain closed when the external noise climate exceeds the following external noise limits.

55dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am)

70dB L_{AFmax} , more than 10 times a night (between 11pm and 7am)

Subsequently, where windows are required to be closed at night (due to the above noise limits being exceeded), the overheating mitigation strategy as required by ADO must provide an alternative method to removing heat other than relying on windows remaining open.

4.0 SURVEY DETAILS & RESULTS

4.1 Measurement Time & Location

A noise and vibration survey was undertaken in the vicinity of the site to determine the existing ambient noise climate and magnitude of ground borne vibration in the vicinity of the site. Measurements were undertaken from a single position on the southern boundary overlooking the Metro Link tramline deemed to be worst-case in terms of both noise and vibration.

The measurement positions are illustrated in Figure 2 below:



Figure 2 – Noise and Vibration Survey Measurement Positions

The measurements were made continuously over a period of approximately 24 hours periods between 10:20 hours on Tuesday 1st and 11:10 hours on Wednesday 2nd November 2022. The measurement period was chosen such that both the morning and evening rush-hour periods were captured in addition to a full night-time.

4.2 Measurement Equipment and Personnel

The noise survey was conducted using an NTi XL2 sound level meter. In accordance with IEC 61672-1:2002 the NTi XL2 has a class 1 frequency response and can operate as an integrating sound level meter with frequency analysis and statistical functions. The meters were set to measure 'A' weighted, broadband and octave band sound pressure levels and various statistical parameters. The meter was field calibrated to 1kHz at 94dB both before and after the measurement during which time no significant deviation was observed. In addition, a valid calibration certificate is held for both the meter and the calibrator.

The vibration survey was carried out using a Sigicom INFRA C22 Triaxial Vibration monitor set to measure VDV's in 10-minute intervals. All measurements were made and partially attended by Mr C Wright BSc (Hons) MIOA of PDA Ltd.

A summary of the weather conditions during the survey period is given in Table 4 below:

Table 4: Weather Conditions

Measurement Date	Temperature	Windspeed	Events
Tuesday 1 st November 2022	8 - 15°C	1 - 5 m/s	Intermittent Rain
Wednesday 2 nd November 2022	7 - 10°C	1 - 10 m/s	Intermittent Rain

4.3 Measured Noise Results

Full details of the measured results can be seen in the appendix included at the end of this report. A summary of the results is given in Table 5 below, all values have been rounded to the nearest dB.

Table 5: Summary of noise measurements

Period	Average dB L _{Aeq,T}	Night-time L _{AFMax} ¹
Daytime (07:00 – 23:00)	64	n/a
Night-time (23:00 – 07:00)	55	81

Notes:

- 1 The WHO Guidelines for Community Noise state that sleep disturbance may occur where the specified 45dB L_{Amax} is exceeded internally 10 to 15 times over the 8-hour night-time period. The L_{Amax} recorded for these positions is the L_{Amax} exceeded no more than 10 times over the full night-time-period or equivalent.

4.4 Description of Noise Sources

The noise climate in the vicinity of the site is dominated by distant traffic noise. In addition, tram movements on the adjacent metro link line had an intermittent contribution between 06:00 – 00:00 hours. It was noted that vehicle movements on Dundonald Road were relatively infrequent and were not considered to significantly contribute to the ambient noise climate.

4.5 Measurement Vibration Results

A summary of the vibration measurements in terms of VDV ms^{-1.75} is given in the Table below. Note that the measurements are split into daytime [07:00 – 23:00] and night-time [23:00 – 07:00] periods. The measurements were combined to calculate the overall VDV for both the daytime and the night-time periods as follows.

$$VDV(T) = \sqrt[4]{\sum (VDV(dT))^4}$$

Table 6: Summary of Vibration Measurements $VDV \text{ ms}^{-1.75}$

Period	VDV $\text{m/s}^{1.75}$		
	X axis (horizontal)	Y axis (horizontal)	Z axis (vertical)
Daytime (07:00 – 23:00)	0.04	0.04	0.15
Night-time (23:00 – 07:00)	0.02	0.02	0.1

5.0 NOISE IMPACT ASSESSMENT AND MITIGATION

The noise climate in the vicinity of the site is dominated by distant road traffic noise and intermittent tram movements on the adjacent line. The character of the noise is considered to be typical for a city centre environment and in our experience, sites with noise levels similar to those measured are suitable for residential development provided that adequate acoustic attenuation is provided to habitable areas. The acoustic weak points of a building façade are typically the glazing and ventilation elements, calculations have been undertaken to determine building fabric specifications to ensure that suitable internal noise levels can be achieved within the dwellings.

5.1 Noise Modelling

In order to calculate the noise propagation around the proposed development, the site and its surroundings have been modelled in SoundPLAN noise propagation software. The software uses the method of ISO 9613 'Acoustics – attenuation of sound during propagation outdoors – general method of calculation' and takes into account geometric spreading, ground effects, air absorption, barrier attenuation and reflections from the surroundings to calculate the noise levels incident at various points.

The model was calibrated to the noise levels measured on-site subsequently, the proposed layout of new building and landscaping features were added. A ground absorption coefficient of 0 has been used to take into account the pre-dominantly hard surfaces (roads, hard-standing, etc.). This would likely provide a worse case assumption. The noise map is based on the measured sound pressure levels in Section 4 and shows good correlation with the survey data. An overview of the model can be seen in Appendix B.

5.2 Calculations

Based upon the measured and predicted noise levels, calculations have been undertaken to determine acoustic specification requirements for the proposed residential dwellings. Calculations have been undertaken in octave bands from 63 Hz to 8kHz inclusive, for the night-time L_{eq} , day-time L_{eq} and night-time L_{max} levels. The calculated internal noise levels are dependent on the size of room, location and relative glazing area. Room and glazing dimensions are taken from the following drawings provided to us by the client.

The sound insulation provided by the building envelope is a combination of the sound reduction indices of the individual façade elements and the area of the façade they cover. The result is a composite sound insulation value for the whole façade.

The calculation of noise break-in to the residential rooms has been undertaken in accordance with the calculation methods of BS EN 12354-3:2000 *Building Acoustics – Estimation of acoustic performance of buildings from the performance of elements. Part 3: Airborne sound insulation against outdoor*

sound, in octave bands. Reverberation time is 0.5 seconds as per the BS EN 12354-3 reference time for dwellings.

Information on the sound insulation properties for specific element details has been sourced from either manufacturer's literature or Insul® Sound insulation prediction software.

5.3 Design Assumptions

5.3.1 Walls

The exact wall construction has not been confirmed however for the purposes of this assessment, it is assumed that the proposed façades for the buildings will be typical cavity masonry construction comprising brickwork outer leaf with 100mm cavity fully filled with mineral wool insulation and 100mm blockwork inner leaf with an internal plasterboard lining. From acoustic test data for similar constructions, it is assumed that the build-up has an acoustic performance of at least 53 dB R_w .

Please note that the external façade should have no unsealed penetrations, and any openings for ventilation should meet the specifications for ventilators as discussed below.

5.4 Roof

Within the calculations the roof is assumed to be a traditional slate tile, with minimum 200mm cavity and plasterboard ceiling within the attic bedrooms.

It is recommended that in order to maintain the sound insulation of the building façade, the internal ceiling within attic bedrooms is a minimum of 2 no. layers of 15mm sound resistant plasterboard (min. total mass per unit area 25kg/m²) with 100mm mineral wool insulation (minimum density 10kg/m³) between the joists.

Insul sound prediction software would suggest the above structure has a laboratory sound insulation of at least 52 dB R_w , which is considered to be acceptable.

5.4.1 Ventilation

Our calculations suggest that suitable internal noise levels can be achieved using acoustically attenuated trickle vents. It is noted however, that during periods when windows are open internal noise levels will likely exceed the criteria of Section 3.

With regard to purge ventilation BS 8223:2014 states:

"The Building Regulations' supporting documents on ventilation recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice."

5.5 Glazing and Ventilation Specification

The dominant paths for noise transfer to the interior of buildings are generally the glazing and ventilation elements of the façade constructions. Based on this premise, to achieve the required internal noise levels as discussed in Section 3 the development would require the following glazing and ventilation specifications.

Table 7: Glazing and Ventilation Schedule

Room Type	Minimum Glazing Rating R_w dB	Minimum combined Ventilator Rating $D_{n,e,w}$ dB	Calculated Highest Internal Noise Level dBA (Day/Night/Max)
Bedrooms	45	45	25/16/45
Attic Bedrooms ¹	45	45	26/16/45
Living Rooms	38	38	32/-/-

Notes:

- 1 For bedrooms in the attic, our calculations have indicated that the upgraded ceiling construction as discussed in Section 5.4 will be required to maintain the acoustic integrity of the facade.

5.6 Glazing Specification and Installation

For the glazing specification in Table 7 (above), all sound insulation values quoted above must be achieved by the overall combination of frame and glazing, and not just by the glazing alone. The frame should not reduce the performance of the system overall. Where spandrel panels are proposed these should achieve a sound insulation performance equivalent to the specified glazing.

Glazing framing systems must be fully sealed with any gaps around the perimeter to be stuffed with dense mineral wool to full frame depth and sealed both sides with acoustic non-setting mastic, with additional weathering protection to be applied external to this. No gaps should be left unsealed.

The minimum performance requirements for the combination of glazing and framing recommended in the above tables are as follows:

Table 8: Required Minimum Sound Insulation of Combined Glazing and Framing

Typical Product	Minimum Sound Reduction Index R (dB) at Octave Band Centre Frequency (Hz)							R_w
	63	125	250	500	1000	2000	4000	
10/12/6mm	22	26	27	34	40	38	46	38
10/20/8.4mm Acoustic Laminate	25	27	36	41	45	50	57	45

Figures stated in the table above unless otherwise stated are based on Pilkington manufacturer quoted data. Acoustic ratings should be checked with the manufacturer and supported by laboratory test reports where necessary.

5.7 Ventilator Requirements

The ventilator inlets described in the following table are calculated to provide adequate sound insulation to maintain internal noise levels compliant with the guidance criteria when used in conjunction with the selected glazing. Selected ventilation inlets should provide equal or greater sound insulation performance across the frequency range to the values in Table 9; example products are noted below.

The acoustic specification relates to the combined performance of all ventilation elements. Where two or more ventilators are required to meet the ventilation requirement, the acoustic performance for a single ventilator must be selected so that the combined performance is as stated in the table below,

e.g. for 2 no. ventilators, the acoustic performance of each will need to be $D_{n,e,w}$ 48 dB to meet a combined $D_{n,e,w}$ 45 dB specification¹. Requirements should be checked with the manufacturer.

Table 9: Required Minimum Sound insulation of Ventilators

Example Product	Minimum Normalised Element Level Difference $D_{n,e}$ (dB) at Octave Band Centre Frequency (Hz)						$D_{n,e,w}$
	125	250	500	1000	2000	4000	
Simon Acoustic EHAS	40	36	34	35	44	40	38
Greenwood 2500EAW (2 Acoustic Modules)	42	40	38	47	53	55	45

It should be noted that inclusion of ventilators alone does not ensure compliance with Building Regulations or other regulatory requirements for ventilation. The ventilation strategy should be checked by others.

5.7.1 Mechanical Ventilation

If mechanically assisted ventilation is desirable as an alternative to trickle ventilators this will be acceptable in terms of attenuating noise ingress from external sources. However, it will need to be ensured that self-generated noise from the mechanical system does not give rise to exceedances of the internal noise criteria detailed section 3.

5.8 Approved Document O (ADO), Method of Removing Heat

With reference to the noise survey results and noise modelling around site our assessment has indicated that generally noise at the façade of the proposed development is predicted to exceed the following criteria.

55dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am)

70dB L_{AFmax} , more than 10 times a night (between 11pm and 7am)

Consequently based on a 15 dB reduction for a partially open window, noise within bedrooms is predicted to exceed the following ADO limits above which windows are expected to remain closed to control the ingress of external noise.

40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).

55dB L_{AFmax} , more than 10 times a night (between 11pm and 7am)

Therefore, in accordance with the requirements of ADO an alternative method to remove heat other than relying on open windows will be required.

¹ It is likely that a through wall vent or mechanical system will be required to achieve a performance of 48 dB $D_{n,e,w}$

6.0 EXTERNAL AMENITY SPACES

The SoundPLAN model as detailed in Section 5.1 has been used to produce the following noise map depicting the predicted noise climate to the external amenity spaces. The external amenity space guidance from BS 8233:2014 and WHO Guidelines suggest an upper limit of 55 dB L_{Aeq} during daytime.

With reference to Figure 3 below it can be seen that a large proportion of the proposed development site is expected to achieve the upper (55 dBA) recommended BS 8233 criteria. Note that our model accounts for a 2m fence along the southern boundary as indicated within the drawings. It should be ensured that the fence is of a close boarded construction with no gaps at the bottom and a minimum mass of 10kg/m². A good quality timber fence is likely to be sufficient.

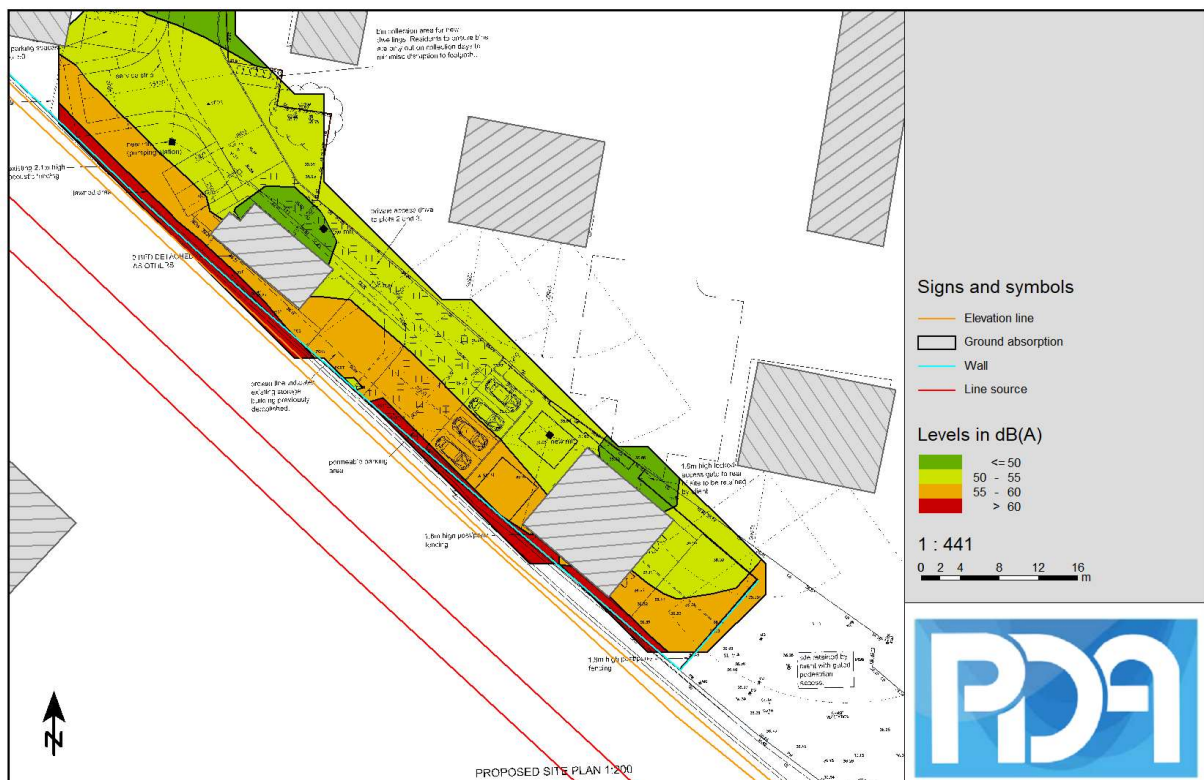


Figure 3 – Predicted noise levels within external amenity spaces.

It can be seen some areas of the site are predicted to marginally exceed 55 dBA. With regards to external noise levels within amenity spaces BS 8233:2014 (section 7.7.3.2) gives the following advice:

“For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.”

In regards to the proposed development, the site is within close proximity of the Metro Link tramline and can therefore be considered an ‘urban area adjoining the strategic transport network’. As such,

the necessity to achieve the recommended 55 dBA external criteria should be considered against the benefits of including a garden amenity space to the proposed development.

It should be noted that the BS8233 advisory guidelines have not been adopted in UK noise or planning policy. In addition using the 55 dBA guideline as a fixed threshold beyond which noise sensitive development should be prohibited is unrealistic. The National Noise Incidence Study undertaken by DEFRA in 2009 indicates that more than 50% of the UK population is exposed to day time noise levels of more than 55 dBA however the majority of persons surveyed do not report being highly annoyed within the National Noise Attitude Survey 2000 undertaken by Defra. In addition the National Noise Attitude Survey 2012 (NNAS2012) Summary Report December 2014 - reports that "In general 72% of respondents had a positive attitude to their local noise environment."

7.0 VIBRATION IMPACT ASSESSMENT

Vibration was measured at the southern boundary of the site, this location was judged to be representative of the likely worst case location relative to prospective vibration sources, i.e. the Metro Link tram line. It is noted as the proposed dwellings are set back from the boundary, the level of vibration is likely to be lower than reported due to additional distance attenuation between the source and receiver.

The predicted vibration levels in Table 9 below are compared to the criteria of BS 6472:2008 *Guide to Evaluation of human exposure to vibration in buildings*

Table 9: Comparison of measured vibration with BS 6472 criteria

Period		BS 6472 ‘Low probability of adverse comment’ criterion [VDV]	Maximum predicted vibration [VDV] ms ^{-1.75}		
			X	Y	Z
Southern Site Boundary					
Night	Residential Buildings 8hr night 23:00 – 07:00 hours	0.1 – 0.2	0.02	0.02	0.1
Day	Residential Buildings 16hr day 07:00 – 23:00 hours	0.2 – 0.4	0.04	0.04	0.15

It can be seen above that the measured vibration levels achieve the 'low probability of adverse comment' criteria of BS 6472 for both day and night time periods and as such, are considered to be acceptable.

8.0 CONCLUSION

PDA Ltd have been commissioned by Brenmall Ltd to carry out an ambient noise and vibration assessment for the proposed residential development on the land off Dundonald Road in Didsbury, South Manchester, M20 6RU.

A noise and vibration survey was undertaken in the vicinity of the site to determine the existing ambient noise climate and magnitude of ground borne vibration in the vicinity of the site.

The measured vibration levels achieve the 'low probability of adverse comment' criteria of BS 6472-1:2008 for both day and night time periods and as such, are considered to be acceptable.

The results of the noise survey were used to inform a SoundPLAN noise model such that the noise propagation across the proposed development site can be predicted. Based on the predicted façade noise levels recommendations are given for the glazing, ventilation and building façade elements that will be required to achieve the internal noise level requirements.



Our calculations suggest that the noise criteria of BS8233:2014 and WHO Guidelines can be achieved both within the dwellings and for majority of the external amenity spaces and is therefore in accordance with the requirements of the National Planning Policy Framework.

Further, our assessment suggests that in accordance with The Building Regulations Approved Document O, open windows are unlikely to be suitable as a means to mitigate against overheating. Therefore an alternative strategy will be required to mitigate overheating.

APPENDIX A – DEFINITION OF ACOUSTIC TERMS

The decibel

This is the basic unit of noise, denoted dB.

A Weighting

This is a weighting process which simulates the human ear's different sensitivity at different frequencies. A weighting can be shown two typical ways, 50 dB(A) L_{eq} or 50 dB L_{Aeq} . Both mean the same thing. (See below for a definition of L_{eq}). The dB(A) level can be regarded as the overall level perceived by human beings.

L_{eq} and $L_{eq(s)}$

This is the equivalent continuous noise level which contains the same acoustic energy as the actual time-varying sound. In other words it is a kind of average noise level. It is denoted dB L_{eq} or, for A-weighted figures dB(A) L_{eq} or dB L_{Aeq} . It can also be expressed in terms of frequency analysis (see later). $L_{eq(s)}$ is the sample L_{eq} level.

L_n

This is the level exceeded for n% of the time. It is denoted dB L_n or, for A-weighted figures dB(A) L_n or dB L_{An} . It can be expressed in terms of frequency analysis (see later). L_{90} is the level exceeded for 90% of the time and is a measure of the lowest level typically reached. L_{10} is the level exceeded for 10% of the time and is the highest level typically reached. L_{50} is the level exceeded for 50% of the time and, mathematically, it is the median.

L_{max}

This is the maximum level reached during a measurement period. The “time constant”, or the ability of the equipment to respond to impulses is usually expressed along with it, e.g. “Fast”, “Slow”, etc. It is denoted dB L_{max} or, for A-weighted figures dB(A) L_{max} , dB L_{Amax} , etc. It can also be expressed in terms of frequency analysis.

Frequency Analysis

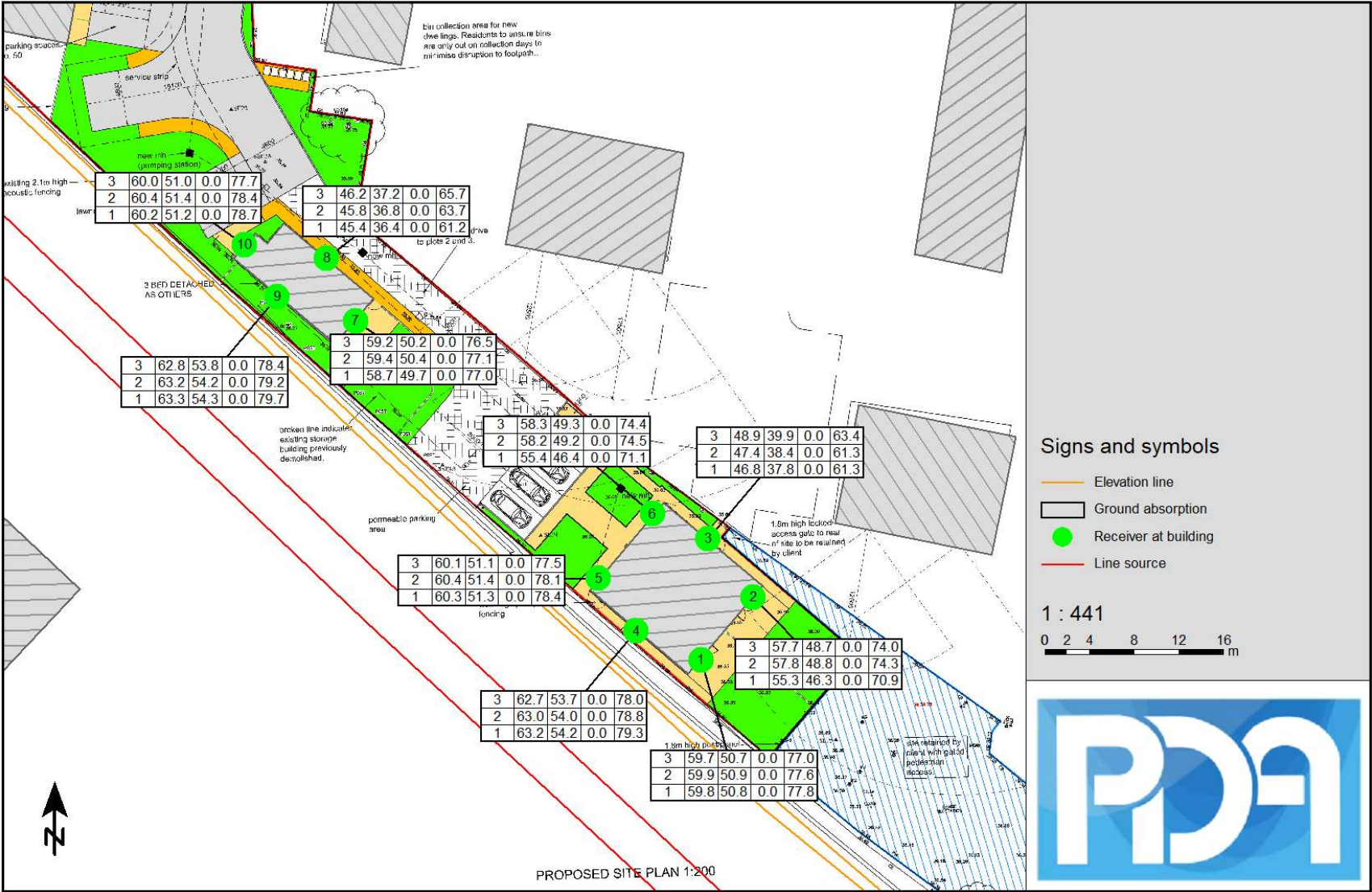
Whereas dB(A) gives a very useful overall figure, it has its limitations in that it cannot be used to model or predict the effect of noise control and mitigation as this nearly always has radically different performance at different frequencies.

Frequency analysis expresses an overall noise level at each frequency or band of frequencies in the audible range. Octave band analysis divides the audible range into 10 bands from 31.5 Hz to 16 kHz and the noise level in each band can be expressed in any form e.g. L_{eq} , L_{90} , L_{max} etc. One third octave band analysis uses 30 bands.

Narrow band analysis takes the process to resolutions of less than 1 Hz. This is useful for identifying the existence of tones (whines, hums, etc.) and in pin-pointing the sources.

APPENDIX B –NOISE MODEL RESULTS – FACADE NOISE LEVELS

Note that the first column relates to the floor level, the 2nd = Daytime Noise Level (dB L_{Aeq}), The 3rd = Night-time Noise Level (dB L_{Aeq}) and the 5th = dB L_{AFmax}



APPENDIX C – MEASURED NOISE LEVELS

Our Ref: J004101
Client: Brenmall Ltd
Project: Dundonald Road
Results: Ambient Noise Measurements

Date	Time	Octave Band Centre Frequencies (Hz), dB L _{eq}										
		dB, L _{Aeq}	dB, L _{Amax}	dB, L _{A90}	63	125	250	500	1k	2k	4k	8k
01/11/2022	10:15	69	97	48	68	58	58	58	64	59	62	65
01/11/2022	10:20	64	82	48	58	63	65	61	62	50	44	35
01/11/2022	10:25	61	83	48	56	53	52	55	61	48	39	29
01/11/2022	10:30	65	84	48	58	63	64	61	63	51	46	37
01/11/2022	10:35	70	87	48	59	63	65	63	69	55	49	41
01/11/2022	10:40	51	60	47	52	47	45	47	49	41	33	25
01/11/2022	10:45	67	83	47	59	65	66	63	66	54	48	39
01/11/2022	10:50	67	84	48	58	61	62	61	66	53	46	37
01/11/2022	10:55	64	83	48	56	60	61	60	63	52	46	35
01/11/2022	11:00	53	63	49	55	53	50	49	51	43	40	34
01/11/2022	11:05	66	83	48	58	63	65	62	64	52	46	37
01/11/2022	11:10	63	82	47	55	53	54	56	63	49	41	31
01/11/2022	11:15	65	83	47	60	63	64	61	63	51	44	36
01/11/2022	11:20	58	80	48	56	55	55	54	57	46	39	32
01/11/2022	11:25	63	83	47	57	63	64	57	61	50	43	34
01/11/2022	11:30	65	83	48	59	63	64	61	64	53	47	37
01/11/2022	11:35	57	80	47	57	57	57	54	54	44	37	31
01/11/2022	11:40	59	79	48	56	55	56	55	58	46	39	31
01/11/2022	11:45	63	82	47	56	61	63	59	61	50	45	35
01/11/2022	11:50	63	82	47	57	59	59	58	62	50	44	35
01/11/2022	11:55	65	82	47	57	63	65	61	63	51	46	37
01/11/2022	12:00	64	83	46	57	61	62	60	63	51	45	37
01/11/2022	12:05	67	87	46	56	59	61	60	66	52	45	37
01/11/2022	12:10	47	55	45	50	46	44	44	45	34	30	27
01/11/2022	12:15	65	86	47	56	59	61	60	64	51	42	34
01/11/2022	12:20	66	84	46	57	63	65	62	64	52	46	38
01/11/2022	12:25	61	82	46	54	52	54	55	60	46	37	27
01/11/2022	12:30	60	80	46	55	53	54	53	59	48	42	33
01/11/2022	12:35	62	83	46	55	60	62	59	60	48	42	33
01/11/2022	12:40	66	82	46	56	60	62	60	65	51	44	35
01/11/2022	12:45	67	84	46	58	64	65	62	65	52	48	41
01/11/2022	12:50	63	82	46	56	60	61	59	62	49	43	34
01/11/2022	12:55	67	84	47	58	63	65	62	66	53	48	40
01/11/2022	13:00	60	80	47	57	56	55	55	59	46	38	29
01/11/2022	13:05	65	84	47	58	61	63	60	63	51	45	37
01/11/2022	13:10	58	77	47	58	55	54	54	56	48	41	32
01/11/2022	13:15	65	84	47	58	62	64	61	63	51	46	37
01/11/2022	13:20	66	84	47	58	61	62	60	65	52	46	37
01/11/2022	13:25	67	85	47	58	63	64	62	66	52	47	41
01/11/2022	13:30	66	85	46	57	60	61	60	65	51	45	39
01/11/2022	13:35	58	80	45	52	51	52	53	57	45	36	26
01/11/2022	13:40	66	89	46	57	63	64	61	65	53	45	35
01/11/2022	13:45	63	82	47	55	54	54	56	63	50	43	34
01/11/2022	13:50	66	83	47	57	62	64	61	65	53	47	38
01/11/2022	13:55	65	85	48	56	60	62	60	65	51	43	34
01/11/2022	14:00	63	81	48	58	61	63	60	61	50	43	35
01/11/2022	14:05	62	81	48	56	60	61	56	60	49	42	34
01/11/2022	14:10	60	81	49	56	51	50	54	59	47	38	30
01/11/2022	14:15	65	83	51	57	63	64	61	63	51	46	38
01/11/2022	14:20	64	82	50	57	60	61	60	63	50	44	36
01/11/2022	14:25	65	82	57	59	61	62	63	63	52	45	35
01/11/2022	14:30	60	64	58	59	55	54	60	56	48	41	29
01/11/2022	14:35	63	82	51	57	54	55	59	62	49	44	38
01/11/2022	14:40	67	87	51	57	63	64	62	66	53	49	41
01/11/2022	14:45	61	76	55	58	54	55	59	57	52	47	44
01/11/2022	14:50	66	84	53	61	63	64	62	65	53	48	40
01/11/2022	14:55	67	83	53	60	64	65	62	65	53	47	39
01/11/2022	15:00	62	83	53	59	56	53	57	62	48	41	35
01/11/2022	15:05	66	83	53	59	63	65	62	64	53	49	42
01/11/2022	15:10	62	81	49	57	61	62	60	59	47	41	31
01/11/2022	15:15	67	84	50	57	59	59	60	66	52	45	37
01/11/2022	15:20	63	82	48	58	62	64	61	61	50	46	39
01/11/2022	15:25	67	85	48	58	60	62	61	66	52	45	37
01/11/2022	15:30	66	83	48	59	63	64	62	65	52	46	39
01/11/2022	15:35	67	86	50	58	61	62	60	67	53	46	39
01/11/2022	15:40	49	52	47	53	47	44	45	46	40	37	32
01/11/2022	15:45	65	81	47	58	65	67	62	63	52	48	41
01/11/2022	15:50	62	82	47	57	53	55	56	61	50	45	38
01/11/2022	15:55	65	82	48	58	63	65	61	63	50	45	37
01/11/2022	16:00	65	82	48	57	61	63	60	63	51	46	40
01/11/2022	16:05	63	82	46	57	60	62	59	61	50	45	35
01/11/2022	16:10	61	83	47	58	51	53	54	60	46	40	34
01/11/2022	16:15	65	83	45	57	63	64	61	63	50	44	35

Our Ref: J004101
Client: Brenmall Ltd
Project: Dundonald Road
Results: Ambient Noise Measurements

		Octave Band Centre Frequencies (Hz), dB L _{eq}										
Date	Time	dB, L _{Aeq}	dB, L _{Amax}	dB, L _{A90}	63	125	250	500	1k	2k	4k	8k
01/11/2022	16:20	63	82	49	57	60	61	59	61	51	45	38
01/11/2022	16:25	59	80	45	53	50	52	53	58	45	38	30
01/11/2022	16:30	63	82	44	56	60	61	59	61	49	42	33
01/11/2022	16:35	62	81	44	56	60	62	58	60	50	44	34
01/11/2022	16:40	48	64	45	53	47	46	45	46	39	27	21
01/11/2022	16:45	64	88	45	56	60	61	59	63	53	44	36
01/11/2022	16:50	65	84	46	57	60	62	60	64	50	42	33
01/11/2022	16:55	63	84	46	57	61	63	59	62	49	45	36
01/11/2022	17:00	64	82	46	57	59	59	58	63	50	44	36
01/11/2022	17:05	60	82	47	55	51	52	54	60	46	35	26
01/11/2022	17:10	64	83	47	57	63	64	61	62	50	44	35
01/11/2022	17:15	62	80	48	57	61	63	59	59	51	46	37
01/11/2022	17:20	59	80	47	55	51	52	54	59	47	42	35
01/11/2022	17:25	60	80	46	55	60	62	57	57	47	43	35
01/11/2022	17:30	62	80	46	56	60	61	59	60	48	43	32
01/11/2022	17:35	58	79	46	56	54	52	54	57	45	36	27
01/11/2022	17:40	63	80	44	56	63	65	60	59	50	44	35
01/11/2022	17:45	63	83	42	56	61	62	60	61	49	42	32
01/11/2022	17:50	66	83	42	57	61	62	60	65	52	45	35
01/11/2022	17:55	61	83	44	54	51	52	54	61	46	40	33
01/11/2022	18:00	59	79	43	55	60	61	57	57	45	41	33
01/11/2022	18:05	66	83	44	58	65	66	63	64	52	49	41
01/11/2022	18:10	61	80	44	57	53	56	56	60	48	43	35
01/11/2022	18:15	60	82	43	57	51	52	54	59	45	37	29
01/11/2022	18:20	65	84	42	57	65	67	62	63	54	49	40
01/11/2022	18:25	66	85	45	56	55	57	58	66	52	46	38
01/11/2022	18:30	65	84	46	56	62	64	61	64	50	45	38
01/11/2022	18:35	67	87	47	57	60	63	60	66	53	46	38
01/11/2022	18:40	63	82	46	58	64	66	61	60	51	47	40
01/11/2022	18:45	65	85	45	57	61	62	60	64	51	44	38
01/11/2022	18:50	48	53	46	51	48	45	44	45	40	37	33
01/11/2022	18:55	58	79	47	54	53	53	54	57	44	38	30
01/11/2022	19:00	64	81	47	58	66	67	61	61	51	46	36
01/11/2022	19:05	66	82	47	58	62	64	61	65	52	46	37
01/11/2022	19:10	64	82	47	56	60	62	60	62	50	42	34
01/11/2022	19:15	60	80	48	54	60	62	58	57	47	41	34
01/11/2022	19:20	62	84	48	53	58	58	57	62	47	38	29
01/11/2022	19:25	65	83	47	59	61	63	61	64	51	43	34
01/11/2022	19:30	60	81	47	55	52	55	57	59	47	38	29
01/11/2022	19:35	64	81	46	56	62	64	60	62	51	46	38
01/11/2022	19:40	64	85	46	57	62	64	60	62	50	43	33
01/11/2022	19:45	46	59	44	50	45	44	43	44	32	22	19
01/11/2022	19:50	58	79	45	53	51	52	53	57	44	35	25
01/11/2022	19:55	61	81	45	56	61	63	58	58	48	43	34
01/11/2022	20:00	64	82	46	55	61	62	59	63	51	47	37
01/11/2022	20:05	60	80	47	54	53	53	54	58	48	42	32
01/11/2022	20:10	63	82	48	56	63	65	60	60	49	45	36
01/11/2022	20:15	67	84	47	57	63	65	62	65	53	47	38
01/11/2022	20:20	56	76	47	54	53	55	53	54	44	35	26
01/11/2022	20:25	62	80	47	57	62	64	58	59	49	43	33
01/11/2022	20:30	48	53	47	50	46	47	44	46	34	20	18
01/11/2022	20:35	60	81	47	53	51	53	54	59	46	36	26
01/11/2022	20:40	48	52	47	50	44	43	44	46	34	19	17
01/11/2022	20:45	61	81	47	54	60	63	59	58	47	42	32
01/11/2022	20:50	60	81	46	53	50	53	54	59	46	38	27
01/11/2022	20:55	50	68	45	49	56	54	45	45	35	30	26
01/11/2022	21:00	48	54	46	54	46	43	45	45	38	34	30
01/11/2022	21:05	62	80	45	56	64	66	59	58	48	44	35
01/11/2022	21:10	63	83	45	56	62	64	59	61	52	45	34
01/11/2022	21:15	56	81	45	51	49	50	51	56	42	33	24
01/11/2022	21:20	46	54	45	50	46	44	44	44	32	21	18
01/11/2022	21:25	63	83	45	56	61	62	59	61	50	44	35
01/11/2022	21:30	52	63	44	55	56	53	51	48	34	19	17
01/11/2022	21:35	60	81	45	52	51	52	53	59	46	38	28
01/11/2022	21:40	45	53	43	53	47	45	41	43	30	19	18
01/11/2022	21:45	58	78	43	55	60	62	56	53	45	39	30
01/11/2022	21:50	62	82	43	54	60	62	58	61	49	43	34
01/11/2022	21:55	44	47	43	47	43	42	41	43	30	19	17
01/11/2022	22:00	56	76	44	51	51	52	52	54	47	43	33
01/11/2022	22:05	60	79	44	53	60	63	57	55	46	40	31
01/11/2022	22:10	61	81	45	53	58	58	56	59	46	38	29
01/11/2022	22:15	62	85	46	53	51	52	55	62	48	38	26
01/11/2022	22:20	61	81	46	54	60	62	58	58	48	44	35

Our Ref: J004101
Client: Brenmall Ltd
Project: Dundonald Road
Results: Ambient Noise Measurements

Date	Time	Octave Band Centre Frequencies (Hz), dB L _{eq}										
		dB, L _{Aeq}	dB, L _{Amax}	dB, L _{A90}	63	125	250	500	1k	2k	4k	8k
01/11/2022	22:25	59	81	45	51	49	49	53	59	46	36	26
01/11/2022	22:30	46	49	45	47	43	41	42	44	32	21	18
01/11/2022	22:35	62	80	45	54	60	62	59	60	49	43	34
01/11/2022	22:40	45	49	45	48	43	40	42	44	32	24	20
01/11/2022	22:45	61	82	44	53	60	62	58	59	49	44	36
01/11/2022	22:50	58	79	44	52	50	52	53	57	44	36	26
01/11/2022	22:55	46	55	44	47	43	40	41	43	37	34	30
01/11/2022	23:00	63	81	45	55	60	62	59	61	50	44	36
01/11/2022	23:05	45	47	43	48	43	40	41	43	33	29	24
01/11/2022	23:10	49	69	44	51	46	43	44	48	37	25	21
01/11/2022	23:15	63	82	43	55	60	63	59	62	48	43	34
01/11/2022	23:20	47	58	43	50	43	40	41	43	39	37	32
01/11/2022	23:25	58	79	45	52	50	53	53	57	46	43	35
01/11/2022	23:30	62	79	45	56	64	67	60	57	49	45	36
01/11/2022	23:35	56	76	42	55	51	53	53	54	43	37	30
01/11/2022	23:40	56	61	45	46	43	42	45	49	51	50	45
01/11/2022	23:45	57	61	56	48	43	42	46	50	52	51	46
01/11/2022	23:50	61	80	46	54	61	63	58	58	50	46	40
01/11/2022	23:55	61	79	45	54	61	63	58	58	49	45	39
02/11/2022	00:00	48	52	45	47	42	39	40	42	42	41	36
02/11/2022	00:05	59	81	45	52	50	52	53	58	46	41	35
02/11/2022	00:10	47	53	44	47	42	40	39	41	41	39	34
02/11/2022	00:15	49	54	47	46	43	40	40	43	44	42	38
02/11/2022	00:20	47	52	46	47	42	38	40	41	42	40	35
02/11/2022	00:25	47	52	46	47	40	37	39	41	42	40	35
02/11/2022	00:30	43	49	42	45	39	36	37	38	37	35	31
02/11/2022	00:35	45	52	42	44	38	35	37	38	40	38	33
02/11/2022	00:40	40	46	39	44	38	35	36	36	33	31	26
02/11/2022	00:45	39	47	38	45	38	35	35	35	30	28	23
02/11/2022	00:50	38	44	37	44	37	34	35	35	29	26	22
02/11/2022	00:55	40	48	38	52	41	34	36	36	31	29	25
02/11/2022	01:00	43	51	40	45	39	36	37	38	37	36	31
02/11/2022	01:05	40	47	39	46	40	36	36	36	32	30	25
02/11/2022	01:10	41	45	39	49	43	40	38	38	30	26	22
02/11/2022	01:15	42	48	41	48	45	38	39	39	30	25	21
02/11/2022	01:20	42	47	41	48	42	38	40	40	29	23	20
02/11/2022	01:25	42	46	41	47	45	38	39	39	28	23	19
02/11/2022	01:30	42	45	40	47	47	38	39	39	28	23	20
02/11/2022	01:35	40	51	39	46	40	36	38	38	28	22	19
02/11/2022	01:40	40	46	39	47	40	36	38	38	28	22	19
02/11/2022	01:45	40	46	39	45	40	36	37	38	28	25	20
02/11/2022	01:50	40	43	38	45	40	36	37	38	28	23	19
02/11/2022	01:55	41	45	39	46	40	37	39	38	27	22	21
02/11/2022	02:00	40	47	39	46	41	37	38	38	27	22	20
02/11/2022	02:05	42	55	40	46	41	38	40	39	29	23	20
02/11/2022	02:10	42	47	41	46	41	37	39	40	29	24	20
02/11/2022	02:15	41	45	40	46	40	37	39	39	29	24	20
02/11/2022	02:20	42	47	40	45	41	37	39	40	29	23	19
02/11/2022	02:25	41	47	40	46	41	38	38	39	30	27	22
02/11/2022	02:30	42	46	40	45	41	38	40	39	29	25	21
02/11/2022	02:35	41	44	39	44	39	36	37	39	28	22	19
02/11/2022	02:40	41	46	40	44	40	37	39	39	29	23	20
02/11/2022	02:45	42	47	40	47	41	38	40	40	29	23	19
02/11/2022	02:50	41	48	40	46	41	37	39	39	28	24	20
02/11/2022	02:55	42	48	40	45	40	37	40	39	29	25	25
02/11/2022	03:00	41	48	40	44	40	37	39	39	28	23	22
02/11/2022	03:05	42	50	40	49	49	43	39	38	28	25	21
02/11/2022	03:10	42	47	40	45	41	37	40	39	29	24	20
02/11/2022	03:15	41	49	40	49	47	39	38	39	29	26	21
02/11/2022	03:20	42	47	40	46	40	37	39	39	28	23	19
02/11/2022	03:25	41	45	40	45	39	36	38	39	27	21	18
02/11/2022	03:30	41	45	40	45	40	37	38	40	28	22	19
02/11/2022	03:35	40	45	39	44	39	35	37	38	28	25	21
02/11/2022	03:40	41	45	40	45	40	36	38	39	29	26	22
02/11/2022	03:45	42	49	40	45	40	37	39	40	28	23	20
02/11/2022	03:50	41	46	40	46	41	37	39	39	27	22	19
02/11/2022	03:55	43	48	41	46	42	38	41	41	28	21	24
02/11/2022	04:00	43	47	42	46	42	39	41	41	28	20	18
02/11/2022	04:05	44	50	43	47	43	39	41	42	29	22	19
02/11/2022	04:10	45	48	43	48	44	40	42	43	30	21	19
02/11/2022	04:15	45	48	44	48	43	40	42	43	31	22	19
02/11/2022	04:20	45	51	44	49	44	40	43	44	31	24	20
02/11/2022	04:25	44	48	43	48	43	39	41	43	30	22	19

Our Ref: J004101
Client: Brenmall Ltd
Project: Dundonald Road
Results: Ambient Noise Measurements

Date	Time	Octave Band Centre Frequencies (Hz), dB L _{eq}										
		dB, L _{Aeq}	dB, L _{Amax}	dB, L _{A90}	63	125	250	500	1k	2k	4k	8k
02/11/2022	04:30	45	49	44	49	43	40	43	44	31	20	22
02/11/2022	04:35	46	53	45	49	46	43	44	44	31	21	19
02/11/2022	04:40	46	49	45	49	45	41	44	45	32	21	19
02/11/2022	04:45	46	50	45	49	44	41	44	44	31	21	18
02/11/2022	04:50	47	51	45	48	44	41	44	45	32	23	21
02/11/2022	04:55	46	50	44	47	43	40	43	44	33	26	22
02/11/2022	05:00	47	50	45	48	44	41	44	45	32	25	20
02/11/2022	05:05	47	51	46	50	45	41	44	45	33	24	20
02/11/2022	05:10	47	54	45	49	45	41	44	45	32	29	22
02/11/2022	05:15	48	52	47	50	45	42	45	46	34	26	22
02/11/2022	05:20	50	55	49	51	48	44	47	48	36	26	22
02/11/2022	05:25	50	53	48	51	47	43	47	48	35	27	23
02/11/2022	05:30	50	53	49	51	47	45	47	48	36	25	21
02/11/2022	05:35	50	54	50	51	47	44	47	49	36	24	20
02/11/2022	05:40	61	81	50	55	60	62	58	58	47	42	33
02/11/2022	05:45	51	55	50	51	48	44	47	49	37	25	26
02/11/2022	05:50	62	79	50	56	61	64	59	59	50	45	35
02/11/2022	05:55	60	79	49	55	62	65	57	54	46	42	33
02/11/2022	06:00	59	80	50	55	52	53	54	58	47	38	30
02/11/2022	06:05	52	54	51	55	49	45	48	50	37	25	22
02/11/2022	06:10	62	82	51	57	61	63	59	60	49	42	36
02/11/2022	06:15	52	62	51	54	50	47	49	51	39	27	23
02/11/2022	06:20	52	54	51	53	49	47	49	51	38	29	24
02/11/2022	06:25	63	83	52	58	62	63	60	61	52	47	39
02/11/2022	06:30	53	58	52	54	50	47	50	52	39	40	33
02/11/2022	06:35	64	81	53	59	67	68	59	61	54	50	41
02/11/2022	06:40	55	59	54	55	54	51	51	53	40	32	26
02/11/2022	06:45	62	81	54	58	61	64	59	58	47	41	33
02/11/2022	06:50	65	83	55	58	61	63	61	64	52	47	39
02/11/2022	06:55	60	81	55	57	54	54	56	59	46	41	41
02/11/2022	07:00	64	82	55	58	60	62	60	63	51	44	37
02/11/2022	07:05	62	80	55	58	62	65	58	60	51	45	36
02/11/2022	07:10	59	79	55	60	58	57	56	57	46	38	29
02/11/2022	07:15	66	84	55	59	63	65	63	64	51	44	36
02/11/2022	07:20	65	85	55	59	61	62	61	64	50	41	34
02/11/2022	07:25	64	82	55	59	62	64	61	62	51	45	37
02/11/2022	07:30	60	79	55	57	55	55	56	59	46	49	42
02/11/2022	07:35	64	81	55	59	65	67	60	61	52	47	37
02/11/2022	07:40	63	83	55	58	61	63	60	61	51	47	36
02/11/2022	07:45	63	84	55	58	55	56	57	63	50	42	32
02/11/2022	07:50	69	88	54	60	65	67	64	68	55	52	40
02/11/2022	07:55	66	85	54	58	56	56	57	66	51	46	38
02/11/2022	08:00	60	80	54	58	54	54	55	59	49	45	35
02/11/2022	08:05	63	82	53	59	63	65	60	60	51	49	40
02/11/2022	08:10	64	81	53	60	61	63	60	62	52	50	39
02/11/2022	08:15	66	84	53	60	64	66	62	64	52	47	41
02/11/2022	08:20	67	85	53	60	62	63	61	66	53	48	42
02/11/2022	08:25	67	83	53	60	65	67	64	65	54	48	41
02/11/2022	08:30	54	62	52	56	51	49	51	52	40	33	28
02/11/2022	08:35	64	82	52	58	56	58	59	63	52	45	36
02/11/2022	08:40	64	82	52	59	63	64	60	61	50	45	37
02/11/2022	08:45	64	82	51	58	61	63	60	63	50	44	36
02/11/2022	08:50	63	81	51	58	61	62	59	61	50	45	37
02/11/2022	08:55	62	83	51	59	55	54	55	61	48	39	29
02/11/2022	09:00	64	83	52	59	61	63	60	63	49	43	33
02/11/2022	09:05	65	84	52	60	61	63	60	63	50	42	33
02/11/2022	09:10	65	84	51	60	61	62	60	64	50	42	33
02/11/2022	09:15	64	86	51	59	60	61	59	64	50	43	36
02/11/2022	09:20	58	78	51	59	56	55	54	56	44	37	29
02/11/2022	09:25	66	84	51	60	62	63	61	64	54	48	41
02/11/2022	09:30	64	82	51	59	61	63	59	62	52	46	37
02/11/2022	09:35	60	81	51	57	54	54	55	59	45	38	31
02/11/2022	09:40	63	81	51	58	64	66	60	59	51	48	40
02/11/2022	09:45	69	86	51	62	63	65	63	68	55	47	39
02/11/2022	09:50	60	82	51	56	53	53	55	60	46	38	31
02/11/2022	09:55	66	83	52	59	63	65	62	64	52	46	37
02/11/2022	10:00	65	82	52	58	61	62	60	63	51	45	36
02/11/2022	10:05	64	82	52	58	63	65	61	62	50	45	37
02/11/2022	10:10	65	82	52	61	61	63	61	64	52	46	38
02/11/2022	10:15	57	79	52	60	58	56	54	55	44	40	35
02/11/2022	10:20	64	82	52	59	61	63	60	62	51	45	38
02/11/2022	10:25	52	60	51	55	50	47	49	50	41	39	34
02/11/2022	10:30	67	84	51	60	67	69	63	65	55	51	44

Our Ref:

Client:

Project:

Results:

J004101
Brenmall Ltd
Dundonald Road
Ambient Noise Measurements

Date	Time	Octave Band Centre Frequencies (Hz), dB L _{eq}										
		dB, L _{Aeq}	dB, L _{Amax}	dB, L _{A90}	63	125	250	500	1k	2k	4k	8k
02/11/2022	10:35	66	83	52	62	69	64	62	63	56	51	41
02/11/2022	10:40	72	82	67	66	76	66	70	68	63	61	54
02/11/2022	10:45	73	85	66	68	78	69	70	68	64	60	54
02/11/2022	10:50	72	88	66	67	76	67	68	70	62	58	52
02/11/2022	10:55	70	84	59	65	73	65	66	67	60	55	48
02/11/2022	11:00	66	84	60	62	71	61	59	63	56	52	45
02/11/2022	11:05	67	83	56	64	72	65	62	64	57	52	45
02/11/2022	11:10	65	82	51	62	71	64	62	62	56	51	45
02/11/2022	11:15	64	82	51	63	62	63	60	62	53	50	49