

**RESIDENTIAL DEVELOPMENT AT
THE MANCHESTER COLLEGE, NORTHENDEN CAMPUS**

NOISE ASSESSMENT

**On behalf of:
Miller Homes**

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1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd was commissioned by Miller Homes to carry out a noise assessment in connection with a planning application for a proposed residential development at the site of The Manchester College, Northenden Campus, M23 0DD.

1.2 A noise assessment report 'P20-540-R01v1' dated March 2021, was originally prepared by Hepworth Acoustics and submitted with the planning application, however the noise survey work and subsequent analyses has been reviewed and updated to take into account the requirements of the Environmental Health Officer (EHO), as detailed in the following planning condition:

"a) Before the development commences a scheme for acoustically insulating the proposed residential accommodation against noise from Princess Parkway and Sale Road shall be submitted to and approved in writing by the City Council as local planning authority. There may be other actual or potential sources of noise which require consideration on or near the site, including any local commercial/industrial premises.

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

Bedrooms (night time - 23.00 - 07.00) 30 dB LAeq (individual noise events shall not exceed 45 dB LAmax,F by more than 15 times)

Living Rooms (daytime - 07.00 - 23.00) 35 dB LAeq

Gardens and terraces (daytime) 55 dB LAeq"

1.3 On this basis, a new noise survey has been carried out, including the rush hour period and care has been taken to ensure that the noise survey was **not** affected by school holidays and road closures. There were also no COVID-19 related lockdowns or restrictions in place during the updated noise survey.

- 1.4 The findings of the noise survey have been used to calibrate a road traffic noise model of roads in the surrounding area, as road traffic noise is the predominant noise source incident upon the development site.
- 1.5 The results of the noise survey/modelling have been used to establish recommendations for noise mitigation measures in order to achieve the acoustic design criteria stated in the planning condition above.
- 1.6 Ventilation and thermal comfort requirements to satisfy potential overheating are beyond our area of expertise and will need to be reviewed by a suitably qualified person, such as a ventilation/M&E consultant. However, we have provided advice for maintaining the sound insulation of the building envelopes where alternate means of ventilation may be required.
- 1.7 The proposed development location is shown in Figure 1 and the latest proposed development layout is shown in Figure 2.
- 1.8 The noise assessment has included:
- An attended noise survey which includes the rush hour period;
 - Computerised road traffic noise contour modelling using CadnaA software;
 - Assessment of potential noise impact on the proposed development, based upon the proposed layout; and,
 - Recommendations of appropriate noise mitigation measures.
- 1.9 The various noise units and indices referred to in this report are described in Appendix I. All noise levels mentioned in the text have been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 SITE DESCRIPTION & PROPOSALS

Site Description

- 2.1 The proposed development site is currently occupied by The Manchester College, Northenden Campus.
- 2.2 The site is comprised of a main campus building which is situated toward the centre/north-east of the site, with car parking to the south and west of the main campus building. The south-east area of the site is currently a playing field. An overview of the existing site can be seen in Figure 1.
- 2.3 The site is bounded by residences directly to the north, west and south-west. The south-east of the site is bounded by the A5103 Princess Parkway, which is the main noise source influencing the noise climate on the site. The B5166 Sale Road runs along the south-west of the site on the other side of a single row of dwellings. The M60 runs approximately 380m to the north of the northern site boundary beyond existing dwellings.

Proposals

- 2.4 The proposed residential development layout is shown in Figure 2. Proposals are for 224 detached, semi-detached style houses. It is noted that in the vicinity of the boundary with the A5103, the site layout has been designed so that the dwellings will be orientated such that the private gardens will be located on the shielded side of the dwellings.
- 2.5 We understand that there are no proposals to install external plant such as 'air source heat pumps' and therefore assessment of any such noise sources is not necessary.

3.0 NOISE SURVEY & ASSESSMENT

Noise Survey

- 3.1 An attended noise survey was carried out at three main locations on the site, with some additional measurements taken at three further locations. The noise measurement locations are indicated in Figure 1 and are described below.
- 3.2 Locations A, B, C: These locations were selected to coincide with the positions of the most exposed proposed elevations to road traffic noise from Princess Parkway.
- 3.3 Locations D and E: These locations were used to gather data on the spread of road traffic noise further back from Princess Parkway to aid calibration of our subsequent computerised road traffic noise model.
- 3.4 During the noise survey visit an inspection around the site was carried out to confirm the noise sources incident upon the proposed development. In line with our previous experience on the site, the dominant noise source is from road traffic noise and the rest of the site further back from the Princess Parkway is noticeably quieter as demonstrated by the levels measured further back at Location F.
- 3.5 The development site is significantly screened from road traffic noise on Sale Road by the row of existing dwellings.
- 3.6 The noise survey was carried out on Wednesday 3 November 2021. The site is open and not suitable for leaving unattended noise monitoring equipment over an extended period, therefore attended noise surveys were carried out during representative periods of the daytime and night-time.
- 3.7 The night-time survey was carried out between 04:05 and 07:00, representing the worse-case (i.e. highest noise levels) three hours of night when road traffic flow rates are increasing towards the morning. This is considered a robust representation of the night-time noise levels.
- 3.8 The daytime survey was carried out between 07:00 and 13:00 which includes the rush hour period as stipulated in the planning condition. The higher road traffic flow rates during these periods provide a robust representation of the daytime noise levels.
- 3.9 The noise survey was carried out with a sound level meter continuously logging data at Location A and supplementary synchronised measurements taken at satellite Locations B to F.

- 3.10 The noise survey measurements were carried out in 5-minute periods to readily facilitate synchronised measurements at the satellite locations.
- 3.11 Acoustic calibration checks of the sound level meters were carried out before and after the noise measurements and no significant variation in the calibrated noise level was observed. The noise measurements were taken in 'free-field' conditions and at a microphone height of approximately 1.4m above the ground. Frequency analysis was also carried out.
- 3.12 Weather conditions during the noise survey were suitable for sound levels measurements and full details of the weather conditions along with the equipment used are provided in Appendix II.
- 3.13 The full results of the noise surveys are shown in Appendix II and summarised in Table 1.

Table 1: Range of Noise Survey Results (dB)

Location	Daytime $L_{Aeq,T}$	Night-time $L_{Aeq,T}$	Night-time L_{Amax}
A	58-64	52-62	60-68
B	58-61	51-58	58-64
C	59-61	52-58	60-64
D	57-59	51-60	57-65
E	58-59	52-59	58-62
F	54-57	43-53	50-56

- 3.14 As can be seen by the range of levels shown in Table 1, the daytime levels are typically slightly higher than the night-time values as is typically the case for sites dominated by road traffic noise and indicates a representative dataset. As is often the case, the noise levels at the end of the night (approaching 7am) are similar to daytime levels.
- 3.15 The L_{Amax} values did not exceed 70 dB L_{Amax} during the night-time at any of the locations.
- 3.16 We have taken the logarithmically averaged daytime and night-time $L_{Aeq,T}$ values as representative of the 16-hour daytime $L_{Aeq,16h}$ and 8-hour night-time $L_{Aeq,8h}$ values.
- 3.17 Table 2 shows the road traffic noise exposure levels for all locations.

Table 2: Road Traffic Noise Exposure Levels (dB)

Location	Daytime $L_{Aeq,16h}$	Night-time $L_{Aeq,8h}$
A	61	58
B	59*	57*
C	59*	57*
D	58*	56*
E	59*	55*
F	55*	48*

*There values have been extrapolated based on the average difference between the synchronised levels at the relevant satellite location and Location A.

- 3.18 The results in Table 2 show that the highest noise levels were measured in the south-east corner of the site, nearest to the A5103 Princess Parkway.

Computation Noise Model

- 3.19 A computational noise model was undertaken using CadnaA software in order to predict road traffic noise levels across the entirety of the proposed residential development.
- 3.20 The noise model calculation is based on the CRTN methodology for road traffic noise and calibrated using the results of the noise surveys.
- 3.21 We have also estimated some low levels of use of the internal roads within the development itself which are included in the noise contours.
- 3.22 The ground height data used in the model for the existing topography of the area has been obtained from OS Terrain 5 data.
- 3.23 All of the noise contour plots shown in Figures 3 to 6 include the recommended acoustic barrier which are discussed in Section 5.
- 3.24 The calculated 16-hour daytime noise contours at ground floor level are shown in Figure 3, and at first floor level are shown in Figure 4.
- 3.25 The 8-hour night-time noise contours at ground floor level are shown in Figure 5, and are shown at first floor level in Figure 6.
- 3.26 The implications of the noise assessment on the requirement for suitable noise mitigation measures are discussed in Section 5.

4.0 NOISE MITIGATION MEASURES

- 4.1 The planning condition noise criteria can be achieved with fairly modest noise mitigation measures, as described below.

Gardens

- 4.2 We have provided recommendations for 2m high acoustic barriers at key locations as shown in Figure 7. These acoustic barriers along with the screening provided by the proposed dwellings themselves will ensure that the noise levels in gardens across the vast majority of the site are within 50 dB $L_{Aeq,16h}$ and also are within 55 dB $L_{Aeq,16h}$ at the most exposed gardens.
- 4.3 The acoustic barriers should be solid with no holes or gaps along their length or at the base and should have a minimum surface mass of 10 kg.m⁻². Suitable barrier constructions would include proprietary acoustic timber fencing of minimum 20mm thickness or solid brick walls. Access gates in the barrier would be acceptable if necessary, as long as they are built to the same standard as acoustic fencing.
- 4.4 Subject to the above recommendations, road traffic noise levels will be within the planning condition noise criterion in private gardens.

Building Envelope Sound Insulation

- 4.5 Windows of standard well-sealed thermal double glazing (4 mm glass - 12 mm cavity - 4 mm glass) with standard trickle ventilation fitted have a typical sound reduction performance of 25 dB $R_w + C_{tr}$. Therefore, based on the planning condition internal noise level criteria, where external noise levels exceed 60 dB $L_{Aeq,16h}$ during the daytime and/or 55 dB $L_{Aeq,8h}$ and/or 70 dB L_{Amax} at night, higher specification glazing will be necessary.
- 4.6 Based on the noise contour plots in Figures 3 to 6, it is the case that standard well-fitted thermal double glazing e.g. 4mm glass – nominal (12-20mm) cavity – 4mm glass, and standard trickle ventilation will be suitable to achieve the planning condition internal noise criteria for the majority of the proposed development that is set back from the A5103 away from the south-east corner of the site.
- 4.7 We have carried out noise break-in calculations for houses proposed in the vicinity of the south-east corner of the site where the road traffic noise levels incident upon the development are greatest (to determine the sound insulation requirements for habitable rooms).

4.8 We recommend the following sound insulation scheme for those plots identified in Figure 7:

- Bedrooms with a view towards the A5103 to have well-fitted, enhanced sound insulated double glazing with a minimum laboratory sound insulation performance of 33 dB $R_w + C_{tr}$. This could typically be achieved with double glazing formed of 10mm glass – nominal (12-20mm) cavity – 6mm glass; or 8.4mm acoustic laminated glass – nominal (12-20mm) cavity – 6mm glass.
- For living rooms/dining rooms with a view towards the A5103, enhanced sound insulated double glazing with a minimum laboratory sound insulation performance of 28 dB $R_w + C_{tr}$. This could typically be achieved with double glazing formed of 6mm glass – nominal (12-20mm) cavity – 4mm glass.
- For all habitable rooms with a view towards the A5103, we recommend the installation of upgraded acoustic ventilation with a minimum sound insulation performance of 44 dB $D_{n,e,w}$.
- For top floor bedrooms, we recommend that ceilings are formed of two layers of plasterboard with mineral wool above and with no penetrations in the ceiling (i.e. no recessed downlighters etc.)

Ventilation & Overheating

- 4.9 Based on the wording of the planning condition, it is our interpretation that the EHO would like overheating to be taken into account within the context of the noise mitigation scheme.
- 4.10 Given that the internal design criteria during the daytime is 35 dB $L_{Aeq,16h}$ and during the night-time it is 30 dB $L_{Aeq,8h}$; based on a nominal loss through a partially open window of 15 dB, to can reasonably be derived that where external noise levels at an elevation are predicted to exceed 50 dB $L_{Aeq,16h}$ during the daytime and 45 dB $L_{Aeq,8h}$ during the night-time - windows will need to be closed in order to achieve the design criteria, as outlined in the recommendations above.
- 4.11 Where the predicted noise levels exceed 50 dB $L_{Aeq,16h}$ during the daytime and 45 dB $L_{Aeq,8h}$ during the night-time, resulting in closed windows in order to achieve the internal noise level criteria, the ventilation/M&E consultant will need to assess the potential for overheating and determine how thermal comfort can be maintained without compromising the sound insulation of the building envelope.

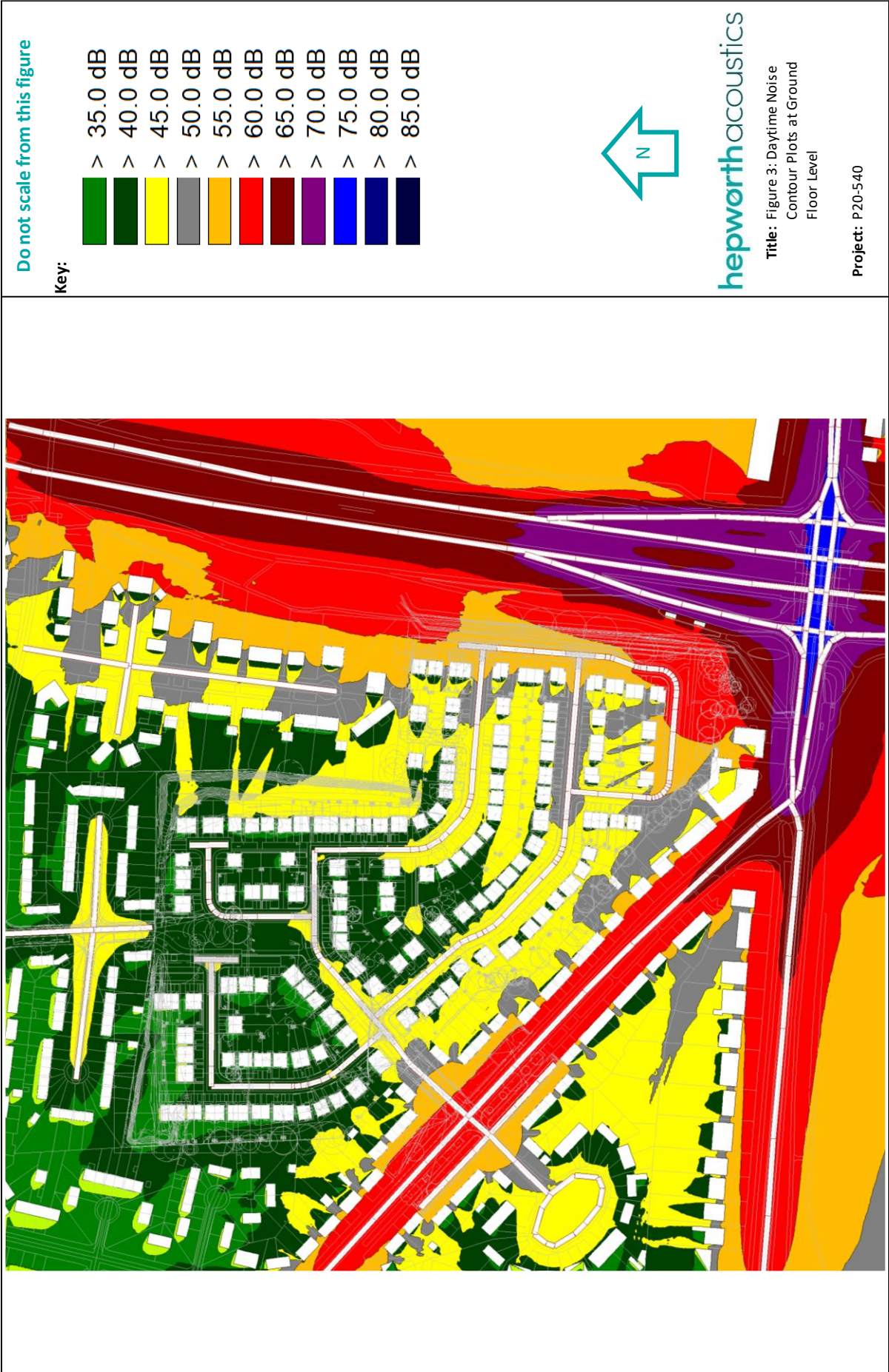
- 4.12 The elevations where this will need to be considered can easily be determined using the contour plots in Figures 3 to 6.
- 4.13 We have provided the following outline recommendations with respect to maintaining the sound insulation performance in the context of providing thermal comfort:
- If it is found that alternate means of ventilation are required where windows need to be closed to achieve the internal noise level criteria, then any ventilation terminations in the most exposed elevations identified above should have a minimum building element performance of 44 dB $D_{n,e,w}$ and 35 dB $D_{n,e,w}$ for any dwellings further back into the development where windows need to be closed.
 - If possible any ventilation terminations should be placed on the quieter side of the dwellings with reference to the noise contour plots in Figures 3 to 6.
 - For elevations where windows need to be closed in order to achieve the internal noise levels criteria, the option of being able to open the window should be provided to the residents.

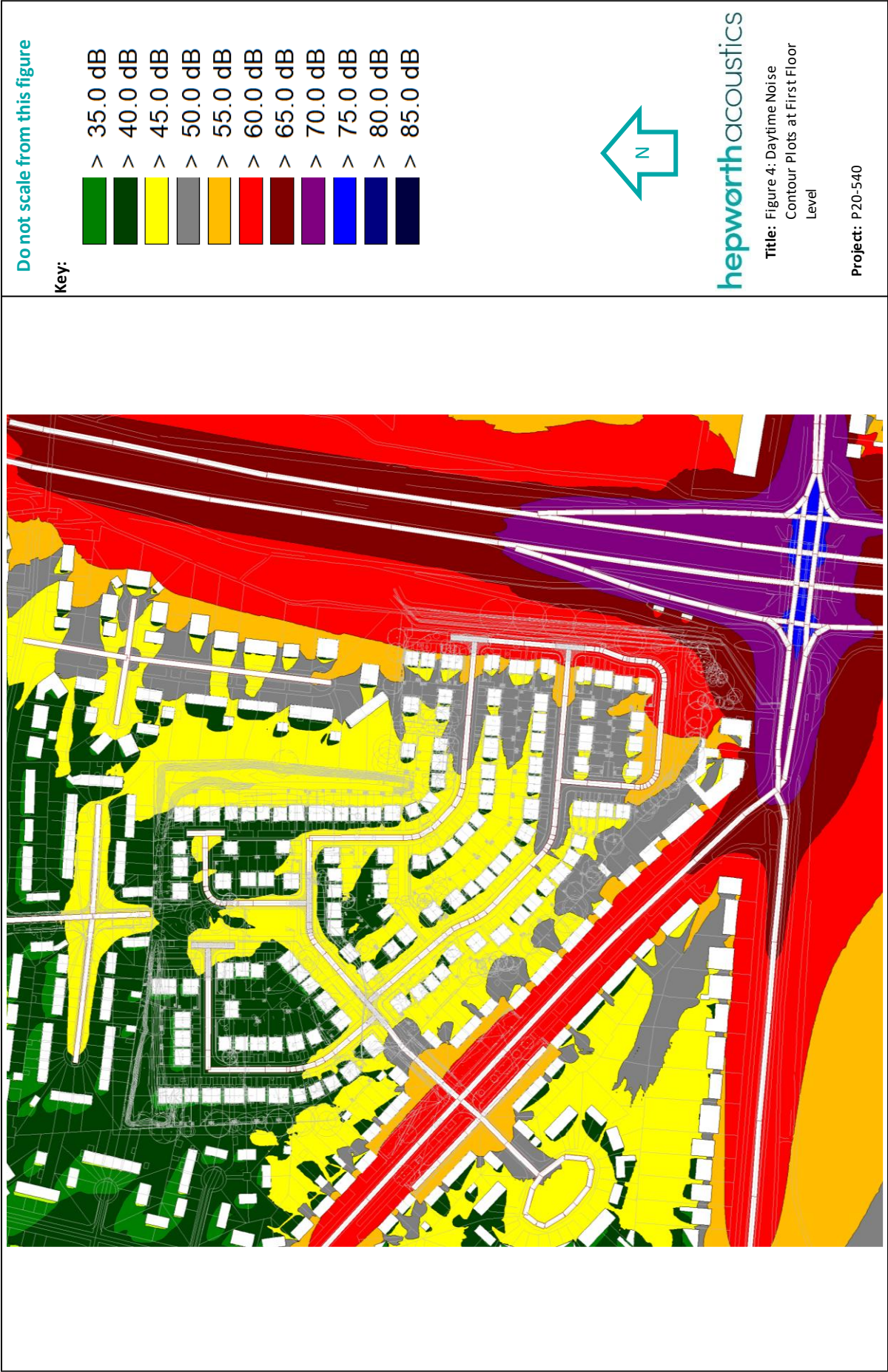
5.0 SUMMARY & CONCLUSION

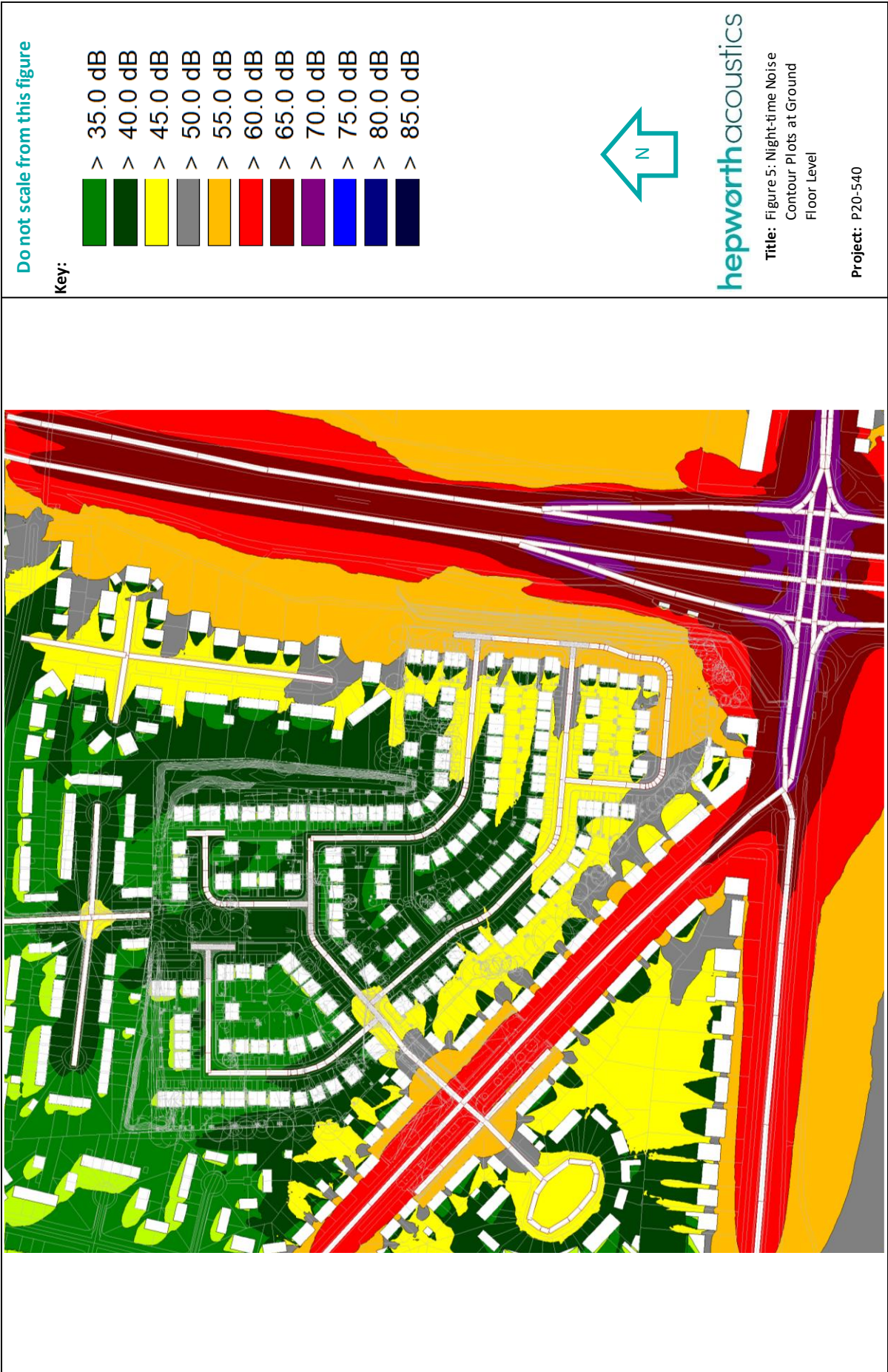
- 5.1 The impact of noise has been assessed for a proposed residential development on the current site of The Manchester College, Northenden Campus.
- 5.2 The assessment has addressed the potential impact of road traffic noise on the proposed residential development.
- 5.3 The assessment has been based upon the results of a noise survey which includes the rush hour period in line with the EHO requirements.
- 5.4 A computerised noise model has been created using CadnaA software and calibrated using the results of the noise surveys.
- 5.5 An appropriate scheme of noise mitigation measures has been recommended in this report to achieve acceptable noise levels for the new residents as defined in the planning condition put forward by the EHO. These measures include upgraded glazing and ventilation for dwellings most exposed to traffic noise.
- 5.6 Outline comments and advice have been provided with respect to maintaining the sound insulation of the building envelopes within the context of providing thermal comfort.















Appendix I: Noise Units & Indices

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the pressure values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that the human response to sound most closely follows a logarithmic relationship. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (at the threshold of hearing) to 120 dB (at the threshold of pain).

Due to the logarithmic nature of decibels, when two sounds of the same level are combined together, the total sound level is (under normal circumstances) 3 dB higher than each of the individual sound levels e.g. 60 dB plus 60 dB = 63 dB. In terms of perceived 'loudness', a 3 dB(A) variation in sound level is a relatively small (but nevertheless just noticeable) change. An increase in sound level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in sound level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' the frequency spectrum appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using a mathematical filter called the 'A' weighting, which is built into sound level meters. Sound levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or Hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Relevant Sound & Vibration Terms

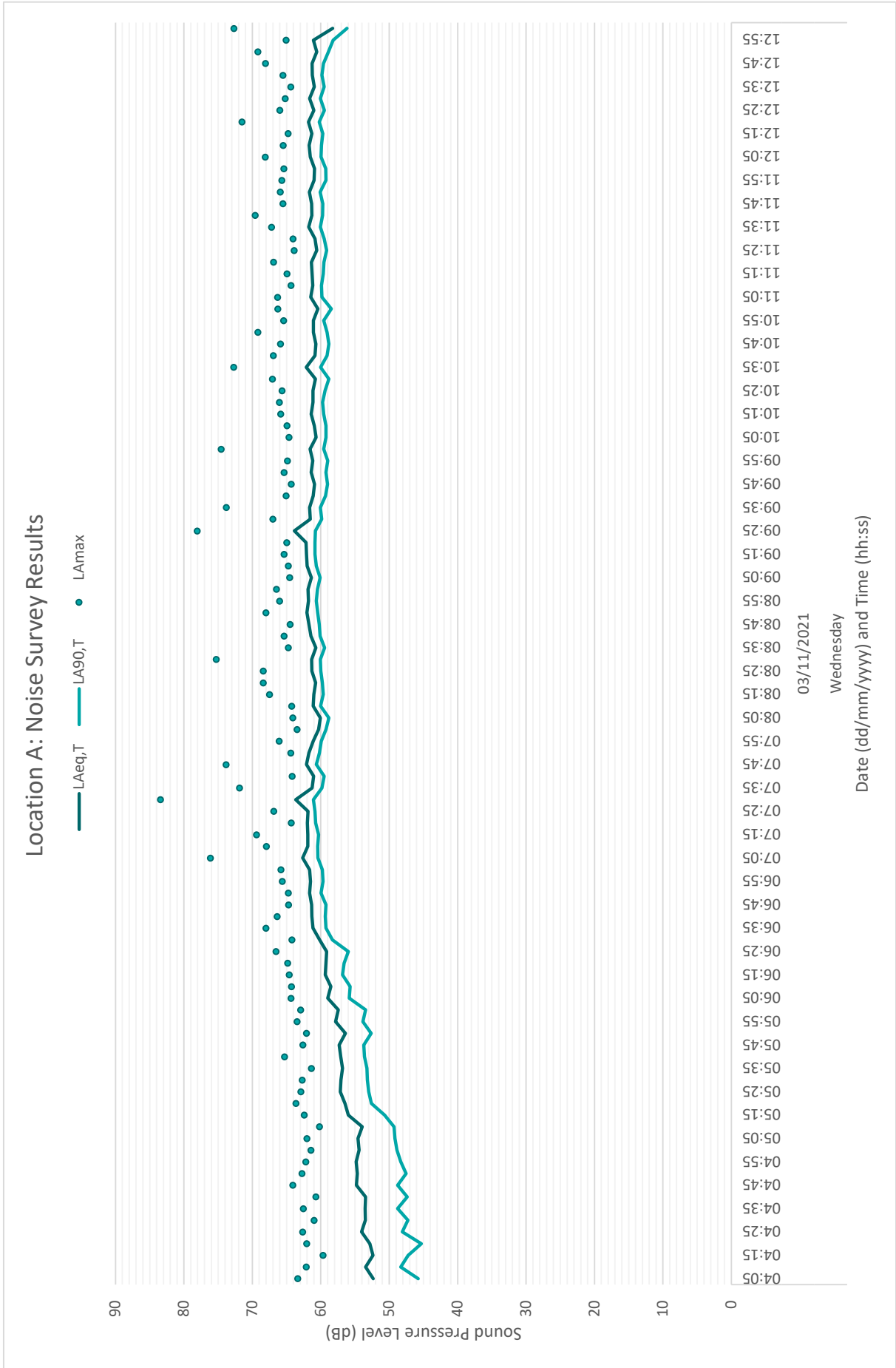
When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case, it is therefore not possible to represent the noise with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices can be used. The various indices used in this report, along with other relevant terms are described below.

- $L_{Aeq,T}$ This is the A-weighted 'Equivalent Continuous Sound Level' which is an average of the total sound pressure measured over a specified time period. In other words, $L_{Aeq,T}$ is the level of a steady sound which has the same total (A-weighted) sound pressure as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for most forms of environmental noise.
- L_{Amax} This is the 'Maximum A-weighted Sound Level' that was measured during the monitoring period. L_{Amax} used in this report refers throughout to L_{Amax} measured using the fast time weighting of the sound level meter, $L_{Amax,f}$.
- $L_{A10,T}$ This is the A-weighted noise level exceeded for 10% of the time period. $L_{A10,T}$ is usually used as a measure of traffic noise.
- $L_{A90,T}$ This is the A-weighted sound level exceeded for 90% of a measurement time period. $L_{A90,T}$ is used as a measure of background sound level.
- $D_{n,e,w}$ This the 'Weighted Element Normalised Level Difference', which is a single figure value quantifying the sound insulation performance of a building element, such as an air vent.
- R This is the 'Sound Reduction Index' as measured in a laboratory, which is a measure of the sound insulation properties of a building element (e.g. a wall) in a stated frequency band.
- R_w This is the 'Weighted Sound Reduction Index' (R_w), which is a single figure quantity of R , the laboratory measured Sound Reduction Index.
- C_{tr} This is a weighted transport noise spectrum, which can be added to $D_{nT,w}$ or R_w in some standards to account for the spectral composition of different sound sources.

Appendix II: Noise Survey Results

Date	Wednesday 3 November 2021
Equipment	Brüel & Kjær 2250 'Class 1' sound analyser (S/N: 3011706) Brüel & Kjær 2260 'Type 1' sound analyser (S/N: 02467016)
Weather	Dry, ~8°C with low winds <4 m.s ⁻¹ and moderate cloud coverage

Please see the results of the noise survey in the graph and tables overleaf.



Night/Early Morning Noise Survey Results at Satellite Survey Locations

Location	Time		Measured Noise Levels (dB)	
	Start	End	L_{Amax}	$L_{Aeq,T}$
B	04:05	04:10	57.8	51.4
B	04:10	04:15	64.5	51.8
B	05:05	05:10	60.7	53.7
B	05:10	05:15	59.1	52.8
B	06:05	06:10	61.5	57.7
B	06:10	06:15	63.4	57.4
C	04:20	04:25	64.2	51.9
C	04:25	04:30	60.9	53.2
C	05:20	05:25	60.3	54.9
C	05:25	05:30	60.8	55.7
C	06:20	06:25	62.4	58.2
C	06:25	06:30	63.2	58.1
D	04:35	04:40	57.0	51.2
D	05:35	05:40	60.1	55.1
D	06:35	06:40	64.9	59.6
E	04:55	05:00	57.8	52.3
E	05:55	06:00	58.6	55.0
E	06:55	07:00	62.0	58.8
F	04:45	04:50	49.5	43.3
F	05:45	05:50	52.6	47.1
F	06:45	06:50	56.2	52.8

Daytime Noise Survey Results at Satellite Survey Locations

Location	Time		Measured Noise Levels (dB)	
	Start	End	L_{Amax}	$L_{Aeq,T}$
B	07:05	07:10	67.1	60.6
B	07:10	07:15	63.5	60.3
B	08:05	08:10	63.6	57.5
B	08:10	08:15	63.9	58.8
B	09:05	09:10	63.5	60.0
B	09:10	09:15	64.5	60.5
C	07:20	07:25	62.8	60.6
C	07:25	07:30	67.5	60.5
C	08:20	08:25	67.2	59.0
C	08:25	08:30	71.8	59.7
C	09:20	09:25	62.5	59.8
C	09:25	09:30	62.9	59.7
D	07:35	07:40	61.6	58.8
D	08:35	08:40	62.1	57.1
D	09:35	09:40	64.3	58.2
E	07:55	08:00	62.1	59.2
E	08:55	09:00	64.0	59.3
E	09:55	10:00	62.9	58.3
F	07:45	07:50	61.5	56.6
F	08:45	08:50	61.0	57.3
F	09:45	09:50	58.7	54.2