

**TECHNICAL APPENDIX 11.1**

**HALSNEAD GARDEN VILLAGE, WHISTON PHASE 3  
PROPOSED RESIDENTIAL DEVELOPMENT**

**NOISE ASSESSMENT**

On behalf of:  
**Taylor Wimpey**

## TECHNICAL APPENDIX 11.1

### HALSNEAD GARDEN VILLAGE, WHISTON PHASE 3 PROPOSED RESIDENTIAL DEVELOPMENT

### NOISE IMPACT ASSESSMENT

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## 1. INTRODUCTION

- 1.1 Hepworth Acoustics Ltd was commissioned by Taylor Wimpey to carry out a noise survey and assessment in connection with the proposed residential development of the Phase 3 parcel within the wider Halsnead Garden Village scheme.
- 1.2 Phase 3 is split broadly in half, comprising a southern section (Phase 3A) and a northern section (Phase 3B). A hybrid planning application has been submitted, comprising a full planning application for Phase 3A and an outline application for Phase 3B. The site location is shown in Figure 1.
- 1.3 Phase 3A comprises 93 dwellings in a mix of three, four and five bedrooms units, the site location is shown in Figure 2. At this stage, no layout drawings are available for Phase 3B.
- 1.4 The site is located within a mixed context consisting of existing and consented residential development and areas of woodland and open fields. The Phase 3 parcel is bounded to the south by the M62 Motorway which runs broadly at grade relative to the development land along the eastern part of the site. Both the motorway and the development land then fall gradually towards the west, with the motorway increasingly running within a cutting. As a result, the motorway becomes screened by and is not visible from the western part of the site.
- 1.5 The closest proposed dwellings of Phase 3A are approximately 90 m from the motorway boundary, with intervening public open space and internal access roads providing separation between the proposed dwellings and the motorway.
- 1.6 To the north of the site is Halsnead Caravan Park which bounds the Phase 3B land, beyond which lies an under-construction residential development on land south of Lickers Lane.
- 1.7 To the west, the Phase 3 parcel is bound by an area of woodland (with an associated pond known as 'Big Water'), beyond which lies the site of a consented residential scheme with Windy Arbor Road and the M62 Motorway further west. Vehicular access to Phase 3 is proposed via the approved Taylor Wimpey Phase 2A development to the east, which is currently under construction.
- 1.8 The M62 is the only significant source of noise in the local area, with Fox's Bank Lane being a relatively lightly trafficked lane.
- 1.9 The noise assessment has included:
  - An inspection of the development site and surrounding area;
  - Measurement of road traffic noise levels on the development land;
  - Assessment of the potential noise impact on the development land; and
  - Recommendations for noise mitigation measures.

- 1.10 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. ACOUSTIC CRITERIA

### National Planning Policy Framework (2024)

2.1 Paragraph 198 of the National Planning Policy Framework (NPPF), December 2024, 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;”*

### Noise Policy Statement for England (2010)

2.2 The Noise Policy Statement for England (NPSE) 2010, which is referred to in the NPPF, includes three aims:

- I. Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- II. Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- III. Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

### BS 8233:2014 ‘Guidance on sound insulation and noise reduction for buildings’.

2.3 No specific guidance is given in the NPPF on acoustic design criteria, therefore, the guidance discussed below has been used for acoustic design purposes.

2.4 Guidance on acceptable noise levels in habitable rooms and private gardens is set out in British Standard 8233: 2014, ‘Guidance on sound insulation and noise reduction for buildings’. BS 8233 recommends that it is desirable that noise from external sources does not exceed the guidelines values that are shown in Table 1 inside habitable rooms for daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods.

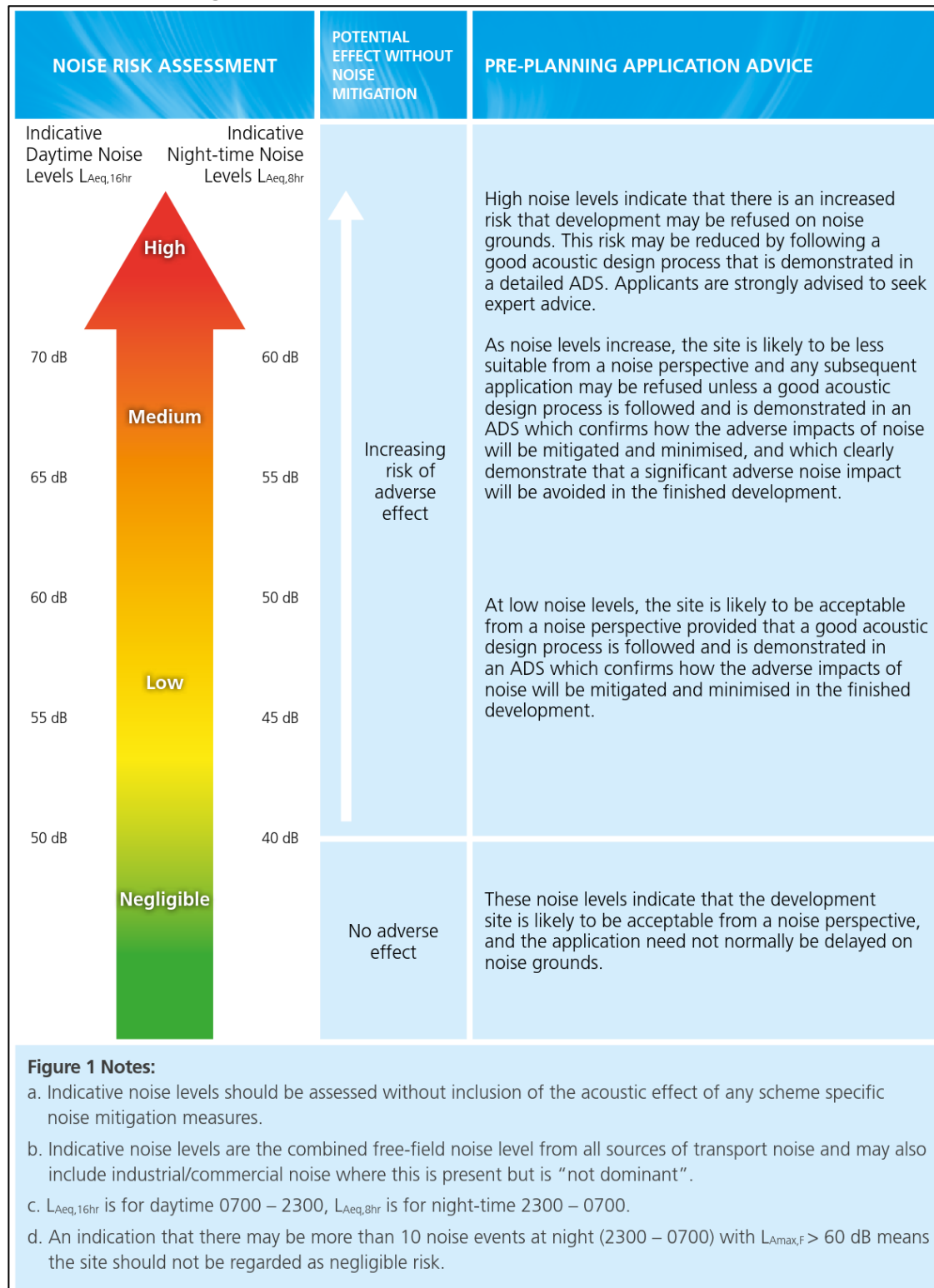
**Table 1: BS 8233:2014 Recommended Acoustic Design Criteria (dB  $L_{Aeq,T}$ )**

| Activity                   | Location         | Daytime<br>07:00 – 23:00 | Night-time<br>23:00 – 07:00 |
|----------------------------|------------------|--------------------------|-----------------------------|
| Resting                    | Living room      | 35                       | -                           |
| Dining                     | Dining room/area | 40                       | -                           |
| Sleeping (daytime resting) | Bedroom          | 35                       | 30                          |

- 2.5 BS 8233 also recognises that regular individual noise events at night can cause sleep disturbance. Peaks of noise from individual events are usually described in terms of  $L_{AFmax}$  values and these can be highly variable and unpredictable.
- 2.6 BS 8233 also recognises that regular individual noise events at night can cause sleep disturbance. Peaks of noise from individual events are usually described in terms of  $L_{AFmax}$  values and these can be highly variable and unpredictable.
- 2.7 ProPG: Planning & Noise ‘Professional Practice Guidance on Planning & Noise’ 2017 states that “*in most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB  $L_{Amax,F}$  more than 10 times a night*”.
- 2.8 For private outdoor amenity spaces of the new houses (e.g. rear gardens) BS 8233 states that ‘it is desirable that the external noise level does not exceed 50 dB  $L_{Aeq,16hr}$  with an upper guideline value of 55 dB  $L_{Aeq,16hr}$  which would be acceptable in noisier environments’. In our experience, most local planning authorities have traditionally adopted, or accepted, the 55 dB(A) guideline value for rear gardens of proposed new residential developments.

### ProPG: Planning & Noise – New Residential Development (2017)

- 2.9 There is also guidance in ‘ProPG: Planning & Noise – New Residential Development’ (2017), although this guidance does not constitute official government guidance and has no legal standing. The ProPG describes a staged approach to the assessment of noise impact on proposed new residential development sites. Stage 1 is an initial site noise risk assessment, indicating whether the proposed site is considered to pose a negligible, low, medium or high risk from a noise perspective.
- 2.10 The ProPG initial site noise risk assessment criteria are shown in Chart 1 overleaf.

**Chart 1: ProPG Stage 1: Initial Site Noise Risk Assessment Criteria**

2.11 Chart 1 broadly sets out indicative noise levels that define the element of risk of noise impact on proposed residential development land, ranging from 'Negligible' to 'High'.

- 2.12 Chart 1 broadly sets out indicative noise levels that define the element of risk of noise impact on proposed residential development land, ranging from 'Negligible' to 'High'.
- 2.13 The guidance states that these noise levels *"should be interpreted flexibly having regard to the locality, the project and the wider context"*.
- 2.14 The ProPG criteria apply to residential development land that is exposed to transportation noise or mixed transportation noise and industrial/commercial noise where the latter is not the dominant noise source.
- 2.15 Stage 2 of the ProPG approach is a more detailed assessment in the form of an Acoustic Design Statement (ADS). However, the acoustic design criteria that are specified in ProPG, and which forms the basis of the ADS, are essentially the same as those recommended in BS 8233, as summarised previously in Table 1 of this report.
- 2.16 Similarly to BS 8233, ProPG recognises that regular individual noise events at night can cause sleep disturbance. The ProPG guidance suggests that for design purposes, wherever practicable, peaks of noise inside bedrooms from external sources should not exceed 45 dB  $L_{AFmax}$  more than 10 times per night'.

### Acoustic Design Criteria

- 2.17 For this assessment, we therefore recommend that the following noise criteria be adopted in order to assess the suitability of the site for residential development in terms of environmental noise and to ascertain any requirements for noise mitigation measures.
- 2.18 The criteria are to apply with windows closed and trickle ventilation provided:
- Daytime noise not exceeding 35 dB  $L_{Aeq,16hr}$  inside living rooms and bedrooms, 40 dB  $L_{Aeq,16hr}$  inside dining rooms; and
  - Night-time noise levels not exceeding 30 dB  $L_{Aeq,8hr}$  and generally not exceeding 45 dB  $L_{AFmax}$  in bedrooms (i.e. no more than 10 times per night).
- 2.19 For private outdoor amenity spaces of the new houses (e.g. rear gardens) BS 8233 states that 'it is desirable that the external noise level does not exceed 50 dB  $L_{Aeq,T}$  with an upper guideline value of 55 dB  $L_{Aeq,T}$  which would be acceptable in noisier environments'.
- 2.20 Our recommendations for noise mitigation to achieve the adopted noise design criteria are described in Section 5.

### 3. ROAD TRAFFIC NOISE SURVEY

- 3.1 Noise measurements were carried out over a 24-hour period at a location on site representative of the proposed first row of dwellings facing towards the motorway. Some supplementary short-term measurements were carried out other locations on the land.
- 3.2 The 24-hour noise measurement location is shown as Location 1 on Figure 1 and described below:
- Location 1: Towards the eastern end of the southernmost row of proposed dwellings, where the development land is most exposed to road traffic noise from the M62 (approx. 90m from the M62)
- 3.3 The noise measurements were taken using automated noise monitoring equipment between approximately 11:30 on Wednesday 8 May, until 11:30 on Thursday 9 May 2024. The noise survey was carried out using a Rion NL52 'Class 1' integrating sound level meter (s/n: 620870), complying with BS EN 60804:2001 independently and calibrated within the preceding 24 months. The noise survey measurements were taken in consecutive one-minute periods.
- 3.4 Because the noise from the M62 was found to be very steady, supplementary short-term attended noise measurements were also carried out at various locations on site during the daytime to assist with calibration of the computer noise model. These are shown on Figure 1 as Locations 2-6.
- 3.5 The supplementary noise survey was carried out between 10:15 and 13:00 on Thursday 19 September 2024, using a Brüel & Kjær 2260 'Class 1' integrating sound level meter (s/n: 3011706), complying with BS EN 60804:2001 independently and calibrated within the preceding 24 months. The noise measurements were carried out over a series of 5-minute periods.
- 3.6 Acoustic calibration of both sound level meters was carried out before and after the noise measurements using acoustic calibrators that had been independently calibrated within the preceding 12 months. No variation in the calibration level was noted.
- 3.7 The noise measurements have been carried out in compliance with BS 7445: 2003 (Part 1). Both sets of noise measurements were taken in 'free-field' conditions and at a microphone height of approximately 1.5 metres above the ground.
- 3.8 Weather conditions during the noise surveys were suitable for sound level measurements, being dry with low winds.
- 3.9 The measured daytime (07:00-23:00) and night-time (23:00-07:00)  $L_{Aeq}$  values have been logarithmically averaged to obtain the actual  $L_{Aeq,16hr}$  and  $L_{Aeq,8hr}$  values respectively and shown in Table 2 below.

**Table 2: Measured Road Traffic Noise Exposure Levels (dB)**

| Location   | Daytime $L_{Aeq,16hr}$ | Night-time $L_{Aeq,8hr}$ |
|------------|------------------------|--------------------------|
| Location 1 | 56                     | 52                       |

3.10 Measured peaks of noise at night were in the range 45-78 dB  $L_{AFmax}$  due to passing vehicles with the 10<sup>th</sup> highest measured night-time  $L_{AFmax}$  value being 69 dB  $L_{AFmax}$ .

3.11 The attended measurement results (Locations 2 to 6) are summarised in Table 3 below.

**Table 3: Summary of Attended Noise Measurements (dB)**

| Location                             | Daytime $L_{Aeq,5mins}$ Range<br>(Logarithmic Average) |
|--------------------------------------|--------------------------------------------------------|
| Location 2: (90m from M62 boundary)  | 59-60<br>(59)                                          |
| Location 3: (75m from M62 boundary)  | 61-62<br>(61)                                          |
| Location 4: (70m from M62 boundary)  | 61<br>(61)                                             |
| Location 5: (175m from M62 boundary) | 56-58<br>(56)                                          |
| Location 6: (250m from M62 boundary) | 54-55<br>(55)                                          |

3.12 For comparison purposes, it should be noted that the typical measured noise levels at Location 1 during the late morning/lunchtime period were around 56 - 57 dB  $L_{Aeq}$ .

3.13 The measured noise levels have been used to calibrate the computerised noise model of the site.

## 4. ROAD TRAFFIC NOISE MODEL

- 4.1 A computerised noise model of the development site and surrounding roads has been created using DataKustik's CADNA-A® noise modelling software.
- 4.2 Geographical information for the site and its surroundings, including ground level data, has been obtained from Ordnance Survey digital mapping.
- 4.3 Using the results of the road traffic noise survey iterations of the noise propagation model have been generated to provide predicted  $L_{Aeq,16hr}$  daytime at 1.5m and  $L_{Aeq,8hr}$  night-time noise levels at 4.5m above local ground.
- 4.4 The following relevant CADNA-A® settings and standards were used in the noise model:
- Software Version: 2025 MR 1 (build: 211.5558).
  - Standards: CRTN and ISO 9613:2024.
  - Source of topographical data: Ordnance Survey Terrain 5 data.
  - Orders of reflection: 2.
  - Search radius: 2 km.
  - Ground absorption: 1. Ground in the area is generally absorptive.
  - Temperature: 10°C.
  - Humidity: 70%.
- 4.5 The noise contour plans for the model are presented in Figure 3 for the daytime at 1.5m height and Figure 4 for the night-time at 4.5m height.
- 4.6 The results of these calculations have been used to assess the level of sound insulation necessary for the windows and ventilation serving habitable rooms of the proposed dwellings, and to inform the assessment of external amenity areas. The results form the basis of the noise control recommendations in Section 5.

## 5. NOISE ASSESSMENT & MITIGATION SCHEME

### Initial Noise Risk Assessment

- 5.1 By reference to Chart 1, the calculated noise exposure levels for the proposed dwellings in the eastern part of the site (closest to the M62) would fall within the 'Medium-Low' risk category of ProPG for both the daytime and night-time periods.
- 5.2 For the western part of the site, where the motorway is in a cutting, the calculated noise exposure levels would fall within the 'Low' risk category for both daytime and night-time periods.
- 5.3 In terms of the ProPG, the site is therefore suitable for residential development subject to the noise climate being taken into account and appropriate noise mitigation measures implemented where necessary.
- 5.4 Due to the lower noise levels, no specific noise mitigation measures are anticipated to be required for the dwellings to the western part of the site.
- 5.5 However, for dwellings located towards the M62 in the eastern part of the site, predicted road traffic noise levels indicate that some mitigation measures will be necessary to secure appropriate internal noise conditions within habitable rooms and to achieve suitable noise environments within external amenity areas.
- 5.6 The development proposals for Phase 3A are now at a stage where the site layout is fixed. The layout nonetheless demonstrates 'good acoustic design' principles, including orientating and fronting the majority of dwellings towards the internal site road and M62, and providing a substantial stand-off distance to the M62 of approximately 90m at the closest point.
- 5.7 'Good acoustic design' should remain proportionate and reasonable in the context of the specific development, whilst taking account of other factors that influence overall scheme quality. The mitigation measures outlined in this report, together with the adopted layout strategy, would constitute 'good acoustic design'. It is recommended that these measures are reviewed and, if necessary, refined at the detailed design stage.
- 5.8 Our noise mitigation recommendations are described below.

### External Noise Criteria

- 5.9 For the small number of dwellings (mainly on the corner of internal site roads) that will be less protected from road traffic noise by the dwellings themselves, acoustic mitigation in the form of specialist boundary fencing would be required.
- 5.10 For these dwellings, we recommend controlling noise levels within rear gardens through the provision of acoustic barriers of 2.0m in height. Plots requiring acoustic barriers are shown in blue on Figure 2.

- 5.11 The acoustic barriers must be imperforate (i.e. have no holes or gaps along their length or at the base) and have a surface mass no less than  $10 \text{ kg/m}^2$ . If formed of timber fencing should be at least 20mm thick and have double-rebated boards; cover strips; and gravel boards at the base. Where required, gates in the acoustic fencing would be acceptable as long as they are built to the same specification as the fence itself.

## Glazing

- 5.12 Windows of standard well-sealed thermal double glazing (4mm glass – 4mm glass) have a typical sound reduction performance of  $25 \text{ dB } R_w + C_{tr}$ .
- 5.13 Therefore, where road traffic noise levels exceed (façade values) of  $60 \text{ dB } L_{Aeq,16hr}$  during the daytime and/or  $55 \text{ dB } L_{Aeq,8hr}$  and/or  $70 \text{ dB } L_{Amax(10th highest)}$  at night, higher specification glazing will be necessary. From the survey results these threshold values will be exceeded in the eastern area.
- 5.14 We therefore recommend that the living room and bedroom windows of the nearest houses to the motorway at the eastern end of the site are fitted with upgraded double glazing with a sound insulation performance of  $29 \text{ dB } R_w + C_{tr}$  (Noise Mitigation Scheme 1 on Figure 2).
- 5.15 Typically, this would be achieved with double glazing specifications of:
- $(29 \text{ dB } R_w + C_{tr})$  6mm glass - nominal (12-20mm) cavity – 4mm acoustic laminated glass.
- 5.16 The living room and bedroom windows of the nearest houses to the motorway in the middle part of the site will require upgraded double glazing with a sound insulation performance of up to  $27 \text{ dB } R_w + C_{tr}$  (Noise Mitigation Scheme 2 on Figure 2).
- 5.17 Typically, a sound insulation performance  $27 \text{ dB } R_w + C_{tr}$ , (can be achieved with double glazing specifications such as:
- $(27 \text{ dB } R_w + C_{tr})$  4mm glass - nominal (12-20mm) cavity – 4mm acoustic laminated glass.
- 5.18 For both living rooms and bedrooms of dwellings to the west of the site standard thermal double glazing likely to be adequate, this also applies to other houses on the site that are further away from the motorway and or screened effectively by other houses.

## Ventilation

- 5.19 Also, for all habitable rooms for which sound insulated windows are necessary, we recommend that specialist acoustic vents are fitted instead of standard window frame slot vents. Various types of acoustic vents are commercially available.
- 5.20 However, in terms of acoustic performance we would recommend types such as the Greenwood EAR42W 3-part system, comprising humidity sensitive indoor unit, acoustic sleeve, and outdoor

acoustic canopy or wall mounted Ryton AAC125HP units, or another ventilation system which has a good acoustic performance rating of over 42 dB  $D_{n,e,w}$ .

- 5.21 Standard thermal double glazing and standard slot vents are adequate for other houses on the site including any future dwellings on Phase 3B that are further away from the motorway and or screened effectively by other houses.
- 5.22 It is noted that the above recommendations do not take account of the requirement of Approved Document O of the Building Regulations (ADO), as that is not a planning matter. It should however be noted that the provisions of ADO will require that mechanical ventilation for dwellings in the areas of development in proximity to the M62 motorway.

### External Walls

- 5.23 The exact construction of the external walls is not known at this stage however it is assumed that the sound insulation performance of the wall construction will not be less than 50 dB  $R_w$ . This can be achieved using standard wall constructions, without any specific acoustic enhancements.

### Planning Condition

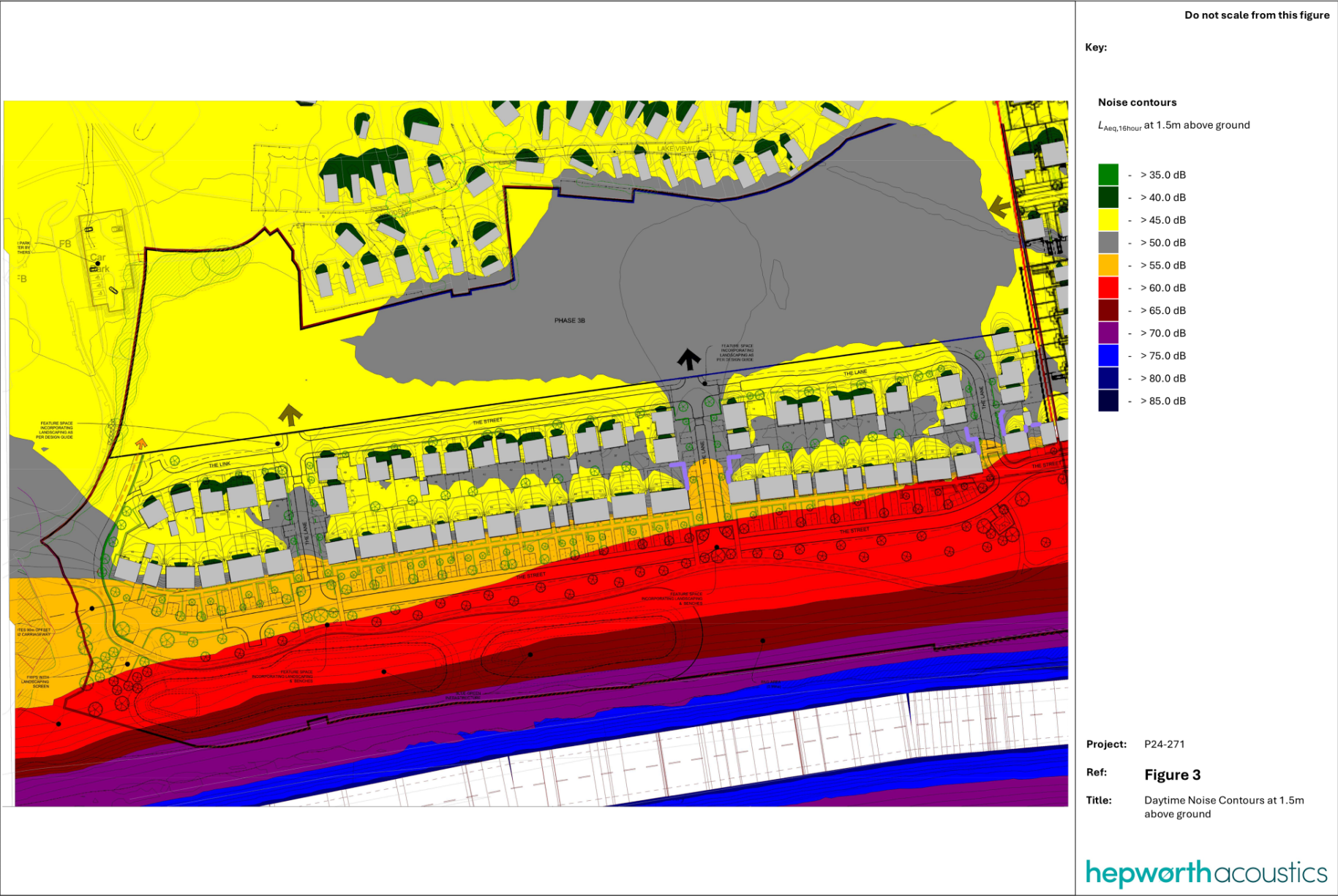
The need to ensure that an adequate scheme of noise mitigation is implemented can be formalised by an appropriately worded planning condition that requires a scheme of noise mitigation measures as described in this report to be implemented prior to occupation of relevant dwellings.

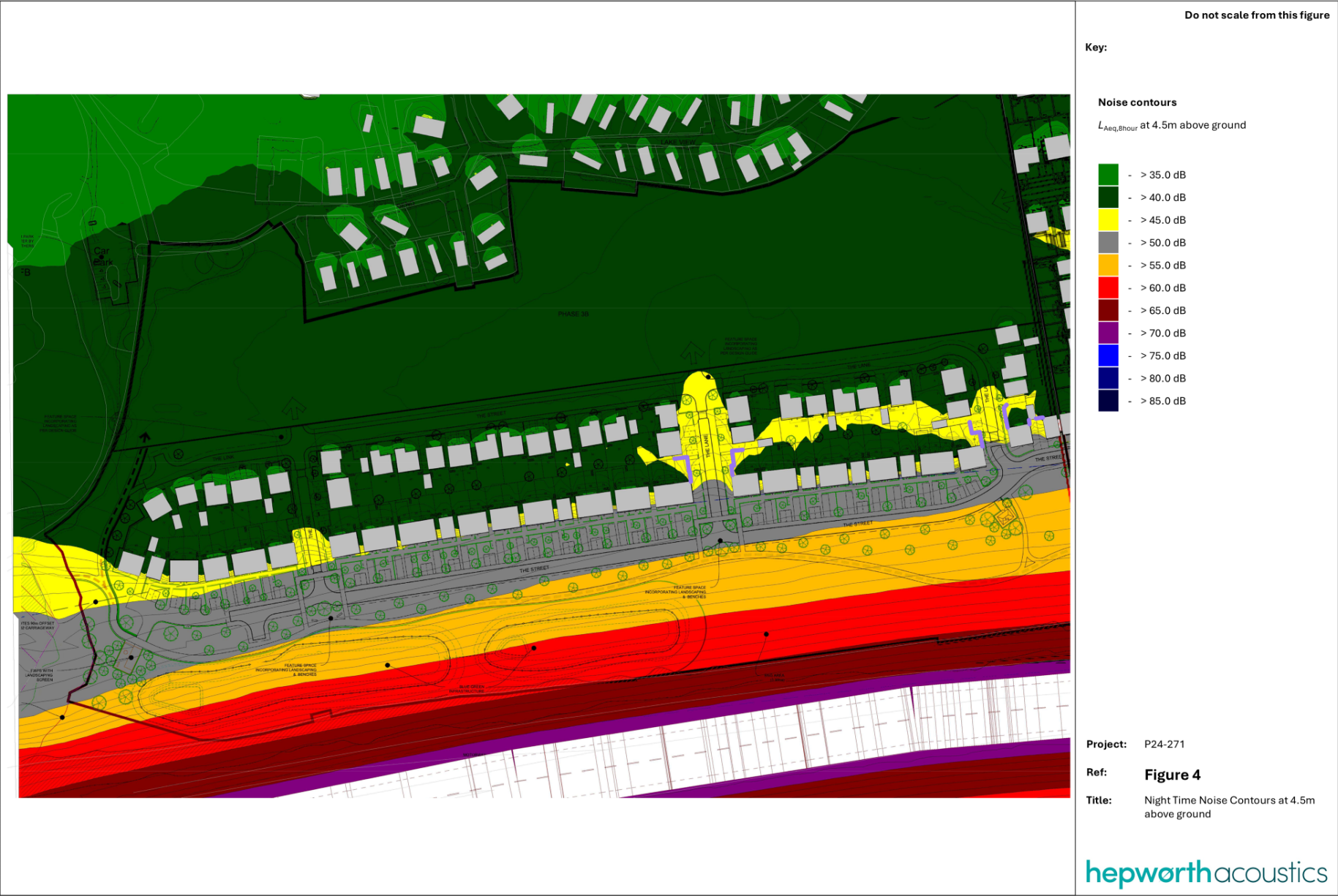
## 6. SUMMARY AND CONCLUSION

- 6.1 The impact of motorway traffic noise has been assessed for a proposed residential development on land to the north of the M62 at Phase 3 of the Halsnead Garden Village development in Knowsley
- 6.2 Traffic noise levels have been measured on the development land for daytime and night-time periods.
- 6.3 British Standard guideline acoustic design criteria have been adopted that will ensure the protection of residential amenity. However, to achieve these criteria it will be necessary to implement noise mitigation measures for development in the eastern part of the site nearest to the M62.
- 6.4 We have recommended that an appropriate scheme of sound insulation is implemented for the new houses that will be most exposed to traffic noise in order to protect the amenity of the new residents.
- 6.5 The implementation of an adequate scheme of noise mitigation measures as described in this report can be ensured by the use of an appropriately worded planning condition.









## APPENDIX A: ACOUSTICS 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 values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. 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 (threshold of hearing) to 120dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise 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' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise 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 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 climate 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. There are also a number of ways to describe sound insulation performance.

The indices used in this report are described below:

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><math>L_{Aeq,T}</math></b> | <b>A-weighted Equivalent Continuous Sound Level:</b> An average of the total sound pressure measured over a specified time period ( $T$ ). 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. |
| <b><math>L_{Amax}</math></b>  | <b>Maximum A-weighted Sound Level with Fast Time-weighting:</b> The maximum A-weighted sound pressure level during the measurement period, using the Fast time-weighting of 125ms. $L_{Amax}$ used in this report refers throughout to $L_{AFmax}$ with the Fast time weighting, denoted $L_{AFmax}$ or $L_{Amax,f}$ in other documents but $L_{Amax}$ in BS 8233:2014 standard notation.                                   |
| <b><math>L_{A90,T}</math></b> | <b>A-weighted 90 Percentile Level:</b> The A-weighted sound level exceeded for 90% of a measurement time period ( $T$ ). $L_{A90,T}$ is generally used as a measure of Background Sound Level.                                                                                                                                                                                                                              |
| <b><math>C_{tr}</math></b>    | <b>Transport Noise Spectral Adaptation Term:</b> A term used with single figure broadband sound insulation metrics (e.g. $R_w$ , $D_{n,e,w}$ or $D_{nT,w}$ ) to account for the spectral composition of typical transport noise sources.                                                                                                                                                                                    |
| <b><math>D_{n,e,w}</math></b> | <b>Weighted Element Normalised Level Difference:</b> A frequency weighted single figure laboratory value quantifying the sound insulation performance of a building element, such as an air vent.                                                                                                                                                                                                                           |
| <b><math>R_w</math></b>       | <b>Weighted Sound Reduction Index:</b> A single figure frequency weighted laboratory sound insulation performance metric of a building element or construction arrangement (e.g. a wall).                                                                                                                                                                                                                                   |

**APPENDIX B: NOISE SURVEY RESULTS**

|                  |                                                                                                                                                                                                          |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Date(s)</b>   | Wednesday 8 May- Thursday 9 May 2024<br>Thursday 19 September 2024                                                                                                                                       |
| <b>Equipment</b> | Rion NL-52 'Class 1' sound analysers (s/n's: 620870)<br>Brüel & Kjær 2260 'Class 1' sound analysers (s/n's: 3011706) with associated calibrator(s) and tripod(s)/environmental outdoor monitoring kit(s) |
| <b>Weather</b>   | Daytime: 23 °C, partially overcast, dry, SW wind <3 m/s<br>Night-time: 15°C, partially overcast, dry, SW wind <3 m/s                                                                                     |

Chart(s) overleaf

**Location 2:**

| Time  |       | Measured noise levels (dB) |           |           | Notes                       |
|-------|-------|----------------------------|-----------|-----------|-----------------------------|
| Start | Stop  | $L_{AFmax}$                | $L_{Aeq}$ | $L_{A90}$ |                             |
| 10:20 | 10:25 | 63.9                       | 60.0      | 58.5      | Road traffic noise from M62 |
| 10:25 | 10:30 | 66.1                       | 60.0      | 58.1      |                             |
| 10:30 | 10:30 | 63.2                       | 59.5      | 57.7      |                             |
| 10:37 | 10:42 | 64.8                       | 59.9      | 56.4      |                             |
| 10:42 | 10:47 | 64.5                       | 58.6      | 56.5      |                             |
| 10:47 | 10:52 | 64.3                       | 59.9      | 57.6      |                             |

**Location 3:**

| Time  |       | Measured noise levels (dB) |           |           | Notes                       |
|-------|-------|----------------------------|-----------|-----------|-----------------------------|
| Start | Stop  | $L_{AFmax}$                | $L_{Aeq}$ | $L_{A90}$ |                             |
| 10:53 | 10:58 | 64.5                       | 61.2      | 59.6      | Road traffic noise from M62 |
| 10:58 | 11:03 | 64.9                       | 61.0      | 59.7      |                             |
| 11:03 | 11:08 | 65.7                       | 61.8      | 59.9      |                             |

**Location 4:**

| Time  |       | Measured noise levels (dB) |           |           | Notes                       |
|-------|-------|----------------------------|-----------|-----------|-----------------------------|
| Start | Stop  | $L_{AFmax}$                | $L_{Aeq}$ | $L_{A90}$ |                             |
| 11:30 | 11:35 | 67.8                       | 61.5      | 59.1      | Road traffic noise from M62 |
| 11:35 | 11:40 | 66.4                       | 60.7      | 57.8      |                             |
| 11:40 | 11:45 | 68.7                       | 61.4      | 58.9      |                             |

**Location 5:**

| Time  |       | Measured noise levels (dB) |           |           | Notes                       |
|-------|-------|----------------------------|-----------|-----------|-----------------------------|
| Start | Stop  | $L_{AFmax}$                | $L_{Aeq}$ | $L_{A90}$ |                             |
| 12:07 | 12:12 | 70.8                       | 57.1      | 55.3      | Road traffic noise from M62 |
| 12:12 | 12:17 | 63.1                       | 56.8      | 54.2      |                             |
| 12:17 | 12:19 | 63.5                       | 58.0      | 55.8      |                             |
| 12:22 | 12:27 | 64.0                       | 56.5      | 53.6      |                             |
| 12:27 | 12:32 | 66.7                       | 55.8      | 52.8      |                             |
| 12:32 | 12:37 | 65.0                       | 57.9      | 55.9      |                             |

**Location 6:**

| Time  |       | Measured noise levels (dB) |           |           | Notes                       |
|-------|-------|----------------------------|-----------|-----------|-----------------------------|
| Start | Stop  | $L_{AFmax}$                | $L_{Aeq}$ | $L_{A90}$ |                             |
| 12:40 | 12:45 | 59.8                       | 54.1      | 50.0      | Road traffic noise from M62 |
| 12:45 | 12:50 | 72.5                       | 55.1      | 52.4      |                             |
| 12:50 | 12:55 | 69.2                       | 55.5      | 52.9      |                             |

Location 1:

