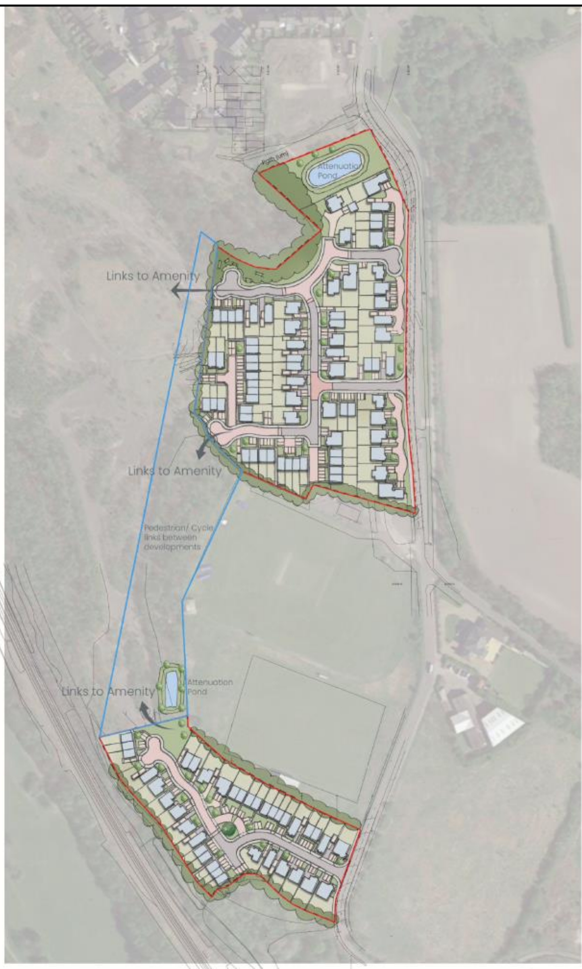
# Wooley Colliery Road, Darton, S75 5HY

## Noise Assessment

## 784-B038941




## Rouse Homes

## August 2022

**Prepared by Tetra Tech Limited.**

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# Document control

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# 1.0 INTRODUCTION

## 1.1 PURPOSE OF THIS REPORT

This noise assessment has been prepared by Tetra Tech on behalf of Rouse Homes to inform a planning application for a proposed residential development on land at Wooley Colliery Road, Darton, South Yorkshire.

A description of the existing noise environment in and around the site is provided. A noise survey has been undertaken and the results used to verify predictions of the effects of noise. The noise levels across the site have been predicted at proposed receptors using CADNA noise modelling software, which incorporates ISO 9613 and CRTN methodologies and calculations.

A list of acoustic terminology and abbreviations used in this report is provided in Appendix A and a set of location plans, noise contour plots relevant to the assessment are presented throughout the document.

## 1.2 LEGISLATIVE CONTEXT (ENGLAND)

This report is intended to provide information relevant to the local planning authority and their consultees in support of a planning application for the above proposed development. Policy guidance with respect to noise is found in the National Planning Policy Framework (NPPF), published in July 2021. With regard to noise and planning, the NPPF contains the following statement at paragraph 174:

"*174 Planning policies and decisions should contribute to and enhance the natural and local environment by:*

> *e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans…"*

*"185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

> *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*

*b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason…"*

*"187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.*

*188. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."*

The Planning Practice Guidance (PPG) provides further guidance with regard to the assessment of noise within the context of the NPPF. The overall aim of this guidance is, tying in with the principles of the NPPF and the Explanatory Note of the Noise Policy Statement for England (NPSE), is to, *'identify whether the overall effect of noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.'*
A summary of the effects of noise exposure associated with both noise generating developments and noise sensitive developments is presented within the PPG and repeated as follows:

**Table 1.1 NPPG Noise Exposure Hierarchy**

| Perception | Examples of Outcomes | Increasing Effect Level | Action |
|---|---|---|---|
| Not present | No Effect | No Observed Effect | No Specific Measures Required |
| Present and not intrusive | Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life. | No Observed Adverse Effect | No Specific Measures Required |
| Lowest Observed Adverse Effect Level (LOAEL) | | | |
| Present and intrusive | Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life. | Observed Adverse Effect | Mitigate and reduce to a minimum |
| Significant Observed Adverse Effect Level (SOAEL) | | | |

| | | | |
|---|---|---|---|
| Present and disruptive | The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | Significant Observed Adverse Effect | Avoid |
| Present and very disruptive | Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory. | Unacceptable Adverse Effect | Prevent |

The NPPF, NPSE and PPG do not, however, present absolute noise level criteria which define SOAEL, LOAEL and NOEL which is applicable to all sources of noise in all situations. Therefore, within the context of the Proposed Development, national planning policy and appropriate guidance documents including 'BS 8233 – Guidance on Sound Insulation and Noise Reduction for Buildings' (2014) and 'BS 4142: 2014 Methods for Rating and Assessing Industrial and Commercial Sound'. Section 2.0 presents the noise level criteria used as a basis of this assessment.

The PPG also states that *neither the NPSE nor the NPPF (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of the proposed development.*

## 1.3 ACOUSTIC CONSULTANTS' QUALIFICATIONS AND PROFESSIONAL MEMBERSHIPS

The lead project Acoustic Consultant is David Fink. The report has been checked by Ashley Shepherd and verified by Nigel Mann. Relevant qualifications, membership and experience are summarised below.

**Table 1.2 Acoustic Consultants' Qualifications & Experience**

| Name | Job Title | Education | Experience in Undertaking Noise Assessments (Start date of working in noise & acoustics) | Attained Associate Membership of the Institute of Acoustics (date) | Attained Membership of the Institute of Acoustics (date) |
|---|---|---|---|---|---|
| David Fink | Environmental Technician | BEng 2016 | Mar 2017 | Jun 2017 | - |
| Ashley Shepherd | Principal Consultant | BSc 2013 | Feb 2014 | Feb 2014 | Nov 2017 |
| Nigel Mann | Director | BSc 1997<br>MSc 1999 | Nov 2001 | Nov 1998 | Nov 2001 |

## 2.0 ASSESSMENT CRITERIA

In order to enable the assessment of the proposed development in terms of LOAEL and SOAEL, Table 2.1 presents equivalent noise levels and associated actions with the target noise level criteria identified. The noise level criteria detailed below have been derived from standards and design guidance:

- *BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings – Code of practice'*
- *World Health Organisation (WHO) 'Guidelines for Community Noise (1999)'*

**Table 2.1 Noise Level Criteria and Actions**

| Effect Level | Noise Level Criteria | Action/Justification |
|---|---|---|
| Lowest Observed Adverse Effect Level (LOAEL) | Internal noise levels do not exceed (with windows open):<br>Bedrooms (night-time) – 30 dB$L_{Aeq}$,8hours /<br>45 dB $L_{Amax}$ (up to 10 – 15 times per night)<br>Living Rooms (daytime) – 35 dB$L_{Aeq}$,16hours<br>Private external Amenity Space (daytime) – 55 dB $L_{Aeq}$,16hours | No Action Required<br>Within BS8233/WHO Criteria |
| Significant Observed Adverse Effect Level (SOAEL) | Internal noise levels exceed (with windows closed):<br>Bedrooms (night-time) – 30 dB $L_{Aeq}$,8hours /<br>45 dB $L_{Amax}$ (More than 15 times per night)<br>Living Rooms (daytime)– 35 dB $L_{Aeq}$,16hours<br>Depending on context, external noise levels exceed:<br>Private external Amenity Space (daytime) – 55 dB $L_{Aeq}$,16hours | Mitigate to achieve (with windows closed):<br>Bedrooms – 30 dB $L_{Aeq,8hours}$ / 45 dB $L_{Amax}$<br>Living Rooms – 35 dB $L_{Aeq,16hours}$<br>Depending on context, external amenity space<br>Mitigate and reduce to a minimum |

## 2.1 VIBRATION ASSESSMENT CRITERIA

There are two applicable British Standards to describe vibration which are:

BS 6472-2:2008, "Guide to Evaluation of Human Exposure to Vibrations in Buildings (1 Hz to 80 Hz)"; and BS 7385-2:1993 "Evaluation and Measurement for Vibration in Buildings" Parts 1 (1990) and 2 (1993).

### Building Damage

BS 7385-2:1993 *Evaluation and Measurement for Vibration in Buildings* provides guidance on acceptable values of transient vibration for the avoidance of cosmetic damage to buildings as follows.

**Table 2.2 Transient Vibration Guide Values for Cosmetic Damage**

| Type of Building | Peak Component Particle Velocity in frequency range of predominant pulse | |
|---|---|---|
| | 4 Hz to 15 Hz | 15 Hz and above |
| Residential Buildings | 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz | 20 mm/s at 15 Hz increasing to 50 mm/s at 50 Hz and above |

Table 2.2 above shows the limits for transient vibration, above which cosmetic damage could occur. Minor damage is possible at vibration magnitudes which are greater than twice those given above and major damage to a building structure may occur at values greater than four times the tabulated values. PPV values of below 15 mm/s are unlikely to results in any damage to buildings. Damage is classified into the following categories:

**Table 2.3 Damage Classification**

| Damage | Description |
|---|---|
| Cosmetic | The formation of hairline cracks on drywall surfaces, or the growth of existing cracks in plaster or drywall surfaces; in addition, the formation of hairline cracks in mortar joints of brick/concrete block construction. |
| Minor | The formation of large cracks or loosening and falling of plaster or drywall surfaces, or cracks through bricks/concrete blocks. |
| Major | Damage to structural elements of the building, cracks in support columns, loosening of joints, splaying of masonry cracks, etc |

## Human Exposure

BS 6472-2:2008 Guide to evaluation of human exposure to vibrations in buildings provides general guidance on human exposure to building vibration in the range of 1 Hz to 80 Hz and includes curves of equal annoyance for humans.

Human reaction to vibration depends on displacement, frequency, the duration (exposure time), point of application and direction of the vibration. It appears that the effect of vibration on the people within a building will be far more serious than the effect on the building itself. The units in which VDV is measured are metres per second raised to the power of minus 1.75 (or $ms^{-1.75}$). The Standard gives recommended vibration dose values above which various degrees of adverse comment may be expected in residential buildings, with a daily 16-hour VDV of 0.2 to 0.4 $ms^{-1.75}$ likely to give low probability of adverse comment as shown in the following table.

**Table 2.4 VDV and Various Degrees of Adverse Comment in Residential Buildings**

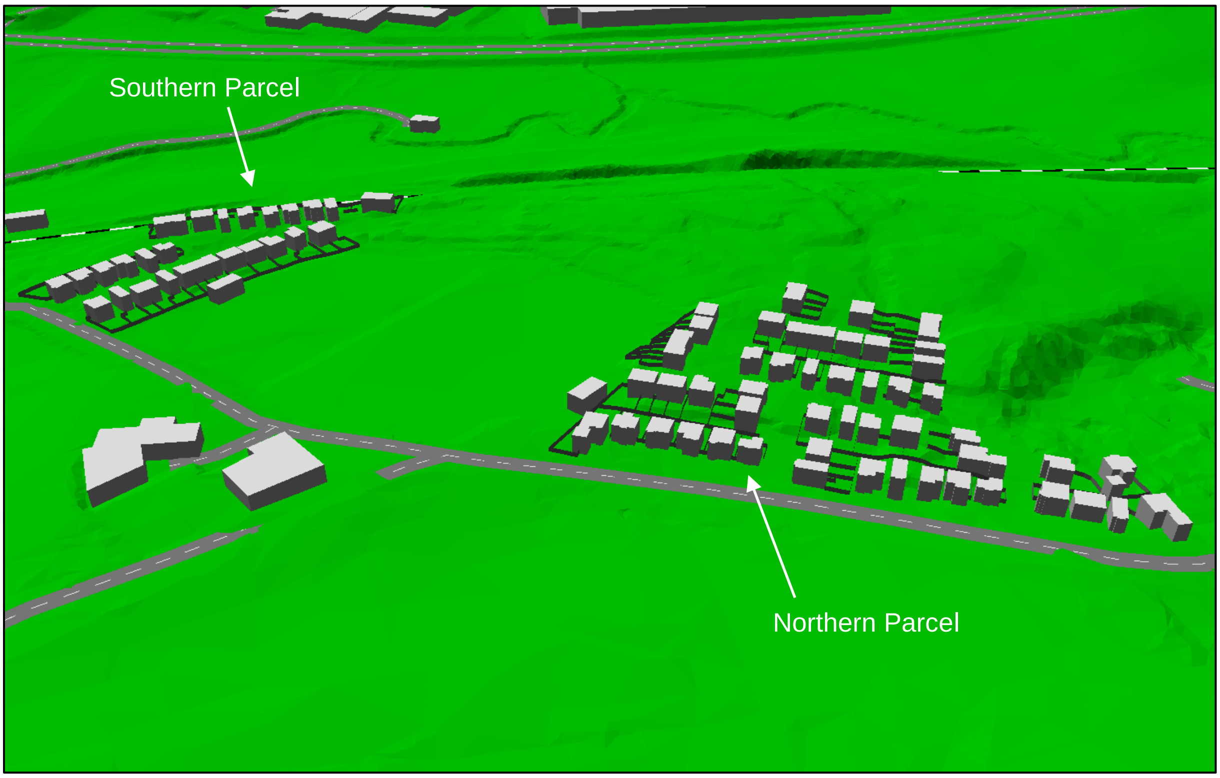
| Location | Low probability of adverse comment | Adverse comment possible | Adverse comment probable |
|---|---|---|---|
| Residential Buildings (16-hour DAYTIME 07.00 – 23.00) | 0.2 to 0.4 $ms^{-1.75}$ | 0.4 to 0.8 $ms^{-1.75}$ | 0.8 to 1.6 $ms^{-1.75}$ |
| Residential Buildings (8-hour NIGHT-TIME 23.00 – 07.00) | 0.1 to 0.2 $ms^{-1.75}$ | 0.2 to 0.4 $ms^{-1.75}$ | 0.8 $ms^{-1.75}$ |

# 3.0 ASSESSMENT METHODOLOGY

## 3.1 NOISE MODELLING METHODOLOGY

Three-dimensional noise modelling has been undertaken based on the monitoring data to predict $L_{Aeq}$ noise levels both horizontally and vertically. CADNA noise modelling software has been used as shown in Figure 3.1. The figure shows the proposed development and the surrounding road network. This model is based on ISO 9613 noise propagation methodology and allows for detailed prediction of noise levels to be undertaken for large numbers of receptor points and different noise emission scenarios both horizontally and vertically.

**Figure 3.1 CADNA Noise Model**

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The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data and model settings as given in the table below have been used.

**Table 3.1 Modelling Parameters Sources and Assumptions**

| Parameter | Source | Details |
|---|---|---|
| Horizontal distances – around site | Ordnance Survey | Ordnance Survey |
| Ground levels | Ordnance Survey | LiDAR Digital Terrain Model |
| Traffic Data | Tetra Tech | Tetra Tech observations and validated noise measurements. |
| Building heights | Tetra Tech | 8 m height for two storey residential properties. Other height properties reviewed using Google Street View and amended as required |
| Site Layout | PDG Architectural | 22-087_003_Sketch Masterplan |

It is acknowledged that a number of these assumptions will affect the overall noise levels presented in this report. However, it should be noted that certain assumptions made, as identified above, are worst case.

## 3.2 MODEL VERIFICATION (EXISTING AMBIENT NOISE CLIMATE)

Traffic noise from surrounding roads has been verified by modelling a measured daytime monitoring location for the 'existing' scenario. The comparison between the monitored and modelled results for the site is shown in the tables below.

**Table 3.2 Modelled vs. Monitored Results $L_{Aeq;\ daytime\ 07:00 – 23:00}$**

| Location | Monitored $L_{Aeq}$ | Modelled $L_{Aeq}$ | Difference between Monitored and Modelled Results |
|---|---|---|---|
| LT1 | 52.2 | 53.0 | 0.8 |
| LT2 | 55.0 | 55.4 | 0.4 |
| LT3 | 56.7 | 58.1 | 1.4 |
| LT4 | 56.0 | 55.8 | -0.2 |

All values are sound pressure levels in dB re: 2x $10^{-5}$ Pa

**Table 3.3 Modelled vs. Monitored Results $L_{Aeq;\ night-time\ 23:00 – 07:00}$**

| Location | Monitored $L_{Aeq}$ | Modelled $L_{Aeq}$ | Difference between Monitored and Modelled Results |
|---|---|---|---|
| LT1 | 46.5 | 47.6 | 1.1 |
| LT2 | 48.9 | 50.0 | 1.1 |
| LT3 | 51.5 | 53.0 | 1.5 |
| LT4 | 52.7 | 51.0 | -1.7 |

All values are sound pressure levels in dB re: 2x $10^{-5}$ Pa

**Table 3.4 Modelled vs. Monitored Results $L_{AMax; night\text{-}time\ 23:00 – 07:00}$**

| Location | Monitored $L_{Aeq}$ | Modelled $L_{Aeq}$ | Difference between Monitored and Modelled Results |
|---|---|---|---|
| LT1 | 62.1 | 64.7 | 2.6 |
| LT2 | 70.1 | 67.7 | -2.4 |
| LT3 | 68.2 | 66.3 | -1.9 |
| LT4 | 63.5 | 63.6 | 0.1 |

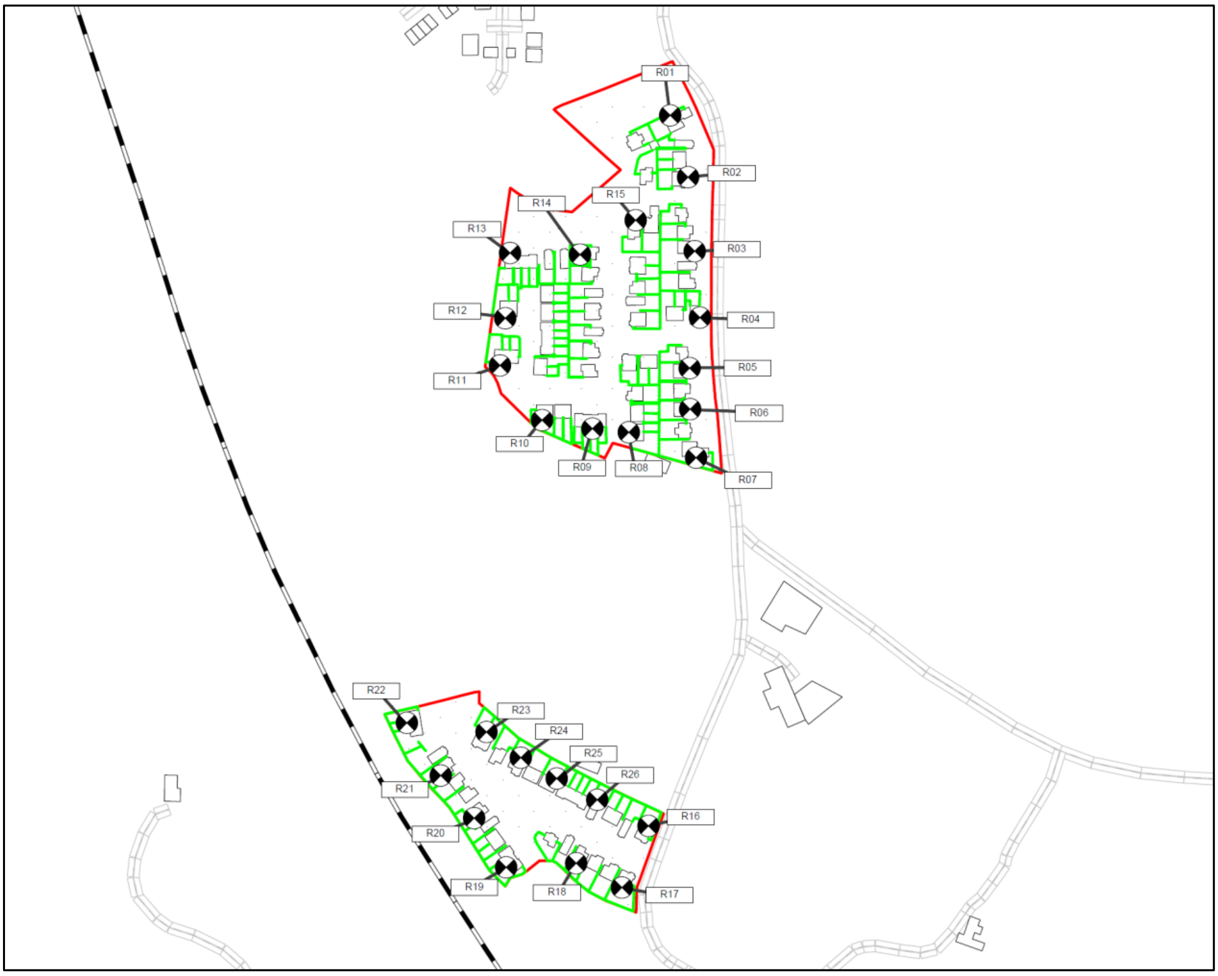
All values are sound pressure levels in dB re: 2x $10^{-5}$ Pa

As all of the verification points show a divergence between monitored and modelled results of no more than ±3 dB, the models are considered suitably verified.

## 3.3 SENSITIVE RECEPTOR LOCATIONS

The locations of proposed receptor locations are presented in Figures 3.2 & 3.3 below.

**Figure 3.2 Sensitive Receptor Locations**

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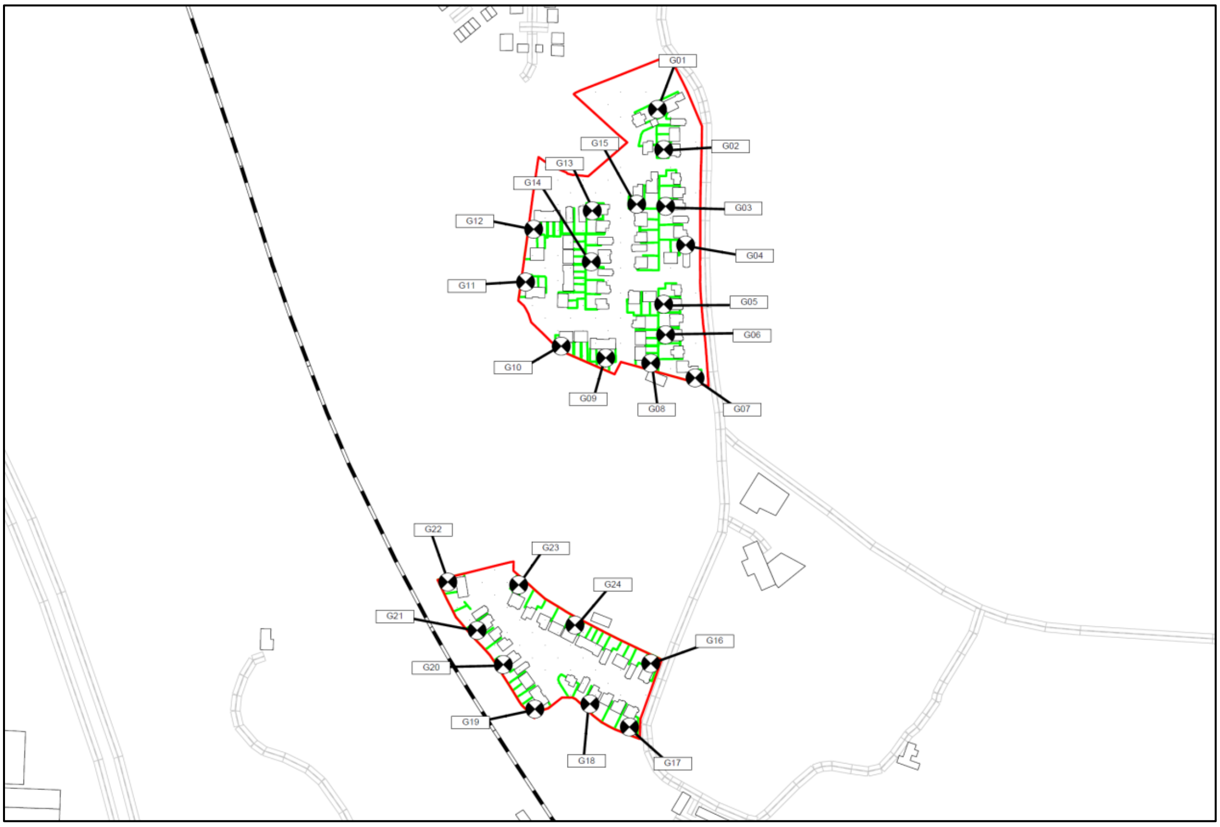
## Figure 3.3 Garden Receptor Locations

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# 4.0 BASELINE CONDITIONS

## 4.1 BASELINE NOISE SURVEY

A monitoring survey was undertaken to characterise baseline ambient noise levels currently experienced on the site and to establish the relative local background and traffic noise levels. Equipment used during the survey included:

| | | | |
|---|---|---|---|
| *Rion NL-52* | *Environmental Noise Analyser* | *s/n* | *1221576* |
| *Rion NL-52* | *Environmental Noise Analyser* | *s/n* | *843173* |
| *Rion NL-52* | *Environmental Noise Analyser* | *s/n* | *810558* |
| *Rion NL-52* | *Environmental Noise Analyser* | *s/n* | *710448* |
| *Rion NC-75* | *Sound Calibrator* | *s/n* | *35270131* |

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice, a drift of 0.2 dB was observed. The accuracy of the calibrators can be traced to National Physical Laboratory Standards, calibration certificates for which are available on request.

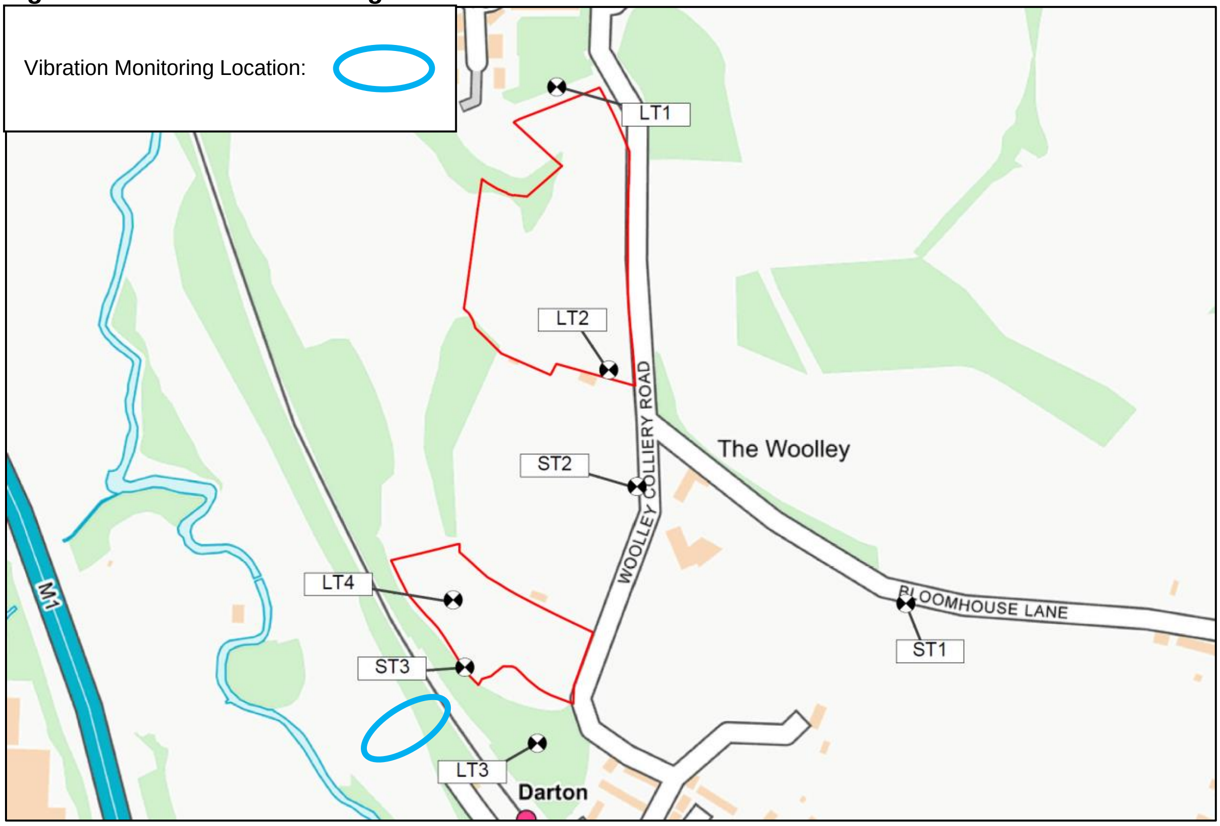
A baseline monitoring survey was undertaken (as specified in the following table and shown in Figure 4.1) from Thursday 21st July 2022 to Tuesday 26th July 2022. Four monitoring locations were measured unattended over a 120-hour period. The raw data collected from the long-term monitoring is available upon request.

Measurements were taken in general accordance with BS 7445-1:2003 *The Description and Measurement of Environmental Noise: Guide to quantities and procedures*. Weather conditions during the survey period were observed as being variable.

**Table 4.1 Noise Monitoring Locations**

| Ref | Description |
|---|---|
| LT1 | North of proposed development, south of Maltby Avenue |
| LT2 | West of Woolley Colliery Road |
| LT3 | North of Darton Railway Station |
| LT4 | East of Existing Railway Line |
| ST1 | Roadside on Bloomhouse Lane |
| ST2 | West of Woolley Colliery Road |
| ST3 | Overlooking Existing Railway Line |

**Figure 4.1 Noise Monitoring Location**

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## 4.2 NOISE SURVEY RESULTS

The dominant noise source found in the area is road traffic noise from the M1 motorway and local traffic on Woolley Colliery Road, as well as rail movements to the west of the site.

Ambient and background noise levels are usually described using the $L_{Aeq}$ index (a form of energy average) and the $L_{A90}$ index (i.e. the level exceeded for 90% of the measurement period) respectively. Road traffic noise is generally described using the $L_{A10}$ index (i.e. the level exceeded for 10% of the measurement period). For the long-term (LT) locations, the presented $L_{Aeq,T}$ and $L_{A10,T}$ are average noise levels whilst the $L_{A90}$ is the modal noise level of each 5 minute measurement over the stated survey period.

**Table 4.2 Meteorological Conditions during the Survey**

| Survey Location | Date & Time | Temperature (ºC) | Wind Speed (m/s) | Wind Direction | Cloud Cover (Oktas) | Dominant Noise Source |
|---|---|---|---|---|---|---|
| Day ST1 | 25/07/2022 14:56 | 18 | 2 - 3 | SW | 5 | Road traffic noise from Bloomhouse Lane & Woolley Colliery Road |
| Day ST2 | 25/07/2022 15:40 | 18 | 3 - 4 | SW | 5 | Road traffic noise Woolley Colliery Road & Distant M1 |
| Day ST3 | 25/07/2022 15:20 | 18 | 3 – 4 | SW | 5 | Distant road traffic noise from M1 and Rail Passes |

| Survey Location | Date & Time | Temperature (°C) | Wind Speed (m/s) | Wind Direction | Cloud Cover (Oktas) | Dominant Noise Source |
|---|---|---|---|---|---|---|
| Evening ST1 | 25/07/2022 22:07 | 14 | 0 - 1 | NW | 8 | Road traffic noise from Bloomhouse Lane & Woolley Colliery Road |
| Evening ST2 | 25/07/2022 21:37 | 14 | 1 - 2 | NW | 8 | Road traffic noise Woolley Colliery Road & Distant M1 |
| Evening ST3 | 25/07/2022 21:19 | 14 | 1 - 2 | NW | 8 | Distant road traffic noise from M1 and Rail Passes |
| Night ST1 | 25/07/2022 23:41 | 14 | 0 - 1 | NW | 8 | Road traffic noise from Bloomhouse Lane & Woolley Colliery Road |
| Night ST2 | 25/07/2022 23:18 | 14 | 0 - 1 | NW | 8 | Road traffic noise Woolley Colliery Road & Distant M1 |
| Night ST3 | 25/07/2022 23:00 | 14 | 0 - 1 | NW | 8 | Distant road traffic noise from M1 and Rail Passes |

The results of the statistical measurements and frequency measurements conducted during the survey are summarised in the following table. All values are sound pressure levels in dB (re: 2 x 10-5 Pa).

**Table 4.3 Results of Baseline Noise Monitoring Survey (Average Levels)**

| Period | Duration (T) | Monitoring Date and Times | Location | $L_{Aeq,T}$ (dB) | $L_{Amax,T}$ (dB) | $L_{Amin,T}$ (dB) | $L_{A10,T}$ (dB) | $L_{A90,T}$ (dB) |
|---|---|---|---|---|---|---|---|---|
| Weekday Daytime | 47 Hours | 21/07/2022 – 26/07/22 07:00 - 23:00 | LT1 | 52.1 | 82.2 | 27.5 | 53.6 | 53.0 |
| Weekday Night-time 23:00 – 07:00 | 24 Hours | 21/07/2022 – 26/07/2022 23:00 - 07:00 | | 46.5 | 76.5 | 24.2 | 44.4 | 38.0 |
| Weekend Daytime | 32 Hours | 23/07/2022 – 24/07/2022 07:00 - 23:00 | | 52.2 | 73.9 | 32.5 | 54.0 | 50.0 |
| Weekend Night-time | 16 hours | 23/07/2022 – 24/07/2022 23:00 - 07:00 | | 45.3 | 71.3 | 28.9 | 45.9 | 41.0 |
| Weekday Daytime | 47 Hours | 21/07/2022 – 26/07/22 07:00 - 23:00 | LT2 | 55.0 | 82.5 | 29.9 | 57.2 | 53.0 |
| Weekday Night-time 23:00 – 07:00 | 24 Hours | 21/07/2022 – 26/07/2022 23:00 - 07:00 | | 48.9 | 81.7 | 26.5 | 45.8 | 43.0 |
| Weekend Daytime | 32 Hours | 23/07/2022 – 24/07/2022 07:00 - 23:00 | | 54.1 | 82.4 | 32.5 | 56.1 | 48.0 |
| Weekend Night-time | 16 hours | 23/07/2022 – 24/07/2022 23:00 - 07:00 | | 47.0 | 80.8 | 30.2 | 46.0 | 40.0 |
| Weekday Daytime | 46 Hours | 21/07/2022 – 26/07/22 07:00 - 23:00 | LT3 | 56.7 | 86.0 | 36.8 | 59.0 | 47.0 |
| Weekday Night-time 23:00 – 07:00 | 24 Hours | 21/07/2022 – 26/07/2022 23:00 - 07:00 | | 51.5 | 78.4 | 31.0 | 50.8 | 48.0 |
| Weekend Daytime | 32 Hours | 23/07/2022 – 24/07/2022 07:00 - 23:00 | | 56.2 | 83.0 | 41.1 | 58.6 | 52.0 |
| Weekend Night-time | 16 hours | 23/07/2022 – 24/07/2022 23:00 - 07:00 | | 49.0 | 73.8 | 32.1 | 49.7 | 40.0 |
| Weekday Daytime | 46 Hours | 21/07/2022 – 26/07/22 07:00 - 23:00 | LT4 | 55.9 | 77.7 | 38.3 | 54.3 | 47.0 |

| Period | Duration (T) | Monitoring Date and Times | Location | $L_{Aeq,T}$ (dB) | $L_{Amax,T}$ (dB) | $L_{Amin,T}$ (dB) | $L_{A10,T}$ (dB) | $L_{A90,T}$ (dB) |
|---|---|---|---|---|---|---|---|---|
| Weekday Night-time 23:00 – 07:00 | 24 Hours | 21/07/2022 – 26/07/2022 23:00 - 07:00 | | 52.7 | 74.0 | 31.2 | 51.6 | 50.0 |
| Weekend Daytime | 32 Hours | 23/07/2022 – 24/07/2022 07:00 - 23:00 | | 56.0 | 79.5 | 41.6 | 56.7 | 54.0 |
| Weekend Night-time | 16 hours | 23/07/2022 – 24/07/2022 23:00 - 07:00 | | 50.6 | 69.5 | 32.6 | 51.4 | 42.0 |
| Daytime 07:00 – 19:00 | 15 Mins | 25/07/2022 14:56 | ST1 | 58.0 | 81.1 | 50.5 | 58.1 | 52.7 |
| | 15 Mins | 25/07/2022 15:40 | ST2 | 62.1 | 79.0 | 54.8 | 61.2 | 56.9 |
| | 15 Mins | 25/07/2022 15:20 | ST3 | 62.7 | 73.9 | 58.9 | 64.0 | 61.0 |
| Evening 19:00 – 23:00 | 15 Mins | 25/07/2022 22:07 | ST1 | 50.3 | 74.0 | 41.8 | 48 | 44.2 |
| | 15 Mins | 25/07/2022 21:37 | ST2 | 60.5 | 81.6 | 46.9 | 57.7 | 49.8 |
| | 15 Mins | 25/07/2022 21:19 | ST3 | 56.7 | 68.4 | 50.5 | 58.4 | 54.0 |
| Night-time 23:00 – 07:00 | 15 Mins | 25/07/2022 23:41 | ST1 | 45.9 | 57.3 | 41.9 | 47.3 | 44.1 |
| | 15 Mins | 25/07/2022 23:18 | ST2 | 52.2 | 64.9 | 44.6 | 54.6 | 48.1 |
| | 15 Mins | 25/07/2022 23:00 | ST3 | 55.6 | 65.6 | 49.4 | 57.3 | 53.1 |

All values are sound pressure levels in dB re: 2x $10^{-5}$ Pa

## 4.3 ATTENDED VIBRATION METHODOLOGY AND RESULTS

Attended baseline vibration measurements were taken using a Vibrock V901 Seismograph (serial number 1147) fitted with a ground vibration transducer to measure Peak Particle Velocity (PPV) and Vibration Dose value (VDV) at a scanning duration of 10 seconds. The attended vibration measurements were carried out at the fixed distances from the rail (presented within Figure 4.1), the results of the attended baseline vibration survey are presented in Table 4.5.

**Table 4.3 Results of attended baseline vibration survey**

| Ref | Activity | PPV (mms-1) | VDV ($m/s^{1.75}$) |
|---|---|---|---|
| 5m from Rail | Background | 0.150 | X 0.002 |
| | | | Y 0.003 |
| | | | Z 0.004 |
| | Train Pass | 0.350 | X 0.002 |
| | | | Y 0.003 |
| | | | Z 0.005 |

| Ref | Activity | PPV (mms-1) | VDV (m/s$^{1.75}$) |
|---|---|---|---|
| 10m from Rail | Background | 0.125 | X 0.002 |
| | | | Y 0.003 |
| | | | Z 0.004 |
| | Train Pass | 0.250 | X 0.002 |
| | | | Y 0.003 |
| | | | Z 0.005 |
| 15m from Rail | Background | 0.125 | X 0.002 |
| | | | Y 0.003 |
| | | | Z 0.005 |
| | Train Pass | 0.175 | X 0.002 |
| | | | Y 0.003 |
| | | | Z 0.004 |
| 20m from Rail | Background | 0.125 | X 0.002 |
| | | | Y 0.003 |
| | | | Z 0.004 |
| | Train Pass | 0.150 | X 0.002 |
| | | | Y 0.004 |
| | | | Z 0.004 |

# 5.0 ASSESSMENT OF EFFECTS

## 5.1 NOISE INTRUSION ASSESSMENT

Internal noise levels within potential dwellings have been assessed both with windows open, where a reduction from a partially open window of 10 dB has been used, and with windows closed where an assumption of glazing and open trickle vents with specification $R_w$+$C_{tr}$ 25 dB (e.g 4/16/4mm double glazing or equivalent) has been used.

The results presented in tables 5.1 – 5.3 below show the predicted noise intrusion levels across the site, with living room and bedroom glazing mitigation strategy outlined in Section 6.

**Table 5.1 Residential Daytime ($L_{Aeq}$) Noise Intrusion**

| Location | External $L_{Aeq}$ at 1m from Facade | Internal $L_{Aeq}$ with Windows Open | Internal $L_{Aeq}$ with Windows Closed | Criteria Internal $L_{Aeq}$ |
|---|---|---|---|---|
| R01 | 44.5 | 34.5 | 19.5 | 35 |
| R02 | 52.8 | 42.8 | 27.8 | 35 |
| R03 | 54.5 | 44.5 | 29.5 | 35 |
| R04 | 57.1 | 47.1 | 32.1 | 35 |
| R05 | 55.8 | 45.8 | 30.8 | 35 |
| R06 | 55.2 | 45.2 | 30.2 | 35 |
| R07 | 47.7 | 37.7 | 22.7 | 35 |
| R08 | 46.2 | 36.2 | 21.2 | 35 |
| R09 | 47.4 | 37.4 | 22.4 | 35 |
| R10 | 49.0 | 39.0 | 24.0 | 35 |
| R11 | 48.1 | 38.1 | 23.1 | 35 |
| R12 | 45.7 | 35.7 | 20.7 | 35 |
| R13 | 44.4 | 34.4 | 19.4 | 35 |
| R14 | 37.7 | 27.7 | 12.7 | 35 |
| R15 | 42.3 | 32.3 | 17.3 | 35 |
| R16 | 50.0 | 40.0 | 25.0 | 35 |
| R17 | 49.7 | 39.7 | 24.7 | 35 |
| R18 | 48.6 | 38.6 | 23.6 | 35 |
| R19 | 55.7 | 45.7 | 30.7 | 35 |
| R20 | 51.1 | 41.1 | 26.1 | 35 |
| R21 | 57.1 | 47.1 | 32.1 | 35 |
| R22 | 58.1 | 48.1 | 33.1 | 35 |
| R23 | 44.9 | 34.9 | 19.9 | 35 |

| | | | | |
|---|---|---|---|---|
| R24 | 44.0 | 34.0 | 19.0 | 35 |
| R25 | 45.3 | 35.3 | 20.3 | 35 |
| R26 | 46.0 | 36.0 | 21.0 | 35 |

All values are sound pressure levels in dB re: 2x $10^{-5}$ Pa

**Table 5.2 Residential Night-Time ($L_{Aeq}$) Noise Intrusion**

| Location | External $L_{Aeq}$ at 1m from Facade | Internal $L_{Aeq}$ with Windows Open | Internal $L_{Aeq}$ with Windows Closed | Criteria Internal $L_{Aeq}$ |
|---|---|---|---|---|
| R01 | 48.1 | 38.1 | 23.1 | 30 |
| R02 | 50.1 | 40.1 | 25.1 | 30 |
| R03 | 51.1 | 41.1 | 26.1 | 30 |
| R04 | 52.0 | 42.0 | 27.0 | 30 |
| R05 | 50.4 | 40.4 | 25.4 | 30 |
| R06 | 49.9 | 39.9 | 24.9 | 30 |
| R07 | 48.1 | 38.1 | 23.1 | 30 |
| R08 | 42.8 | 32.8 | 17.8 | 30 |
| R09 | 46.1 | 36.1 | 21.1 | 30 |
| R10 | 46.6 | 36.6 | 21.6 | 30 |
| R11 | 45.9 | 35.9 | 20.9 | 30 |
| R12 | 42.9 | 32.9 | 17.9 | 30 |
| R13 | 43.0 | 33.0 | 18.0 | 30 |
| R14 | 39.4 | 29.4 | 14.4 | 30 |
| R15 | 39.3 | 29.3 | 14.3 | 30 |
| R16 | 50.0 | 40.0 | 25.0 | 30 |
| R17 | 50.9 | 40.9 | 25.9 | 30 |
| R18 | 50.1 | 40.1 | 25.1 | 30 |
| R19 | 55.1 | 45.1 | 30.1 | 30 |
| R20 | 53.7 | 43.7 | 28.7 | 30 |
| R21 | 55.5 | 45.5 | 30.5 | 30 |
| R22 | 55.8 | 45.8 | 30.8 | 30 |
| R23 | 47.6 | 37.6 | 22.6 | 30 |
| R24 | 41.4 | 31.4 | 16.4 | 30 |
| R25 | 43.1 | 33.1 | 18.1 | 30 |
| R26 | 45.3 | 35.3 | 20.3 | 30 |

All values are sound pressure levels in dB re: 2x $10^{-5}$ Pa

**Table 5.3 Residential Night-Time ($L_{AMax}$) Noise Intrusion**

| Location | External $L_{Aeq}$ at 1m from Facade | Internal $L_{Aeq}$ with Windows Open | Internal $L_{Aeq}$ with Windows Closed | Criteria Internal $L_{Aeq}$ |
|---|---|---|---|---|
| R01 | 64.7 | 54.7 | 39.7 | 45 |
| R02 | 68.3 | 58.3 | 43.3 | 45 |
| R03 | 69.7 | 59.7 | 44.7 | 45 |
| R04 | 71.2 | 61.2 | 46.2 | 45 |
| R05 | 68.7 | 58.7 | 43.7 | 45 |
| R06 | 68.1 | 58.1 | 43.1 | 45 |
| R07 | 65.6 | 55.6 | 40.6 | 45 |
| R08 | 55.8 | 45.8 | 30.8 | 45 |
| R09 | 60.7 | 50.7 | 35.7 | 45 |
| R10 | 60.9 | 50.9 | 35.9 | 45 |
| R11 | 58.8 | 48.8 | 33.8 | 45 |
| R12 | 55.5 | 45.5 | 30.5 | 45 |
| R13 | 56.7 | 46.7 | 31.7 | 45 |
| R14 | 55.3 | 45.3 | 30.3 | 45 |
| R15 | 51.1 | 41.1 | 26.1 | 45 |
| R16 | 68.6 | 58.6 | 43.6 | 45 |
| R17 | 65.2 | 55.2 | 40.2 | 45 |
| R18 | 63.1 | 53.1 | 38.1 | 45 |
| R19 | 67.6 | 57.6 | 42.6 | 45 |
| R20 | 65.9 | 55.9 | 40.9 | 45 |
| R21 | 67.5 | 57.5 | 42.5 | 45 |
| R22 | 67.9 | 57.9 | 42.9 | 45 |
| R23 | 60.8 | 50.8 | 35.8 | 45 |
| R24 | 57.4 | 47.4 | 32.4 | 45 |
| R25 | 58.5 | 48.5 | 33.5 | 45 |
| R26 | 61.8 | 51.8 | 36.8 | 45 |

All values are sound pressure levels in dB re: $2x\ 10^{-5}$ Pa

The results presented above demonstrate that the BS 8233:2014 internal noise level targets are exceeded at a number of receptors with windows partially open and closed during both the daytime and night-time periods. In order to achieve the recommended internal noise criteria, mitigation measures are outlined in Section 6.0 of this report.

## 5.2 EXTERNAL AMENITY AREAS

Predicted daytime noise levels within proposed garden areas are presented in Table 5.4. Predictions are made with the intrinsic mitigation measure of 2.0m close-boarded garden fences

**Table 5.4 External Daytime ($L_{Aeq,16hour}$) Noise Levels**

| Location | Height (m) | External $L_{Aeq}$ | Criteria External $L_{Aeq}$ |
|---|---|---|---|
| G01 | 1.2 | 44.1 | 55 |
| G02 | 1.2 | 41.1 | 55 |
| G03 | 1.2 | 43.3 | 55 |
| G04 | 1.2 | 46.9 | 55 |
| G05 | 1.2 | 40.3 | 55 |
| G06 | 1.2 | 40.8 | 55 |
| G07 | 1.2 | 48.2 | 55 |
| G08 | 1.2 | 46.1 | 55 |
| G09 | 1.2 | 47.6 | 55 |
| G10 | 1.2 | 48.0 | 55 |
| G11 | 1.2 | 47.4 | 55 |
| G12 | 1.2 | 45.2 | 55 |
| G13 | 1.2 | 38.5 | 55 |
| G14 | 1.2 | 41.2 | 55 |
| G15 | 1.2 | 41.4 | 55 |
| G16 | 1.2 | 50.2 | 55 |
| G17 | 1.2 | 50.2 | 55 |
| G18 | 1.2 | 47.8 | 55 |
| G19 | 1.2 | 54.7 | 55 |
| G20 | 1.2 | 51.0 | 55 |
| G21 | 1.2 | 53.1 | 55 |
| G22 | 1.2 | 55.3 | 55 |
| G23 | 1.2 | 47.7 | 55 |
| G24 | 1.2 | 44.9 | 55 |

All values are sound pressure levels in dB re: 2x $10^{-5}$ Pa

As demonstrated in the table above, noise limits for external amenity areas outlined in BS 8233 are exceeded at receptor G22 with the assumed mitigation in place, and so additional mitigation measures are recommended within Section 6.0.

## 5.3 VIBRATION ASSESSMENT

The following table shows the maximum Peak Particle Velocity measured at the site for comparison with the BS 7385 criteria.

**Table 5.5 Vibration Assessment – Building Damage**

| Location | Max PPV (mm/s) | Damage Criterion | Within Criterion? |
|---|---|---|---|
| Site Boundary | 0.350 | 15.0 | Yes |
| 10m from Site Boundary | 0.250 | 15.0 | Yes |
| 15m from Site Boundary | 0.175 | 15.0 | Yes |
| 20m from Site Boundary | 0.150 | 15.0 | Yes |

The results in the table above show that the maximum peak particle velocity (PPV) measured at a location representative of the foundations of the proposed development is typically up to 0.350 mm/s during a train pass from the railway to the southwest of the site. This is a positive indication that there is unlikely to be any building damage associated with vibration from the adjacent railway.

Table 5.6 shows the averaged measured vibration dose value (VDV) over the full monitoring period for comparison with the BS 6472 criteria.

**Table 5.6 Vibration Assessment – Human Response**

| Location | Highest Measured VDV ($ms^{-1.75}$) | | | Onset of Low probability of adverse comment (night-time ($ms^{-1.75}$)) | Within Criteria? |
|---|---|---|---|---|---|
| | X | Y | Z | | |
| Site Boundary | 0.002 | 0.003 | 0.005 | 0.1 to 0.2 | Yes |
| 10m from Site Boundary | 0.002 | 0.003 | 0.005 | | Yes |
| 15m from Site Boundary | 0.002 | 0.003 | 0.005 | | Yes |
| 20m from Site Boundary | 0.002 | 0.004 | 0.004 | | Yes |

The results in the table above show that when compared to the worst-case night-time criteria, the highest measured VDV measurements at locations representative of the closest foundations of the proposed redevelopment are considerably below the criteria outlined in BS 6472. This indicates that it is significantly lower than 'low probability of adverse comment' when compared to the BS 6472 criteria.

# 6.0 MITIGATION

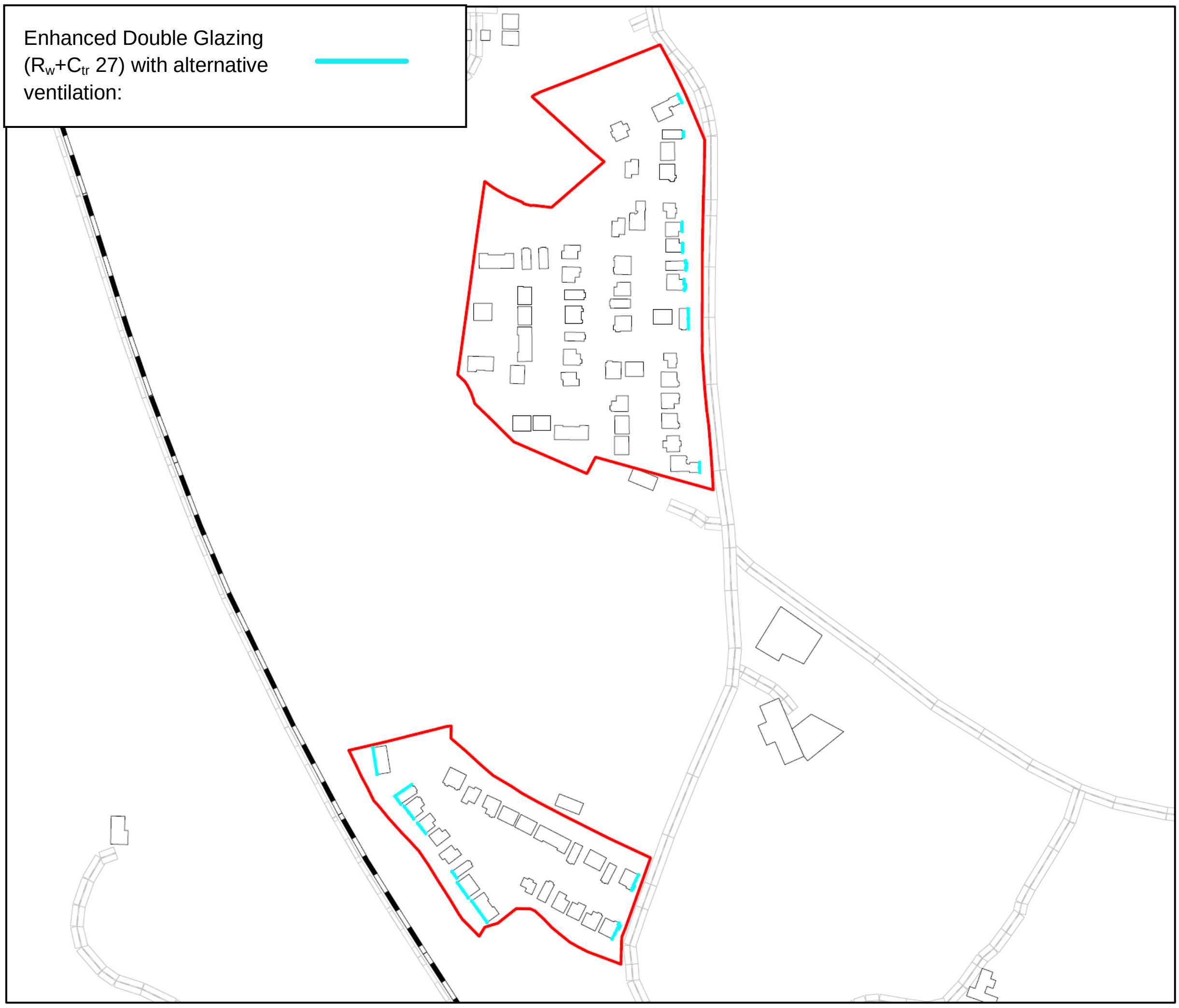
## 6.1 GLAZING AND VENTILATION

Internal noise level targets outlined in BS8233 are exceeded at a number of bedroom locations, and therefore enhanced glazing of up to $R_w+C_{tr}$ 27 will be required. Where this is required, double glazing of specification Pilkington Standard 6-16-6 or equivalent will be sufficient.

Where internal noise criteria cannot be met with windows partially open, alternative ventilation will be required. Alternative ventilation is understood to be provided by Greenwood Airvac CV3 GIP, to comply with System 3 passive ventilation as outlined within Building Regulations.

A mitigation strategy outlining the required locations of alternative ventilation for living rooms is outlined in Figures 6.1 & 6.2 below.

**Figure 6.1 Mitigation Strategy – Bedrooms**



With the ventilation strategy implemented as outlined in Figures 6.1 & 6.2, noise levels within living rooms and bedrooms are predicted to fall below 35 dBA and 30 dBA during the daytime and night-time respectively, and therefore below the Lowest Observed Adverse Effect Level (LOAEL).

## 6.2 EXTERNAL AMENITY AREAS

As demonstrated in the above table, the external BS 8233 noise level targets are met across the majority of the site, with the exception of a small number of receptors along the south-western boundary adjoining the railway line, at which external noise criteria are marginally exceeded. As such, it is recommended that garden fences along this boundary should be built up to a height of 2.2m, as demonstrated in Figure 6.2. These barriers should be of solid construction with no gaps and a minimum mass of 10kg/$m^2$.

**Figure 6.2 Mitigation Strategy – External Amenity Areas**


Not to scale
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# 7.0 CONCLUSIONS OF NOISE ASSESSMENT

This report presents the findings of a noise assessment to support a planning application for a proposed residential development on land adjacent to Woolley Colliery Road. Reference has been given to relevant planning policy and guidance documents with the assessment demonstrating the suitability of the site for residential development.

*NPPF 170 (e) and 180 (a)*

With appropriate mitigation it is considered that the proposed development is not expected to give rise to significant adverse impacts on health or quality of life.

A glazing and ventilation strategy has been provided which achieves both ventilation and internal ambient noise level requirements of $L_{Aeq\ daytime}$ of 35 dB and $L_{Aeq\ night\text{-}time}$ of 30 dB in all residential living spaces and bedrooms of the proposed development. Standard double glazing (e.g. 4mm/16mm/4mm) will be acceptable at the majority of locations throughout the site with alternative ventilation and enhanced glazing (e.g. 6mm/16mm/6mm) required for bedrooms most exposed to road and rail traffic noise.

Noise levels meet BS 8233 requirements of 55dB $L_{Aeq}$ with intrinsic 2.0m close-boarded garden fences in the majority of external amenity areas, however fences of an increased height of 2.2m are required for gardens most exposed to road and rail traffic noise along the south-western boundaries.

*Planning Practice Guidance: Noise / ProPG – Planning and Noise*

The noise mitigation measures recommended within this report are considered sufficient to reduce the effects of identified sources of noise to prevent the adopted thresholds (within the context of BS 8233) for Significant Observed Adverse Effect Level (SOAEL) being exceeded for future residents.

# APPENDICES

# APPENDIX A – ACOUSTIC TERMINOLOGY AND ABBREVIATIONS

An explanation of the specific acoustic terminology referred to within this report is provided below.

dB — Sound levels from any source can be measured in frequency bands in order to provide detailed information about the spectral content of the noise, i.e. whether it is high-pitched, low-pitched, or with no distinct tonal character. These measurements are usually undertaken in octave or third octave frequency bands. If these values are summed logarithmically, a single dB figure is obtained. This is usually not very helpful as it simply describes the total amount of acoustic energy measured and does not take any account of the ear's ability to hear certain frequencies more readily than others.

dB(A) — Instead, the dBA figure is used, as this is found to relate better to the loudness of the sound heard. The dBA figure is obtained by subtracting an appropriate correction, which represents the variation in the ear's ability to hear different frequencies, from the individual octave or third octave band values, before summing them logarithmically. As a result the single dBA value provides a good representation of how loud a sound is.

$L_{Aeq}$ — Since almost all sounds vary or fluctuate with time it is helpful, instead of having an instantaneous value to describe the noise event, to have an average of the total acoustic energy experienced over its duration. The $L_{Aeq,\ 07:00-23:00}$ for example, describes the equivalent continuous noise level over the 12 hour period between 7 am and 11 pm. During this time period the $L_{pA}$ at any particular time is likely to have been either greater or lower that the $L_{Aeq,\ 07:00-23:00}$.

$L_{Amin}$ — The $L_{Amin}$ is the quietest instantaneous noise level. This is usually the quietest 125 milliseconds measured during any given period of time.

$L_{Amax}$ — The $L_{Amax}$ is the loudest instantaneous noise level. This is usually the loudest 125 milliseconds measured during any given period of time.

$L_n$ — Another method of describing, with a single value, a noise level which varies over a given time period is, instead of considering the average amount of acoustic energy, to consider the length of time for which a particular noise level is exceeded. If a level of x dBA is exceeded for say. 6 minutes within one hour, then that level can be described as being exceeded for 10% of the total measurement period. This is denoted as the $L_{A10,\ 1\ hr}$ = x dB.

The $L_{A10}$ index is often used in the description of road traffic noise, whilst the $L_{A90}$, the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise. $L_{A1}$ and $L_{Amax}$ are common descriptors of construction noise.

$R_w$ The *weighted sound reduction index* determined using the above *measurement* procedure, but weighted in accordance with the procedures set down in BS EN ISO 717-1. Partitioning and building board manufacturers commonly use this index to describe the inherent sound insulation performance of their products.

An explanation of abbreviations used within this report is provided below.

CADNA – Computer Aided Noise Abatement
DMRB – Design Manual for Roads and Bridges
HGV – Heavy Goods Vehicle
UDP – Unitary Development Plan
UKAS – United Kingdom Accreditation Service

# APPENDIX B – REPORT CONDITIONS

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