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Proposed Residential Development
Land off Keresforth Road, Dodworth, Barnsley

Noise Impact Assessment

For:
Keepmoat Homes

13th September 2024

Ref: NIA/10106/21/10225/v3/Keresforth Rd, Dodworth
Issue: Third
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Contents

1 Introduction

1.1 Overview

Environmental Noise Solutions Ltd (ENS) has been commissioned by Keepmoat Homes to undertake a noise survey and assessment for a proposed residential development at land off Keresforth Road in Dodworth, Barnsley (hereafter referred to as 'the site').

The assessment has been requested to inform a planning application for the proposed development.

The report has been prepared for Keepmoat Homes for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties referring to the report should consult Keepmoat Homes and ENS as to the extent to which the findings may be appropriate for their use.

A glossary of acoustic terms used in the main body of the text is contained in Appendix A.

1.2 Site Description

The site is located to the north-east of Keresforth Road in Dodworth, as shown in Figure 1.1.

Figure 1.1: Location of Proposed Development

The site is bound by:

- Vacant grass land / embankment to the east with the M1 motorway further beyond
- Vacant grass land to the north and south
- An existing residential estate to the west

The proposed development is for up to 215 no. new build dwellings, however, for the purposes of the report, an indicative layout of 212 no. new build dwellings has been used to demonstrate how future residential noise amenity can be adequately protected.

2 Policy Context and Assessment Guidance

2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)1 was updated in December 2023 and sets out the Government's planning policies for England and how these are expected to be applied.

Where issues of noise impact are concerned the NPPF provides brief guidance in paragraph 180 where it states that planning policies and decisions should contribute to and enhance the natural and local environment by:

'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of…..noise pollution'.

Paragraph 191 advises 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…..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'.

The NPPF also refers to the 2010 DEFRA publication, the Noise Policy Statement for England (NPSE) which reinforces and supplements the NPPF.

2.2 Noise Policy Statement for England

The Noise Policy Statement for England[2] (NPSE) sets out the long-term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This long-term vision is supported by the following aims:

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

The NPSE describes the following levels at which noise impacts may be identified:

- NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise
- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected
- SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur

According to the explanatory notes in the statement, where a noise level falls between the lowest observable adverse effect level (LOAEL) and a level which represents a significant observable adverse effect level (SOAEL):

'….all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur.'

1 National Planning Policy Framework. Ministry of Housing, Communities and Local Government (2021)
[2] Government Department for Environment, Food and Rural Affairs. Noise Policy Statement for England. March 2010.

2.3 Planning Practice Guidance on Noise

Planning Practice Guidance[3] (PPG) is an online resource which provides additional guidance and elaboration on the NPPF. It advises that the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or likely to occur
- Whether or not an adverse effect is occurring or likely to occur
- Whether or not a good standard of amenity can be achieved

In line with the Explanatory Note of the NPSE, the PPG references the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG acknowledges that:

'…the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation'.

The PPG also provides general advice on the typical options available for mitigating noise, suggesting that Local Plans may include noise standards applicable to proposed developments within the Local Authority's administrative boundary, although it states that:

'Care should be taken, however, to avoid these being implemented as fixed thresholds as specific circumstances may justify some variation being allowed'.

With regard to the mitigation of extant environmental noise at a proposed residential development, the guidance states that:

'… consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations'.

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation. The following guidance documents provide some meaningful context.

2.4 Assessment Guidance

British Standard 8233:2014

British Standard 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' (BS8233)[4] provides recommendations for the control of noise both in and around buildings and suggests criteria and limits appropriate to their function. For dwellings, the main considerations are:

- Bedrooms - the effect of noise upon sleep
- Other habitable rooms - the effect of noise upon resting, listening and communicating

[3] Planning Practice Guidance on Noise: http://planningguidance.planningportal.gov.uk/blog/guidance/noise/
[4] British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings. BSI

It is desirable that the internal ambient noise level does not exceed the guideline values as replicated in Table 2.1.

Table 2.1: Indoor Ambient Noise Levels for Dwellings - BS8233:2014

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

BS8233 states:

'If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.'

For traditional external areas that are used for amenity space, such as gardens, BS8233 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. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.'

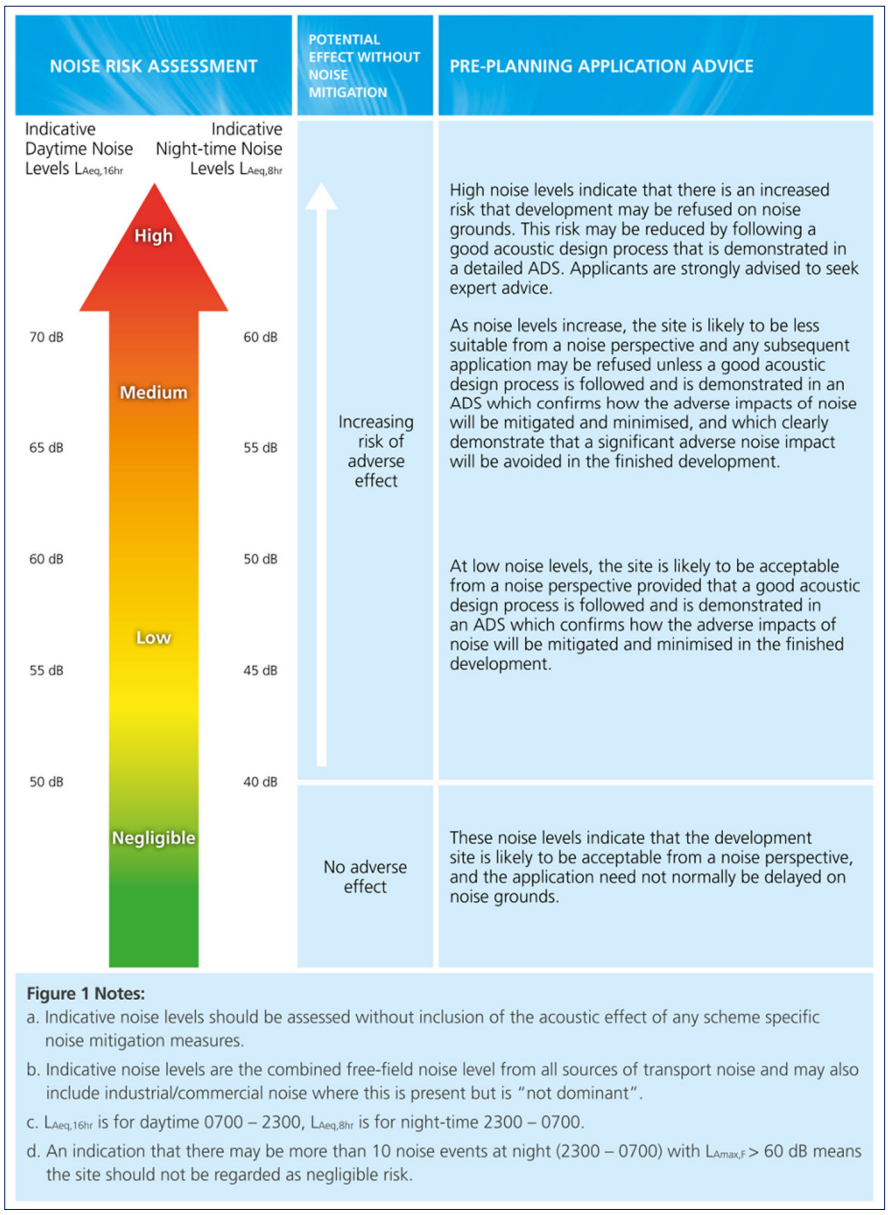
ProPG Planning and Noise: New Residential Development

ProPG Planning and Noise: New Residential Development (ProPG)[5] promotes a systematic two-stage, risk-based approach to noise assessments that inform planning applications for new residential developments.

The 'Stage 1 Initial Site Noise Risk Assessment' should be conducted, at the proposed development site, at the earliest opportunity, before any planning application is submitted. The noise risk assessment should provide an indication of the likely risk of adverse effects from noise were no subsequent mitigation to be included as part of the development proposal. It should indicate whether the proposed site is considered to pose a negligible, low, medium or high risk from a noise perspective. Figure 2.1 summarises the initial noise risk assessment and demonstrates how measured site noise levels relate to potential adverse effects from noise.

5 'ProPG Planning and Noise: New Residential Development (ProPG)', 2017. Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH)

Figure 2.1: ProPG: Stage 1 – Initial Site Noise Risk Assessment



ProPG recommends compliance with indoor noise level targets in residential dwellings based on the guidance contained in BS8233 (see Table 2.1). However, it is noted that:

'Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable".....Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally'.

Additionally, with regard to individual noise events, ProPG states:

'Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. 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 45dB $L_{Amax,F}$ more than 10 times a night.'

ProPG acknowledges that the internal target noise level**s** may only be practically achieved with windows closed in certain areas (e.g. in urban areas or sites adjacent to transportation noise sources) and states that:

'In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide 'whole dwelling ventilation' in accordance with Building Regulations Approved Document F (e.g. trickle ventilators in the open position).

It should also be noted that the internal noise level guidelines are generally not applicable under 'purge ventilation' conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).'

ProPG also considers compliance with ambient noise level targets for external amenity areas in line with the recommendation of BS8233. On this issue, ProPG states that:

'Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:

- *a relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
- *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); and/or*
- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
- *a relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.'*

3 Noise Survey and Results

3.1 Overview

In order to establish external noise levels affecting the proposed development, noise monitoring was carried out between Tuesday 23rd and Wednesday 24th November 2021.

The adopted noise monitoring positions (shown in Appendix B) were as follows:

- 1 – north-eastern corner of the site, approximately 9 metres from the slip road (Junction 37, Northbound) of the M1 Motorway, at a height of 1.5m above ground
- 1A – as per Position 1, but at a height of 4m above ground
- 1B – as per Position 1 but at a distance of 18 metres from the slip road
- 1C – as per Position 1B but at a height of 4m above ground
- 1D – as per Position 1 but at a distance of 36m from the slip road
- 1E – as per Position 1D but at a height of 4m above ground
- 2 – eastern boundary of the site, approximately 20 metres from the slip road (Junction 37, Northbound) of the M1 Motorway, at a height of 1.5m above ground
- 2A – as per Position 2, but at a height of 4m above ground
- 2B – as per Position 2 but at a distance of 40 metres from the slip road
- 2C – as per Position 2B but at a height of 4m above ground
- 2D – as per Position 2 but at a distance of 60m from the slip road
- 2E – as per Position 2D but at a height of 4m above ground
- 3 – south-eastern corner of the site, approximately 20 metres from the slip road (Junction 37, Northbound) of the M1 Motorway, at a height of 1.5m above ground
- 3A – as per Position 3, but at a height of 4m above ground
- 3B – as per Position 3 but at a distance of 40 metres from the slip road
- 3C – as per Position 3B but at a height of 4m above ground
- 3D – as per Position 3 but at a distance of 80m from the slip road
- 3E – as per Position 3D but at a height of 4m above ground

Noise measurements were undertaken using Bruel & Kjaer 2250 Type 1 integrating sound level meters. Each meter was connected to a windshield covered microphone positioned in free field conditions (i.e. > 3.5 metres from a vertical reflective surface) at the locations detailed above.

The calibration of each measurement system was verified immediately before and after the survey period using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration levels greater than 0.5 dB was noted.

Measurements consisted of A–weighted broadband parameters including L_{Aeq}, L_{A10} and L_{AFmax} together with linear octave band data.

Weather conditions during the survey were dry, cool (~ 7°C) and calm (wind speeds ~ 3 – 4 m/s); therefore, appropriate for noise monitoring.

3.2 Summary of Results

Table 3.1 presents a summary of the noise data for each measurement session, at each measurement position, rounded to the nearest decibel.

Table 3.1: Summary of Noise Measurement Data

Position	Date	Time (hh:mm)	Period	L_{Aeq} (dB)	L_{AFmax} (dB)	L_{A10} (dB)	Noise Source	Notes
1	23/11/2021	10:01 – 13:01	Day	57	75	59	Road traffic on M1 Motorway and J37 northbound exit slip road	Below surface of slip road
1A	23/11/2021	10:03 – 10:18	Day	60	71	62		Approx. same height as slip road
	23/11/2021	23:00 – 23:30	Night	54	67	58		
	24/11/2021	02:06 – 02:36	Night	52	68	53		
1B	23/11/2021	10:25 – 10:40	Day	59	75	61		Below surface of slip road
1C	23/11/2021	10:45 – 11:00	Day	61	72	63		Slightly above surface of slip road
1D	23/11/2021	11:04 – 11:19	Day	58	78	60		Approx. same height as slip road
1E	23/11/2021	11:25 – 11:40	Day	60	67	63		Slightly above surface of slip road
2	23/11/2021	13:19 – 16:19	Day	61	73	63	Road traffic on M1 Motorway and J37 northbound exit slip road	Below road surface
2A	23/11/2021	13:22 – 13:37	Day	63	73	65		
	23/11/2021 – 24/11/2021	23:37 – 00:07	Night	54	67	57		
	24/11/2021	01:27 – 01:57	Night	54	68	56		
2B	23/11/2021	13:45 – 14:00	Day	61	68	63		
2C	23/11/2021	14:13 – 14:28	Day	63	70	65		
2D	23/11/2021	14:38 – 14:53	Day	60	65	62		
2E	23/11/2021	14:59 – 15:14	Day	62	72	64		
3	24/11/2021	13:19 – 16:19	Day	65	73	67	Road traffic on M1 Motorway and J37 northbound exit slip road	Above road surface but shielded due to topography
3A	24/11/2021	00:18 – 01:18	Night	66	74	69		Above and exposed to road surface
	24/11/2021	14:03 – 14:18	Day	73	78	74		
3B	24/11/2021	14:20 – 14:35	Day	61	65	62		Above road surface but shielded due to topography
3C	24/11/2021	14:37 – 14:54	Day	65	68	66		Above road, embankment offering some screening
3D	24/11/2021	14:57 – 15:12	Day	58	64	60		Above road surface but shielded due to topography
3E	24/11/2021	15:13 – 15:28	Day	59	64	60		Above road surface, embankment offering some screening

3.3 Analysis

Road Traffic Noise Levels

For the prediction of daytime road traffic noise, the Department of Transport's Memorandum on the Calculation of Road Traffic Noise (CRTN) explains that the following shortened measurement procedure may be used. Measurements of $L_{A10,1hr}$ are made over any three consecutive hours between 10:00 - 17:00 hrs.

Using $L_{A10,3hr}$ as the arithmetic mean of three consecutive hourly L_{A10} values, the $L_{A10,18hr}$ and $L_{Aeq,16hr}$ can be calculated from the following equations:

(i) $L_{A10,18hr} = L_{A10,3hr} - 1$ dB

(ii) $L_{Aeq,16hr} \approx L_{A10,18hr} - 2$ dB

Substituting (ii) into (i) gives the following approximation:

(iii) $L_{Aeq,16hr} \approx L_{A10,3hr} - 3$ dB

Based on the above formula, the daytime ambient noise level is calculated to be:

- 56 dB $L_{Aeq,16hr}$ at the north-eastern corner (Position 1)
- 60 dB $L_{Aeq,16hr}$ at the eastern boundary (Position 2)
- 64 dB $L_{Aeq,16hr}$ at the south-eastern corner (Position 3)

A study prepared by TRL Limited on behalf of the Department for Environment, Food and Rural Affairs (DEFRA) entitled '*Converting the UK Traffic Noise Index $L_{A10\ (18\ hour)}$ to EU Noise Indices for Noise Mapping'* presents a methodology for calculating night-time road traffic noise levels, based on daytime road traffic noise levels, using the following formula:

(iv) $L_{Aeq,8hr} \approx 0.87 \times L_{A10,18hr} + 4.24$ (for motorway roads)

Based on the above formula, the night-time ambient noise level is calculated to be:

- 55 dB $L_{Aeq,8hr}$ at Position 1
- 58 dB $L_{Aeq,8hr}$ at Position 2
- 61 dB $L_{Aeq,8hr}$ at Position 3

However, analysis of simultaneous measured data [at ground floor height (1.5m) and at first floor height (4m)] established an increase in measured noise levels, due to increased exposure to the motorway and slip road, at height (as shown in Table 3.1).

Based on the above, the following night-time ambient noise levels have been determined at first floor height:

- 58 dB $L_{Aeq,8hr}$ at Position 1A
- 61 dB $L_{Aeq,8hr}$ at Position 2A
- 68 dB $L_{Aeq,8hr}$ at Position 3A

Night-time maximum noise levels were attributed to vehicle movements on the M1 Motorway / J37 northbound exit slip road and were measured at

- ≤ 68 dB L_{AFmax} at Position 1A
- ≤ 68 dB L_{AFmax} at Position 2A
- ≤ 74 dB L_{AFmax} at Position 3A

4 Noise Assessment

4.1 Initial Site Noise Risk Assessment

Assessment of the measured/calculated ambient noise level data, using the ProPG initial site noise risk assessment diagram shown in Section 2, has determined that the site would be categorised as shown in Table 4.1 in terms of adverse effects from noise.

Table 4.1: Risk of Adverse Effects from Noise

Position	Distance from Nearest Carriageway	Height (a.g.l.)	Period	External Noise Levels (dB L_{Aeq})	Risk
1	9m	1.5m	Day (07:00–23:00)	56	Low
1A		4m	Day (07:00–23:00)	60	Low
			Night (23:00–07:00)	58	Medium
1B	18m	1.5m	Day (07:00–23:00)	58	Low
1C		4m	Day (07:00–23:00)	60	Low
			Night (23:00–07:00)	58	Medium
1D	36m	1.5m	Day (07:00–23:00)	58	Low
1E		4m	Day (07:00–23:00)	59	Low
			Night (23:00–07:00)	58	Medium
2	20m	1.5m	Day (07:00–23:00)	60	Low
2A		4m	Day (07:00–23:00)	63	Medium
			Night (23:00–07:00)	61	Medium
2B	40m	1.5m	Day (07:00–23:00)	61	Low
2C		4m	Day (07:00–23:00)	62	Low / Medium
			Night (23:00–07:00)	60	Medium
2D	60m	1.5m	Day (07:00–23:00)	60	Low
2E		4m	Day (07:00–23:00)	60	Low
			Night (23:00–07:00)	59	Medium
3	20m	1.5m	Day (07:00–23:00)	64	Medium
3A		4m	Day (07:00–23:00)	71	Medium
			Night (23:00–07:00)	68	High
3B	40m	1.5m	Day (07:00–23:00)	59	Low
3C		4m	Day (07:00–23:00)	63	Medium
			Night (23:00–07:00)	60	Medium
3D	80m	1.5m	Day (07:00–23:00)	57	Low
3E		4m	Day (07:00–23:00)	58	Low
			Night (23:00–07:00)	56	Medium

It can be seen that the risk of adverse noise impacts at the site is:

- Low – medium during the daytime
- Medium – high at night

4.2 Noise Propagation

In order to calculate noise propagation across the site a three-dimensional model of the site and the immediate surrounding area has been created using the proprietary noise modelling software CadnaA.

The data files and input parameters used to create the model are presented in Table 4.2.

Table 4.2: CadnaA Model Input Data

Input Parameter	Data Source / Model Settings
Base landline map	2022016 Masterplan n1664-005 Rev I by Keepmoat Homes
Topography	Environment Agency LIDAR Composite DTM (Digital Terrain Model) 2017
Receptor Positions	– Living rooms: 1.5m above ground level (agl) – Bedrooms: 4.5m agl – Gardens: 1.5m agl and ≥ 3.5m from buildings where possible
Barriers	None included in preliminary modelling exercise
Ground Absorption	The default ground absorption setting for the site is 0.5 (mixed ground)
Reflections	– Maximum order of reflection is 2 – Building facades classified as 'structured' for reflections
Noise Sources	– M1 Motorway and J37 Exit (Northbound) slip road are primary noise sources Sources verified with noise level monitoring data acquired on site
Relative Humidity (%)	70
Temperature (°C)	10

Noise propagation across the site is shown in contour plots presented in Appendix C for illustrative purposes.

4.3 External Noise Levels

Table 4.3 below presents a summary of the highest noise levels at predicted at the various land parcels set out in the masterplan drawing.

Table 4.3: External Façade Noise Levels

Location	External Noise Levels (dB $L_{Aeq,T}$)	
	Day (07:00–23:00)	Night (23:00–07:00)
Northern land parcel – Ground Floor	61-64	59-62
Northern land parcel – First Floor	63-67	61-65
Central land parcel – Ground Floor	64	61
Central land Parcel – First Floor	67	64
Southern land parcel – Ground Floor	58	55
Southern land parcel – First Floor	62	59

Facades which benefit from the acoustic barrier effect formed by intervening properties will be exposed to lower noise levels in comparison to those presented in Table 4.3, with the majority of western facing facades exposed to noise levels ≤ 45 dB $L_{Aeq,16hr}$ during the daytime and many which are exposed noise levels ≤ 40 dB $L_{Aeq,8hr}$ during the night time.

4.4 External Amenity

With regard to external noise levels during the day, the noise contour plots shown in Appendix C show that external noise levels in areas shielded from the M1 are expected to satisfy the upper guideline value of ≤ 55 dB $L_{Aeq,T}$ for external amenity areas, as recommended by BS 8233 / ProPG, in some plots (i.e. those in the northern and western areas of the site); however, it can also be seen that some areas of the site would exceed the guideline value. On this basis, it is recommended that proposed gardens are protected by 2.4m high imperforate acoustic barrier e.g. solid masonry wall or fencing (close-boarded timber, mass per unit area ≥ 10kg/m^2) at garden perimeters.

Mitigated noise propagation across the site is shown in contour plots presented in Appendix E. It can be seen that some of the proposed garden areas on the most exposed (i.e. eastern) parts of the site would still exceed the guideline value, even after mitigation; however, BS8233 states that:

'..... it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.'

4.5 Indoor Noise Levels

Feasibility of Open Windows

With regard to internal noise levels when windows are open, the World Health Organisation (WHO) Guidelines for Community Noise (1999) states:

'the noise reduction from outside to inside with the window partly open is 15 decibels'.

Based on the noise levels summarised above in Table 4.3, noise levels at the most noise exposed façade locations are above the level at which ventilation via partially open windows would be suitable. On this basis, it is not recommended that permanently open windows or standard (non-acoustic) trickle events are relied upon as the primary means of ventilation for proposed habitable rooms in these areas.

The assessment has therefore assumed that windows will be closed, as part of the noise mitigation strategy for the site. A scheme of sound insulation will be required with acoustically attenuated ventilation such that the minimum ventilation rates specified in Approved Document Part F can be achieved.

Windows may be opened for temporary purge ventilation to enable discretionary rapid air changing, with the resultant internal levels exceeding the noise criteria, however this would be on a short-term temporary basis only.

Closed Windows

Calculations have been undertaken to determine the minimum sound insulation performance of glazing and ventilation elements, incorporating the measured/calculated external noise level data on site based on the noise ingress calculation methodology outlined Annex G of BS 8233:2014.

As the final plot layout/elevation designs (including room dimensions and façade element surface areas) are yet to be determined, the following has been assumed for assessment purposes:

- Typical living room volume of 60m^3 with glazing area of 5m^2
- Typical bedroom volume of 25m^3 with glazing area of 3m^2
- Room reverberation time of 0.5 seconds
- Typical masonry external wall construction
- Typical slate / tile roof with double-boarded plasterboard ceiling and insulated ceiling void

Scheme of Sound Attenuation

Minimum sound reduction values are presented in Table 4.1, based on commonly available ventilation and glazing products, assuming a cavity masonry construction for the façade.

The scheme of mitigation presented below has been calculated to achieve both the BS 8233 internal ambient noise criteria during the day and night, and to limit individual noise events internally to a level not exceeding 45 dB $L_{Amax,F}$ more than 10 times a night.

Table 4.1: Required Sound Reduction of Façade Elements

Element	Required Sound Reduction (dB)						Indicative Specification
	125 Hz	250 Hz	500 Hz	1kHz	2kHz	Weighted R_w ($R_w + C_{tr}$) / $D_{n,e,w}$ ($D_{n,e,w} + C_{tr}$)	
Northern and central land Parcel – Bedrooms (≤ 67 dB $L_{Aeq,16hr}$ and/or 61 dB $L_{Aeq,8hr}$)							
Glazing	26	26	27	36	42	**34 (30)**	4/16/6.4 Acoustic double glazing
Ventilation	42	37	37	37	43	**43 (41)**	1 no. Ryton AAC125HP through wall ventilator
All other Bedrooms (≤ 64 dB $L_{Aeq,16hr}$ and/or 59 dB $L_{Aeq,8hr}$)							
Glazing	20	20	30	39	35	**33 (28)**	6/16/6 Thermal double glazing
Ventilation	42	37	37	37	43	**43 (41)**	1 no. Ryton AAC125HP through wall ventilator
All other habitable rooms							
Glazing	20	20	30	39	35	**33 (28)**	6/16/6 Standard thermal double glazing
Ventilation	42	37	37	37	43	**43 (41)**	2 no. Ryton AAC125HP through wall ventilator

Alternative solutions, to the indicative specifications shown above may be considered if sound reduction performances are equivalent to (or greater than) those stipulated.

The glazing recommendations apply to the window within a sealed unit. It is the responsibility of the window supplier to ensure that the window frame does not compromise the performance of the glazing.

Calculations assume a minimum equivalent free area of ≥8000 mm² for individual ventilation elements. The opening and free area of the ventilation unit should be checked by a mechanical services engineer before designs are finalised. Should the equivalent open area be insufficient to meet the minimum requirements of Part F of the Building Regulations, it may be necessary to increase the number of units per habitable room. It is recommended that any design changes be reviewed by a qualified acoustician.

Please note that the above specifications are indicative at this stage and may require further refinement once detailed information becomes available at a later stage in the planning / design process. However the results demonstrate that it is possible to satisfy the BS 8233 IANL criteria using a passive ventilation system.

When selecting a glazing system to satisfy the requirements outlined in Table 4.4, it is important to ensure that the $R_w + C_{tr}$ value is achieved (rather than simply the R_w value). Published R_w values tend to be higher than corresponding $R_w + C_{tr}$ values; therefore, incorrect selection could result in an overestimation of sound reduction performance which in turn could result in higher internal noise levels.

The opening and free area of the ventilation unit should be checked by a mechanical service engineer before designs are finalised. Should the equivalent open area be insufficient to meet the minimum requirements of Part F of the Building Regulations, it may be necessary to increase the number of units per habitable room. Where this applies, the required sound reduction of the ventilation units should be increased accordingly (3 dB per doubling of required no. of vent units).

5 Summary and Conclusions

A noise survey and assessment has been performed for a proposed residential development at land off Keresforth Road in Dodworth, Barnsley.

Noise monitoring was carried out between Tuesday 23rd and Wednesday 24th November 2021 to establish external noise levels affecting the proposed development.

Section 4 provides an assessment using BS8233 / ProPG guidance along with a noise mitigation strategy to minimise potential adverse noise impacts to potential future residents at the site.

Appendix A – Abbreviations and Definitions

Sound Pressure Level (L_p)
The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 μPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$L_p = 20 \log_{10}(p/p_o)$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_o = reference sound pressure (20 μPa).

A-weighting
A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$
The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T, has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$
The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T. $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$
The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T. L_{A90} is typically taken as representative of background noise.

$L_{AF\ max}$
The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

Single Event Level / Sound Exposure Level (SEL or L_{AE})
The energy produced by a discrete noise event averaged over one second, regardless of the event duration. This allows for comparison between different noise events which occur over different lengths of time.

Weighted Sound Reduction Index (R_W)
Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_W is used to characterise the insulation of a material or product that has been measured in a laboratory).

Appendix B – Noise Measurement Positions

Appendix C – Unmitigated Noise Contour Plots

Figure C1: Day (Northern Part of Site) at 1.5m height

Figure C2: Day (Mid Part of Site) at 1.5m height

Figure C3: Day (Southern Part of Site) at 1.5m height

Appendix D – Indicative Façade Noise Levels

Figure D1: Day (Northern Part of Site) at 4.5m height

Figure D2: Day (Mid Part of Site) at 4.5m height

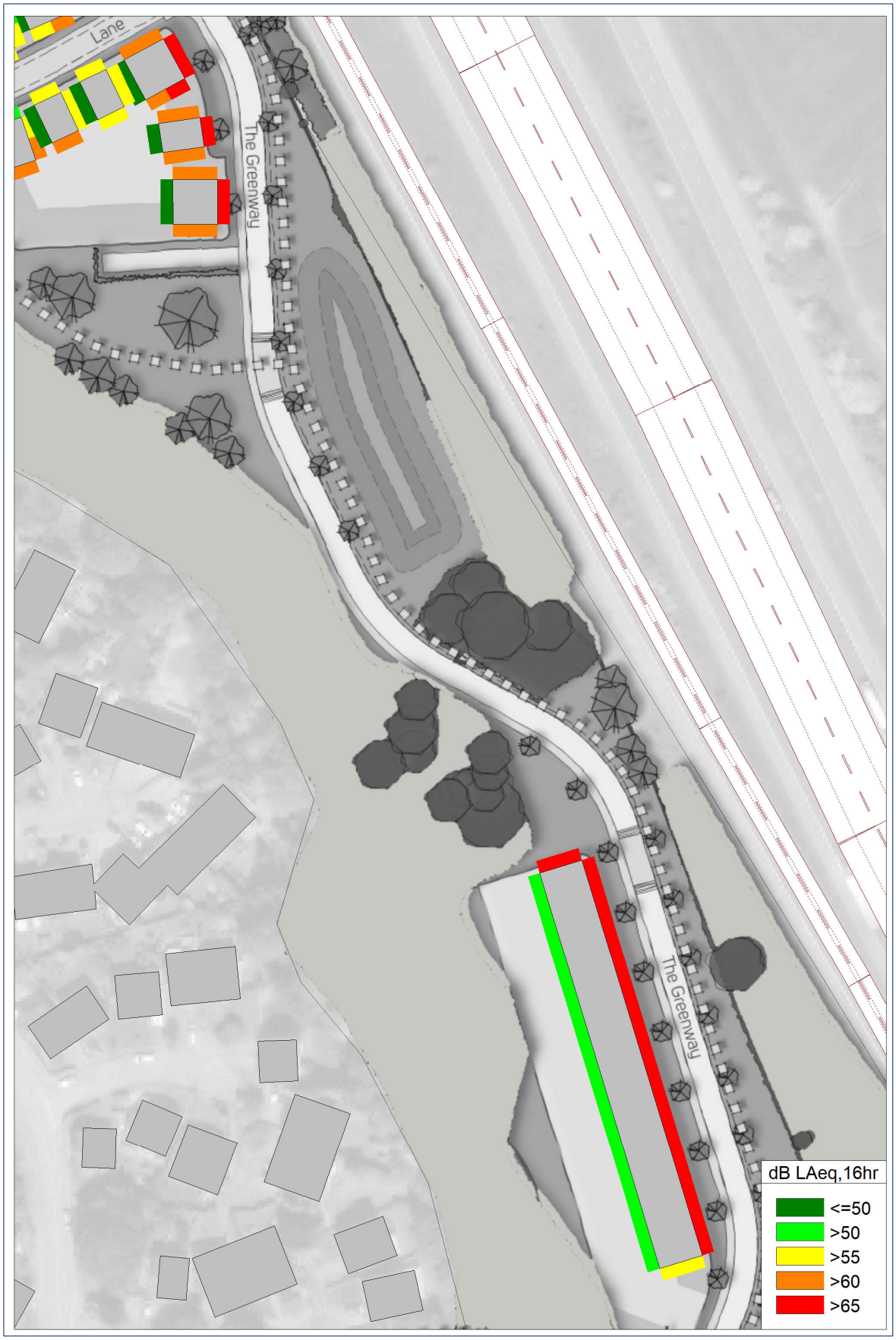


Figure D3: Day (Southern Part of Site) at 4.5m height

Figure D4: Night (Northern Part of Site) at 4.5m height

Figure D5: Night (Mid Part of Site) at 4.5m height

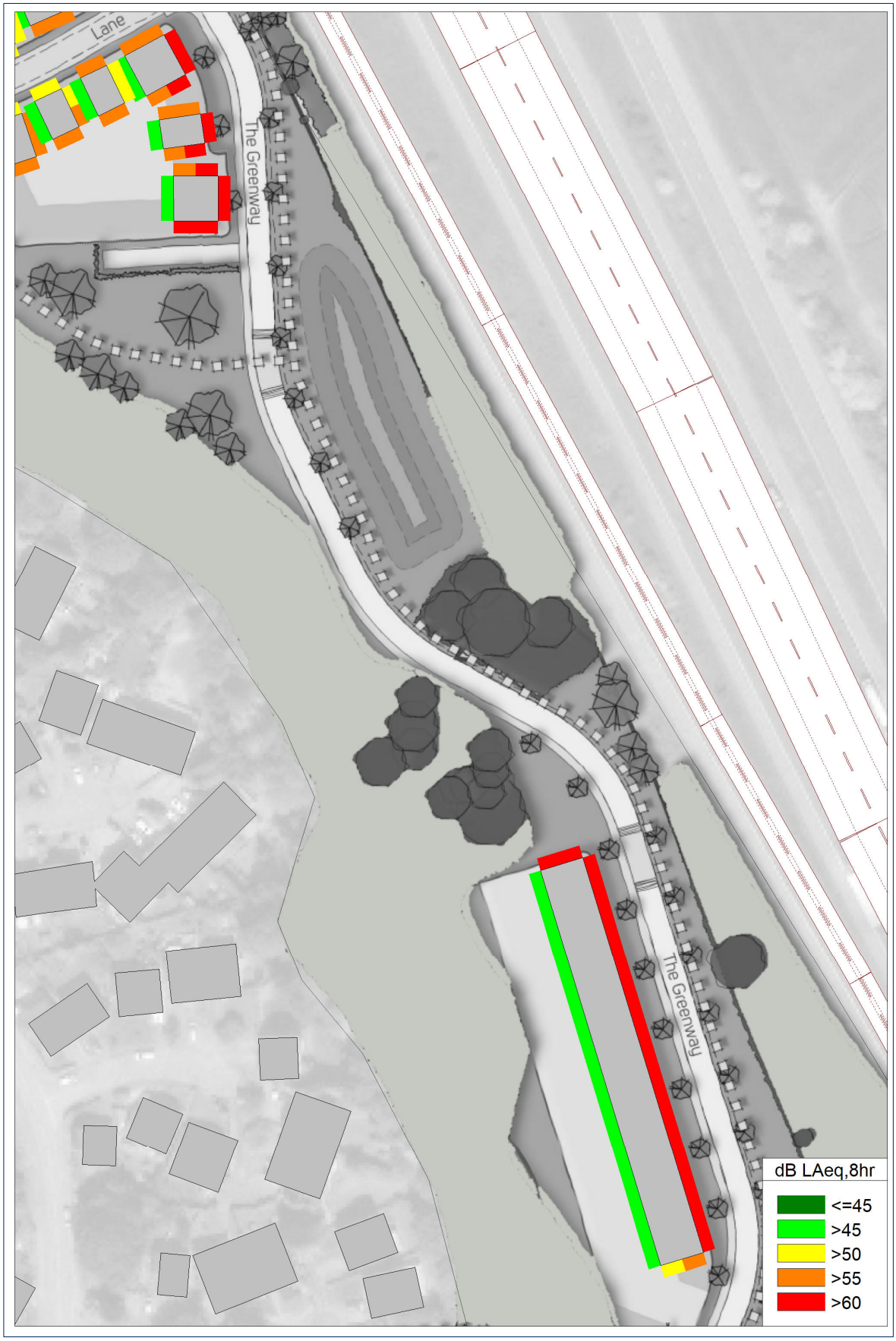
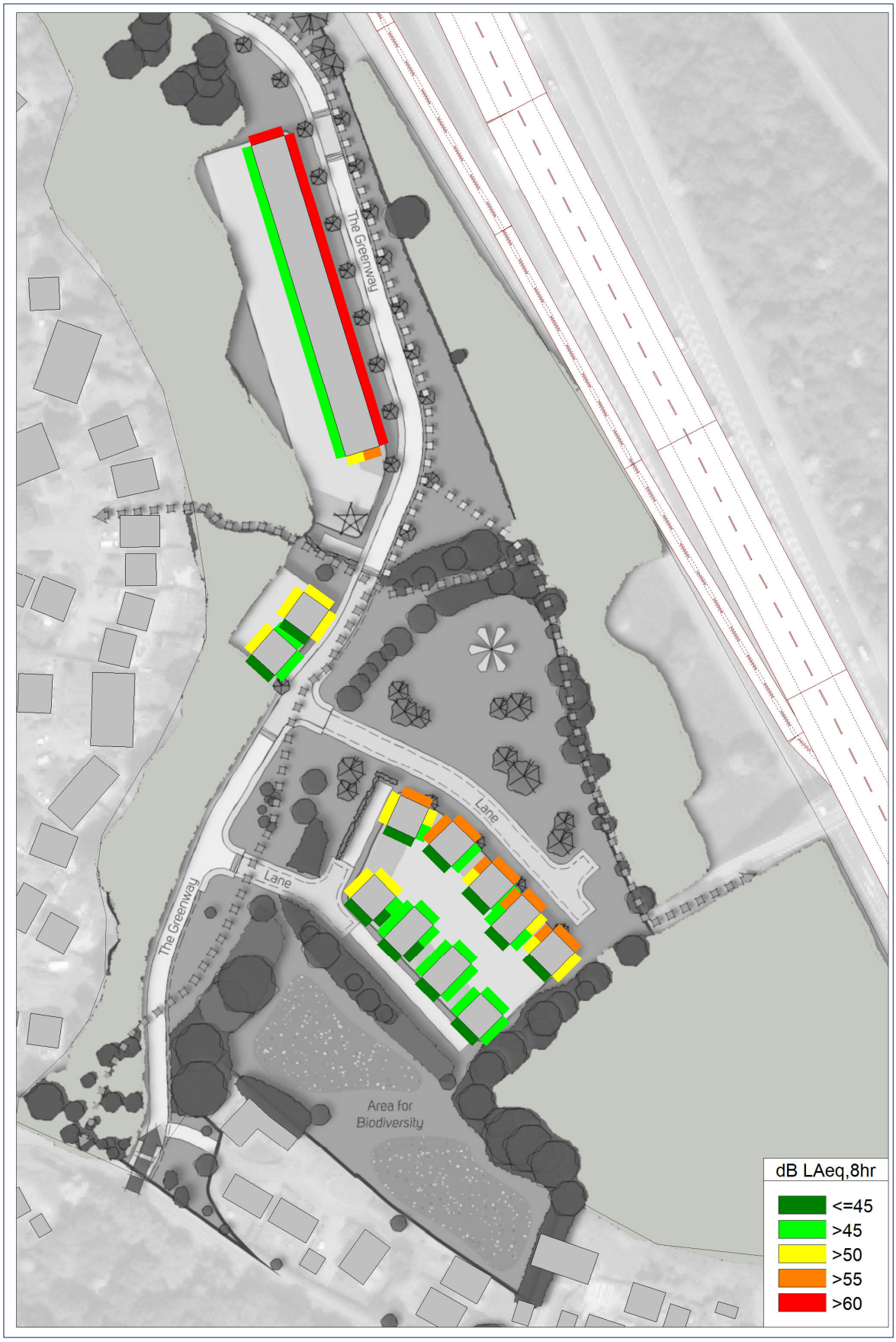


Figure D6: Night (Southern Part of Site) at 4.5m height

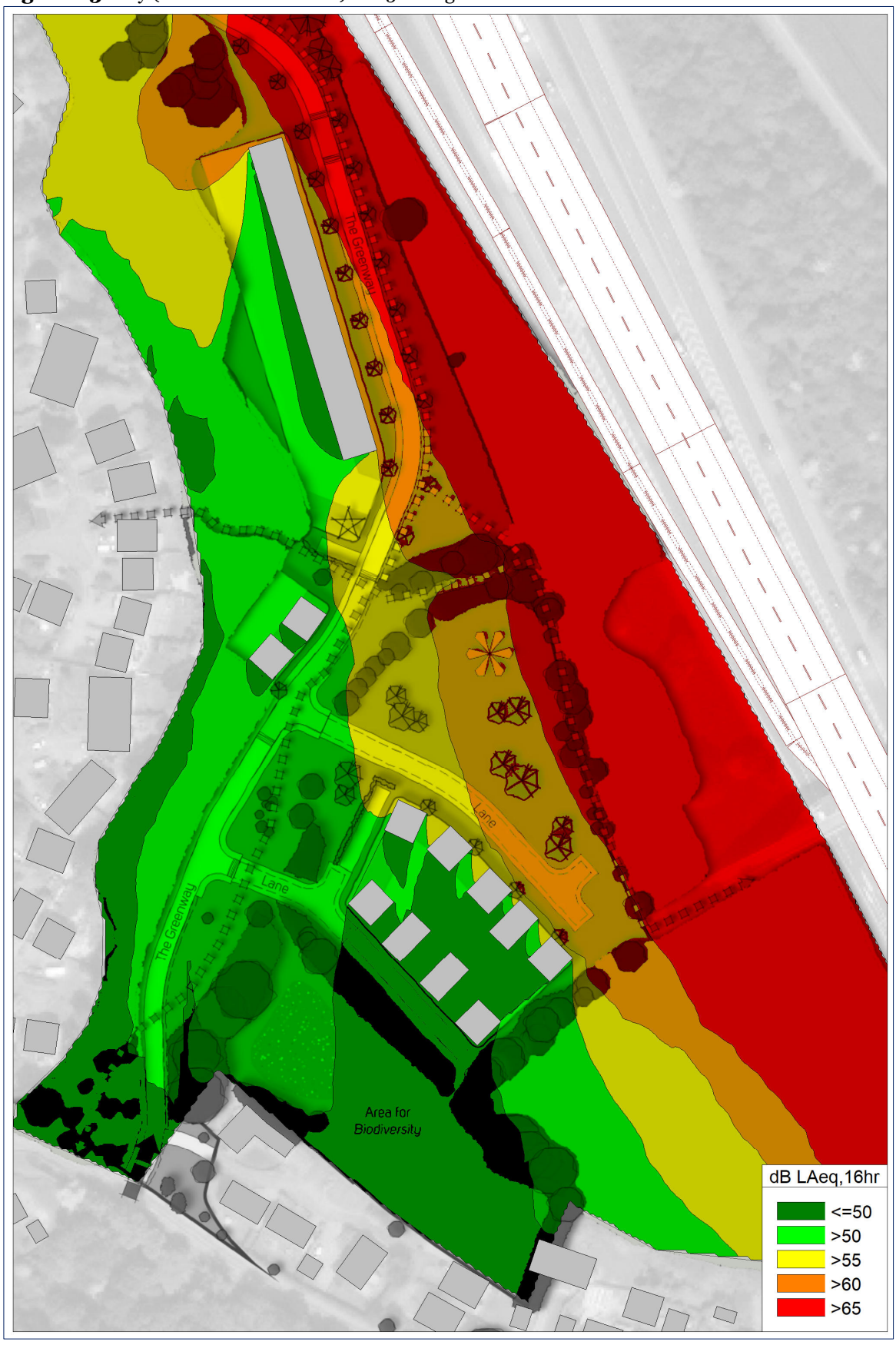


Appendix E – Mitigated Noise Contour Plots

Figure E1: Day (Northern Part of Site) at 1.5m height

Figure E2: Day (Mid Part of Site) at 1.5m height

Figure E3: Day (Southern Part of Site) at 1.5m height



Appendix

E – Night Time Overheating

Figure F1: Northern Part of Site at First Floor Level

Figure F2: Mid Part of Site at 1.5m height

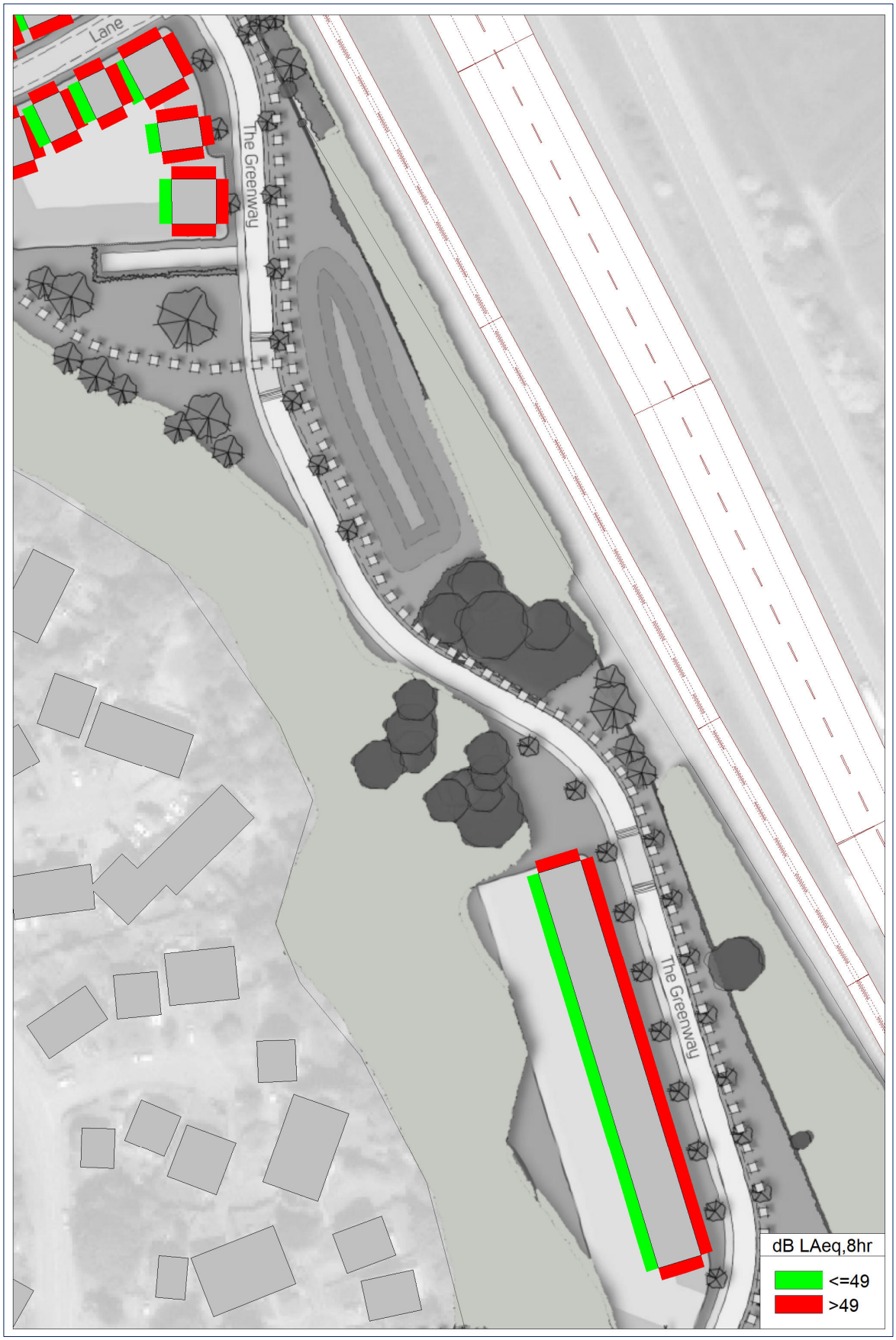


Figure F3: Southern Part of Site at 1.5m height