



**Persimmon Homes**

**Reserved Matters Application (Parcels A2  
and B6) and Discharge of Conditions,  
North Littlehampton**

**Noise Assessment**  
**November 2018**

Executive Park, Avalon Way, Anstey, Leicester, LE7 7GR



creative minds safe hands



## Document Control

Project: Reserved Matters Application (Parcel A2 and B6) and Discharge of Condition

Client: Persimmon Homes

Job Number: A100896

File Origin: O:\Acoustics Air Quality and Noise\Active Projects\A100896

### Document Checking:

|              |                                                  |                |
|--------------|--------------------------------------------------|----------------|
| Prepared by: | Emma Aspinall<br><i>Environmental Consultant</i> | Initialled: EA |
|--------------|--------------------------------------------------|----------------|

|             |                                                           |                |
|-------------|-----------------------------------------------------------|----------------|
| Checked by: | Graham Davis<br><i>Principal Environmental Consultant</i> | Initialled: GD |
|-------------|-----------------------------------------------------------|----------------|

|              |                               |                |
|--------------|-------------------------------|----------------|
| Verified by: | Nigel Mann<br><i>Director</i> | Initialled: NM |
|--------------|-------------------------------|----------------|

| Issue | Date                           | Status                          |
|-------|--------------------------------|---------------------------------|
| 1     | 13 <sup>th</sup> March 2018    | First Issue                     |
| 2     | 23 <sup>rd</sup> November 2018 | Second Issue – Finalised Layout |
| 3     |                                |                                 |
| 4     |                                |                                 |



## Contents Page

|     |                                 |    |
|-----|---------------------------------|----|
| 1.0 | Introduction.....               | 1  |
| 2.0 | Assessment Criteria .....       | 6  |
| 3.0 | Assessment Methodology .....    | 7  |
| 4.0 | Noise Survey .....              | 12 |
| 5.0 | Assessment of Key Effects ..... | 15 |
| 6.0 | Noise Mitigation .....          | 18 |
| 7.0 | Conclusions .....               | 19 |

## Appendix Contents

Appendix A – Acoustic Terminology and Abbreviations

Appendix B – Sketches

Appendix C – Noise Intrusion and Glazing/Ventilation Results Table

Appendix D – Report Conditions



## 1.0 Introduction

### 1.1 Purpose of this Report

This report presents the findings of a noise assessment for a reserved matters application for parcels A2 and B6 of a residential development in north Littlehampton and the discharge of Conditions 37 and 38 of planning permission ref LU-47-11 which states:

*"37 In addition to the measures described in Condition 36 above, any development on land within Noise Exposure Category C and D shall incorporate noise mitigation measures details of which are to be submitted to, and approved in writing by, the Local Planning Authority. These measures shall thereafter be permanently maintained."*

*"38 All ground level private amenity spaces shall have a predicted noise level of less than or equal to  $L_{Aeq}$ , 55dB (measured over a 1 hour period) within the first 5 metres from the building facade"*

A description of the existing noise environment in and around the site is provided. Noise surveys have been undertaken and the results used to verify predictions of the short-term and long-term effects of noise. The noise levels from the proposed development have been predicted at local representative 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 and noise contour plots relevant to the assessment are presented in Appendix B.

### 1.2 Legislative Context (England)

PPG24 (from which Noise Exposure Categories were defined) was replaced by NPPF on 27 March 2012 and then updated on 24<sup>th</sup> July 2018. 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 National Planning Policy Framework (NPPF), published on 24<sup>th</sup> July 2018. With regard to noise and planning, NPPF contains the following statement at paragraph 170:

*"170. 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*

A further 2 short statements are presented at paragraph 180, which state:

*"180. 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 impact 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 an amenity value for this reason."*

Furthermore, paragraphs 182 and 183 state:

*"182. 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.*

*183. 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."*

Practice Guidance (PPG): Noise provides further guidance with regard to the assessment of noise within the context of Planning Policy. 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, 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 Noise Exposure Hierarchy**

| Perception                                        | Examples of Outcomes                                                                                                                                                                                                                                                                                                                                                                                 | Increasing Effect Level              | Action                           |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|----------------------------------|
| Not noticeable                                    | No Effect                                                                                                                                                                                                                                                                                                                                                                                            | No Observed Effect                   | No Specific Measures Required    |
| Noticeable and not intrusive                      | Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.                                                                                                                                                                                             | No Observed Adverse Effect (NOEL)    | No Specific Measures Required    |
| Lowest Observed Adverse Effect Level (LOAEL)      |                                                                                                                                                                                                                                                                                                                                                                                                      |                                      |                                  |
| Noticeable and intrusive                          | Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.                                             | Observed Adverse Effect              | Mitigate and reduce to a minimum |
| Significant Observed Adverse Effect Level (SOAEL) |                                                                                                                                                                                                                                                                                                                                                                                                      |                                      |                                  |
| Noticeable and disruptive                         | The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. 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                            |
| Noticeable and very disruptive                    | Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory                                                                                                               | Unacceptable Observed Adverse Effect | Prevent                          |

The NPPF, NSPE 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, the extant planning permission, national planning policy and appropriate guidance documents including the 'World Health Organisation Community Noise Guidelines' (1999) and 'BS 8233 – Guidance on Sound Insulation and Noise Reduction for Buildings' (2014), Section 2.0 presents the noise level criteria used as a basis of this assessment.

### 1.3 ProPG Planning and Noise - New Residential Development

Professional Practice Guidance on Planning and Noise for new residential development (ProPG) was launched on 22<sup>nd</sup> June 2017 by the Chartered Institute of Environmental Health (CIEH), the Association of Noise



Consultants (ANC) and the Institute of Acoustics (IOA). The guidance has been published to provide practitioners with guidance on the management of noise within the planning system in England.

The guidance is specifically for 'new residential development that would be exposed predominantly to noise from existing transport sources' and reflects the Government's overarching Noise Policy Statement for England (NPSE), the National Planning Policy Framework (NPPF), and Planning Practice Guidance (including PPG-Noise), as well as other authoritative sources of guidance.

The guidance provides advice for Local Planning Authorities (LPAs) and developers, and their respective professional advisers which complements Government planning and noise policy and guidance and, in particular, aims to:

- Advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
- Encourage the process of good acoustic design in and around new residential developments;
- Outline what should be taken into account in deciding planning applications for new noise-sensitive developments;
- Promote appropriate noise exposure standards; and
- Assist the delivery of sustainable development.

There are two stages of the overall approach outlined in the ProPG:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of 4 key elements which is underpinned by an Acoustic Design Statement.

With regards to Stage 1, ProPG provides guidance to produce an initial site risk assessment, pre-mitigation, with regards to noise based on the prevailing daytime and night time noise levels across the site, from which the site (or areas thereof) can be allocated a Noise Risk as shown in Figure 1.1 below, together with their corresponding sound levels as referred to in the ProPG.



**Figure 1.1 ProPG Stage 1, Noise Risk Assessment**

| Noise Risk Assessment                                                                                                                                                                                                                                                                                                        | Potential Effect Without Noise Mitigation | Pre-Planning Application Advice                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Indicative Daytime Noise Levels <math>L_{Aeq,15hr}</math></p> <p>Indicative Night-Time Noise Levels <math>L_{Aeq,9hr}</math></p> <p>70 dB</p> <p>65 dB</p> <p>60 dB</p> <p>55 dB</p> <p>50 dB</p> <p>High</p> <p>Medium</p> <p>Low</p> <p>Negligible</p> <p>60 dB</p> <p>55 dB</p> <p>50 dB</p> <p>45 dB</p> <p>40 dB</p> | <p>Increasing risk of adverse effect</p>  | <p>High noise levels indicate that there is an increased risk that development may be refused on noise grounds. The risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.</p> <p>As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigate and minimised, and which clearly demonstrates that a significant adverse noise impact will be avoided in the finished development.</p> <p>At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.</p> |
|                                                                                                                                                                                                                                                                                                                              | No adverse effect                         | <p>These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



## 2.0 Assessment Criteria

### 2.1 Internal Noise 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. For the purpose of this assessment, the target noise level criteria are noted in italics in the table below.

**Table 2.1 Noise Level Criteria and Actions**

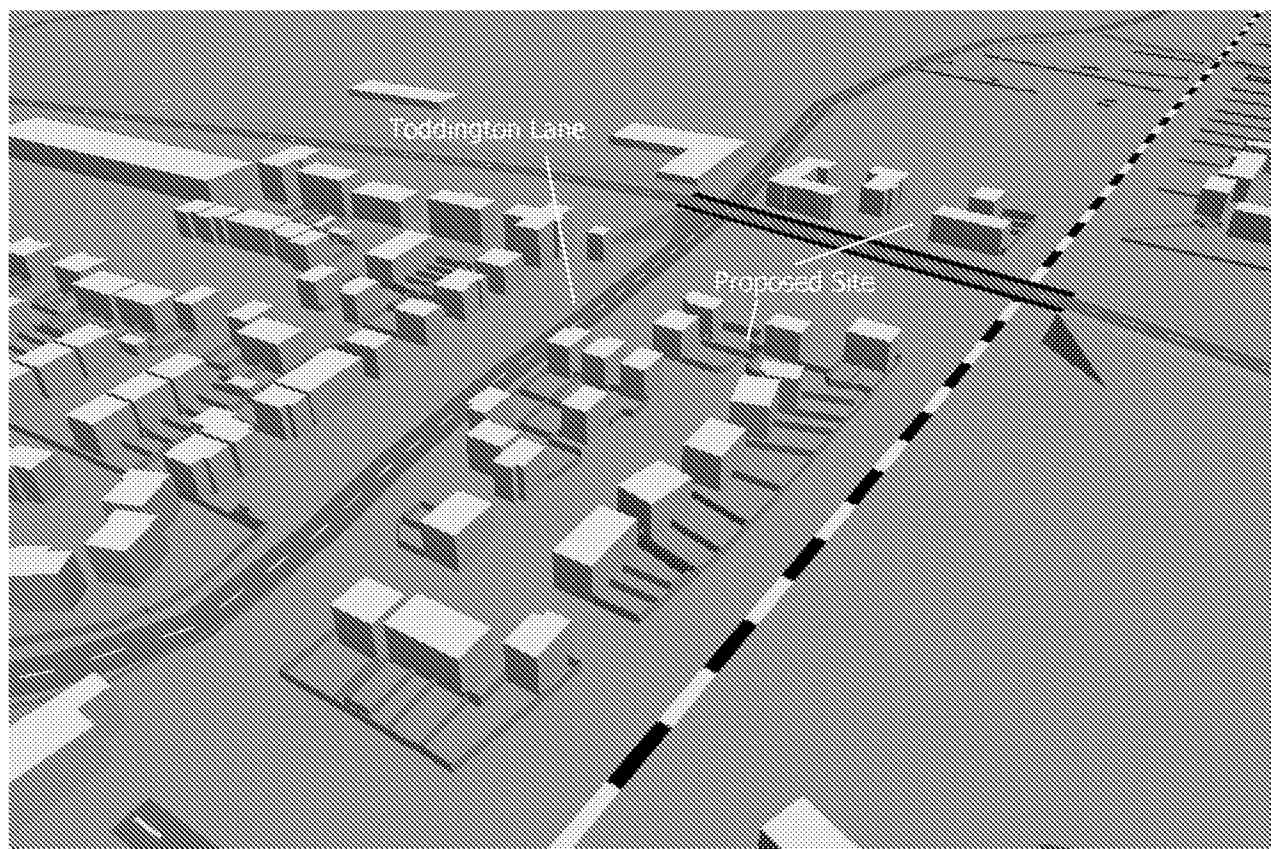
| Noise Level Criteria                                                                                                                                                                               | Effect Level                         | Action / Justification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bedrooms – 30 dBL <sub>Aeq,8hours</sub> / 45 dBL <sub>Amax</sub><br>Living Rooms – 30 dBL <sub>Aeq,16hours</sub><br>External Amenity Space – 50 dBL <sub>Aeq,16hours</sub>                         | No Observed Adverse Effect Level     | None<br>Within BS8233 / WHO criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Noise levels exceed:<br>Bedrooms – 30 dBL <sub>Aeq,8hours</sub> / 45 dBL <sub>Amax</sub><br>Living Rooms – 35 dBL <sub>Aeq,16hours</sub><br>External Amenity Space – 55 dBL <sub>Aeq,16hours</sub> | Lowest Observed Adverse Effect Level | Mitigate to achieve:<br><i>Bedrooms – 30 dBL<sub>Aeq,8hours</sub> / 45 dBL<sub>Amax</sub></i><br><i>Living Rooms – 35 dBL<sub>Aeq,16hours</sub></i><br><i>External Amenity Space – 55 dBL<sub>Aeq,16hours</sub></i><br>Within BS8233 / WHO criteria                                                                                                                                                                                                                                                                                                                                                                       |
| Noise levels exceed:<br><br>Bedrooms – 30 dBL <sub>Aeq,8hours</sub><br>Living Rooms – 35 dBL <sub>Aeq,16hours</sub><br>External Amenity Space – 55 dBL <sub>Aeq,16hours</sub>                      | Significant Observed Adverse Effect  | Avoid<br><br>However, if due to other design considerations noise criteria is not achievable or that the target criteria can be achieved for certain periods (e.g. when windows are closed), the following noise levels may be acceptable as an upper limit:<br><br>Bedrooms – 35 dBL <sub>Aeq,8hours</sub><br>Living Rooms – 40 dBL <sub>Aeq,16hours</sub><br>External Amenity Space – 60 dBL <sub>Aeq,16hours</sub><br><br>This is on the basis that the guideline noise values do not represent people's response to noise in all cases with the specified criteria only a marginal exceedance of the target criteria. |
| Noise levels with mitigation exceed:<br><br>Bedrooms – 35 dBL <sub>Aeq,8hours</sub><br>Living Rooms – 40 dBL <sub>Aeq,16hours</sub><br>External Amenity Space – 60 dBL <sub>Aeq,16hours</sub>      | Unacceptable Observed Adverse Effect | Prevent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## 3.0 Assessment Methodology

### 3.1 Noise Modelling Methodology

Three dimensional noise modelling has been undertaken based on the monitoring data to predict  $L_{Aeq}$  and  $L_{Amax}$  noise levels at a large number of locations both horizontally and vertically. CADNA noise modelling software has been used (as shown in Figure 3.1). This model is based on the Department of Transport Calculation of Road Traffic Noise (CRTN) and 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**



The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data, assumptions 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 – around site          | Ordnance Survey                       | Ordnance Survey                                                                                                                                                                                                                                       |
| Ground levels – other areas          | Site Observations and Ordnance Survey | OS 1:25,000 contours and OS 1:10,000 spot heights.                                                                                                                                                                                                    |
| Traffic data, main surrounding roads | WYGE                                  | Traffic flows for local roads based on WYGE observations and experience.                                                                                                                                                                              |
| Traffic data – local roads           | WYGE                                  | Traffic flows for local roads based on WYGE observations and experience.                                                                                                                                                                              |
| Building heights – around site       | WYGE Observations                     | 8 m height for two storey residential properties, and 4 m for Bungalows                                                                                                                                                                               |
| Barrier heights                      | WYGE Observations                     | All existing barriers at 1.0 m with the exception of hedges and trees which are assumed to offer no noise protection.                                                                                                                                 |
| Receptor positions                   | WYGE                                  | 1 m from façade, height of 1.5 m for ground floor, 4 m for first floor properties with ground floor or bungalow dormer windows. 7 m for dormer windows on two storey properties. 1.5 m height for model grid and monitoring locations for validation. |
| Reflections                          | WYGE                                  | First order reflections have been applied based on mirror image sources                                                                                                                                                                               |
| Absorbent Ground                     | CADNA                                 | Frequency dependant ground absorption has been applied based on values specified in VDI 2714/16 clause 6.3.                                                                                                                                           |
| Façade Correction                    | CADNA                                 | Façade corrections have been incorporated into the modelling                                                                                                                                                                                          |
| Gradient                             | CADNA                                 | Gradient for each road has been calculated from the height information using the 'calc slope of roads' tool                                                                                                                                           |
| Plans                                | Persimmon                             | Drawing Title: Site Layout<br>Drawing No.: 544_PL_100 Dated: July 2018                                                                                                                                                                                |

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 Input Data

### 3.2.1 Model Verification

The model was verified by modelling the monitoring locations for the 'existing' weekday scenario. Daytime and night-time  $L_{Aeq}$  and night-time  $L_{Amax}$  scenarios have been verified. The comparison between the monitoring and modelling results (including contributions from local roads) are 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      | 68.0                | 68.1               | 0.1                                               |
| LT2      | 60.9                | 61.5               | 0.6                                               |
| LT3      | 66.0                | 65.8               | -0.2                                              |
| ST1      | 70.7                | 70.7               | 0.0                                               |
| ST2      | 53.1                | 54.3               | 1.2                                               |
| ST3      | 62.9                | 63.4               | 0.5                                               |
| ST4      | 55.7                | 56.1               | 0.4                                               |
| ST5      | 77.0                | 76.7               | -0.3                                              |
| ST6      | 82.1                | 82.1               | 0.0                                               |

All values are sound pressure levels in dB re:  $2 \times 10^{-5}$  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      | 62.7                | 62.7               | 0.0                                               |
| LT2      | 56.8                | 56.2               | -0.6                                              |
| LT3      | 59.8                | 61.3               | 1.5                                               |
| ST1      | 64.2                | 65.2               | 1.0                                               |
| ST2      | 38.9                | 42.8               | 3.9                                               |
| ST3      | 39.0                | 56.3               | 17.3                                              |
| ST4      | 45.4                | 54.8               | 9.4                                               |
| ST5      | 71.1                | 71.6               | 0.5                                               |
| ST6      | 77.4                | 77.6               | 0.2                                               |

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

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

| Location | Monitored $L_{Amax}$ | Modelled $L_{Amax}$ | Difference between Monitored and Modelled Results |
|----------|----------------------|---------------------|---------------------------------------------------|
| LT1      | 84.5                 | 84.4                | -0.1                                              |
| LT2      | 89.4                 | 89.2                | -0.2                                              |
| LT3      | 92.9                 | 91.5                | -1.4                                              |
| ST1      | 81.0                 | 86.5                | 5.5                                               |
| ST2      | 50.2                 | 62.7                | 12.5                                              |
| ST3      | 84.2                 | 83.3                | -0.9                                              |
| ST4      | 67.0                 | 69.9                | 2.9                                               |



| Location | Monitored $L_{Amax}$ | Modelled $L_{Amax}$ | Difference between Monitored and Modelled Results |
|----------|----------------------|---------------------|---------------------------------------------------|
| ST5      | 90.5                 | 88.7                | -1.8                                              |
| ST6      | 96.3                 | 96.0                | -0.3                                              |
| LT1      | 84.5                 | 84.4                | -0.1                                              |

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

The verification points show a divergence between monitored and modelled results of no more than 3 dB with the exception of locations ST2 - ST4 during the night-time  $L_{Aeq}$  scenarios and ST1 and ST2 for the night-time  $L_{Amax}$  scenarios where the model is predicting a higher level than was recorded during short term measurements, probably due to the low number of cars passing during the short-term 15 minute measurements. Accordingly, Toddington Lane immediately south of the site has been modelled based upon the predicted traffic flows included in Table 3.5 below with a night-time correction applied.

### 3.2.2 Traffic Noise Data

All roads expected to make a significant contribution have been included within this assessment. Traffic flows and HGV percentages for the proposed Lyminster Bypass and Toddington Lane have been based on traffic data provided by Mayer Brown. Estimates of the vehicle speeds have been made based upon the speed restrictions currently in force in the area.

**Table 3.5 Lyminster Bypass Traffic Data**

| Road                       | 18hr AAWT | HGV % | Speed (kmph) |
|----------------------------|-----------|-------|--------------|
| Lyminster Bypass           | 15092     | 05    | 48           |
| Toddington Lane            | 10210     | 08    | 48           |
| Development Link Road East | 7882      | 05    | 48           |

A correction has been applied to convert the predicted 18 hour  $L_{A10}$  traffic noise levels to 16 hour  $L_{Aeq}$  noise levels using the following formula, as provided within PPG 24:

$$L_{Aeq}(16\text{hour}) = L_{A10}(18\text{hour}) - 2\text{dB}$$

During the night-time period, a correction of  $0.9 \times L_{A10,18\text{hours}} - 3.77$  has been applied to each link within the  $L_{A10,18\text{hours}}$  noise model to derive the  $L_{Aeq,8\text{hours}}$  which follows the guidance provided within DMRB.

### 3.2.3 Sensitive Receptors

Existing noise levels have been assessed at properties across the site with respect to direct noise from the existing ambient noise climate surrounding the site. The locations of the proposed receptors are shown in SK02 of Appendix B.

**Table 3.6 Residential Receptor Locations**

| Ref. | Description       | Closest Source  | Approximate Distance To Source (m) | Height (m) |
|------|-------------------|-----------------|------------------------------------|------------|
| R01  | Southwest of Site | Railway         | 21.8                               | 1.5/4.0    |
| R02  | Southwest of Site | Railway         | 21.5                               | 1.5/4.0    |
| R03  | Southwest of Site | Railway         | 22.0                               | 1.5/4.0    |
| R04  | Southwest of Site | Railway         | 22.3                               | 1.5/4.0    |
| R05  | South of Site     | Railway         | 20.6                               | 1.5/4.0    |
| R06  | South of Site     | Railway         | 22.0                               | 1.5/4.0    |
| R07  | South of Site     | Railway         | 21.7                               | 1.5/4.0    |
| R08  | South of Site     | Railway         | 16.0                               | 1.5/4.0    |
| R09  | South of Site     | Railway         | 16.6                               | 1.5/4.0    |
| R10  | Southeast of Site | New Link Road   | 31.2                               | 1.5/4.0    |
| R11  | Southeast of Site | Railway         | 16.5                               | 1.5/4.0    |
| R12  | Southeast of Site | Railway         | 20.2                               | 1.5/4.0    |
| R13  | East of site      | Toddington Lane | 39.7                               | 1.5/4.0    |
| R14  | Northeast of Site | Toddington Lane | 9.8                                | 1.5/4.0    |
| R15  | East of Site      | New Link Road   | 24.5                               | 1.5/4.0    |
| R16  | Centre of Site    | New Link Road   | 47.4                               | 1.5/4.0    |
| R17  | North of Site     | Toddington Lane | 20.4                               | 1.5/4.0    |
| R18  | Northwest of site | Toddington Lane | 9.0                                | 1.5/4.0    |
| R19  | West of Site      | Toddington Lane | 18.7                               | 1.5/4.0    |
| R20  | West of Site      | Toddington Lane | 23.4                               | 1.5/4.0    |
| R21  | West of Site      | Toddington Lane | 23.0                               | 1.5/4.0    |
| R22  | Centre of Site    | Railway         | 30.8                               | 1.5/4.0    |

**Table 3.7 Private External Amenity Area Receptor Locations**

| Ref. | Description       | Closest Source  | Approximate Distance To Source (m) | Height (m) |
|------|-------------------|-----------------|------------------------------------|------------|
| G01  | West of Site      | Toddington Lane | 26.8                               | 1.2        |
| G02  | Southwest of Site | Railway         | 19.8                               | 1.2        |
| G03  | Southwest of Site | Railway         | 15.9                               | 1.2        |
| G04  | South of Site     | Railway         | 16.1                               | 1.2        |
| G05  | South of Site     | Railway         | 14.5                               | 1.2        |
| G06  | South of Site     | Railway         | 15.5                               | 1.2        |
| G07  | Southeast of site | Railway         | 14.7                               | 1.2        |
| G08  | Southeast of site | Railway         | 16.4                               | 1.2        |
| G09  | Centre of Site    | New Link Road   | 52.8                               | 1.2        |
| G10  | Centre of Site    | Toddington Lane | 10.1                               | 1.2        |
| G11  | West of Site      | Toddington Lane | 25.4                               | 1.2        |
| G12  | West of Site      | Toddington Lane | 14.1                               | 1.2        |



## 4.0 Noise Survey

### 4.1 Noise Survey Methodology

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:

|            |                                      |     |         |
|------------|--------------------------------------|-----|---------|
| B&K 2260   | Environmental Noise Analyser (WYG1)  | s/n | 2361273 |
| B&K 4231   | Calibrator                           | s/n | 2176211 |
| Rion NL-52 | Environmental Noise Analyser (WYG13) | s/n | 620858  |
| Rion NL-52 | Environmental Noise Analyser (WYG14) | s/n | 610212  |
| Rion NL-52 | Environmental Noise Analyser (WYG15) | s/n | 1221575 |

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice and no drift 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 at nine locations (as specified in the following table and shown in SK01 of Appendix B) from Wednesday 8<sup>th</sup> October 2014 to Tuesday 14<sup>th</sup> October 2014. Attended short term measurements were undertaken at six locations during the day, evening and night-time periods with three additional locations being measured unattended over a 115 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 dry with scattered showers. Anemometer readings confirmed that wind speeds were less than 5 ms<sup>-1</sup> at all times during the survey with a predominant westerly wind direction.

**Table 4.1 Noise Monitoring Locations**

| Ref | Description                                           |
|-----|-------------------------------------------------------|
| LT1 | Junction of Lyminster Road and Mill Lane              |
| LT2 | Land behind Empress Close along the rail line         |
| LT3 | Land north of Sunflower Close, along the rail line.   |
| ST1 | Junction of Lyminster Road and Mill Lane              |
| ST2 | On Fuller's Walk, next to play area.                  |
| ST3 | Along Toddington Lane behind garden centre.           |
| ST4 | At the junction of Empress Close and Hearnfield Road. |
| ST5 | At the junction of Worthing Road and Landsdowne Road. |
| ST6 | Along Norway Lane adjacent to the A259.               |



## 4.2 Noise Survey Results

Existing ambient noise levels around the site are dominated by road traffic noise from the A259 (Worthing Road) and the West Coastway railway line.

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).

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:  $2 \times 10^{-5}$  Pa).

**Table 4.2 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) |
|--------------------------------|--------------|------------------------------------------|----------|------------------|-------------------|-------------------|------------------|------------------|
| Day<br>07:00 - 23:00           | 44 hours     | 08/10/2014 - 13/10/2014<br>07:00 - 23:00 | LT1      | 68.0             | 101.7             | 36.3              | 71.2             | 53.0             |
| Night<br>23:00 - 07:00         | 24 hours     | 08/10/2014 - 13/10/2014<br>23:00 - 07:00 |          | 62.7             | 84.5              | 28.9              | 60.5             | 43.9             |
| Weekend Day<br>07:00 - 23:00   | 32 hours     | 11/10/2014 - 12/10/2014<br>07:00 - 23:00 |          | 67.1             | 103.6             | 36.1              | 70.6             | 49.7             |
| Weekend Night<br>23:00 - 07:00 | 16 hours     | 11/10/2014 - 12/10/2014<br>23:00 - 07:00 |          | 60.0             | 84.3              | 25.6              | 58.3             | 36.6             |
| Day<br>07:00 - 23:00           | 44 hours     | 08/10/2014 - 13/10/2014<br>07:00 - 23:00 | LT2      | 60.9             | 96.5              | 34.7              | 55.7             | 47.3             |
| Night<br>23:00 - 07:00         | 24 hours     | 08/10/2014 - 13/10/2014<br>23:00 - 07:00 |          | 56.8             | 85.0              | 26.5              | 51.2             | 42.9             |
| Weekend Day<br>07:00 - 23:00   | 32 hours     | 11/10/2014 - 12/10/2014<br>07:00 - 23:00 |          | 60.3             | 89.4              | 33.7              | 53.0             | 45.0             |
| Weekend Night<br>23:00 - 07:00 | 16 hours     | 11/10/2014 - 12/10/2014<br>23:00 - 07:00 |          | 55.8             | 89.3              | 23.4              | 43.9             | 34.8             |
| Day<br>07:00 - 23:00           | 44 hours     | 08/10/2014 - 13/10/2014<br>07:00 - 23:00 | LT3      | 66.0             | 108.9             | 36.0              | 62.4             | 55.4             |
| Night<br>23:00 - 07:00         | 24 hours     | 08/10/2014 - 13/10/2014<br>23:00 - 07:00 |          | 59.8             | 94.1              | 28.3              | 55.7             | 44.8             |
| Weekend Day<br>07:00 - 23:00   | 32 hours     | 11/10/2014 - 12/10/2014<br>07:00 - 23:00 |          | 65.9             | 102.2             | 35.6              | 60.9             | 53.1             |
| Weekend Night<br>23:00 - 07:00 | 16 hours     | 11/10/2014 - 12/10/2014<br>23:00 - 07:00 |          | 59.8             | 90.6              | 24.5              | 53.5             | 37.9             |
| Day<br>07:00 - 19:00           | 15 Mins      | 14/10/2014 11:28                         | ST1      | 70.7             | 91.8              | 42.6              | 73.9             | 52.5             |
|                                | 15 Mins      | 14/10/2014 11:48                         | ST2      | 53.1             | 74.2              | 38.6              | 54.6             | 42.1             |
|                                | 15 Mins      | 14/10/2014 12:07                         | ST3      | 62.9             | 84.2              | 39.0              | 63.0             | 41.8             |
|                                | 15 Mins      | 14/10/2014 12:26                         | ST4      | 55.7             | 74.0              | 40.3              | 55.3             | 42.7             |
|                                | 15 Mins      | 14/10/2014 13:09                         | ST5      | 77.0             | 92.3              | 54.3              | 80.5             | 67.7             |



| 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) |
|--------------------------|--------------|---------------------------|----------|------------------|-------------------|-------------------|------------------|------------------|
|                          | 15 Mins      | 14/10/2014 10:38          | ST6      | 82.1             | 93.6              | 59.7              | 86.8             | 68.6             |
| Evening<br>19:00 - 23:00 | 15 Mins      | 13/10/2014 21:05          | ST1      | 70.0             | 85.7              | 35.4              | 74.2             | 42.2             |
|                          | 15 Mins      | 13/10/2014 21:26          | ST2      | 45.4             | 62.7              | 36.8              | 46.6             | 40.7             |
|                          | 15 Mins      | 13/10/2014 21:48          | ST3      | 63.2             | 83.5              | 37.1              | 57.5             | 39.6             |
|                          | 15 Mins      | 13/10/2014 22:09          | ST4      | 52.4             | 75.6              | 37.7              | 47.4             | 40.6             |
|                          | 15 Mins      | 13/10/2014 20:44          | ST5      | 74.4             | 89.5              | 43.7              | 78.8             | 53.1             |
|                          | 15 Mins      | 13/10/2014 20:21          | ST6      | 77.5             | 94.2              | 46.4              | 80.8             | 55.7             |
| Night<br>23:00 - 07:00   | 15 Mins      | 13/10/2014 23:52          | ST1      | 64.2             | 81.0              | 35.5              | 67.9             | 41.6             |
|                          | 15 Mins      | 14/10/2014 00:12          | ST2      | 38.9             | 50.2              | 32.1              | 41.3             | 34.8             |
|                          | 15 Mins      | 14/10/2014 00:31          | ST3      | 39.0             | 53.7              | 31.7              | 41.4             | 35.1             |
|                          | 15 Mins      | 14/10/2014 00:50          | ST4      | 45.4             | 67.0              | 34.7              | 43.7             | 36.9             |
|                          | 15 Mins      | 13/10/2014 23:30          | ST5      | 71.1             | 90.5              | 35.9              | 74.0             | 41.5             |
|                          | 15 Mins      | 13/10/2014 23:05          | ST6      | 77.4             | 96.3              | 41.7              | 80.2             | 46.6             |

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



## 5.0 Assessment of Key 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 with specification  $R_w$  30 dB (e.g 6/12/6mm double glazing or equivalent) has been used. These assessments include noise from existing roads, the proposed link roads, the railway line directly south.

The results presented in Tables 5.1 – 5.3 below show the predicted noise intrusion levels at properties across the site. The recommended WHO/BS 8233 internal noise levels are met across the site during the night-time, assuming a windows-closed scenario, however majority of façades are predicted to exceed the relevant criteria ( $L_{Aeq}$ ,  $L_{Amax}$ ) with windows open during the both daytime and night-time periods. In order to achieve the recommended internal noise criteria, a range of mitigation measures are outlined in Section 6.1 of this report; SK05 in Appendix B shows the glazing requirements for the proposed development. In order to meet both ventilation and internal noise criteria all habitable rooms on site require alternative ventilation, with some properties closest to the railway and link road requiring alternative ventilation for noise sensitive rooms such as bedrooms and living rooms.

**Table 5.1 Daytime Noise Intrusion Levels  $L_{Aeq}$  16 hour**

| Location | External $L_{Aeq}$<br>at 1m from facade | Internal $L_{Aeq}$ with<br>windows open | Internal $L_{Aeq}$ with<br>windows closed | Criteria<br>Internal $L_{Aeq}$ |
|----------|-----------------------------------------|-----------------------------------------|-------------------------------------------|--------------------------------|
| R01      | 50.2                                    | 40.2                                    | 20.2                                      | 35                             |
| R02      | 58.7                                    | 48.7                                    | 28.7                                      | 35                             |
| R03      | 53.0                                    | 43.0                                    | 23.0                                      | 35                             |
| R04      | 52.5                                    | 42.5                                    | 22.5                                      | 35                             |
| R05      | 54.1                                    | 44.1                                    | 24.1                                      | 35                             |
| R06      | 53.8                                    | 43.8                                    | 23.8                                      | 35                             |
| R07      | 54.6                                    | 44.6                                    | 24.6                                      | 35                             |
| R08      | 50.8                                    | 40.8                                    | 20.8                                      | 35                             |
| R09      | 61.1                                    | 51.1                                    | 31.1                                      | 35                             |
| R10      | 57.5                                    | 47.5                                    | 27.5                                      | 35                             |
| R11      | 60.5                                    | 50.5                                    | 30.5                                      | 35                             |
| R12      | 54.0                                    | 44.0                                    | 24.0                                      | 35                             |
| R13      | 57.6                                    | 47.6                                    | 27.6                                      | 35                             |
| R14      | 63.5                                    | 53.5                                    | 33.5                                      | 35                             |
| R15      | 60.0                                    | 50.0                                    | 30.0                                      | 35                             |
| R16      | 58.8                                    | 48.8                                    | 28.8                                      | 35                             |
| R17      | 61.0                                    | 51.0                                    | 31.0                                      | 35                             |
| R18      | 62.3                                    | 52.3                                    | 32.3                                      | 35                             |
| R19      | 52.1                                    | 42.1                                    | 22.1                                      | 35                             |
| R20      | 56.4                                    | 46.4                                    | 26.4                                      | 35                             |



| Location | External $L_{Aeq}$<br>at 1m from facade | Internal $L_{Aeq}$ with<br>windows open | Internal $L_{Aeq}$ with<br>windows closed | Criteria<br>Internal $L_{Aeq}$ |
|----------|-----------------------------------------|-----------------------------------------|-------------------------------------------|--------------------------------|
| R21      | 51.6                                    | 41.6                                    | 21.6                                      | 35                             |
| R22      | 50.2                                    | 40.2                                    | 20.2                                      | 35                             |

**Table 5.2 Night-time Noise Intrusion Levels  $L_{Aeq}$  8 hour**

| Location | External $L_{Aeq}$<br>at 1m from facade | Internal $L_{Aeq}$ with<br>windows open | Internal $L_{Aeq}$ with<br>windows closed | Criteria<br>Internal $L_{Aeq}$ |
|----------|-----------------------------------------|-----------------------------------------|-------------------------------------------|--------------------------------|
| R01      | 48.1                                    | 38.1                                    | 18.1                                      | 30                             |
| R02      | 57.3                                    | 47.3                                    | 27.3                                      | 30                             |
| R03      | 49.6                                    | 39.6                                    | 19.6                                      | 30                             |
| R04      | 49.2                                    | 39.2                                    | 19.2                                      | 30                             |
| R05      | 50.0                                    | 40.0                                    | 20.0                                      | 30                             |
| R06      | 49.7                                    | 39.7                                    | 19.7                                      | 30                             |
| R07      | 50.0                                    | 40.0                                    | 20.0                                      | 30                             |
| R08      | 48.6                                    | 38.6                                    | 18.6                                      | 30                             |
| R09      | 58.3                                    | 48.3                                    | 28.3                                      | 30                             |
| R10      | 50.1                                    | 40.1                                    | 20.1                                      | 30                             |
| R11      | 58.1                                    | 48.1                                    | 28.1                                      | 30                             |
| R12      | 49.6                                    | 39.6                                    | 19.6                                      | 30                             |
| R13      | 52.8                                    | 42.8                                    | 22.8                                      | 30                             |
| R14      | 52.8                                    | 42.8                                    | 22.8                                      | 30                             |
| R15      | 52.0                                    | 42.0                                    | 22.0                                      | 30                             |
| R16      | 52.5                                    | 42.5                                    | 22.5                                      | 30                             |
| R17      | 49.4                                    | 39.4                                    | 19.4                                      | 30                             |
| R18      | 50.1                                    | 40.1                                    | 20.1                                      | 30                             |
| R19      | 47.6                                    | 37.6                                    | 17.6                                      | 30                             |
| R20      | 48.9                                    | 38.9                                    | 18.9                                      | 30                             |
| R21      | 48.4                                    | 38.4                                    | 18.4                                      | 30                             |
| R22      | 44.2                                    | 34.2                                    | 14.2                                      | 30                             |

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

**Table 5.3 Night-time Noise Intrusion Levels  $L_{Amax}$** 

| Location | External $L_{Amax}$<br>at 1m from facade | Internal $L_{Amax}$ with<br>windows open | Internal $L_{Amax}$ with<br>windows closed | Criteria<br>Internal $L_{Amax}$ |
|----------|------------------------------------------|------------------------------------------|--------------------------------------------|---------------------------------|
| R01      | 74.7                                     | 64.7                                     | 44.7                                       | 45                              |
| R02      | 85.2                                     | 75.2                                     | 55.2                                       | 45                              |
| R03      | 75.6                                     | 65.6                                     | 45.6                                       | 45                              |
| R04      | 75.1                                     | 65.1                                     | 45.1                                       | 45                              |
| R05      | 75.8                                     | 65.8                                     | 45.8                                       | 45                              |
| R06      | 75.6                                     | 65.6                                     | 45.6                                       | 45                              |
| R07      | 76.0                                     | 66.0                                     | 46.0                                       | 45                              |
| R08      | 75.4                                     | 65.4                                     | 45.4                                       | 45                              |
| R09      | 86.1                                     | 76.1                                     | 56.1                                       | 45                              |
| R10      | 75.3                                     | 65.3                                     | 45.3                                       | 45                              |
| R11      | 86.2                                     | 76.2                                     | 56.2                                       | 45                              |
| R12      | 74.4                                     | 64.4                                     | 44.4                                       | 45                              |
| R13      | 80.0                                     | 70.0                                     | 50.0                                       | 45                              |



| Location | External $L_{Amax}$<br>at 1m from facade | Internal $L_{Amax}$ with<br>windows open | Internal $L_{Amax}$ with<br>windows closed | Criteria<br>Internal $L_{Amax}$ |
|----------|------------------------------------------|------------------------------------------|--------------------------------------------|---------------------------------|
| R14      | 83.2                                     | 73.2                                     | 53.2                                       | 45                              |
| R15      | 81.1                                     | 71.1                                     | 51.1                                       | 45                              |
| R16      | 79.4                                     | 69.4                                     | 49.4                                       | 45                              |
| R17      | 80.4                                     | 70.4                                     | 50.4                                       | 45                              |
| R18      | 82.4                                     | 72.4                                     | 52.4                                       | 45                              |
| R19      | 71.8                                     | 61.8                                     | 41.8                                       | 45                              |
| R20      | 77.5                                     | 67.5                                     | 47.5                                       | 45                              |
| R21      | 73.1                                     | 63.1                                     | 43.1                                       | 45                              |
| R22      | 68.9                                     | 58.9                                     | 38.9                                       | 45                              |

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

### 5.1.1 Private External Amenity Area Noise Levels

Daytime noise levels in gardens and private external spaces of the proposed development have been assessed in the table below. The location of the 'garden' receptor locations are shown on SK02 in Appendix B. The scheme proposals include the construction of barriers in the form of 1.8m high fences across the majority of the site, with 2.0-2.5m high garden fences along the southern boundary with the railway and 2.5m fences with gardens adjacent to the new link road. Full location details for garden fences are shown in SK05.

**Table 5.4 Private External Amenity Area Noise Levels  $L_{Aeq,16hr}$**

| Ref | External $L_{Aeq,16hr}$<br>Daytime | BS 8233 Upper Limit<br>Criteria $L_{Aeq}$ |
|-----|------------------------------------|-------------------------------------------|
| G01 | 51.7                               | 55.0                                      |
| G02 | 51.5                               | 55.0                                      |
| G03 | 53.0                               | 55.0                                      |
| G04 | 53.7                               | 55.0                                      |
| G05 | 54.5                               | 55.0                                      |
| G06 | 53.8                               | 55.0                                      |
| G07 | 53.8                               | 55.0                                      |
| G08 | 53.9                               | 55.0                                      |
| G09 | 53.9                               | 55.0                                      |
| G10 | 53.7                               | 55.0                                      |
| G11 | 50.2                               | 55.0                                      |
| G12 | 52.7                               | 55.0                                      |

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

The results in the table above show that daytime  $L_{Aeq}$  noise levels within private external amenity areas are predicted to be within the BS 8233 Upper limit (55 dB) and therefore Condition 38 planning permission reference LU-47-11 can be discharged.



## 6.0 Noise Mitigation

### 6.1 Glazing and Ventilation Strategy

The mitigation measures below are sufficient to reduce the effects of any noticeable and disruptive noise from the surrounding environment by helping to prevent noise levels exceeding BS 8233 criteria for  $L_{Aeq}$  and  $L_{Amax}$  within all areas of the proposed development.

In accordance with the requirements of Condition 37 of planning permission ref LU-47-11, the glazing strategy provided in SK05 has been designed to achieve internal daytime  $L_{Aeq}$  of 35 dB, an internal night-time  $L_{Aeq}$  of 30 dB and an internal night-time  $L_{Amax}$  of 45 dB in habitable rooms of the proposed development. Throughout the proposed development, all façades would require alternative ventilation for noise sensitive rooms (bedrooms and living rooms) due to the proximity of the railway and proposed new link road running through the site. Alternative ventilation can be provided in several ways from acoustic trickle vents (which need to have a minimum sound reduction equal to or greater than the glazing) or other passive ventilation systems.

Glazing with a sound reduction between  $R_w$  30 –  $R_w$  42 will need to be provided for most facades within the proposed development, particularly those with facades facing the railway, the proposed link road and Toddington Lane. Facades which require glazing with a sound reduction of  $R_w$  35 –  $R_w$  42 will also require alternative ventilation for noise sensitive rooms (bedrooms and living rooms). The full glazing and ventilation strategy is detailed in SK05 and Appendix B and in Table C1 of Appendix C.

Care will be taken to minimise the potential impact of noise via careful design of building layout with consideration being made to the appropriate positioning of living rooms and bedrooms with respect to the access road and railway. Within the buildings themselves, living rooms and bedrooms will ideally be located on shielded façades with non-sensitive spaces such as corridors, bathrooms, en-suite, utility rooms, window-less gable ends and kitchens should ideally be located on the road facing façades of residential properties.

Fences will be constructed from brick or solid timber panels with no gaps of a ship-lapped design and shall have a surface weight of no less than 15kg/m<sup>2</sup> and be a minimum of 1.8 metres high, with 2.0 – 2.5m fences required for those which lie adjacent to the railway and new link road to provide further protection to external private amenity spaces.



## 7.0 Conclusions

### *Conditions 37 and 38*

In accordance with the requirements of Conditions 37 and 38 of planning permission ref LU-47-11, a glazing and ventilation strategy has been provided which achieves both ventilation and internal ambient noise level requirements of  $L_{Aeq}$  daytime 35 dB,  $L_{Aeq}$  night-time of 30 dB and  $L_{Amax}$  night-time of 45 dB in all residential bedroom and living spaces of the proposed development. The suggested glazing specifications are achievable. Standard double glazing is sufficient across the majority of the site in order to achieve the target internal noise levels when windows are closed, however alternative ventilation will be required for habitable areas (living rooms and bedrooms) of all properties across the site and enhanced glazing is required for most buildings within the site, in order to meet internal targets for noise levels.

All private external amenity areas receptors are below BS 8233 Upper Limit Criteria levels for  $L_{Aeq}$  with fences constructed from brick or solid timber panels with no gaps and be a minimum of 1.8 metres high, with fence lines adjacent to the railway and new link road between 2.0 – 2.5 metres high (as specified in SK05).

The requirements of Conditions 37 & 38 of planning permission ref LU-47-11 are met and can therefore be discharged.

### *NPPF 180 A*

The proposed development is not expected to have an 'adverse impact' on health or quality of life. Similarly, it is considered that all 'adverse impacts on health and quality of life' (relating to noise) are mitigated by the use of an appropriate glazing and ventilation strategy.

### *NPPF 180 B*

Given that nearby the site is surrounded by similarly residential properties to the south and north of the site, it is not considered that any existing businesses wanting to develop would be particularly restricted by the introduction of the new sensitive use of the proposed development. The development is situated in a CPRE Zone 3 area of tranquillity (Zone 1 being the least tranquil and Zone 10 being the most tranquil), as such is not considered to be an area of tranquillity. The site currently doesn't have any public access and given that there are no public footpaths nearby then the tranquillity of the area and access to other areas of greater tranquillity is not expected to be negatively impacted by the development.

### *Planning Practice Guidance: Noise*

It is considered that the noise mitigation in Section 6.1 of this report is sufficient to reduce the effects of any noticeable and disruptive noise being currently emitted from the surrounding environment by helping to prevent noise levels exceeding BS 8233 criteria for  $L_{Aeq}$  and  $L_{Amax}$  within all areas of the proposed development.



## Appendices



## Appendix A – Acoustic Terminology and Abbreviations

### Acoustic Terminology

- 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<sub>Aeq</sub>** 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<sub>Aeq, 07:00 – 23:00</sub> 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<sub>pA</sub> at any particular time is likely to have been either greater or lower than the L<sub>Aeq, 07:00 – 23:00</sub>.
- L<sub>Amin</sub>** The L<sub>Amin</sub> is the quietest instantaneous noise level. This is usually the quietest 125 milliseconds measured during any given period of time.
- L<sub>Amax</sub>** The L<sub>Amax</sub> is the loudest instantaneous noise level. This is usually the loudest 125 milliseconds measured during any given period of time.
- L<sub>n</sub>** 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<sub>A10, 1 hr</sub> = x dB.
- The L<sub>A10</sub> index is often used in the description of road traffic noise, whilst the L<sub>A90</sub>, the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise. L<sub>A1</sub> and L<sub>Amax</sub> are common descriptors of construction noise.
- R<sub>w</sub>** 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.



## **Abbreviations**

CADNA – Computer Aided Noise Abatement

DMRB – Design Manual for Roads and Bridges

HGV – Heavy Goods Vehicle

PPG – Planning Practice Guidance

UDP – Unitary Development Plan

UKAS – United Kingdom Accreditation Service

WYGE – WYG Environment



## Appendix B – Sketches

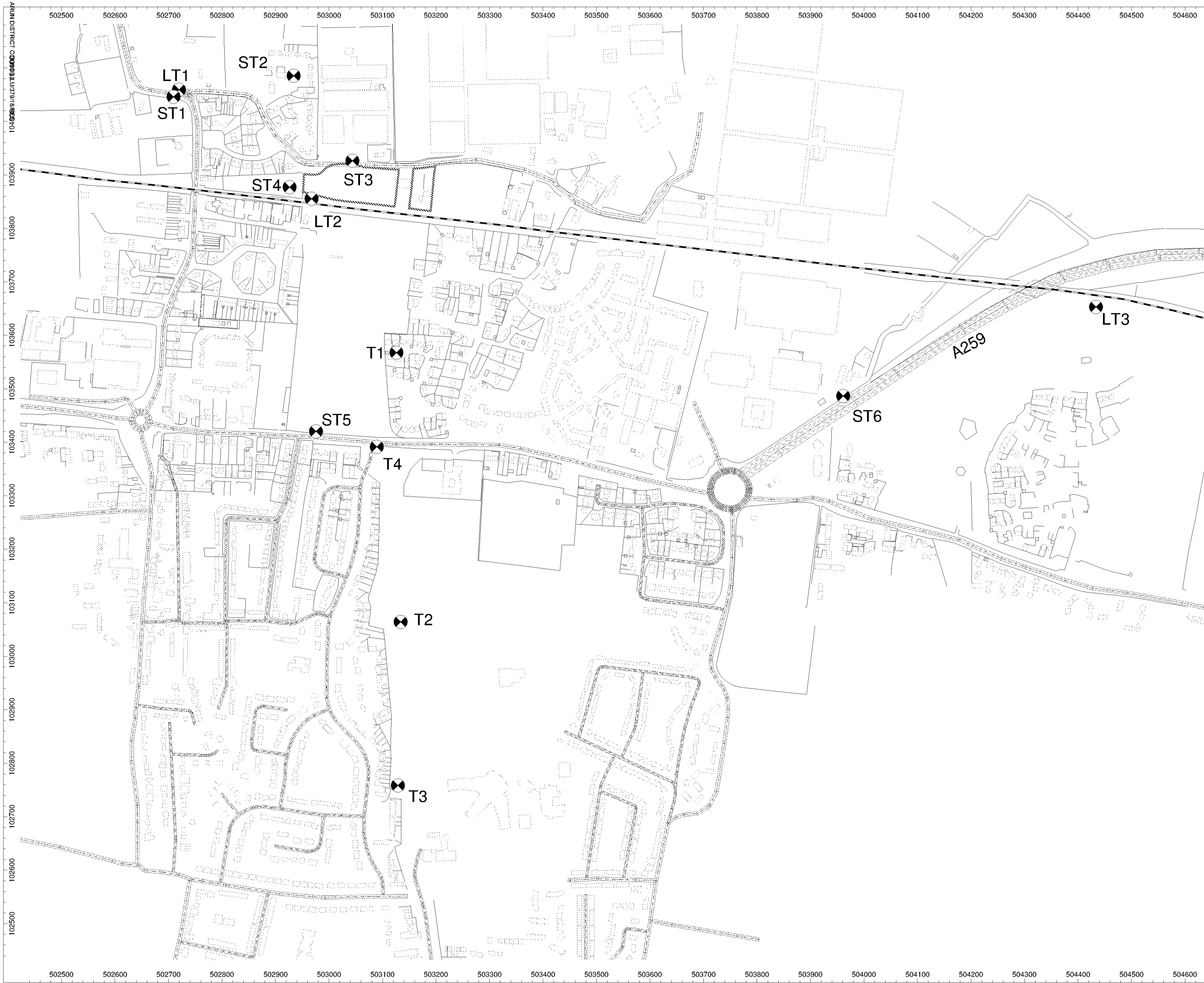
SK01 Noise Monitoring Locations

SK02 Site Layout and Receptor Locations

SK03 Daytime  $L_{Aeq,16hr}$

SK04 Night-time  $L_{Aeq,8hr}$

SK05 Glazing and Ventilation Strategy



Client:  
Persimmon Homes

Project:  
Parcel A2 and B6  
North Littlehampton

Project Number:  
A100896

Drawing Title / Scenario:  
Noise & Vibration  
Monitoring Locations

Drawing Number:  
SK01

Key:  
Site Boundary: 

Scale : Not to scale

WYGE Leicester 07.03.18

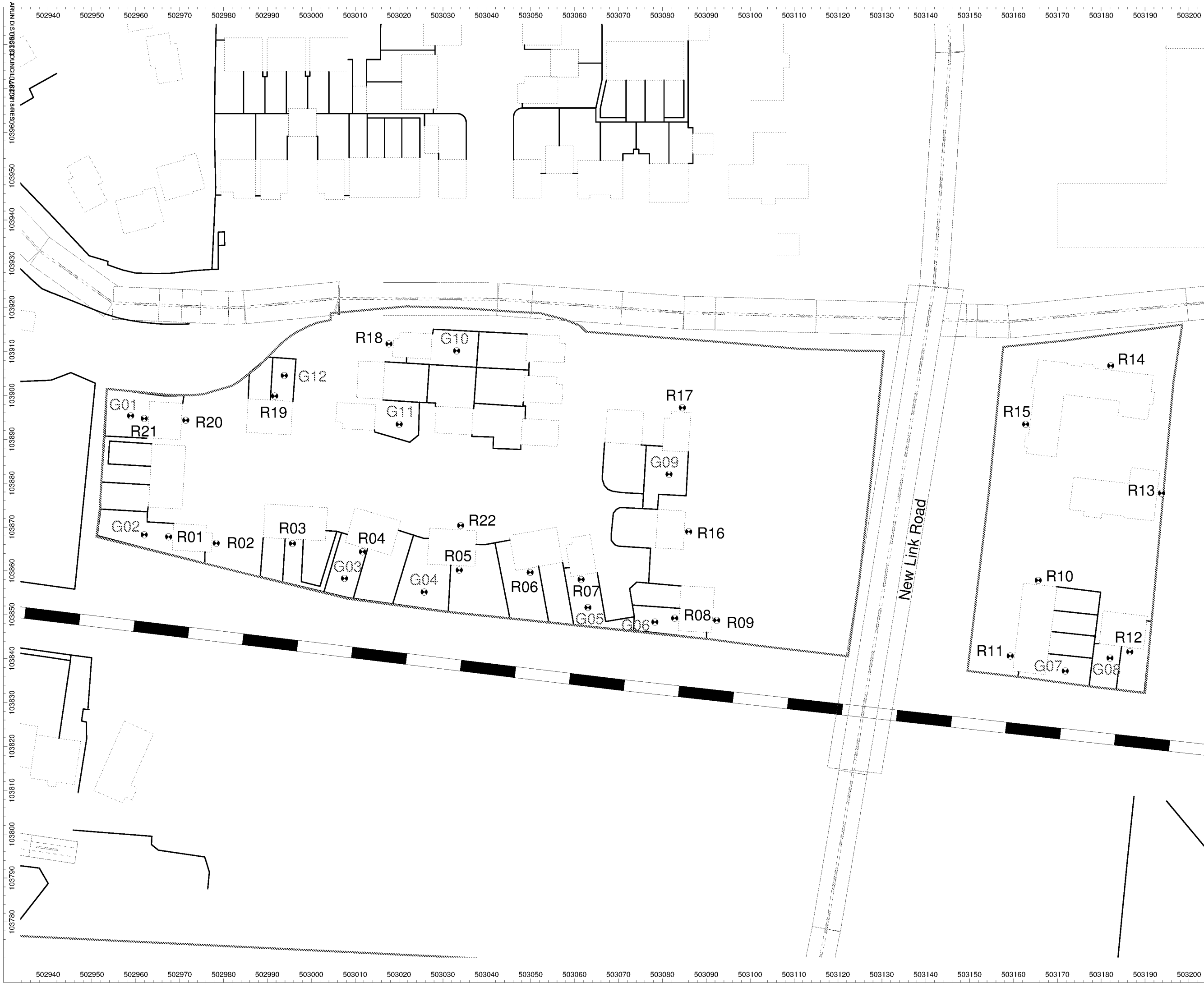
This map is based upon Ordnance Survey material reproduced by WYG on behalf of Her Majesty's Stationary Office, © Crown Copyright. Unauthorised reproduction infringes Crown copyright and may lead to civil proceedings.

Licence Number AL 553611



Executive Park  
Avalon Way  
Anstley  
Leicestershire  
LE7 7GR  
Tel 0116 234 8000

© WYG Environment



Client:  
Persimmon Homes

Project:  
Parcel A2 and B6  
North Littlehampton

Project Number:  
A100896

Drawing Title / Scenario:  
Site Layout and  
Receptor Locations

Drawing Number:  
SK02

Key:  
Site Boundary: 

Scale : Not to scale

WYGE Leicester 15.11.18

This map is based upon Ordnance Survey material reproduced by WYG on behalf of Her Majesty's Stationary Office, © Crown Copyright. Unauthorised reproduction infringes Crown copyright and may lead to civil proceedings.

Licence Number AL 553611



Executive Park  
Avalon Way  
Anstley  
Leicestershire  
LE7 7GR  
Tel 0116 234 8000

© WYG Environment



Client:  
Persimmon Homes

Project:  
Parcel A2 and B6  
North Littlehampton

Project Number:  
A100896

Drawing Title / Scenario:  
Daytime LAeq, 16hr  
Noise Levels

Drawing Number:  
SK03

Key:  
Site Boundary: -----

0.0 - 50.0 dB  
50.0 - 60.0 dB  
60.0 - 70.0 dB  
> 70.0 dB

Scale : Not to scale

WYGE Leicester 15.11.18

This map is based upon Ordnance Survey material reproduced  
by WYG on behalf of Her Majesty's Stationary Office,  
© Crown Copyright. Unauthorised reproduction infringes  
Crown copyright and may lead to civil proceedings.

Licence Number AL 553611



Executive Park  
Avalon Way  
Anstley  
Leicestershire  
LE7 7GR  
Tel 0116 234 8000

© WYG Environment



Client:  
Persimmon Homes

Project:  
Parcel A2 and B6  
North Littlehampton

Project Number:  
A100896

Drawing Title / Scenario:  
Night-time LAeq, 8hr  
Noise Levels

Drawing Number:  
SK04

Key:  
Site Boundary:

0.0 - 50.0 dB  
 50.0 - 60.0 dB  
 60.0 - 70.0 dB  
 > 70.0 dB

Scale : Not to scale

WYGE Leicester 15.11.18

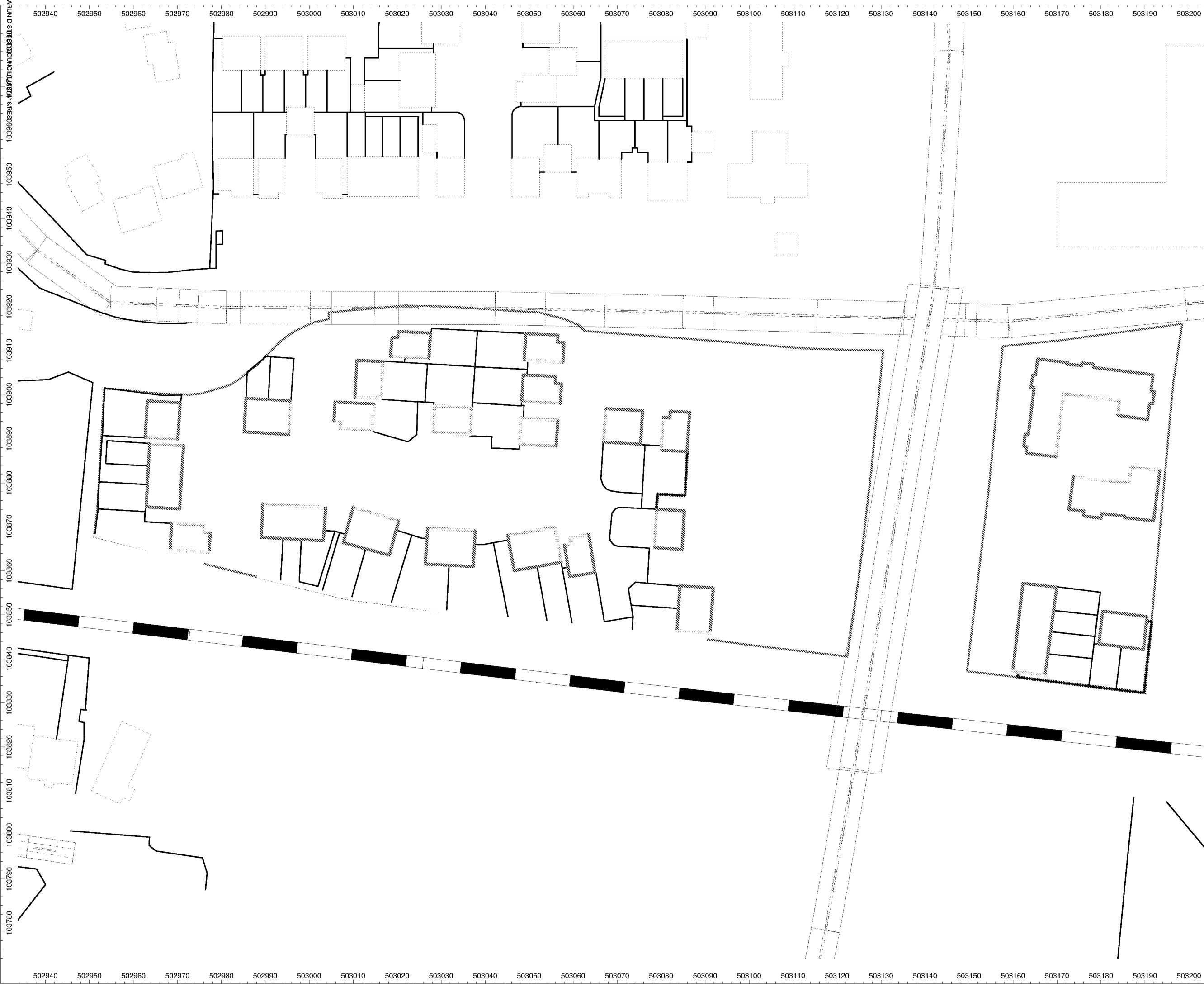
This map is based upon Ordnance Survey material reproduced by WYG on behalf of Her Majesty's Stationary Office, © Crown Copyright. Unauthorised reproduction infringes Crown copyright and may lead to civil proceedings.

Licence Number AL 553611



Executive Park  
Avalon Way  
Anstley  
Leicestershire  
LE7 7GR  
Tel 0116 234 8000

© WYG Environment



Client:  
Persimmon Homes

Project:  
Parcel A2 and B6  
North Littlehampton

Project Number:  
A100896

Drawing Title / Scenario:  
Mitigation Strategy

Drawing Number:  
SK05

Key:  
Site Boundary: -----

Enhanced Glazing &  
Alternative Ventilation  
Rw + Ctr 31 - 42 dB: -----

Enhanced Glazing &  
Alternative Ventilation  
Rw + Ctr 30: -----

2m Fence: -----

2.5m Fence: -----

Windowless Facade: -----

Scale : Not to scale

WYGE Leicester 15.11.18

This map is based upon Ordnance Survey material reproduced  
by WYG on behalf of Her Majesty's Stationary Office,  
© Crown Copyright. Unauthorised reproduction infringes  
Crown copyright and may lead to civil proceedings.

Licence Number AL 553611



Executive Park  
Avalon Way  
Anstley  
Leicestershire  
LE7 7GR  
Tel 0116 234 8000

© WYG Environment



## Appendix D – Report Conditions

This Report has been prepared using reasonable skill and care for the sole benefit of Persimmon Homes ("the Client") for the proposed uses stated in the report by WYG Environment Planning Transport Limited ("WYG"). WYG exclude all liability for any other uses and to any other party. The report must not be relied on or reproduced in whole or in part by any other party without the copyright holder's permission.

No liability is accepted or warranty given for; unconfirmed data, third party documents and information supplied to WYG or for the performance, reliability, standing etc of any products, services, organisations or companies referred to in this report. WYG does not purport to provide specialist legal, tax or accounting advice.

The report refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections.' Environmental conditions can vary and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times. No investigative method can eliminate the possibility of obtaining partially imprecise, incomplete or not fully representative information. Any monitoring or survey work undertaken as part of the commission will have been subject to limitations, including for example timescale, seasonal and weather-related conditions. Actual environmental conditions are typically more complex and variable than the investigative, predictive and modelling approaches indicate in practice, and the output of such approaches cannot be relied upon as a comprehensive or accurate indicator of future conditions. The "shelf life" of the Report will be determined by a number of factors including; its original purpose, the Client's instructions, passage of time, advances in technology and techniques, changes in legislation etc. and therefore may require future re-assessment.

The whole of the report must be read as other sections of the report may contain information which puts into context the findings in any executive summary.

The performance of environmental protection measures and of buildings and other structures in relation to acoustics, vibration, noise mitigation and other environmental issues is influenced to a large extent by the degree to which the relevant environmental considerations are incorporated into the final design and specifications and the quality of workmanship and compliance with the specifications on site during construction. WYG accept no liability for issues with performance arising from such factors.