Lancashire Central

Site Suitability Report

November 2022

Waterman Infrastructure & Environment Limited
2nd Floor, South Central, 11 Peter Street, Manchester, M2 5QR
www.watermangroup.com

Client Name: Maple Grove Developments
Document Reference: WIE11556-109-R-1.3.2
Project Number: WIE11556-109

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015 and BS EN ISO 45001:2018)

Issue	Date	Prepared by	Checked by	Approved by
03	Nov 2022	George Zelenovic		
02	Nov 2022	George Zelenovic Consultant	Mark Maclagan Technical Director	Mark Maclagan Technical Director
01	June 2022	George Zelenovic Consultant	Mark Maclagan Technical Director	Mark Maclagan Technical Director
Comments				

Comments

Disclaimer

This report has been prepared by Waterman Infrastructure & Environment Limited, with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

Contents

Figures

Tables

Appendices

1. Introduction

Waterman infrastructure & Environment Ltd. (hereafter 'Waterman') has been instructed by Lancashire County Council and Maple Grove Developments (hereafter the 'Applicant') to undertake a planning noise assessment of the proposed redevelopment of green field land (hereafter referred to as the 'Site'). The Development falls within the administrative boundary of South Ribble Council although will be acting as Lancashire County Council the determining authority owing to it's interest in the land.

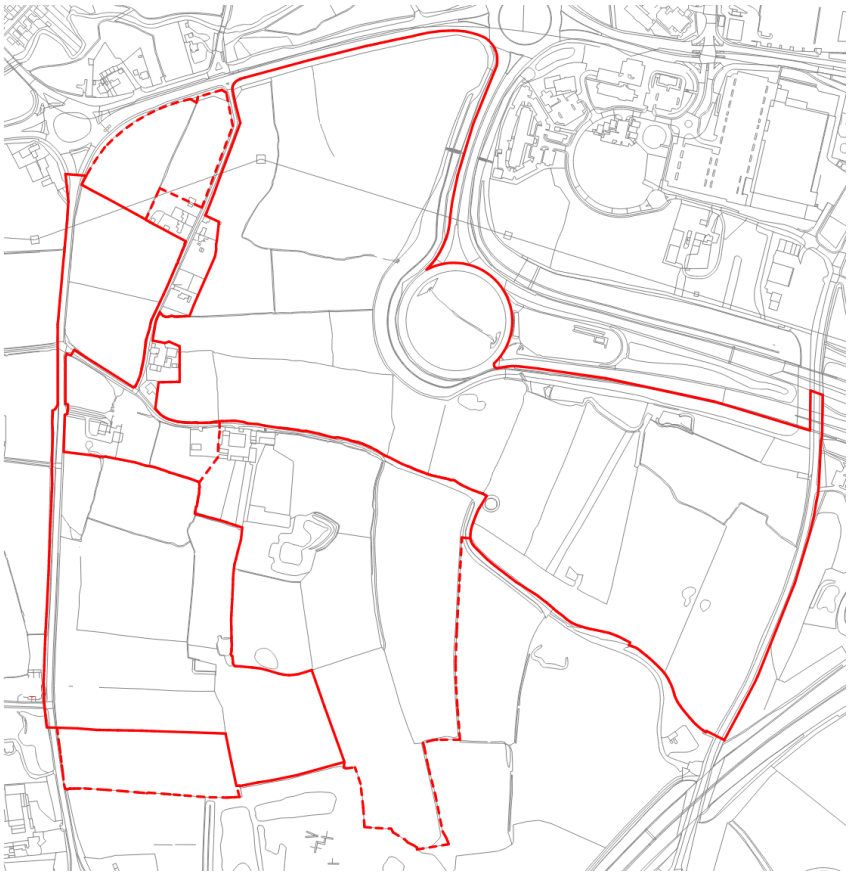
This report provides guidance regarding the existing noise levels present at the Site and, where required, suggests suitable mitigation measures to protect the amenity of future residents of the Proposed Development. Additionally, limiting criteria has been provided to mitigate against any potential adverse effects of Development generated noise on the existing environment. Prevailing noise levels have been established via means of a baseline noise survey at the Site and have been used as the basis for this assessment.

A glossary of the acoustic terminology used within this report is presented as **Appendix A**.

1.1 Site Description and Proposed Development

Currently the Site consists of an unoccupied field and will be redeveloped to accommodate new residential dwellings. The main noise source in the area is from traffic noise of the surrounding road networks such as Stanfield Lane which run adjacent to the site. The A582 and M6 run to, approximately, 280m and 500m to the north and east of the site boundaries respectively. The residential element of the development is shown in dark blue on Figure 1 Approximate Site Boundary.

Figure 1 Approximate Site Boundary with Residential Development presented in blue



2. Assessment Criteria & Guidance

2.1 National Planning Policy

The principal guidance documents within England regarding planning noise and vibration are the National Planning Policy Framework (NPPF)[1], the Noise Policy Statement for England (NPSE)[2] and Noise Planning Practice Guidance (NPPG)[3].

The NPPF was revised and published 20 July 2021. With regard to noise the NPPF still promotes '*good design*' as part of '*sustainable development*' and advocates '*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 185 of NPPF states '*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 and amenity value for this reason;'

Paragraph 187 of the NPPF introduces the '*Agent of change principle*'. '*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.*'

The NPPF reflects advice within NPSE in that they promote the avoidance of significant adverse impacts and reduction of other adverse impacts on health and quality of life; set within the context of the Government's policy on sustainable development.

None of these planning documents provide specific noise criteria with regard to planning, noise and vibration.

2.2 Assessment of Site Suitability for Residential Development – Noise

With regards to residential amenity and noise, the most relevant and credited guidance covering desirable levels of environmental noise for indoor and outdoor environments are the World Health Organisation (WHO), 1999 'Guidelines for Community Noise'[4], BS 8233:2014[5] and ProPG 2017[6].

These documents set out guideline internal and external noise limits which should be met by all residential developments to ensure the critical effects of noise on sleep, annoyance and speech interference are guarded against. Further to this, ProPG advocates a holistic approach with good acoustic design being a key consideration which is not just reliant on achieving the required guideline noise limits.

A summary of the guideline advice presented within these documents and relevant to the proposed Development is provided in Table 1: Summary of Recommended Noise Levels – Residential Amenity (ProPG)

[1] Department for Communities and Local Government (DCLG) (2021); '*The National Planning Policy Framework'*, TSO.
[2] Department for Environment, Food and Rural Affairs (DEFRA) (2010); '*Noise Policy Statement for England*', DEFRA.
[3] DCLG (2014); '*Planning Practice Guidance website*', DCLG. (http://planningguidance.planningportal.gov.uk/)
[4] World Health Organisation (WHO) (1999); '*Guidelines for Community Noise'*, WHO, Geneva.
[5] BSI (2014) '*Guidance on sound insulation and noise reduction in buildings'*. BSI.
[6] ProPG: (May 2017); Professional Practice Guidance on Planning & Noise. New Residential Development.

Table 1: Summary of Recommended Noise Levels – Residential Amenity (ProPG)

Activity	Location	Noise Level	
		Day time	Night-time
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedrooms	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$ 45 dB $L_{Amax,F}$ (note 4)
Relaxing, Enjoyment	Private gardens	50-55dB $L_{Aeq,16h}$	-

Note 1: The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

Note 2: The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, eg 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels in the Table.

Note 3: These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

Note 4: 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. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events.

Note 5: Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the 'open' position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

Note 6: Attention is drawn to the requirements of the Building Regulations.

Note 7: Where development is considered necessary or desirable, despite external noise levels above WHO guideline, the internal L_{Aeq} target levels may be relaxed by up to 5dB 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 5dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form.

When considering external amenity spaces such as gardens, balconies and terraces, the guidance provided in BS 8233 and reproduced in ProPG is:

"the acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50-55 dB $L_{Aeq,16h}$. These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces but should not be prohibited."

ProPG provides a methodology for undertaking a preliminary noise assessment of a proposed development site. The Stage 1 ProPG Initial Noise Risk Assessment is based on the prevailing day (07:00-23:00) and night-time (23:00-07:00) noise levels at the site, established through either measurement or prediction, without any new or additional mitigation. This provides an indication of the likely risk of adverse effects from noise were no subsequent mitigation be included as part of the development proposals. It should indicate whether the Site is considered to pose a negligible, low, medium or high risk from a noise perspective.

Figure 2 has been reproduced from ProPG illustrating the associated noise risks based on the prevailing noise levels and is appended at the end of the report. It is important to note that the assessment of noise risk serves to provide an indication as to the initial suitability of the site for residential development and as to what the acoustic issues are likely to be.

Figure 2: ProPG Noise Risk Assessment

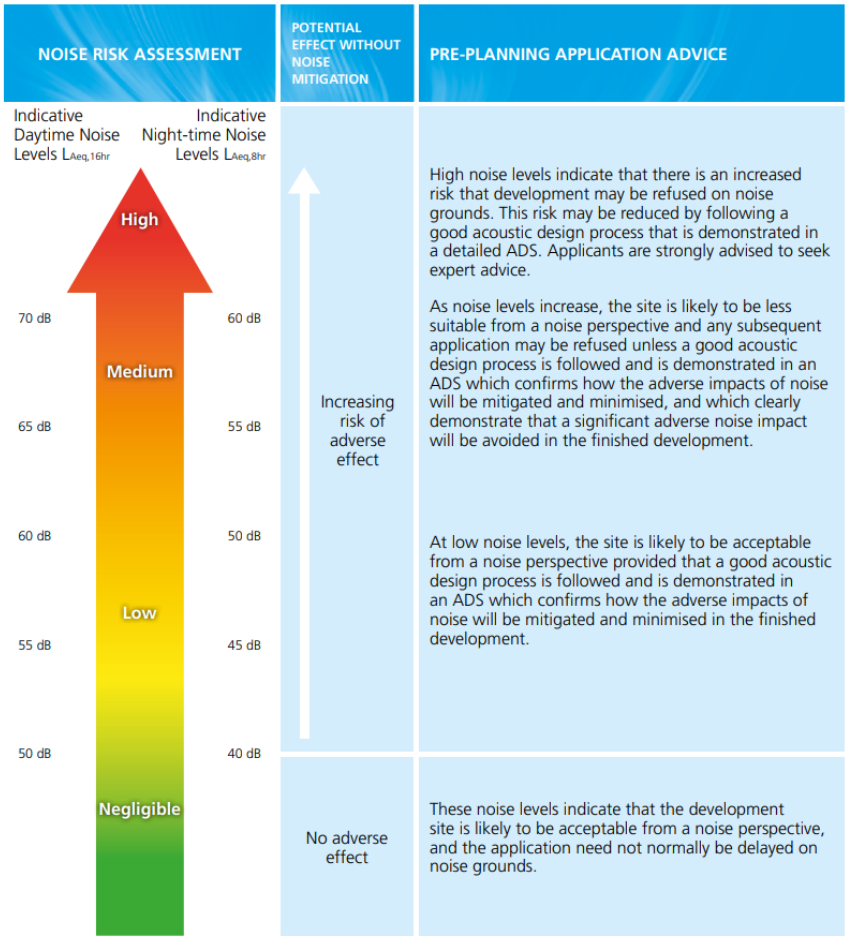


Figure 1 Notes:

a. Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.

b. Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".

c. $L_{Aeq,16hr}$ is for daytime 0700 – 2300, $L_{Aeq,8hr}$ is for night-time 2300 – 0700.

d. An indication that there may be more than 10 noise events at night (2300 – 0700) with $L_{Amax,F} > 60$ dB means the site should not be regarded as negligible risk.

3. Baseline Environmental Conditions

3.1 Baseline Environmental Noise Survey

A baseline noise survey was undertaken over a typical weekday between 1st and 3rd February 2022 to establish and quantify the existing noise environment present at the Proposed Development Site. The survey consisted of three long-term (LT) noise loggers measuring the daytime and night-time noise levels throughout the Site.

The monitoring locations are illustrated as **Figure 3**: Noise Monitoring Locations and described as Table 2: Noise Monitoring Locations.

Figure 3: Noise Monitoring Locations

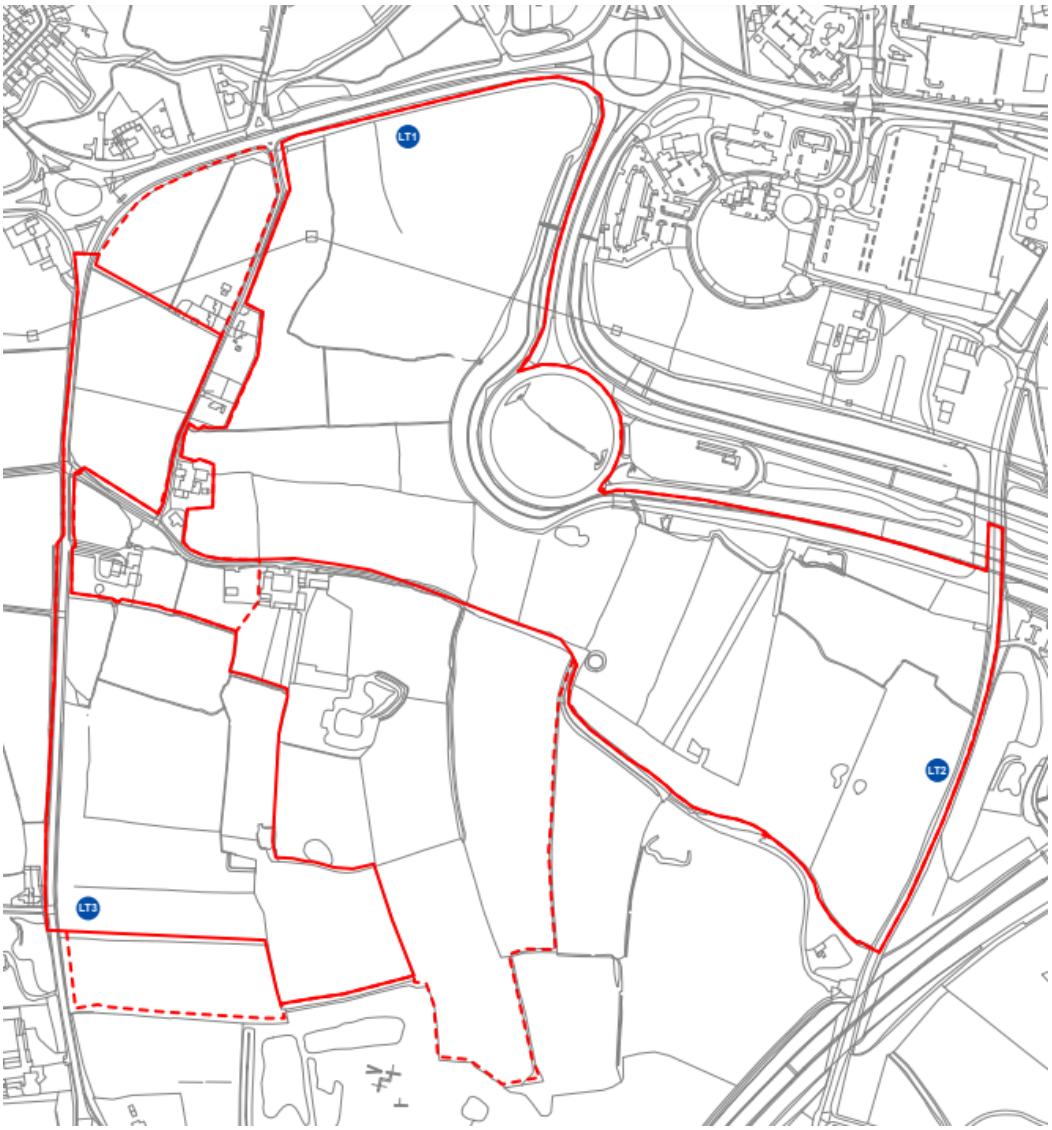


Table 2: Noise Monitoring Locations

Monitoring Location (Figure 3)	Description	Observations
LT1	Free-field noise measurement at in the northern extents of the Site adjacent A582. Microphone situated approx. ~1.5m above ground level (AGL)	Road traffic passing along the A582 was the dominant noise source at this region of the site. Traffic was continuous.
LT2	Free-field noise measurement at in the eastern extents of the Site adjacent Wigan Road. Microphone situated approx. ~1.5m above ground level	Road traffic passing along Wigan Road was the dominant noise source at this region of the site. Traffic was continuous.
LT3	Free-field noise measurement at in the eastern extents of the Site adjacent Stanifield Lane. Microphone situated approx. ~1.5m above ground level	Road traffic passing along Stanifeild Lane was the dominant noise source at this region of the site. Traffic was continuous.

3.1.1 Results of Baseline Noise Survey

All noise measurements were taken with calibrated precision grade (Class 1) sound level meters to provide a detailed description of the prevailing environmental noise characteristics. The sound level meters were set to record over consecutive 5-minute periods the L_{eq}, L_{90}, L_{10}, and L_{max} noise indices in the A-weighting network over a 125ms fast response time constant interval for the duration of each survey. The indices are described in **Appendix A** of this report, but roughly translated they describe in turn the average, background, road traffic, and maximum noise level.

Full details of the instrumentation used for the noise measurements are presented in **Appendix B** with calibration certificates available on request. Weather conditions, whilst not actively monitored during the survey period were reviewed after completion of the survey. Historical weather data from a nearby weather station (ILEYLA21, approx. 0.7km southwest of Site boundary) was sourced via Weather Underground (wunderground.com). Weather conditions were generally suitable for noise measurement with conditions being dry and wind speeds <5ms^{-1}.

Table 3: Summary of Baseline Noise Survey Measurements

Monitoring Location	Period (Duration)	$L_{Aeq,T}$ dB	$L_{A10,T}$ dB	$L_{A90,T}$ dB		$L_{AFmax,5min}$ dB	
		Average[1]	Average[2]	Range	Average[3]	Range	90th %ile
LT1	Day (16hr)	71	73	48 – 70	68	73 – 90	80
	Night (8hr)	65	66	40 – 69	44	69 – 92	78
LT2	Day (16hr)	74	77	51 – 66	63	62 – 98	88
	Night (8hr)	65	61	47 – 64	50	59 – 90	87
LT3	Day (16hr)	59	61	42 – 58	55	59 – 93	73
	Night (8hr)	53	64	37 – 55	42	49 – 80	42

Note 1: Logarithmic average

Note 2: Arithmetic average

Note 3: Modal average

4. Assessment

4.1 Site Suitability for Residential Development – Noise

A 3-dimensional noise model has been developed using the software package CADNA-A® and calibrated using the results of the baseline noise survey. The noise model has then been used to generate daytime $L_{Aeq,16hr}$ (0700-2300), night-time $L_{Aeq,8hr}$ (2300-0700) and night-time L_{AFmax} noise contours across the existing Site, without the proposed development buildings, to inform assessment of site suitability.

4.1.1 Initial Site Noise Risk Assessment

Noise Levels dB $L_{Aeq,T}$

An initial risk assessment of noise levels on-site has been undertaken using the output of the noise propagation model across the vacant Site that will be occupied by the proposed residential scheme. The prevailing noise levels across the Site are predicted as being predominantly between 50 and <70 dB $L_{Aeq,16hr}$ during the daytime and between 40 and <60 $L_{Aeq,8hr}$ during the night During the daytime period the noise risk ranges from low risk to the east of the site to high risk on the west boundary of the site. During the night-time period the noise risk ranges from low risk to the east of the site to high risk on the west boundary of the site.

Noise Levels dB L_{AFmax}

As outlined in **Section 2** both the prevailing average noise levels (in terms of $L_{Aeq,T}$) and the maximum noise levels (in terms of L_{AFmax}) should be assessed during the night-time period. **Figure 4** presents the contour plot of night L_{AFmax} levels across the Site[7].

Maximum levels are above 60 dB L_{AFmax} during the night-time period. A risk level has not been determined here as ProPG does not provide a specific risk rating for L_{AFmax} levels, however, levels consistently >60 dB L_{AFmax} are considered to have the potential for adverse effect. The site ranges from negligible risk to the east to high risk on the west boundary of the site.

Summary

A comparison of the contour plots indicates that the Site would predominantly be low-to-high risk – with night-time noise levels being a prevalent risk factor. The initial Site noise risk assessment therefore indicates that a good acoustic design process should be followed and that most of the site especially to the western areas would require some form of acoustic mitigation to meet guideline internal noise level criteria (see **Table 2-1**) and provide an appropriate level of residential amenity in particular during the night-time period.

Further assessment of the potential noise constraints along with recommended mitigation measures (where required) are discussed in **Section 5**.

[7] The model is calibrated to the measurements presented in **Table 3-3**. Where specific night-time L_{AFmax} data are not available, the average L_{AFmax} level has been used as this is considered indicative of a typical traffic movement.

5. Preliminary Acoustic Design Recommendations

5.1 Site Suitability for Residential Development – Noise

5.1.1 Element 1 – Good Acoustic Design

The illustrative Development layout, as illustrated in Drawing 21017 – SEL SK03_P10 and discussed in Section 1.1, indicates that those acoustic considerations have been exercised within the Development proposals by setting the residential development away from the main noise consisting of the M6 and M65. However, it's also noted that the proposed development will be situated adjacent to a busy road and therefore be exposed to noise from Stanifield Lane.

Noise Levels dB $L_{Aeq,T}$

Figure 4 indicates a largely low risk of adverse effects due to daytime noise levels with some areas of medium risk for those areas of the development site located closes to Stanifield Road.

Figure 4: Daytime Noise Contour Map

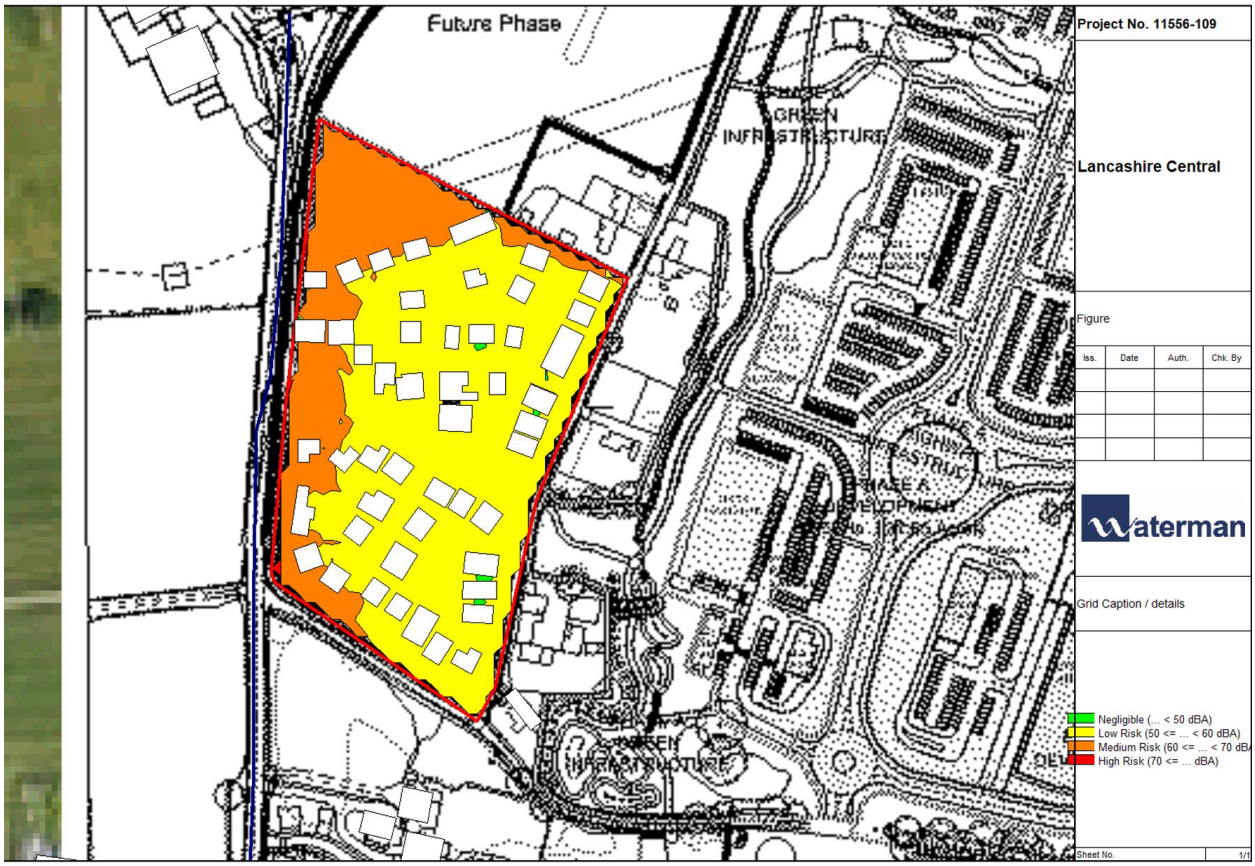
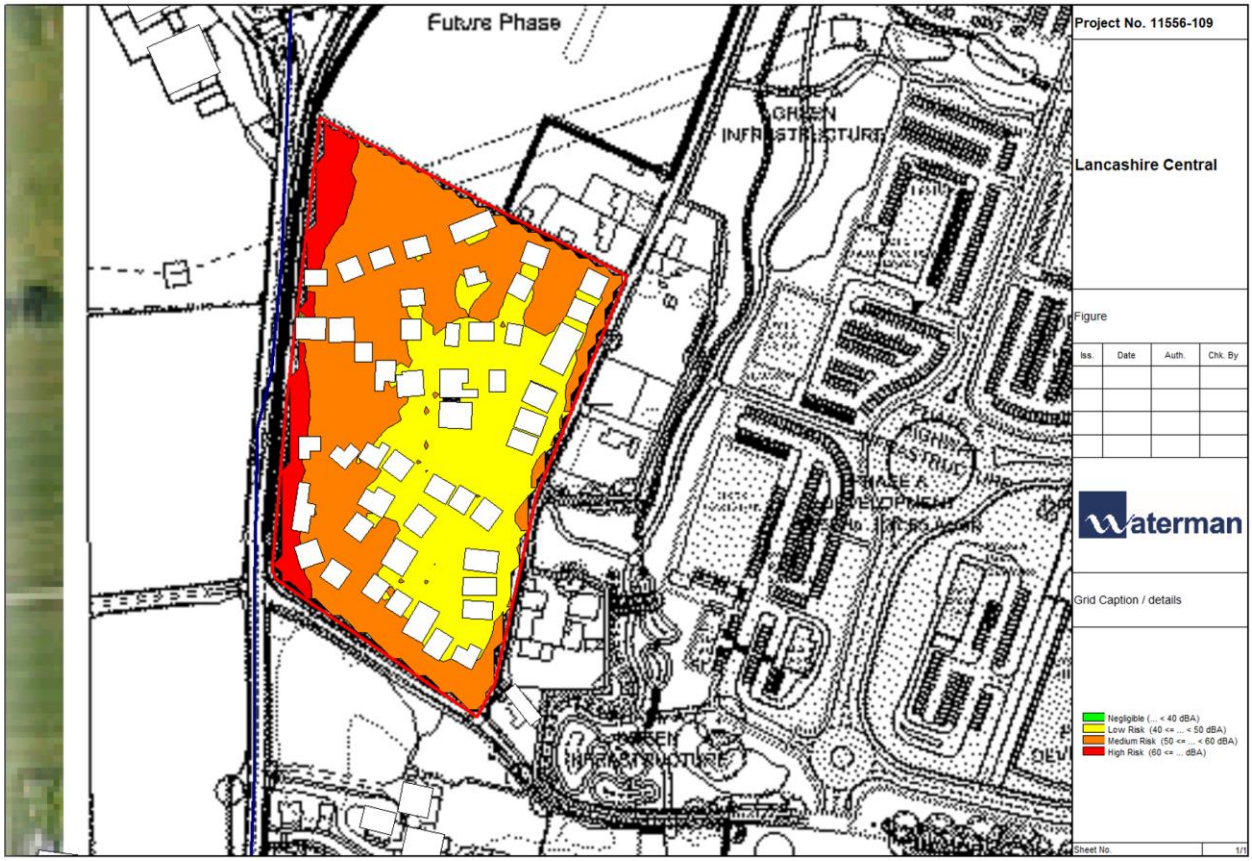


Figure 5 indicates that night-time levels range from 38 to 52 dB $L_{Aeq,8hr}$ this presents a slightly higher risk rating due to the more stringent guideline noise criteria applied to the night-time period.

Figure 5: Night-time Noise Contour Map



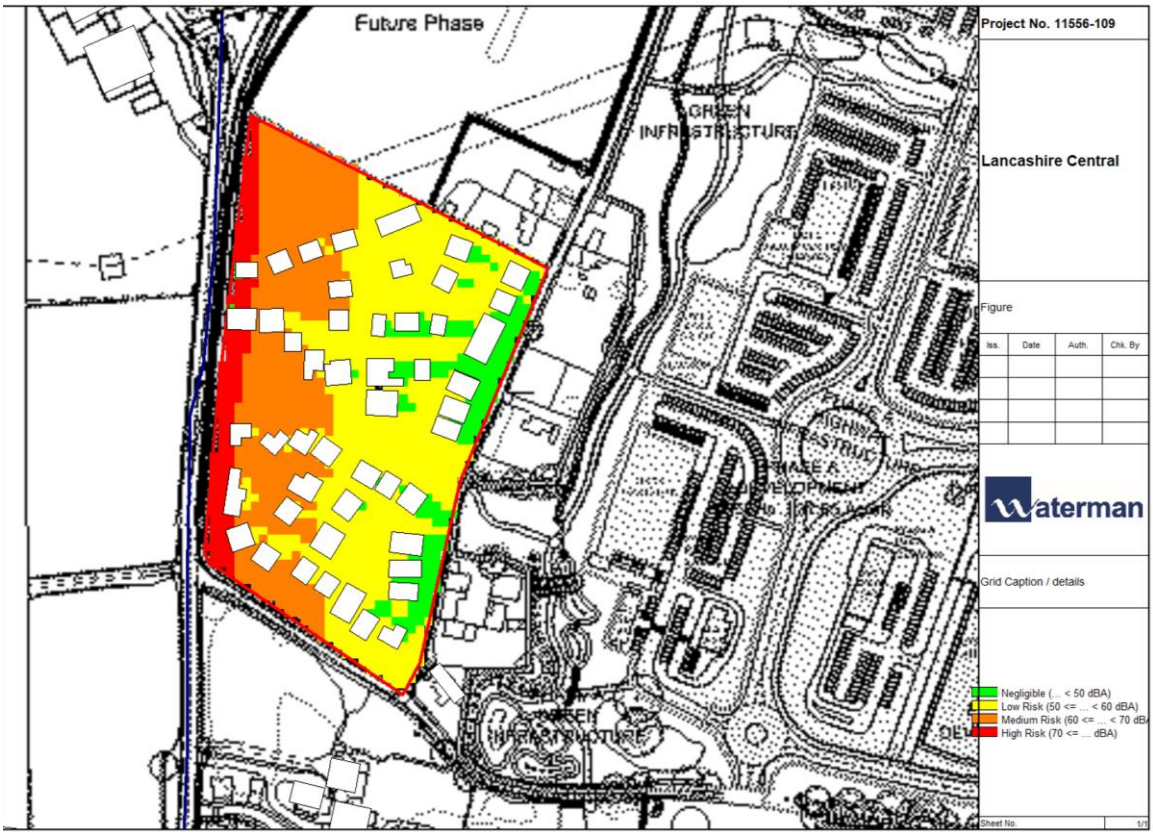
Noise Levels dB L_{AFmax}

Maximum levels are typically between 51 – 86 dB L_{AFmax} during the night-time period, a risk level has not been determined here as ProPG does not provide a specific risk rating for L_{AFmax} levels, however, ProPG does state the following:

An indication that there may be more than 10 noise events at night (2300-0700) with $L_{Amax,F}$>60dB means the site should not be regarded as negligible.

The L_{AFmax} levels are predominantly >60dB and therefore in the absence of mitigation there is a risk that adverse effects may arise.

Figure 6: Night-time Noise Contour Map Maximum Levels



5.1.2 Element 2 – Internal Noise Levels

It is generally accepted that where daytime façade noise levels are ≤50dB $L_{Aeq,16h}$ the internal ambient noise level (IANL) with windows open (based on 50% glazing) would be ≤35dB $L_{Aeq,16h}$ thereby satisfying the criteria of BS8233:2014. Similarly, night-time façade noise levels of ≤45dB $L_{Aeq,8h}$ and ≤60dB L_{Amax} would result in IANLs of ≤30dB $L_{Aeq,8h}$ and ≤45dB L_{Amax} with windows open, again satisfying the criteria of BS8233.

Where the design intent is a natural ventilation strategy through opening of windows then BS8233:2014 considers that IANLs could be increased by 5dB and reasonable internal conditions still provided. This equates to a daytime façade noise level of ≤55dB $L_{Aeq,16h}$ and night-time façade noise levels of ≤50dB $L_{Aeq,8h}$ and ≤65dB $L_{AFmax.}$ This approach is also reflected in ProPG**.**

Table 4 which should be read in conjunction with **Figure 7** and **Figure 8** provides an illustrative acoustic performance which the building facades should provide to ensure that the required internal noise levels would be achieved.

Table 4: Acoustic Specification for Glazing and Ventilation (*Transportation noise only*)

External Noise Level Not Exceeding		Acoustic Performance Requirement[1]	
Day dB L_{Aeq}	**Night dB L_{Aeq} (dB L_{AFmax})**	**Windows dB R_w+C_{tr}**	**Ventilators dB $D_{n,ew}+C_{tr}$**
<50	<45 (<60)	No requirement	
57	52 (67)	26 (Standard Thermal Glazing)	32 (Standard Window Mounted Trickle Ventilator)
60	55 (70)		
63	58 (73)	29	35
66	61 (76)	32	38
69	64 (79)	35	41
72	67 (82)	38	44

Note: [1]The performance specification applies to the whole glazing system, including framing and detailing. The performance of these elements and the overall composite system should be confirmed by a qualified acoustician within the detailed design.

Figure 7: Indicative Glazing Performance - Daytime

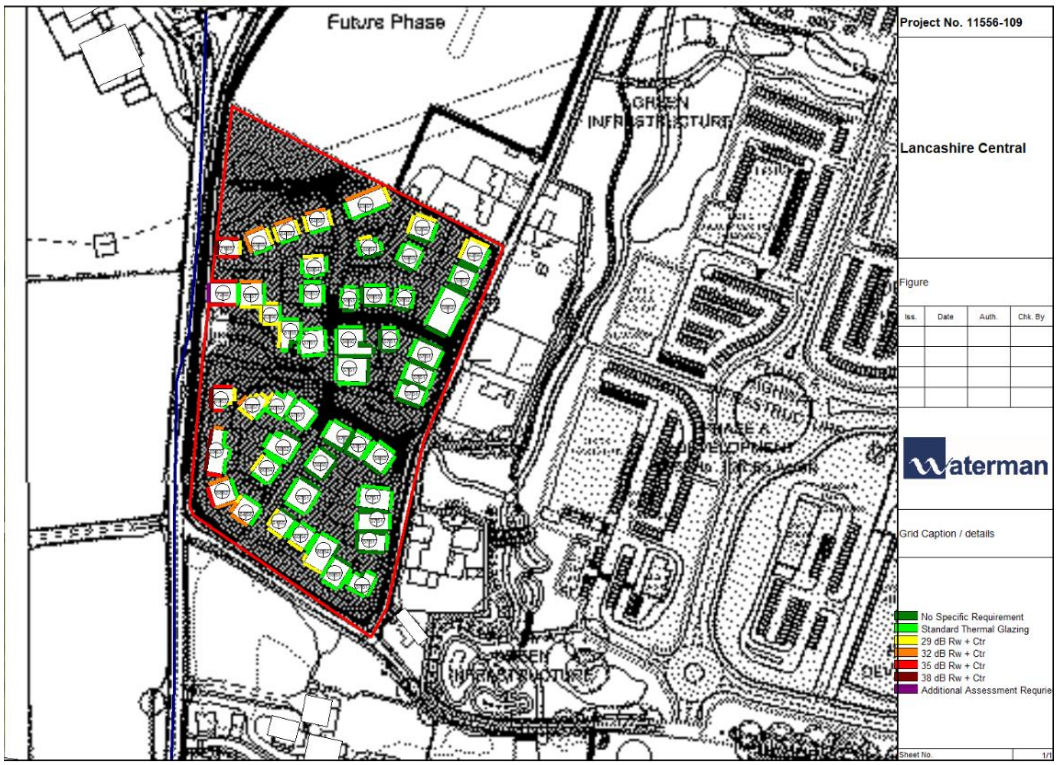
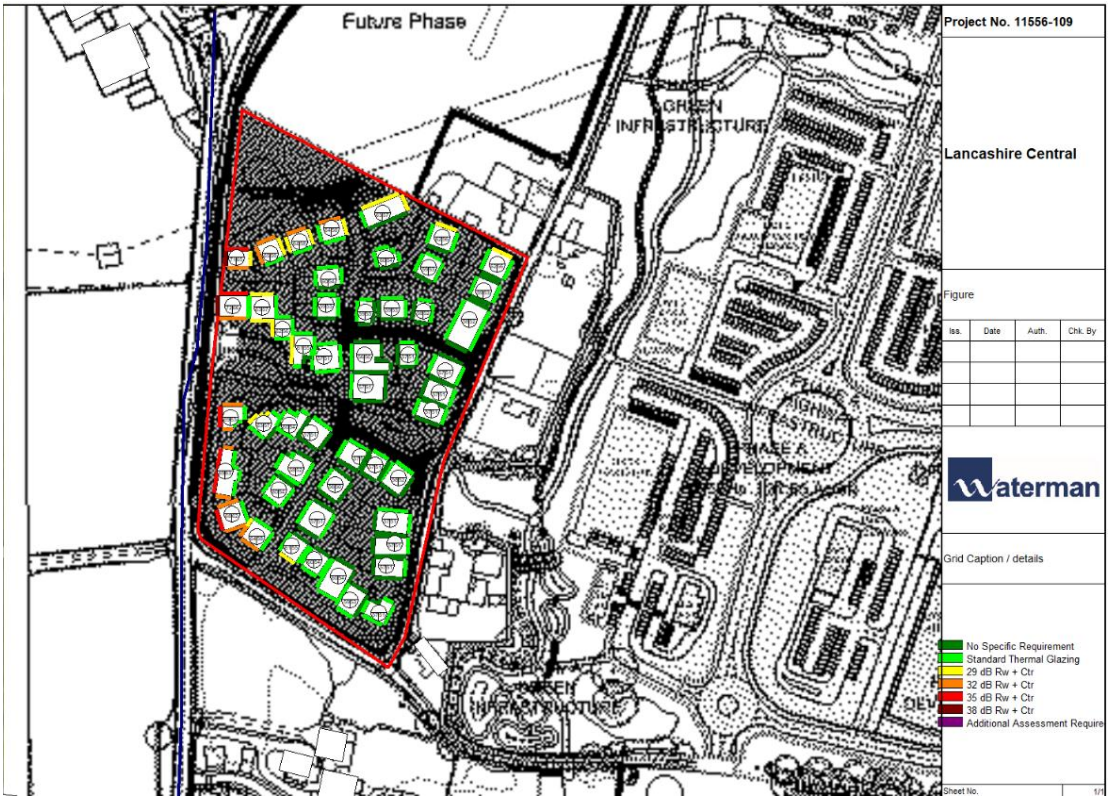


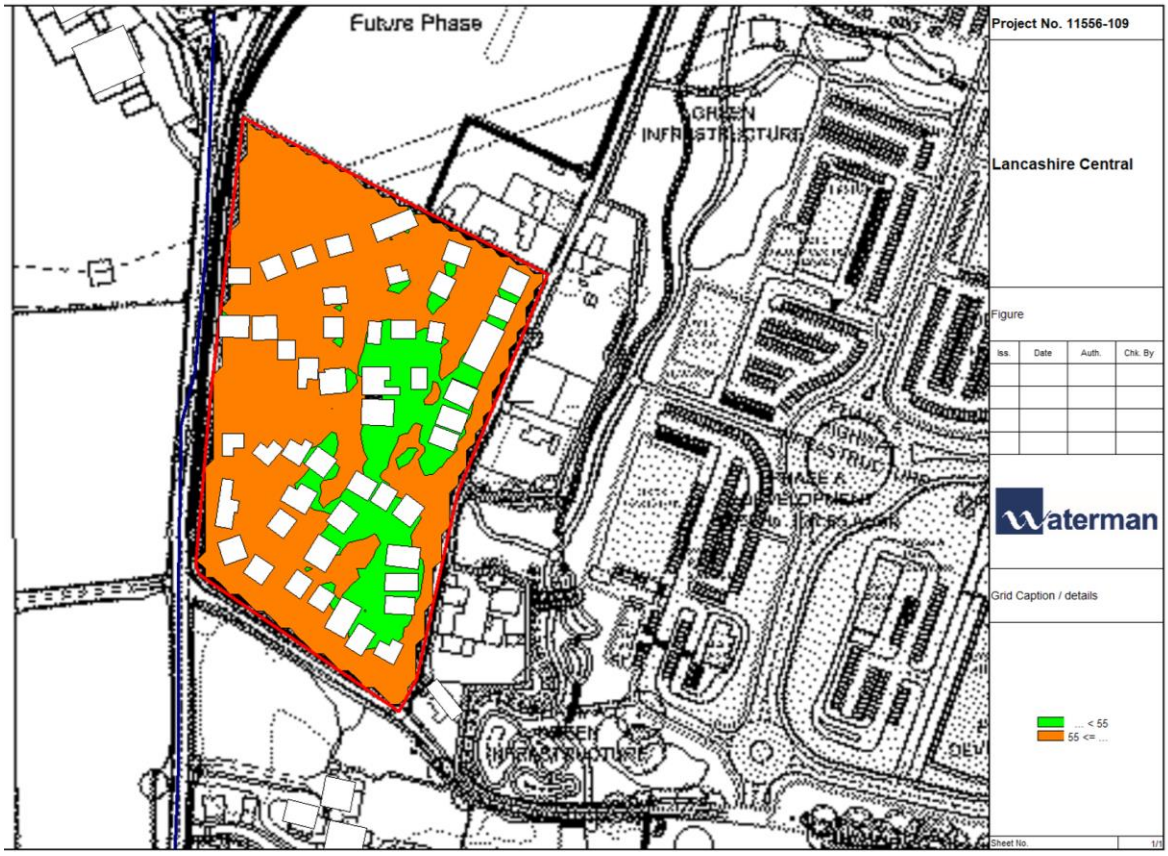
Figure 8: Indicative Glazing Performance – Night-time



5.1.3 Element 3 – External Noise Levels

External daytime mitigation requirement zones have been determined based on a maximum recommended external noise level of 55 dB $L_{Aeq,16hr}$, these areas are illustrated as **Figure 9** The plot illustrates that the Site predominantly exceeds the recommended external noise criteria.

Figure 9: Predicted External Noise Levels



The noise contours illustrated as **Figure 9** suggest that the predicted worst-case noise levels experienced at throughout the Site are predominately above the maximum recommended external noise level of 55 dB $L_{Aeq,16hr}$.

As the external levels above are exposed to noise levels above the 55 dB $L_{Aeq,16hr}$ threshold and are therefore not strictly suitable as external amenity areas, ProPG states:

"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, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings…"*

ProPG asserts that the availability of suitably protected quiet and tranquil outdoor places within, or close to, proposed new residential development in noisier locations may be regarded as a mitigating factor when planning applications are determined for developments with.

It would be possible to reduce noise levels with garden areas further through the provision of a 2.5 to 3m acoustic barrier around the north-western corner of the site as illustrated by the purple line in **Figure 10** below.

Figure 10: Predicted External Noise Levels with 3m Barrier (barrier shown in purple)

6. Conclusions & Recommendations

The initial site noise risk assessment, informed through results of the baseline noise survey and subsequent Cadna-A® noise modelling, indicates that the development site is predominantly 'medium' risk, with 'low' risk areas occurring towards the centre of the Site at a greater distance from Stanifield Lane and the A582.

The results of the ProPG noise assessment are summarised as follows:

- **Element 1:** The proposed design layout incorporates elements of good acoustic design, such as strategic development layout to protect external amenity areas from road traffic noise, further measures have been recommended and are detailed in **Section 5.1.1**. Façade levels for the proposed Development have been predicted from a 3-Dimensional noise propagation model of the Site and have found that the noise risk level for the Site is generally low risk to high risk for daytime $L_{Aeq,16hr}$ and night-time $L_{Aeq,8hr}$ levels.
- **Element 2:** The proposed site ranges from low risk to high risk with façade levels that range from 57 to 72dB during the day and 51 to 72dB during the night, it is predicted that IANL's would not be controlled without acoustic measures implemented, assuming a partially opened window for ventilation purposes.
- **Element 3:** Without further mitigation the predicted noise levels across the Site indicate that the external areas of the Site are likely to exceed the 55 dB $L_{Aeq,16h}$ guideline level. It is recommended that a 3m acoustic barrier be installed along the north and western boundary of Development Zone E. To provide sufficient mitigation such a barrier would likely comprise a close-boarded timber construction. Given that the precise layout of the residential development remains in outline at this stage, such details could be reserved by way of a suitably worded condition.

In summary, the noise assessment indicates that through further incorporation of good acoustic design and selection of appropriate glazing and ventilation, suitable residential amenity would be provided.

APPENDICES

A. Glossary of Acoustic Terms

Ambient sound
The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.

Assessment period
The period in a day over which assessments are made.

A-weighting
A frequency weighting applied to measured or predicted sounds levels in order to compensate for the non-linearity of human hearing.

Background noise
Background noise is the term used to describe the noise measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L_{90} noise level (see below).

Broadband
Containing the full range of frequencies.

Decibel [dB]
The level of noise is measured objectively using a Sound Level Meter. This instrument has been specifically developed to mimic the operation of the human ear. The human ear responds to minute pressure variations in the air. These pressure variations can be likened to the ripples on the surface of water but of course cannot be seen. The pressure variations in the air cause the eardrum to vibrate and this is heard as sound in the brain. The stronger the pressure variations, the louder the sound that is heard.

The range of pressure variations associated with everyday living may span over a range of a million to one. On the top range may be the sound of a jet engine and on the bottom of the range may be the sound of a pin dropping.

Instead of expressing pressure in units ranging from a million to one, it is found convenient to condense this range to a scale 0 to 120 and give it the units of decibels. The following are examples of the decibel readings of every day sounds:

Four engine jet aircraft at 100m	120 dB
Riveting of steel plate at 10m	105 dB
Pneumatic drill at 10m	90 dB
Circular wood saw at 10m	80 dB
Heavy road traffic at 10m	75 dB
Telephone bell at 10m	65 dB
Male speech, average at 10m	50 dB
Whisper at 10m	25 dB
Threshold of hearing, 1000 Hz	0 dB

dB(A): A-weighted decibels
The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the 'A' filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.

Façade Noise Level
A noise level measured or predicted at the façade of a building, typically at a distance of 1m, containing a contribution made up of reflections from the façade itself (+3 dB).

L_{Amax} noise level
This is the maximum noise level recorded over the measurement period.

L_{Amin} noise level
This is the lowest level during the measurement period.

$L_{Aeq,T}$ noise level
This is the 'equivalent continuous A-weighted sound pressure level, in decibels' and is defined in British Standard 7445 as the 'value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time'.

It is a unit commonly used to describe construction noise, noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise.

L_{A90} noise level
This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

L_{A10} noise level	This is the noise level which is achieved for 10% of the monitoring period and is often used to describe road traffic noise.
Sound Reduction Index (R)	The sound reduction index is a single-number rating of the sound reduction through a wall or other building element. Since the sound reduction may be different at different frequencies, test measurements are subjected to a standard procedure which yields a single number that is about equal to the average sound reduction in the middle of the human hearing range.
Weighted Sound Reduction Index (R_W)	Single number rating used to describe the **laboratory** airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
C_{TR}	An adjustment to the Rw scale to take account of the lower performance against a typical spectrum of road traffic noise dominated by low frequencies.
$D_{ne,W}$	Weighted element normalised level difference.

B. Noise Survey

The sound level meters were calibrated both before and after each monitoring period; no drift from the reference level of 94 dB was recorded. Full details on monitoring details can be provided upon request.