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Noise Assessment Report for Proposed Residential Development on Land off Wardentree Lane, Pinchbeck, Lincolnshire

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On behalf of:
Larkfleet Homes

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1.0 INTRODUCTION

1.1 Blue Tree Acoustics has been appointed by Larkfleet Homes to carry out an assessment of the existing noise climate for a proposed residential development on land situated off Wardentree Lane in Pinchbeck, Lincolnshire.

1.2 The potential development plan proposes construction of new residential buildings on the site, along with associated gardens, car parking spaces and access road from Wardentree Lane to the north and Enterprise Way to the south.

1.3 The site is situated on the south-eastern edge of Pinchbeck village and currently comprises an open field. The surrounding area comprises a mixture of fields/farmland, nearby commercial/industrial premises, and nearby residential properties.

1.4 The noise impact assessment has included:

i) Inspection of the site and surroundings.
ii) Noise monitoring surveys undertaken at locations on the site.
iii) Evaluation of the site in accordance with relevant planning policy guidance.
iv) Consideration of noise control measures required to maintain acceptable noise levels within the proposed bedrooms and living rooms in accordance with *British Standard 8233: 1999, 'Code of practice for Sound insulation and noise reduction for buildings'*.

2.0 EXISTING NOISE SOURCES

Road

2.1 Wardentree Lane (which forms part of the B1180) is a moderately busy road with regular passing traffic throughout the day. At night, there are intermittent passing vehicles; however, the end of the night time period is moderately busy also.

Commercial / Industrial

2.2 To the east of the site is a dyke beyond which is Moortoft Lane. On the eastern side of Moortoft Lane are light industrial units, including Kent's of Spalding, Spalding MOT, and Spalding Van Hire. Some of these units appear to generate some noise from vehicle movements. There are also some fixed plant items which run whilst the staff are on site. Some of this noise is audible along the eastern edge of the development site. This is considered further in the noise assessment section.

2.3 To the south of the site, behind an approximately 3m high earth bund, is Empire World Trade, which imports and distributes fresh fruit. The Empire World Trade site is accessed via Enterprise Way. Empire World Trade noise emission was assessed both to the north and to the west, and the layout of the building and surrounding bund appears to attenuate noise egress greatly. This is considered further in the noise assessment section.

2.4 Roythornes Solicitors and Duncan & Toplis Accountants are also situated to the south. These premises appear to generate noise only from staff accessing the car park area, which adjoins the proposed residential site.

3.0 NEW NOISE SOURCES

3.1 The new development is residential in nature and will introduce no significant long-term noise sources.

3.2 Potentially, there will be noise produced at times during the construction of the development. However, this will be restricted to daytime hours only and, can be controlled by an appropriately worded planning condition if needed.

4.0 NOISE SURVEY

4.1 Noise monitoring was undertaken by Blue Tree Acoustics on 22nd and 23rd May 2013 in order to determine the existing ambient noise climate at the site. Attended measurements were taken at accessible locations around the site, as indicated in Figure 1. The measurement locations were selected to be representative of the likely positions of the proposed new dwellings near the site boundaries.

4.2 Noise measurements were carried out using a Rion NA28 Class 1 Integrating Sound Level Meter. Noise was measured in terms of broadband A-weighted indices and at 1/3 octave bands from 50Hz to 10kHz. The measurement microphone was mounted on a tripod at approximately 1.5m height from local ground, and the proprietary environmental windshield was fitted to the microphone. Calibration checks were carried out both before and after the measurements with no variance observed. The sound level meter was within a valid period of laboratory calibration.

4.3 Night-time weather conditions during the survey were dry and calm, with temperature approximately 8° C. Daytime survey weather conditions during the noise surveys were dry and cloudy with low wind speeds <5m/s, and temperature approximately 13° C.

4.4 The primary noise sources observed at the development site are road traffic from Wardentree Lane, and noise from activity and operations at the commercial units to the east.

4.5 Some intermittent noise from the nearby Empire World Trade site was faintly audible during the daytime survey. Whilst being audible, this was not considered to have notable effect on the measured noise levels, and was not of significant noise impact.

4.6 The noise measurement results are detailed in Appendix II and are summarised in the tables below.

Table 1: Averaged Daytime Noise Levels

Location	dB L_{Aeq}	dB L_{Amax}	dB L_{A10}	dB L_{A90}
1	61.6	74.2	65.2	52.3
2	51.5	65.6	53.2	48.7
3	50.8	58.4	52.9	46.0
4	54.9	63.6	55.9	53.6
5	55.0	72.7	55.8	43.9

Table 2: Averaged Night-time Noise Levels

Location	dB L_{Aeq}	dB L_{Amax}	dB L_{A10}	dB L_{A90}
1	62.7	75.9	66.8	45.6
2	47.0	56.9	47.5	42.9
3	48.5	55.6	50.4	45.2

4.7 From the tables above, it can be seen that noise levels are generally highest at Location 1, which is the most exposed to Wardentree Lane traffic noise. Noise levels reduce with distance from this main road. During the day, Location 2 is influenced by distant traffic noise, together with some contribution from commercial activities (commercial activities seem to not start until around 0640 hours). It is considered that noise levels at Location 3 may be higher at other times and clearly are influenced by whether or not office staff are accessing the nearby car park; clearly, staff only use the car park in daytime hours. Location 4 is influenced by mechanical services items across the dyke during the daytime, as well as road traffic noise. Location 5 is influenced by both Empire World Trade noise egress and road traffic noise.

4.8 It should be noted that daytime noise levels are modest, and with the exception of Location 1, which is most exposed to road traffic noise, ambient noise levels are no higher than 55dB L_{Aeq}.

Considering the proposed site layout, there are only around five properties in the vicinity of Location 1 which would experience daytime noise levels above 55dB L_{Aeq}.

4.9 At night, noise levels are low. Road traffic noise is the primary noise source, although commercial activities were noted to start just before 0700 hours.

4.10 It is considered that road traffic noise is dominant across the site, but that there are locations where commercial noise is audible at times.

5.0 NOISE ASSESSMENT

National Planning Policy Framework

5.1 The planning system has recently been radically changed. On 27th March 2012, the National Planning Policy Framework (NPPF) came into force. This document replaces a great many planning guidance documents which previously informed the planning system in England, including PPG24. The new framework states that:

The planning system should contribute to and enhance the natural and local environment by:

- *protecting and enhancing valued landscapes, geological conservation interests and soils;*
- *recognising the wider benefits of ecosystem services;*
- *minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*
- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability;*

and

- *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*

Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts[27] on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts[27] on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established;[28]*

and

- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

[27] *See Explanatory Note to the Noise Policy Statement for England (Department for the Environment, Food and Rural Affairs).*

[28] *Subject to the provisions of the Environmental Protection Act 1990 and other relevant law.*

5.2 In addition, the Noise Policy Statement for England (NPSE) states:

Noise Policy Vision

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

Noise Policy Aims

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- **avoid significant adverse impacts on health and quality of life;**
- **mitigate and minimise adverse impacts on health and quality of life; and**
- **where possible, contribute to the improvement of health and quality of life.**

Guiding principles of sustainable development

Ensuring a Strong Healthy and Just Society – Meeting the diverse needs of all people in existing and future communities, promoting personal wellbeing, social cohesion and inclusion, and creating equal opportunity for all.

Using Sound Science Responsibly – Ensuring policy is developed and implemented on the basis of strong scientific evidence, whilst taking into account scientific uncertainty (through the precautionary principle) as well as public attitudes and values.

Living Within Environmental Limits – Respecting the limits of the planet's environment, resources and biodiversity – to improve our environment and ensure that the natural resources needed for life are unimpaired and remain so for future generations.

Achieving a Sustainable Economy – Building a strong, stable and sustainable economy which provides prosperity and opportunities for all, and in which environmental and social costs fall on those who impose them (polluter pays), and efficient resource use is incentivised.

Promoting Good Governance – Actively promoting effective, participative systems of governance in all levels of society – engaging people's creativity, energy and diversity.

Source: Securing the future – delivering UK sustainable development strategy, HM Government, March 2005.

5.3 The Noise Policy Statement for England Explanatory note states that:

Noise is an inevitable consequence of a mature and vibrant society. For some the noise of city life provides a desirable sense of excitement and exhilaration, but for others noise is an unwanted intrusion that adversely impacts on their quality of life, affecting their health and well being.

The management of noise has developed over many years as the types and character of noise sources have altered and as people's attitude to noise has changed. The Noise Abatement Act came into law in 1960 and the Report from the Committee on the Problem of Noise was published in 1963 (the Wilson report). Since then, examples of noise management can be found in many areas including reducing noise at source; the use of the land use and transport planning systems, compensation measures, the statutory nuisance and licensing regimes and other related legislation.

Furthermore, the broad aim of noise management has been to separate noise sources from sensitive noise receivers and to 'minimise' noise. Of course, taken in isolation and to a literal extreme, noise minimisation would mean no noise at all. In reality, although it has not always been stated, the aim has tended to be to minimise noise as far as reasonably practical. This concept can be found in the Environmental Protection Act 1990, where, in some circumstances, there is a defence of 'best practicable means' in summary statutory nuisance proceedings.

By describing clear policy vision and aims the NPSE provides the necessary clarity and direction to enable decisions to be made regarding what is an acceptable noise burden to place on society.

The intention is that the NPSE should apply to all types of noise apart from noise in the workplace (occupational noise). For the purposes of the NPSE, "noise" includes:

- *"environmental noise" which includes noise from transportation sources;*

- *"neighbour noise" which includes noise from inside and outside people's homes;*

And

- *"neighbourhood noise" which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.*

  The application of the NPSE should mean that noise is properly taken into account at the appropriate time. In the past, the opportunity for the cost effective management of noise has often been missed because the noise implications of a particular policy, development or other activity have not been considered at an early enough stage.

In addition, the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications.

In the longer term, the Government hopes that existing policies could be reviewed (on a prioritised basis), and revised if necessary, so that the policies and any noise management measures being adopted accord with the vision, aims and principles of the NPSE.

Noise management is a complex issue and at times requires complex solutions. Unlike air quality, there are currently no European or national noise limits which have to be met, although there can be specific local limits for specific developments. Furthermore, sound only becomes noise (often defined as 'unwanted sound') when it exists in the wrong place or at the wrong time such that it causes or contributes to some harmful or otherwise unwanted effect, like annoyance or sleep disturbance. Unlike many other pollutants, noise pollution depends not just on the physical aspects of the sound itself, but also the human reaction to it. Consequently, the NPSE provides a clear description of desired outcome from the noise management of a particular situation.

The guiding principles of Government policy on sustainable development should be used to assist in its implementation. The development of further principles specifically to underpin implementation of noise management policy will be kept under review as experience is gained from the application of the NPSE.

There are several key phrases within the NPSE vision and these are discussed below.

Health and quality of life

The World Health Organisation defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, and recognises the enjoyment of the highest attainable standard of health as one of the fundamental rights of every human being.

It can be argued that quality of life contributes to our standard of health. However, in the NPSE it has been decided to make a distinction between 'quality of life' which is a subjective measure that refers to people's emotional, social and physical well being and 'health' which refers to physical and mental well being.

It is recognised that noise exposure can cause annoyance and sleep disturbance both of which impact on quality of life. It is also agreed by many experts that annoyance and sleep disturbance can give rise to adverse health effects. The distinction that has been made between 'quality of life' effects and 'health' effects recognises that there is emerging evidence that long term exposure to some types of transport noise can additionally cause an increased risk of direct health effects. The Government intends to keep research on the health effects of long term exposure to noise under review in accordance with the principles of the NPSE.

Promote good health and good quality of life

This statement expresses the long term desired policy outcome, but in the use of 'promote' and 'good' recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations.

Effective management of noise

This concept confirms that the policy applies to all types of 'noise' (environmental, neighbour and neighbourhood) and that the solution could be more than simply minimising the noise.

Within the context of Government policy on sustainable development

Sustainable development is a core principle underpinning all government policy. For the UK Government the goal of sustainable development is being pursued in an integrated way through a sustainable,

innovative and productive economy that delivers high levels of employment and a just society that promotes social inclusion, sustainable communities and personal wellbeing. The goal is pursued in ways that protect and enhance the physical and natural environment, and that use resources and energy as efficiently as possible.

There is a need to integrate consideration of the economic and social benefit of the activity or policy under examination with proper consideration of the adverse environmental effects, including the impact of noise on health and quality of life. This should avoid noise being treated in isolation in any particular situation, i.e. not focussing solely on the noise impact without taking into account other related factors.

There are several key phrases within the NPSE aims and these are discussed below.

"Significant adverse" and "adverse"

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL . No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL . Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL . Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

The first aim of the Noise Policy Statement for England

Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development.

The second aim of the Noise Policy Statement for England

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.

The third aim of the Noise Policy Statement for England

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

This aim seeks, where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.

5.4 Unfortunately, the above guidance provides no objective, tangible standards or criteria which enable planning decisions to be made. In the absence of such guidance, quantification of noise impact in terms of guidance such as BS8233 (which presents noise limits and criteria based on World Health Organisation recommendations) can be considered as appropriately assessing the potential noise impact with regard to toxicology concepts, and hence in line with the principles of the NPPF and NPSE. Therefore, if a development meets the recommendations of BS8233 and any associated local authority noise requirements, it can be considered as being below the level where there is no detectable adverse effect on health and quality of life due to noise, and this meets the NOEL (No Observed Effect Level) set out in the NPSE.

BS8233

5.5 In order to protect potential future residents against the impact of noise, the guidance given in *British Standard 8233: 1999, 'Code of practice for Sound insulation and noise reduction for buildings'* (BS8233) should be considered. BS8233 provides information on the design of internal acoustics in buildings. It deals with control of noise from outside the building, noise from plant and services within it, and room acoustics for non-critical situations.

5.6 The table below sets out the range of levels recommended in BS8233 for residential accommodation.

Table 3: BS8233 Guidance Criteria for Indoor Ambient Noise Levels

Criterion	Typical Situations	Design Range ($L_{Aeq,T}$ dB)	
		Good	Reasonable
Reasonable resting / sleeping conditions	Living rooms	30	40
	Bedrooms[1]	30	35

[1]For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45 dB L_{Amax}

5.7 In addition, BS8233 makes reference to external noise levels in gardens and balconies, etc., stating that it is desirable that the steady noise level not exceed 50dB $L_{Aeq,T}$ dB, and that 55dB $L_{Aeq,T}$ should be regarded as the upper limit.

5.8 The following noise mitigation section is based on achieving the adopted noise criteria to ensure a suitable level of protection for the future occupants of the development. The following criteria are therefore proposed in accordance with BS8233:

Inside Bedrooms:	30dB $L_{Aeq(8hour)}$	(2300 to 0700 hours)
Inside Living Rooms:	40dB $L_{Aeq(16hour)}$	(0700 to 2300 hours)
External areas such as Gardens:	55dB $L_{Aeq(16hour)}$	(0700 to 2300 hours)

5.9 Noise ingress calculations have been carried out in accordance with BS8233.

6.0 NOISE MITIGATION MEASURES

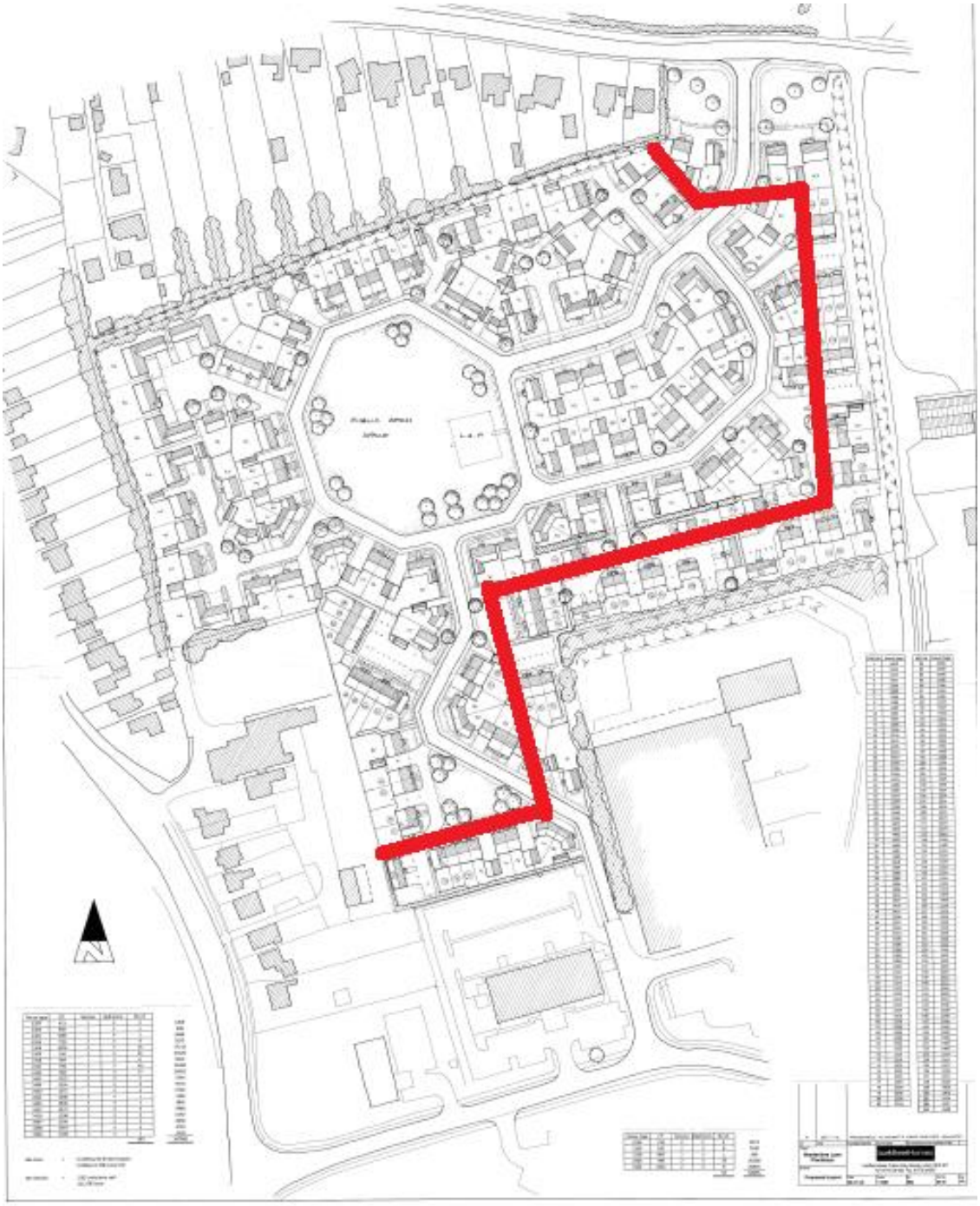
6.1 There are a variety of proportionate and reasonable techniques that can typically be introduced to mitigate the effects of noise, such as:

> **Engineering:** reduction of noise at source (e.g. use of quiet machinery and working methods), containment of generated noise, and protection of noise-sensitive buildings (e.g. by sound insulation and/or screening them by purpose-built barriers);
>
> **Layout:** adequate distance between source and noise-sensitive building; screening by natural barriers, other buildings or non-critical rooms in a building;
>
> **Administrative:** limiting operating time of source, restricting activities on site, specifying an acceptable noise limit.

Site Layout

6.2 The design of the building envelope of the new dwellings can incorporate suitable sound insulation to satisfy the requirements of BS8233. External noise level criteria can also be achieved by provision of acoustic fencing in key locations.

6.3 Considering the proposed residential layout shown in Figure 1, the dwellings most exposed to noise will be those along the northern, eastern, and southern boundaries. Although absolute noise levels are not particularly high, it is considered desirable to provide upgraded acoustic insulation to the building envelopes and gardens of the properties to the extremities of the site in order to help minimise potential noise impact from nearby commercial premises, as shown in the image below. It is considered that the site can be split into two sections: the properties to the west of the line do not require additional acoustic protection, whereas properties to the east should be provided with an acoustic insulation scheme as outlined below.



6.4 All new housing to the east of the red line should be of masonry construction, e.g. external cavity walls with 100mm block-work inner leaf and external 103mm brick leaf with cavity insulation.

6.5 All new housing to the east of the red line should have tiled roof constructions, with ceilings to rooms below comprising a minimum of 2 layers of solid gypsum-based board (total minimum mass per unit area 20kg/m^2), overlaid with minimum 100mm mineral fibre insulation. Any proposed rooms in the roof-space should be designed to have suitable internal linings to achieve the required sound insulation.

6.6 All windows to noise-sensitive rooms in new housing to the east of the red line should have a minimum double glazing of 4mm glass/16mm airgap/10mm glass. This requirement applies only to windows facing out of the site.

6.7 Habitable rooms to the east of the red line, facing out of the site, should be provided with suitable passive acoustic ventilators, such as Greenwood EHA574 or Renson Invisivent AK49 (a minimum performance of 41dB $D_{n,e,w}$ should provide sufficient sound insulation). Alternatively, a ducted ventilation system (e.g. MEV/MVHR or whole house type) could be implemented. It may also be possible to design a continuous running fan system with no requirement for ventilation openings in window frames or external walls into habitable rooms on building elevations directly exposed to noise sources.

6.8 All other houses and types of room not specified above may be provided with standard ventilation and glazing systems.

6.9 Gardens to the east of the red line should be provided with an acoustic barrier. A suitable acoustic barrier could be formed by installing a minimum 2m high close-boarded fence. Close-boarded acoustic fencing should be constructed of solid, weather-treated timber of minimum 18mm thickness. All joints should be tight-butted with timber cover strips or tongue and groove boards to ensure that there are no air gaps in the structure or between the base of the fence and the ground beneath.

6.10 The specifications given above are suitable recommendations. Equivalent acoustic performance may be achieved by other materials or products, but acoustic performance data for all proposed alternative systems should be checked by a competent acoustic consultant prior to installation in order to ensure adequate acoustic performance will be achieved.

6.11 All recommendations given above are for acoustic purposes only. Any other requirements, such as structural, thermal, fire safety, etc., should be checked by suitably qualified specialists.

7.0 SUMMARY AND CONCLUSIONS

7.1 A noise assessment has been carried out for the proposed residential development site on land situated off Wardentree Lane in Pinchbeck.

7.2 The assessment has included measurements of the prevailing ambient noise levels at the site during representative daytime and night-time periods.

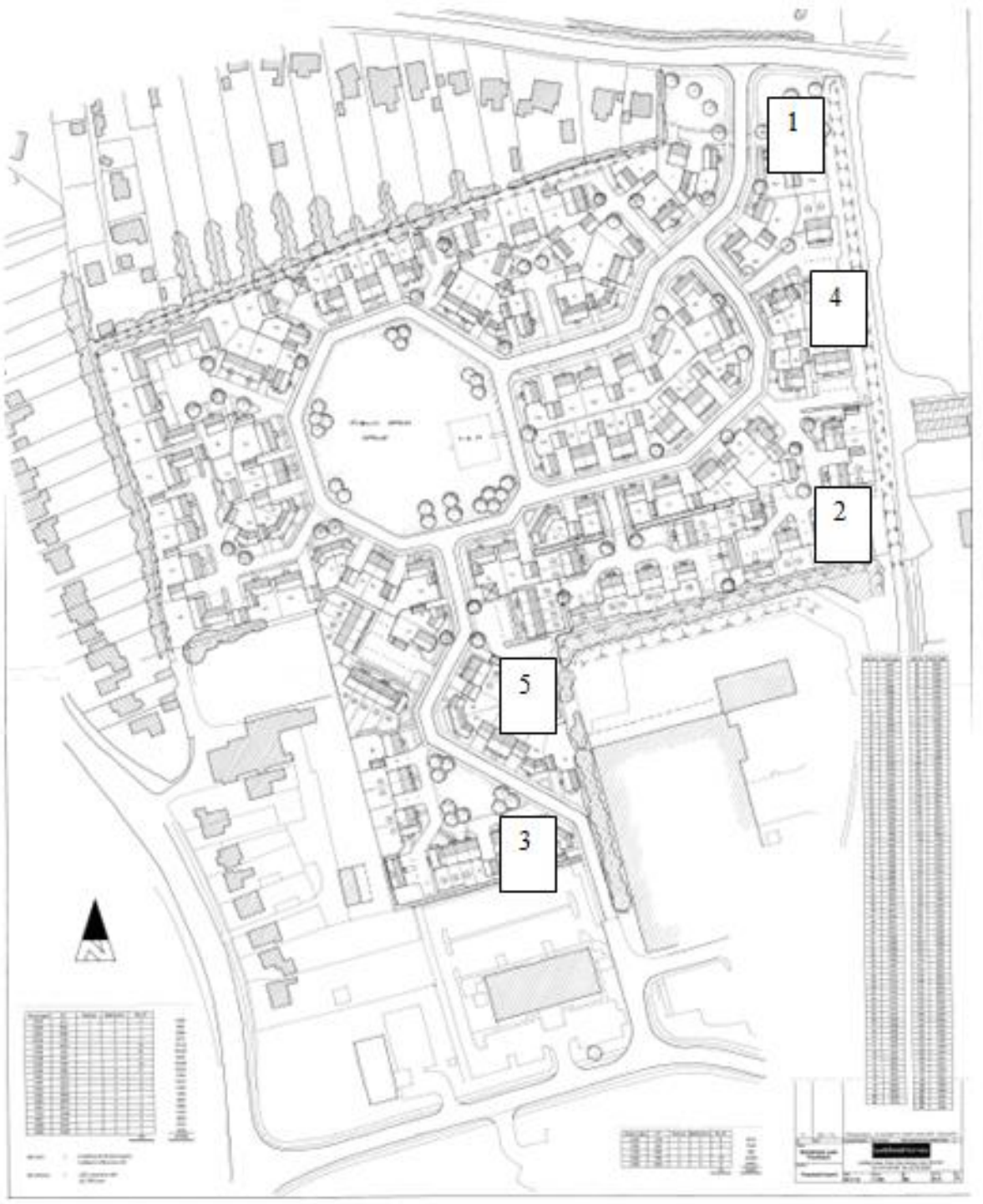
7.3 Local road traffic was found to be the prominent noise source impacting upon the site during the day and night. Some commercial noise was audible at the extremities of the site. In order to provide additional protection to these properties, upgraded acoustic measures have been proposed in these areas.

7.4 The suitability of the noise climate at the site for residential development has been assessed. The assessment has been undertaken in accordance with the National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE). Noise assessment and design targets for internal and external noise levels recommended in BS8233 have been used to quantify noise impact and determine suitability for residential development with due regard to effects on health and quality of life as set out in the NPSE.

7.5 Outline noise control measures have been recommended in order to meet appropriate noise level criteria for the proposed residential development.

7.6 It is our view that the site can be considered suitable for residential development in planning and noise terms, as acceptable noise levels can be achieved following the design and implementation of suitably specified noise mitigation measures. On this basis, we consider that the noise assessment methodology and conclusions meet the principles set out in the NPPF and NPSE.

FIGURE 1 – PROPOSED DEVELOPMENT & APPROXIMATE NOISE MONITORING LOCATIONS



APPENDIX I – NOISE UNITS AND INDICES

a) Sound Pressure Level and the decibel (dB)

A sound wave is a small fluctuation of pressure in air. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. Due to the wide range of pressure variations detectable by the ear, a logarithmic scale is used to convert the values into manageable numbers. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

b) Frequency and Hertz (Hz)

Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or Hertz (Hz). Sometimes large frequencies are often written as kilohertz (kHz), where 1kHz = 1000Hz.

Young people with normal hearing can hear frequencies in the range 20Hz to 20kHz. However, the upper frequency limit gradually reduces as a person gets older.

As the ear hears some frequencies better than others, the A-weighting scale is used to mimic human hearing. A-weighing applies a correction to the sound level at a given frequency depending on how well the ear hears that frequency.

c) Glossary of Terms

In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The indices used in this report are described below.

L_{Aeq} This is the A-weighted equivalent continuous sound level which is an average of the total sound energy measured over a specified time period. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period.

L_{Amax} This is the maximum A-weighted sound level that was recorded during the monitoring period.

L_{A90} This is the A-weighted sound level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

L_{A10} This is the A-weighted sound level exceeded for 10% of the time period and is often used in the assessment of road traffic noise.

SEL This is the Single Event Level or Sound Exposure Level. The SEL is the total energy measured over the event, compressed into 1 second. SEL= L_{Aeq}+10log(t), where t is time in seconds. Also L_{Aeq} =SEL - 10log(t) + 10log(n) where t is time in seconds and n is the number of events in the time period.

APPENDIX II – NOISE SURVEY DATA

Equipment: Rion NA28 Class I integrating sound level meter

Weather: Dry and calm

All values in dB(A), free field, 10 minute measurement periods unless stated otherwise.

Location 1 – North-east corner of the development site

Date	Time	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	Comments
22/05/13	13:50	60.3	72.0	64.2	50.6	Wardentree Lane road traffic noise
22/05/13	14:26	61.5	75.4	65.1	51.9	"
22/05/13	15:58	62.7	75.1	66.3	54.4	"
23/05/13	05:49	61.5	74.5	65.7	43.5	"
23/05/13	06:50	63.7	77.2	67.8	47.6	"

Location 2 – South-east corner of the development site

Date	Time	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	Comments
22/05/13	14:12	52.0	65.3	54.2	48.6	Distant road traffic noise, occasional commercial noise
22/05/13	15:04	51.0	63.3	52.8	48.8	"
22/05/13	16:13	51.4	68.1	52.6	48.7	"
23/05/13	06:02	40.7	46.3	41.9	39.0	Distant road traffic noise
23/05/13	06:14	46.8	56.4	49.0	43.9	"
23/05/13	06:39	49.6	67.9	51.6	45.7	Distant road traffic noise, occasional commercial noise

Location 3 – Southern edge of the development site

Date	Time	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	Comments
22/05/13	14:43	53.2	61.9	55.1	50.0	Distant road traffic noise
22/05/13	16:31	48.6	55.3	51.5	44.4	"
22/05/13	16:43	49.0	58.0	52.2	43.7	"
23/05/13	06:29	48.5	55.6	50.4	45.2	"
23/05/13	07:07	48.5	55.6	50.4	45.2	"

Location 4 – Eastern edge of the development site

Date	Time	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	Comments
22/05/13	15:15	54.9	63.6	55.9	53.6	Distant road traffic noise, with commercial noise

Location 5 – Additional Location near Empire World Trade

Date	Time	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	Comments
22/05/13	16:36	55.0	72.7	55.8	43.9	Distant road traffic noise, with commercial noise