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RIVERDALE DEVELOPMENTS LIMITED

PONDTAIL FARM, HORSHAM

NOISE AND VIBRATION ASSESSMENT

DECEMBER 2024

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Authored By Sam Geering	**Position** Senior Acoustic Consultant	**Signature**	**Date** 13/12/2024
Calculations Checked By Josh Evans	**Position** Senior Acoustic Consultant	**Signature**	**Date** 13/12/2024
Reviewed By Alex Mabey	**Position** Technical Director	**Signature**	**Date** 13/12/2024
Approved By Alex Mabey	**Position** Technical Director	**Signature**	**Date** 13/12/2024

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HEAD OFFICE: 37 Frederick Place, Brighton, E. Sussex BN1 4EA, UK Tel: +44 (0)1273 488186
LONDON OFFICE: 15 Adeline Place, London, WC1B 3AJ, UK Tel: +44 (0)203 9590899
enquiries@southdowns.eu.com www.southdowns.eu.com

Registered in England and Wales at 37 Frederick Place, Brighton, E. Sussex BN1 4EA, UK
Registration No: 3150111 VAT No: GB 673947486

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1. INTRODUCTION

1.1.1 Southdowns Environmental Consultants Ltd was commissioned in July 2020 by Riverdale Developments Limited to undertake a noise and vibration assessment of a proposed residential development at Pondtail Farm in Horsham, West Sussex.

1.1.2 A noise and vibration baseline surveys were undertaken in July and August 2020 and is documented in a Southdowns report (ref: 2374w-SEC-00001-07 [1]) along with a noise and vibration assessment.

1.1.3 The layout of proposed dwellings has since been updated and has been reassessed within this report. A further noise survey was undertaken in July 2024 and is also documented within this report.

1.1.4 The assessment has been prepared to accompany a planning application for the updated development comprising of 304 residential dwellings and 50 additional car parking spaces.

1.1.5 Noise levels measured on the site have been used to assess the potential impacts of environmental noise on the proposed development using noise criteria detailed in British Standard (BS) 8233:2014 [2], BS 4142:2014+A1:2019 [3] and other noise guidelines including Professional Practice Guidance on Planning & Noise (ProPG) [4] and the World Health Organisation (WHO) Guidelines for community noise [5].

1.1.6 Generic noise mitigation measures have been identified with the aim of achieving desirable internal noise levels in habitable rooms following the guidance given in the Sussex Planning Noise Advice Document [6].

1.1.7 Vibration magnitudes measured on site have been used to assess human exposure to vibration following the principles of the assessment methodology described in BS 6472-1:2008 [7].

1.1.8 The noise and vibration levels, guidance and assessment criteria are summarised in Section 2 of this report. The existing site and the development proposals are described in Section 3. A noise and vibration survey undertaken on site is described in Section 4. Details of the noise modelling of the proposed development are described in Section 5 and the noise assessment is presented in Section 6. A vibration assessment is presented in Section 7. Noise mitigation options are discussed in Section 8 and the findings of the assessment are summarised in Section 9 Figures and tables referred to in the report are presented in Appendices A and B, respectively.

2. NOISE LEVELS, VIBRATION UNITS AND CRITERIA

2.1 Noise Levels

2.1.1 Noise and sound are measured on a logarithmic scale in decibels (dB) because of the ears' sensitivity to a wide range of pressure changes. The sound pressure level (SPL) of a signal is denoted by the symbol L_p and defined by the equation $L_p = 10 \log (p/p_o)^2$ where p is the root mean square pressure of the signal and p_o is the reference sound pressure (2×10^{-5} Pa).

2.1.2 The human auditory system is capable of detecting sounds over a frequency range of 20 Hz to 20 kHz. Because the ear is most sensitive to sounds with frequencies between 1 and 5 kHz, an A-weighting network is used to reflect the differential sensitivity of human hearing to sounds of different frequency. The A-weighting sound pressure level, L_{pA}, is measured on a scale defined by the dB(A).

2.1.3 Community response to environmental noise sources is dependent on both acoustic and non-acoustic factors. The acoustic factors include absolute sound level, changes or exceedances of background or ambient levels as well as the characteristics, time, duration, and frequency of noise. National and local planning guidelines for noise assessment are set out below.

2.1.4 The dB(A) level is commonly used for the measurement and assessment of environmental noise due to the relationship between the subjective impression of the auditory strength of a sound, otherwise known as loudness, and the A-weighted sound pressure level of that sound. A change in 3 dB is the minimum perceptible change in event noise levels under normal everyday listening conditions, whilst a 10 dB increase or decrease in the sound pressure level of a steady sound generally corresponds to a perceived doubling or halving of loudness.

2.1.5 An indication of the range of sound pressure levels commonly found in the environment is given below:

Location	L_p dB(A)
Normal threshold of hearing	-10 to 20
Music halls and theatres	20 to 30
Living rooms and offices	30 to 50
Inside motor vehicles	50 to 70
Industrial premises	70 to 100
Burglar alarms at 1 m	100 to 110
Jet aircraft on take-off	110 to 130
Threshold of pain	130 to 140

2.1.6 The $L_{A90,T}$ *background* sound level is defined by the A-weighted sound pressure level of the ambient sound exceeded for 90% of a given time interval, T. This provides a measure of the lower levels of a fluctuating sound and is normally defined separately for day and night-time periods. Other percentiles are also sometimes used to describe the levels of ambient sound exceeded for different periods of time. The $L_{A50,T}$ and $L_{A10,T}$ sound levels denote the level of ambient sound exceeded for 50 and 10% of the time T, respectively whilst the $L_{Amax,F}$ sound level denotes the maximum instantaneous sound level in any given period of time obtained using the FAST time weighting.

2.1.7 The equivalent continuous sound pressure level is denoted by the symbol $L_{Aeq,T}$ and is defined as the notional steady sound which, at a given position over a defined period of time, T, has the same A-weighted acoustic energy as the actual fluctuating sound. This average sound

level is used in the UK for the measurement of noise from most sources including industry, construction, railways and aircraft and is widely used for the measurement of ambient sound, which comprises sound from all sources in the environment.

2.2 Vibration Units

2.2.1 Vibration is the oscillation of particles in an object or surface about a mean stationary position. The number of times a particle oscillates back and forth from its mean position per second defines the frequency of the vibration in Hertz (Hz). The distance a particle moves from its mean position is described as displacement, and is usually measured in m or mm. Vibrations can occur in one or more of three axes with respect to the direction of vibration propagation or the orientation of the receiver: radial, perpendicular and/or vertical, which are referred to as x, y and z respectively.

2.2.2 Depending on the type of vibration excitation, vibrations in an object can occur at a single frequency or at a number of different frequencies and can be categorised as periodic, random or transient.

2.2.3 Vibration is described as periodic if the vibration motion repeats after a time period. This type of vibration is also known as being deterministic, as the vibration induced in the object can be predicted. Frequencies contained in periodic vibrations usually consist of a fundamental frequency and frequencies appearing at multiples of the fundamental frequency, known as harmonics. Periodic vibration can typically be found in machinery or plant with rotating parts that operate at a certain forcing frequency.

2.2.4 Random vibrations, in contrast to periodic vibrations, are particle oscillations that are not repetitive and are therefore difficult to predict. Random vibration typically contains a broad spectrum of frequencies and is described in statistical terms. This type of vibration is also described as non-deterministic.

2.2.5 Transient vibration consists of a short burst of vibration energy, which then decays away after excitation. The decay of the vibration energy will depend on the vibration frequency and damping characteristics of the vibrating object or surface. The hammer blow of a piling rig is a typical source of transient vibration.

2.2.6 As well as displacement, vibration can also be described and measured in terms of velocity and acceleration.

2.2.7 Velocity is a measure of the rate at which the displacement changes with time (mm/s), and can be specified in terms of either Peak Particle Velocity (PPV), or as a root mean square (rms) value. PPVs can be expressed in terms of component or resultant. A component PPV is the highest PPV occurring in the x-, y- or z-axis. PPV is widely used for the assessment of vibration on structures, utilities and other sensitive equipment (including computers and laboratory equipment).

2.2.8 Acceleration defines the rate at which velocity changes with time (m/s^2), and is commonly expressed as an rms value (a_{rms}). In the UK, frequency weighted a_{rms} values are used for the evaluation of human exposure to vibration with regards to annoyance and comfort of occupants inside buildings.

2.3 Human Vibration Response

2.3.1 The human body has a complicated frequency response and has different resonances associated with the whole body and individual body parts. This makes different areas of the

body more sensitive to different vibration frequencies. The threshold of perceptible vibration of humans is generally very low and is typically around 0.14 to 0.3 mms^{-1} at frequencies between 8 Hz and 80 Hz.

2.3.2 Generally, the main transfer of building vibration into a human is either via a person standing on a vibrating floor or via vibrations transferred from the floor into a seat or bed and then into a person's body.

2.3.3 Perceptible vibration inside buildings can give rise to discomfort, disturbance and/or activity interference, as well as giving rise to concerns about building damage. The degree of annoyance someone may experience from the vibration can depend on a number of factors such as: the characteristics of vibration i.e. frequency (typically between 1 Hz and 80 Hz), duration, magnitude, continuous/transient/intermittent; time of day; audible noise that may accompany the vibration; and, the activity someone may be undertaking.

2.3.4 A method to assess human exposure to vibration in buildings is set out in BS 6472-1:2008, Guide to evaluation of human exposure to vibration in buildings, part 1: vibration sources other than blasting. This Standard provides a basis for the evaluation of vibration measurements or calculations in terms of the possibility of adverse comment from building occupants, based on upon the criteria presented in Table 2.1.

Place and time	Low probability of adverse comment	Adverse comment possible	Adverse comment probable
Residential buildings 16 h day	0.2 to 0.4 *(0.4 to 0.8)*[2]	0.4 to 0.8 *(0.8 to 1.6)*[2]	0.8 to 1.6 *(1.6 to 3.2)*[2]
Residential buildings 8 h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

TABLE 2.1: VIBRATION DOSE VALUES ($MS^{-1.75}$) ABOVE WHICH VARIOUS DEGREES OF ADVERSE COMMENT MAY BE EXPECTED IN RESIDENTIAL BUILDINGS

Note: 1) Below these ranges adverse comment is not expected
2) Numbers in parenthesis indicates vibration dose ranges for offices.

2.3.5 The standard goes on to indicate that value ranges are less stringent for offices and workshops and suggests applying multipliers of 2 and 4, respectively, to the above vibration dose ranges for a 16 hr day, i.e. daytime only on the basis that offices and workshops will not be occupied/in use at night.

2.3.6 The Standard defines a procedure for the calculation of a Vibration Dose Value (VDV), which is used to estimate the probability of adverse comment that might be expected from occupants experiencing vibration inside a building. The VDV is defined by the equation:

$$VDV = \left(\int_0^T a^4(t)dt\right)^{\frac{1}{4}}$$

where:

a(t) = the weighted acceleration at time t in m/s^2 and the integration time, T, is the total day or night-time period of interest in seconds.

2.3.7 VDV is described as the fourth root of the integral of the fourth power of vibration value with respect to time. Evaluation of vibration using a VDV places more emphasis on the amplitude

of the vibration event, as opposed to the duration. This means that a doubling of amplitude of a vibration event is equivalent to a 16-fold increase in the duration of the event.

2.4 National Noise Policy and Planning Policy Framework

Noise Policy Statement for England (NPSE)

2.4.1 The Noise Policy Statement for England (March 2010) [8], sets out the long-term vision of Government noise policy.

2.4.2 The vision of the NPSE is to 'Promote good health and a good quality of life through the effective management and control of noise within the context of Government policy on sustainable development'. This vision is supported by three key aims:

- avoid significant adverse impacts on health and quality of life;
- mitigate and reduce to a minimum other adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.

2.4.3 The NPSE applies to most forms of noise, including environmental noise, neighbour noise and neighbourhood noise, but not occupational noise in the workplace.

2.4.4 The NPSE has adopted the following concepts to help consider whether noise is likely to have 'significant adverse' or 'adverse' effects on health and quality of life:

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 noise.

LOAEL – Lowest Observed Adverse Effect Level

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

SOAEL – Significant Observed Adverse Effect Level

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

2.4.5 The NPSE goes on to state that:

"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."

National Planning Policy Framework

2.4.6 The Government's National Planning Policy Framework (NPPF) sets out the government's planning policies for England and how these are expected to be applied. NPPF was originally published in March 2012 revised in July 2018, updated in February 2019, revised in July 2021

and updated in September 2023. The most recent revision of the document was published in December 2023 [9] in response to the Levelling-up and Regeneration Bill: reforms to national planning policy consultation on 19th December 2023.

2.4.7 NPPF defines the Government's planning policy for England and sets out the framework that local authorities should take into account when preparing their local and neighbourhood plans, reflecting the needs and priorities of their communities.

2.4.8 The main references to noise in the NPPF are found in paragraphs 180 and 191. These paragraphs are reproduced below.

"180. 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 …

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

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life[69];

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 …"

2.4.9 Chapter 17 of the NPPF titled 'Facilitating the sustainable use of minerals', refers to noise relating to mineral extraction, stating that planning policies should *"when developing noise limits, recognise that some noisy short-term activities, which may otherwise be regarded as unacceptable, are unavoidable to facilitate minerals extraction"* and *"ensure that any unavoidable noise, dust and particle emissions and any blasting vibrations are controlled, mitigated or removed at source[76], and establish appropriate noise limits for extraction in proximity to noise sensitive properties;…"*

2.4.10 In the preparation of local plans, the NPPF specifies that local planning authorities should:

"set out criteria or requirements to ensure that permitted and proposed operations do not have unacceptable adverse impacts on the natural and historic environment or human health, taking into account the cumulative effects of multiple impacts from individual sites and/or a number of sites in a locality."

2.4.11 For proposed development near to an existing source(s) of noise, paragraphs 187 and 188 (reproduced below) in NPPF indicate that a developer should consider if there could be a significant adverse effect on future occupiers. Where a potential significant adverse effect is identified, developers may be required to factor into their planning application suitable

mitigation measures to avoid any significant adverse impacts on health and the quality of life for future occupiers.

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

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

Planning Practice Guidance - Noise

2.4.12 Planning Practice Guidance (PPG) on noise [10] was issued in March 2014 and was last updated in July 2019. This web-based guidance advises local planning authorities to take into account the acoustic environment, and in doing so consider the following:

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

2.4.13 The PPG includes examples of how to recognise when noise could be a concern and provides example outcomes to which the Observed Effect Levels can apply. The PPG noise exposure hierarchy is presented in Table 2.2, based on the likely average response, along with example outcomes.

2.4.14 While it is acknowledged that planning and nuisance regimes are separate entities, the hierarchy table does provide useful information regarding how the concept of SOAELs and LOAELs, introduced through the NPSE, could be applied and does allow for subjective observations to be considered in the context of potential effect levels. The presence of an "Effect Level" does not infer whether a nuisance is or is not present.

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other psychological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

TABLE 2.2: PLANNING PRACTICE GUIDANCE NOISE EXPOSURE HIERARCHY

2.4.15 The PPG guidance states that "*where external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended*."

2.5 BS 8233:2014

2.5.1 Guidance in BS 8233:2014 on sound insulation and noise reduction for buildings gives recommendations for the control of noise in and around buildings. The Standard suggests appropriate criteria and limits for different situations to guide the design of new or refurbished buildings undergoing a change of use.

2.5.2 Desirable ambient internal noise level design ranges are specified in the Standard and are reproduced in Table 2.3.

Activity	Room	Ambient Indoor Noise Level 07:00 to 23:00 hrs, dB $L_{Aeq,16\ hr}$	Ambient Indoor Noise Level 23:00 to 07:00 hrs, dB $L_{Aeq,8\ hr}$
Resting	Living Room	35	-
Dining	Dining room/ area	40	-
Sleeping (daytime resting)	Bedroom	35	30

TABLE 2.3: BS 8233 INDOOR AMBIENT NOISE LEVELS FOR DWELLINGS

Notes:

- Table provides recommended levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Groundborne noise is assessed separately and is not included as part of these targets, as human response to groundborne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.
- The levels shown 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, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended.
- These 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.
- 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.
- If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.
  If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.
- Attention is drawn to the Building Regulations.
- Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

2.5.3 Note 4 of Table 2.3 refers to regular individual noise events, such as aircraft, and indicates a guideline night-time level in terms of Sound Exposure (L_{AE}) or $L_{Amax,F}$ may be set depending on the character and number of noise events per night.

2.5.4 In external amenity spaces, such as private gardens and patios, BS 8233 indicates that it is desirable that the external noise level in these areas does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ in noisier environments.

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

2.6 Professional Practice Guidance on Planning & Noise (ProPG)

2.6.1 ProPG is a guidance document prepared by the Association of Noise Consultants et al to complement Government planning and noise policy by advocating full consideration of the acoustic environment from the earliest possible stage of the development control process; encouraging the process of good acoustic design in and around new residential developments; outlining what should be taken into account in deciding planning applications for new noise-sensitive developments; improving the understanding of how to determine the extent of potential noise impact and effect; and, assisting with the delivery of sustainable development by promoting good health and wellbeing through the effective management of noise.

2.6.2 ProPG promotes a 2-stage approach to a noise assessment. Stage 1 involves an initial noise risk assessment of the proposed development site. Stage 2 includes a systematic consideration of the following elements: demonstrating a "Good Acoustic Design Process"; observing internal "Noise Level Guidelines"; undertaking an "External Amenity Area Noise Assessment"; and consideration of "Other Relevant Issues".

2.6.3 This two-stage approach is underpinned by the preparation of an "Acoustic Design Statement" (ADS).

2.6.4 The general principles of 'Good Acoustic Design' referred to in ProPG are described as maximising the spatial separation of noise source(s) and receptor(s); investigating the necessity and feasibility of reducing existing noise levels and relocating existing noise sources; using existing topography and existing structures (that are likely to last the expected life of the noise-sensitive scheme) to screen the proposed development site from significant sources of noise; incorporating noise barriers as part of the scheme to screen the proposed development site from significant sources of noise; using the layout of the scheme to reduce noise propagation across the site; using the orientation of buildings to reduce the noise exposure of noise sensitive rooms; and using the building envelope to mitigate noise to acceptable levels.

2.6.5 ProPG includes two supplementary documents. Supplementary Document 1 provides an overview of key aspects of the Government's current planning policy framework. Supplementary Document 2 contains guidance on good acoustic design, which includes reference to BS 8233:2014, BRE Report 'Sound Control for Homes' and the Building Regulations.

2.6.6 ProPG contains guidance on noise maxima in relation to sleep disturbance, stating that individual noise events should not normally exceed 45 dB $L_{Amax,F}$ in bedrooms more than 10 times per night.

2.7 World Health Organization Guidelines

2.7.1 Guideline values for community noise in specific environments are presented in the World Health Organization (WHO) document and are summarised in Table 2.4.

Specific Environment	Critical Health Effect(s)	dB $L_{Aeq,T}$	Time Base hours	dB $L_{Amax,F}$
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45

TABLE 2.4: WHO GUIDELINE NOISE VALUES

Night Noise Guidelines for Europe

2.7.2 The document includes the following information about the potential effects of maximum noise levels during the night hours:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times per night (Vallet & Vernet 1991) and most

studies show an increase in the percentage of awakenings at SEL values of 55-60 dBA (Passchier-Vermeer 1993; Finegold et al. 1994; Pearsons et al. 1995). For intermittent events that approximate aircraft noise, with an effective duration of 10-30s, SEL values of 55-60 corresponds to a L_{Amax} value of 45dB. Ten to 15 of these events during an 8 hour night-time implies a $L_{Aeq, 8h}$ of 20-25dB. This is 5-10dB below the $L_{Aeq, 8h}$ or 30dB for continuous night-time noise exposure, and shows that intermittent character of noise must be taken into account when setting night-time noise limits for noise exposure. For example, this can be achieved by considering the number of noise events and the difference between the maximum sound pressure level and the background of these events."

2.8 British Standard BS 4142:2014+A1:2019

2.8.1 Guidance on the rating and assessing of sound of an industrial and/or commercial nature is contained in British Standard BS 4142: 2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

2.8.2 The standard states that:

"This standard is applicable to the determination of the following levels at outdoor locations:

a) rating levels for sources of sound of an industrial and/or commercial nature; and

b) ambient, background and residual sound levels

for the purposes of:

1) investigating complaints;

2) assessing sound from proposed, new, modified or additional source(s) of sound of an industrial nature and/or commercial nature; and

3) assessing sound at proposed new dwellings or premises used for residential purposes."

2.8.3 This standard, however, is not applicable to the passage of vehicles on public roads and railway systems.

2.8.4 The determination of noise amounting to a nuisance is beyond the scope of this British Standard.

2.8.5 The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.

2.8.6 Typically, the greater the difference between rating level and background noise level, the greater the magnitude of the impact:

- a difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- a difference of around +5 dB is likely to be an indication of an adverse impact, depending on context; and
- the lower the rating level is relative to the measured background sound level, the less likely it is that the specific source will have an adverse impact or a significant adverse

impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

2.8.7 Certain acoustic features can increase the significance of the impact over that expected from a basic comparison between specific sound level and the background sound level. These features include tonality and impulsivity, as well as additional characteristics and intermittency of the sound.

2.8.8 Where appropriate, a rating penalty for sound based on a subjective assessment of its characteristics should be established. In other circumstances an objective appraisal of tonal and/or impulsive characteristics may be appropriate.

2.8.9 An individual's response to sound can be subjective and the significance of a sound level impact can depend on such factors as the margin by which a sound exceeds the background sound level, its absolute level, time of day and change in the acoustic environment, as well as local attitudes to the source of the sound and the character of the neighbourhood. BS 4142:2014 therefore recognises the importance of the context in which a sound occurs and has taken into account the acoustical terms 'sound' and 'noise' in its development. BS 4142 refers to 'sound' as being measured by a sound level meter or other measuring system. The Standard refers to 'noise' as relating to a human response and is routinely described as unwanted sound, or sound that is considered undesirable or disruptive.

2.9 Local Authority Noise Criteria

2.9.1 The site of the proposed residential development is located within the administrative area of Horsham District Council (HDC).

2.9.2 The 'Planning Noise Advice Document: Sussex' [6] is applicable for developers and their consultants when making a planning application and provides advice on noise assessments for developments within the district of Horsham.

2.9.3 In relation to residential developments, the Planning Noise Advice Document: Sussex refers to the World Health Organization Guidelines for Community Noise (2009) (WHO), ProPG (2017) and British Standard 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings to guide planning application assessments. Reference to the rating of commercial noise sources, in line with British Standard 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound is also provided.

2.9.4 According to the Planning Noise Advice Document for Sussex, the indoor ambient noise levels in Tables 4 and 6 of BS 8233 should be applied to residential development that requires planning permission.

2.9.5 The Planning Noise Advice Document for Sussex states that for noise generated by a site of an industrial or commercial nature then:

2.9.6 "1) The rating level of plant, where practicable, shall be no greater that the existing background sound levels, when measured in accordance with BS 4142.

2) Where background sound levels are low, discussions shall be had with the LPA to agree an objective.

3) Apply the indoor ambient noise levels in Tables 4 and 6 of BS8233.

4) Apply the WHO 2009 Community Noise guidelines for outdoor amenity areas."

2.9.7 For new noise sensitive development near to existing industrial/commercial noise sources, the guidance document states that:

"6.6.1. Careful consideration will need to be given to proposals that are likely to site new noise sensitive developments near to existing industrial, commercial, entertainment premises, airfields air ports and sea ports.

6.6.2. The 'agent of change' principle, the principle by which a person or business introducing a new land use is responsible for managing the impact of that change, will apply. The National Planning Policy Framework 2019 Para 182 states: "Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities."

6.6.3. There is no protection offered in law to existing premises from nuisance complaints made by new residents. This may result in formal action being taken against these premises if a statutory nuisance is established or civil action at common law for nuisance.

6.6.4. Where it is apparent to the LPA that existing noise from an existing industrial, commercial, entertainment premises, places of worship, sports clubs, airfields, airports and sea ports is likely to cause unreasonable or adverse effects to new residents, the development is unlikely to be supported unless the applicant (or 'agent of change') provides clear evidence that adequate noise attenuation to the existing noise sources can and will be provided. The applicant (or 'agent of change') will be required to provide a detailed noise mitigation plan with their acoustic assessment.

6.6.5. In some circumstances, legal agreements can be entered into, whereby the developers provide the necessary measures to attenuate the existing noise through appropriate techniques including re-engineering the source to reduce emissions, adequate acoustic enclosure / sound proofing or re-locating the noise source.

6.6.6. As outlined previously, following Good Design, if it is determined that windows shall have to be closed to achieve an acceptable internal noise level then an overheating assessment shall be required and an acoustic, ventilation and overheating mitigation scheme, that considers air quality, provided for review as part of the planning process"

2.9.8 Advise is also included in the Sussex guidance document that indicates a vibration survey should be carried out and that predicted Vibration Dose Values (VDV) should confirm the 'low probability of adverse comment' thresholds of BS 6472-1:2008 'Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting' [7].

3. SITE DESCRIPTION AND DEVELOPMENT PROPOSAL

3.1 Existing Site

3.1.1 An outline of the existing site is shown on Figure A1 of Appendix A.

3.1.2 The area to be developed is currently open fields and wooded areas.

3.1.3 To the south of the site is the A264, which runs in an east to west direction.

3.1.4 Langhurst Wood Road bounds the site directly to the east.

3.1.5 The Sutton & Mole Valley railway line lies to the west of the site, with Warnham Station located near to the northwest corner of the proposed development site.

3.1.6 Next to the railway station are various commercial premises which include: Greens of Horsham a car repair/MOT test centre; Ryan James Benson Commercials Ltd (RJB): a car and commercial vehicle repairs operation; and, Panel 2 Paint: a car body paint specialist.

3.1.7 An industrial estate is situated to the north of the site, which includes Wienerberger a building materials supplier and Britaniacrest Recycling.

3.1.8 Only Wienerberger has operations that take place during night-time periods.

3.1.9 Mercer Road divides the development site into northern and southern parcels of land.

3.2 Proposed Development

3.2.1 The proposed site layout is presented in Figure A2 of Appendix A.

3.2.2 The development comprises 304 residential dwellings and 50 public car parking spaces.

3.2.3 The residential dwellings are a mix of apartments, houses with 2 to 5 bedrooms and front and rear gardens.

3.2.4 There are also various grass covered outdoor amenity spaces located within the development site.

3.3 Subjective Observations

3.3.1 The main source of noise across site was reasonably steady and continuous road traffic on the A264.

3.3.2 Intermittent noise from trains passing on the Sutton & Mole valley railway line was also present.

3.3.3 Secondary sources of noise included local traffic movements on Langhurst Road and Mercer Road.

4. NOISE AND VIBRATION SURVEY

4.1 Noise and Vibration Monitoring

4.1.1 Details of a baseline sound and vibration survey undertaken in 2020 at locations within the site boundary are presented in Southdowns' Noise and Vibration Assessment Report (ref: 2473w-SEC-00001-07) [1].

4.1.2 Source term measurements were also undertaken of industrial and commercial noise sources that surround the proposed development.

4.1.3 The measurement locations of the baseline survey are presented in Figure A3 of Appendix A.

4.2 Attended Noise Monitoring

Night-time Attended Noise Monitoring

4.2.1 Additional sample attended noise measurements were obtained during the night-time period of 18th of July 2024 between 00:32 hrs and 01:20 hrs at 5 no. monitoring locations labelled as ST1A to ST5A on Figure A4 of Appendix A. A static monitor was also used positioned at LT3.

4.2.2 The attended noise measurements were obtained using Rion NL-52 sound level meters fitted with windshields. Each microphone was positioned approximately 1.5m above ground level.

4.2.3 The sound level meters were configured to measure broadband A-weighted levels which included $L_{Amax,F}$, $L_{Aeq,1min}$, $L_{A10,1min}$ and $L_{A90,1min}$ levels over consecutive 1-minute intervals. Continuous $L_{Aeq,1sec}$ measurements were also obtained.

4.2.4 The clock on the attended sound level meter was synchronised with the clock of the static sound level meters.

4.2.5 The sound level meter was calibrated before and after the survey using a Rion NC-74 Class 1 Acoustic Calibrator to generate a calibration level of 94.0 dB at 1 kHz.

4.3 Weather Conditions

4.3.1 The weather during the night-time attended monitoring on Thursday 18th July 2024 was dry and clear skies. Average wind speeds remained below 1 ms^{-1}. The air temperature was around 16^{O}C, with approximately 70% relative humidity.

5. NOISE SURVEY RESULTS

5.1 Attended Noise Survey

5.1.1 The results of the attended noise monitoring during the night-time of 18th July 2024 are summarised in Table 5.1.

5.1.2 The 1-minute results of the of the attended monitoring are presented in Table B2 of Appendix B.

Start Time	End Time	Measured Noise Levels, dB re. 2 x 10^{-5} Pa.								
		ST Location					LT3			
		Loc	$L_{Amax,F}$	$L_{A10,T}$	$L_{Aeq,T}$	$L_{A90,T}$	$L_{Amax,F}$	$L_{A10,T}$	$L_{Aeq,T}$	$L_{A90,T}$
00:32	00:39	ST1	51.8	47.2	45.9	44.4	53.3	47.6	45.9	44.2
00:44	00:50	ST2	50.9	46.4	44.9	43.0	52.2	47.5	45.9	44.4
00:54	01:01	ST3	48.7	43.5	42.4	40.6	48.6	45.6	44.8	43.6
01:04	01:10	ST4	51.9	45.0	43.6	40.9	51.9	47.3	46.1	44.3
01:13	01:19	ST5	52.0	44.8	43.1	41.1	50.3	46.5	45.2	43.6

TABLE 5.1: ATTENDED NIGHT-TIME NOISE SURVEY RESULTS, THURSDAY 18TH JULY 2024

5.1.3 Observations made during the attended survey indicate that operations undertaken by Wienerberger were the principle noise source and dictated the ambient $L_{Aeq,T}$ and background L_{A90} noise levels at all ST locations.

5.1.4 Road traffic on the A264 was present but there were frequent periods where road traffic was absent during the measurements.

5.2 Source Term Survey Results

5.2.1 The results of source-term attended noise measurements of the commercial and industrial activity located to the north of the development site are presented in Section 5.3 of the previous report [1] and are reproduced below Table 5.2.

Company	Source	Distance (m)	Duration (mm:ss)	$L_{Aeq,T}$[1]
Britaniacrest Recycling	Breakout from industrial building	10	02:15	63.2
	HGV on weighbridge	15	02:00	65.1
	Truck Pass-by	20	00:25	67.7
	Dumper truck	25	01:30	61.0
	Luton Van	25	00:25	61.8
	JCB Grabber	25	02:50	65.5
Wienerberger	Breakout from building (north)	20	01:05	64.8
	Forklift trucks (north Yard)	20	01:00	68.1
	Dumper Truck	20	04:00	62.2
	Exhaust/Extract Flue	30	13:20	54.5
	Condenser Unit	5	02:05	55.1
	Breakout from building South #1	8	07:05	50.3
	Breakout from building South #2	5	05:00	56.2
	Breakout from building South #3	5	05:05	52.1
Panel 2 Paint	Breakout from East façade during angle grinding	2.5	02:00	54.5
RJB Commercials	Large Van	5	01:50	59.7
	Wheel Gun	3	01:40	86.9
	Van	5	01:25	62.5
	Breakout from workshop	10	02:15	62.1
	Truck	10	03:35	64.4
Greens of Horsham	Breakout at east façade	10	15:25	48.3

TABLE 5.2: SOURCE-TERM NOISE SURVEY RESULTS, TUESDAY 11TH AUGUST 2020

Note: [1] $L_{Aeq,T}$ noise levels corrected for the influence of underlying residual ambient sound environment

6. NOISE MODELLING

6.1 Sound Model Calculations

6.1.1 A sound model has been developed and calibrated using the measured noise data to calculate sound levels at a sample of façade positions located across the proposed development.

6.1.2 The sound modelling has been undertaken using CadnaA a commercially available software package designed to predict environmental noise levels.

6.2 Model Assumptions

6.2.1 Principal features of the area surrounding the proposed development such as existing buildings and other intervening structures have been based on Ordnance Survey mapping, site plans and supplemented with on-site observations.

6.2.2 Ground contours have been based on Lidar survey results supplied by Defra (Department for Environmental, Food & Rural Affairs) which an accuracy of 2m.

6.2.3 The dimensions of the proposed residential building have been based on the proposed plans. Proposed dwellings have been modelled at a height of 7.5 m with two floors and a gable roof. Where identified on proposed plans, garages and other outbuildings have been modelled at a height of 5m to assume with a single floor and a gable roof.

6.2.4 An existing noise barrier runs along part of the A264 at the south of the proposed development. This has been modelled at a height of 1.8m on the northern boundary of the road.

6.2.5 No extra fencing or other noise protection has been modelled as part of the proposed plans.

6.2.6 Properties have been allocated ID numbers. These are presented in Figures A6 to A8 of Appendix A.

6.3 Calculated Source Noise Levels

6.3.1 The daytime and night-time noise levels ($L_{Aeq,T}$) of vehicle traffic on the A264 were determined by analysis of the unattended noise data at LT1. Levels were obtained by logarithmic averaging of the measured daytime $L_{Aeq,16hr}$ and night-time $L_{Aeq,8hr}$ levels across the noise survey at the LT1 monitoring position. The sound levels are summarised in Table 6.1.

Primary Source	Calibration Receiver Location	Daytime Noise Level (dB $L_{Aeq,16hr}$)	Night-time Noise Level (dB $L_{Aeq,8hr}$)
A264	LT1	60	53

TABLE 6.1 DAYTIME AND NIGHT-TIME NOISE LEVELS OF A264

6.3.3 The typical daytime and night-time noise levels of trains on the Sutton & Mole Valley line were determined using attended noise data obtained at LT2 alongside train timetables. Sound measurements ($L_{Aeq,5min}$) obtained during the daytime attended survey that contained a train pass from which a typical Single Event Level (SEL) was derived. Train timetables were used to determine the approximate number of trains during the daytime and night-time periods in either direction and the following formula was applied to determine the overall daytime $L_{Aeq,16hr}$ and night-time L_{Aeq8hr} levels:

$$L_{Aeq,T} = SEL + 10Log\left(\frac{N}{T}\right)$$

where:

$L_{Aeq,T}$ = The equivalent-continuous sound pressure level (dB) over the period of interest (T);
SEL = The Single Event Level of the noise event;
N = The number of noise events over the time period of interest (T); and
T = Time in seconds.

6.3.4 The calculated daytime and night-time noise levels of Sutton & Mole Valley trains at LT2 are shown in Table 6.2 below.

Location	Average Single Event Level of Train (dB L_{AE})	Daytime (07:00 – 23:00)		Night-time (23:00 – 07:00)	
		No. Trains	Noise Level (dB $L_{Aeq,16hr}$)	No. Trains	Noise Level (dB $L_{Aeq,8hr}$)
LT2	82.6	35	51.4	5	46.0

TABLE 6.2 CALCULATED NOISE LEVELS OF SUTTON & MOLE VALLEY RAILWAY

6.3.5 Point sources have been placed into the model to represent items of plant from surrounding industrial and commercial premises. A vertical area source has been placed into the model for noise breaking out from facades of buildings.

6.3.6 No on-time correction has been applied in order to consider a worse-case assessment, as indicated in Table B1 of Appendix B

6.3.7 During daytime periods, all plant items have been modelled as operational.

6.3.8 During night-time periods, the Weinberger extract flue has been modelled as operational as it is understood that this plant operates 24/7.

6.4 Model Calibration

6.4.1 Receiver positions corresponding to the long-term measurement positions at LT1, LT2 and LT3 were input into the acoustic model and used for calibrating the noise model.

6.4.2 The A264 was modelled and configured using the parameters of the CRTN calculation method with the geometry of the road and side barriers determined using on-site observations and aerial photo imagery. The noise emission of the road was input manually and calibrated to return the noise levels shown in Table 6.1 at the receiver position LT1.

6.4.3 The Sutton & Mole Valley railway has been acoustically modelled and calibrated to return the calculated noise levels shown in Table 6.2.

6.4.4 Noise levels at LT3 were affected by several sources including the A264 and the Sutton & Mole valley railway line. Following calibration of the road and rail traffic noise sources using the noise data at LT1, LT2 and ST3, sound levels were calculated at the LT3 calibration receiver and compared against the measured levels at this position.

6.4.5 Each commercial and industrial noise source has been calibrated to levels presented in Table 5.2 at receiver locations presented in Figure A9 of Appendix A.

6.4.6 During the night-time periods, it is understood that Weinerbrger undertake operations within the factory which was observed during the night-time measurements.

6.4.7 Therefore the model has been calibrated to achieve the night-time noise levels measured at the nearest unattended noise monitor LT3, 47 dB $L_{Aeq,T}$ as well as the attended noise measurement locations ST1A – ST5A presented in Figure A4 of Appendix A

7. NOISE ASSESSMENT

7.1 BS 8233 Assessment

External Noise Levels

7.1.1 BS 8233 guidance on suitable outdoor noise levels states that a desirable level for steady continuous noise should not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ in noisier environments. Similar outdoor guideline levels are also presented in WHO noise guidelines for the identification of 'moderate' and 'serious' annoyance critical health effects.

7.1.2 It is recognised in BS 8233 that these guideline values are not achievable in all circumstances where development might be desirable for other reasons than noise. In higher noise areas, such as city centres or urban areas adjoining the strategic network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations, or making efficient use of land resources to ensure development needs can be met, might be warranted.

7.1.3 Noise contour plots has been calculated from the CadnaA noise propagation model of the proposed site in order to provide an indication of the spatial variation in road and rail noise levels in external areas across the development site. A noise contour plot of predicted daytime levels at a relative ground height of 1.5 m is presented in Figure A10 of Appendix A. A noise contour plot of predicted night-time levels at a relative ground height of 4.0 m is presented in Figure A11 of Appendix A.

7.1.4 Analysis of the daytime noise contour plot shows that the predicted noise levels in most rear garden spaces, are below 55 dB $L_{Aeq,16hr}$.

7.1.5 The rear gardens of dwellings within the areas of G and H, external amenity noise levels are calculated to fall below 50 dB $L_{Aeq,16hr}$ and therefore achieve the desirable guideline value.

7.1.6 The majority of rear gardens of dwellings within the areas of D, E, and F external amenity noise levels are calculated to fall below 50 dB $L_{Aeq,16hr}$ and therefore achieve the desirable guideline value. However, a small number of gardens in these areas exceed 50 dB $L_{Aeq,16hr}$ but fall below 55 dB $L_{Aeq,16hr}$ and therefore achieve the upper guideline value.

7.1.7 The majority of rear gardens of dwellings within the areas of A, B and C are modelled with noise levels that fall below 55 dB $L_{Aeq,16hr}$ and therefore achieve the upper guideline value. The rear gardens of A01, B07-B09, B17 and B18 are predicted to exceed 55 dB $L_{Aeq,16hr}$.

7.1.8 Whilst the predicted levels for these dwellings are above the upper 55 dB $L_{Aeq,T}$ guideline level recommended in BS 8233:2014, the standard does acknowledge that the proposed limits are guidelines only and are not practical to achieve in all circumstances, as stated below:

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

7.1.9 The proposed Pondtail Farm residential development is situated in an area with easy access to National Rail services to and from London via the South London line. The A264 is a major artery road linking A23 and A24, both of which have direct access to London with the M25 and

the wider strategic motorway network. The elevated noise levels in the external amenity areas, which are attributable primarily to the major transport sources, could therefore be offset by the benefits that these transportation links provide.

7.1.10 An indication of how the external noise levels calculated at each dwelling compare to the 50 dB $L_{Aeq,T}$ and 55 dB $L_{Aeq,T}$ BS 8233 guideline levels for outdoor areas is presented in Figure A12 of Appendix A.

7.1.11 It should be noted that barriers such as garden fences have not been modelled.

Internal Noise Levels

7.1.12 BS 8233:2014 recommends desirable daytime guideline levels of 40 dB $L_{Aeq,16hr}$ in dining areas, 35 dB $L_{Aeq,16hr}$ for resting inside bedrooms and living rooms, and 30 dB $L_{Aeq,8hr}$ for sleeping inside bedrooms at night.

7.1.13 Annex G of BS 8233 indicates that a typical road traffic noise reduction for a dwelling with insulating (6-12-6) glass unit windows set in a brick/block wall combined with sound attenuating trickle vents is 33 dB(A). For a façade with a partially open window, BS 8233 indicates that the sound façade reduction is approximately 15 dB(A).

7.1.14 Using these indicated façade reductions, internal noise levels have been estimated at locations across the development site and are summarised with the worst affected receptors in each area in Table 7.1. The full list of receptors is presented in Table B3 of Appendix B.

Property ID	Floor	Predicted Daytime External Free-field Noise Level $L_{Aeq,16hr}$	Predicted Internal Noise Level, dB $L_{Aeq,16hr}$		Predicted Night-time External Free-field Noise Level $L_{Aeq,8hr}$	Predicted Internal Noise Level, dB $L_{Aeq,8hr}$	
			Windows Partially Open	Windows Closed		Windows Partially Open	Windows Closed
A01	GND	58	43	25	51	36	<25
A01	1st	59	44	26	52	37	<25
B01	GND	59	44	26	52	37	<25
B01	1st	60	45	27	53	38	<25
C01	GND	56	41	<25	49	34	<25
C01	1st	57	42	<25	50	35	<25
D01	GND	54	39	<25	47	32	<25
D01	1st	54	39	<25	47	32	<25
E01	GND	52	37	<25	46	31	<25
E01	1st	53	38	<25	47	32	<25
F01	GND	55	40	<25	49	34	<25
F01	1st	55	40	<25	49	34	<25
G01	GND	50	35	<25	43	28	<25
G01	1st	51	36	<25	45	30	<25
H03	GND	50	35	<25	43	28	<25
H03	1st	52	37	<25	45	30	<25

TABLE 7.1: SUMMARY OF CALCULATED DAYTIME AND NIGHT-TIME AMBIENT NOISE LEVELS WITHIN HABITABLE ROOMS AT THE FRONT AND REAR OF THE PROPOSED DEVELOPMENT

Notes:

- *Red text indicates internal predicted noise levels which exceed the criteria.*
- *With windows closed the assumed composite façade reduction is 33 dB from the free-field noise level.*
- *With an open window, the assumed façade reduction is 15 dB from the free-field noise level.*
- *For all buildings apart from the apartment building, night-time internal noise levels are not presented at ground floor height as it is assumed all bedrooms are on upper floors.*

7.1.15 Based on the assumed typical façade reductions, the simple calculations indicate that internal noise levels at the façade areas, all properties of the proposed development are calculated to meet the BS 8233 desirable daytime criteria of 35 dB $L_{Aeq,16hour}$, for living rooms and bedrooms, 40 dB $L_{Aeq,16hour}$, for dining areas and the night-time criterion level of 30 dB $L_{Aeq,8hour}$ for bedrooms with closed insulating windows, assuming a typical façade sound reduction of 33 dB R_w.

7.1.16 With windows partially open, assuming a typical façade reduction of 15 dB R_w, all properties predicted to achieve the BS 8233 desirable criteria are presented in Table 7.2.

Period	Internal Noise Criterion	Dwellings Achieving Criterion With Windows Partially Open	
		Ground Floor	1st Floor
Daytime	35 dB $L_{Aeq,16hr}$	A16, A18, A20	A09, A10, A12, A16-A21
		B16, B19-B22	B04, B05, B10, B11, B13-B16, B19-B22
		C07-C16	C07-C12, C14-C17
		D03, D04, D09-D34	D05-D11, D15, D17-D19, D22-D26, D35
		E06-E09, E15-E18	E02-E18
		F04-F06, F10-F20	F04-F08, F10, F11, F13, F17, F19, F20
		G01-G21	G01-G06, G08-G21
		H01-H12	H01-H03, H05-H12
Night-time	30 dB $L_{Aeq,8hr}$		
			B20, B21
			C07, C08, C11-C16
		D04, D11-D13, D15-D34	D03, D04, D09-D35
		E06-E09, E15-E18	E06-E09, E15-E18
		F04-F06, F12-F20	F04-F06, F10-F20
		G02-G05, G07, G11-G17	G01-G21
		H04-H12	H01-H12

TABLE 7.2: SUMMARY OF DWELLINGS ACHIEVING BS 8233 DESIRABLE CRITERIA WITH WINDOWS PARTIALLY OPEN

7.1.17 BS 8233 indicates that the single value R_w values adopted for the estimation of internal noise levels suffice for initial calculations. However, this method can underestimate internal noise levels by up to 5 dB. As the calculated noise levels are within 5 dB of the target noise levels, a further detailed study is recommended at the detailed design stage of the project. Such a study should incorporate a frequency-dependent calculation of the internal noise levels and demonstrate that the proposed façade elements are adequate in controlling noise to within the target criteria.

7.1.18 The analysis of predicted internal noise levels with windows partially open at each façade for daytime and night-time periods at ground floor height is presented in Figure A13 and Figure A15 of Appendix A, respectively.

7.1.19 The analysis of predicted internal noise levels with windows partially open at each façade for daytime and night-time periods at 1st floor height is presented in Figure A14 and Figure A16 of Appendix A, respectively.

Maximum ($L_{Amax,F}$) Noise Levels

7.1.20 ProPG defines a night-time maximum internal noise level of 45 dB $L_{Amax,F}$. In order to avoid sleep disturbance, the guidance suggests that design measures are put in place to ensure "*…individual noise events do not normally exceed 45 dB $L_{Amax,F}$ more than 10 times a night.*"

7.1.21 Table 7.3 shows the maximum free-field night-time levels across the unattended survey and the number of exceedances of the 45 dB $L_{Amax,F}$ of internal noise levels assuming a minimum sound reduction of 33 dB R_w at locations LT1, LT2 and LT3.

Date	Monitoring Location					
	LT1		LT2		LT3	
	Measured Maximum $L_{Amax,F}$	Calculated # of Exceedances of 45 dB $L_{Amax,F}$[1]	Measured Maximum $L_{Amax,F}$	Calculated # of Exceedances of 45 dB $L_{Amax,F}$[1]	Measured Maximum $L_{Amax,F}$	Calculated # of Exceedances of 45 dB $L_{Amax,F}$[1]
29/07/2020	71	0	80	2	69	0
30/07/2020	72	0	82	2	65	0
31/07/2020	72	0	80	1	68	0
01/08/2020	76	0	88	2	67	0
02/08/2020	66	0	73	0	68	0
03/08/2020	80	1	80	1	69	0
04/08/2020	-	-	81	1	70	0
05/08/2020	-	-	82	1	69	0
06/08/2020	-	-	80	1	68	0
07/08/2020	-	-	82	1	67	0
08/08/2020	-	-	82	1	65	0
09/08/2020	-	-	73	0	66	0
10/08/2020	-	-	79	1	65	0

TABLE 7.3: SUMMARY OF MAXIMUM NOISE LEVELS AND EXCEEDANCES OF INTERNAL CRITERIA

Notes: [1] Internal noise levels, assuming a minimum sound reduction of 33 dB Rw.

7.1.22 Table 7.3 shows that with a minimum sound reduction of 33 dB *Rw*, windows closed, the ProPG criteria of no more than 10 exceedances of 45 dB $L_{Amax,F}$ will be achieved for dwellings surrounding positions LT1, LT2 and LT3.

7.1.23 LT1, LT2 and LT3 are closer to noise sources than any of the proposed dwellings so it is assumed that $L_{Amax,F}$ noise levels at dwellings are likely to be marginally lower than measured at these positions.

7.2 BS 4142 - Existing Noise Sources

7.2.1 Following the principles of BS 4142, the method for predicting the significance of sound of an industrial and/or commercial nature is based on a comparison of the rating level, defined as the specific sound level plus any adjustment for the characteristic features of the sound such as tonality/intermittency, with the background sound level, $L_{A90,T}$.

Background Sound Level ($L_{A90,T}$)

7.2.2 The $L_{A90,T}$ background sound level is the sound level exceeded for 90% of the time in the absence of any sound from the specific source of interest. Consideration of statistical analysis

of background sound levels and the attended measurements indicates that the measurements obtained at LT1, LT2, LT3, ST1, ST2 and ST3 are representative of the background sound environment at receptors close to each of these measurement positions.

7.2.3 The background sound levels derived to assess the commercial activity sound levels are presented in Table 7.4.

Measurement location	Representative Property Areas	Daytime background Noise Level $L_{A90,1hr}$	Night-Time background Noise Level $L_{A90,15min}$
LT1	A	49	32
LT2	B	46	32*
LT3	G	49	32*
ST1	C, D	44	32*
ST2	E, F	48	32*
ST3	H	48	32*

TABLE 7.4: BACKGROUND SOUND LEVEL, L_{A90}, AT MEASUREMENT POINTS
*Note: * - Based on LT1 measurements due to potential influence from plant operational during night-time periods*

Determination of the Specific Sound Level

7.2.4 The specific sound level is the equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time.

7.2.5 The specific sound levels have been determined by calculation via acoustic modelling, as detailed in Section 6.

BS 4142 Assessment

7.2.6 BS 4142 advises that a rating penalty should be established, based on the assessment of a sound's characteristics, and added to the specific sound level where appropriate.

7.2.7 Subjectively there were no notable acoustic features (i.e. tonality, intermittency, or impulsivity) audible at a location considered to be representative of the nearest proposed residential receptor during the attended survey. However, BS4142 states that "*Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.*". A +3 dB has been applied as cautious allowance for sound feature characteristics that may be readily distinctive at each receptor.

7.2.8 According to BS 4142:2014+A1:2019, the greater the difference, the greater the magnitude of the impact. A level difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context, while a level difference of around +5 dB or more is likely to be an indication of an adverse impact, again depending on the context. Where a rating Level falls below the background noise level, then this provides an indication of the specific sound source as having a low impact, depending on the context.

7.2.9 The daytime rating levels for the modelled worst-case scenario for property areas F and G are presented in Table 7.5. Daytime rating levels for the other property areas are presented in Table B4 to Table B9 of Appendix B.

Receptor	Floor	Specific Sound Level, dB ($L_{Aeq,1hr}$)	Feature Correction	Rating Sound Level, dB ($L_{Ar,1hr}$)	Background Sound Level dB ($L_{A90,T}$)	Excess of rating over background sound level, dB
F01	Ground	38	3	41	48	-7
F02		33	3	36		-12
F03		30	3	33		-15
F04		31	3	34		-14
F05		34	3	37		-11
F06		36	3	39		-9
F07		36	3	39		-9
F08		37	3	40		-8
F09		44	3	47		-1
F10		42	3	45		-3
F11		41	3	44		-4
F12		40	3	43		-5
F13		34	3	37		-11
F14		34	3	37		-11
F15		31	3	34		-14
F16		37	3	40		-8
F17		41	3	44		-4
F18		39	3	42		-6
F19		32	3	35		-13
F20		38	3	41		-8
G01	Ground	42	3	45	48	-3
G02		44	3	47		-1
G03		43	3	46		-2
G04		44	3	47		-1
G05		44	3	47		-1
G06		41	3	44		-4
G07		36	3	39		-9
G08		35	3	38		-10
G09		38	3	41		-7
G10		42	3	45		-3
G11		43	3	46		-2
G12		41	3	44		-4
G13		43	3	46		-2
G14		41	3	44		-4
G15		42	3	45		-3
G16		42	3	45		-3
G17		40	3	43		-5
G18		34	3	37		-11
G19		34	3	37		-11
G20		35	3	38		-10
G21		36	3	39		-9

TABLE 7.5: CALCULATED SPECIFIC AND RESULTANT RATING LEVELS- DAYTIME – PROPERTY AREAS F & G

7.2.10 Results for all properties show calculated daytime rating levels do not exceed the background noise level.

7.2.11 According to BS 4142, where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

7.2.12 The local authority criterion is achieved at all dwellings during daytime periods.

7.2.13 The night-time rating levels calculated in the property areas labelled F and G are presented in Table 7.6. Night-time rating levels for the other property areas are presented in Table B10 to Table B15 of Appendix B.

Receptor	Floor	Specific Sound Level, dB ($L_{Aeq,15min}$)	Feature Correction	Rating Sound Level, dB ($L_{Ar,15min}$)	Background Sound Level dB ($L_{A90,T}$)	Excess of rating over background sound level, dB
F01	1st	35	3	38	32	+6
F02		34	3	37		+5
F03		31	3	34		+2
F04		33	3	36		+4
F05		34	3	37		+5
F06		34	3	37		+5
F07		35	3	38		+6
F08		34	3	37		+5
F09		38	3	41		+9
F10		38	3	41		+9
F11		37	3	40		+8
F12		37	3	40		+8
F13		34	3	37		+5
F14		34	3	37		+5
F15		31	3	34		+2
F16		35	3	38		+6
F17		37	3	40		+8
F18		36	3	39		+7
F19		31	3	34		+2
F20		36	3	39		+7
G01	1st	39	3	42	32	+10
G02		40	3	43		+11
G03		42	3	45		+13
G04		44	3	47		+15
G05		44	3	47		+15
G06		42	3	45		+13
G07		36	3	39		+7
G08		36	3	39		+7
G09		36	3	39		+7
G10		43	3	46		+14
G11		43	3	46		+14
G12		41	3	44		+12
G13		42	3	45		+13
G14		40	3	43		+11
G15		41	3	44		+12
G16		40	3	43		+11
G17		38	3	41		+9
G18		34	3	37		+5
G19		34	3	37		+5
G20		36	3	39		+7
G21		36	3	39		+7

TABLE 7.6: CALCULATED SPECIFIC AND RESULTANT RATING LEVELS – NIGHT-TIME – PROPERTY AREAS F & G

7.2.14 The night-time rating levels presented in Table 7.6 are calculated to exceed the night-time background sound level by up to 15 dB at receptors within area G.

7.2.15 According to BS 4142, where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact. A difference of around +5 dB or more is likely to be an indication of an adverse impact and a difference of around +10 dB or more is likely to be an indication of a significant adverse impact.

7.2.16 BS 4142 goes on to indicate that the impact derived by the comparison of the rating Level with background sound level is however dependent on the context of the sound environment at an assessment location.

7.2.17 A summary of the number of dwellings which achieve, marginally achieve or exceed the local authority noise criterion is presented in Table 7.7.

Dwelling Area	Number of Dwellings		
	Local Authority Noise Criterion Achieved	Local Authority Noise Criterion Marginally Achieved	Local Authority Noise Criterion Exceeded
	Excess of rating over background sound level		
	< 0	*= 0*	*> 0*
A	11	5	5
B	5	4	13
C	4	2	11
D	7	8	20
E	0	0	18
F	0	0	20
G	0	0	21
H	0	0	12

TABLE 7.7: NUMBER OF DWELLINGS WHICH ACHIEVE, MARGINALLY ACHIEVE OR EXCEED CRITERION

7.3 BS 4142 - Proposed Noise Sources

7.3.1 Drawings of the proposed development indicate a number of pumping stations and electrical substations are to be installed near to dwellings. The details of these items of plant have not been made available at the time of authoring this report.

7.3.2 These potential sources of noise should be designed to control their rating noise levels. The rating levels should not exceed the representative background sound levels at the dwellings which will be worst impacted.

7.4 Context

7.4.1 When considering the significance of an impact BS 4142 advises that the context of the impact should be taken into account. The context of the impact should consider factors such as: the absolute level of sound; the character and level of the residual sound compared to the character and level of the specific sound; the sensitivity of the receptor; and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

7.4.2 The night-time 'specific' $L_{Aeq,15min}$ sound levels calculated from Weinberger operations in the northern area of the site range between 32 to 39 dB $L_{Aeq,15min}$ at receptor area F, between 34 to 45 dB $L_{Aeq,15min}$ at receptor area G.

7.4.3 The operations by Wienerberger at night appears to have governed the lower range of ambient $L_{Aeq,T}$ and background $L_{A90,T}$ sound levels measured at LT3 during the night-time periods of the noise survey.

7.4.4 The sound levels are likely to be masked to a degree when trains are passing the development site, however, in the absence of the train noise, then the extract fan sound may become distinguishable from the residual sound environment given the potential absence of any other significant sources of sound in the northern area of the development site at night.

Uncertainty

7.4.5 Uncertainty in the measurements and calculations needs to be considered when assessing the outcome of an assessment. Possible sources of uncertainty are listed below:

- location of equipment – the positioning of equipment in the model is based on observations, figures and satellite imagery and as such is deemed to be representative;
- equipment use – no time correction has been applied to the measured noise sources for a worse-case scenario to provide a worst-case assessment;
- the sound sources and environment, including barriers, have been modelled based on satellite imagery and on-site observations;
- the lower range of ambient and background sound levels measured at LT3 at night-time have been assumed to be governed by Wienerberger's night-time operations; and
- the modal $L_{A90,15min}$ value of 32 dB measured during the night-time periods at LT1 has been assumed to provide a representative measure of the residual background sound level across the development site in the absence of the commercial sound generated by Wienerberger's night-time operations.

7.4.6 The outdoor propagation calculations are based on ISO 9613-2 1996. This states that calculations are made with attention restricted to downwind conditions of propagation. Other limitations include other meteorological and non-material limitations such as winds speeds being limited between 1-5 ms^{-1}. It is also noted in ISO 9613-2 1996 that the estimated errors for octave-band sound pressure levels, calculated under the same conditions as the broadband calculation, may be somewhat larger than the errors for A-weighted broadband sources. Between 0-100 m and 100-1000 m the estimated accuracy is displayed in Table 7.8.

Height	**Distance**	
	0 < d < 100 m	**100m < d < 1000 m**
0 < h < 5 m	+/-3 dB	+/-3 dB
5m < h < 30 m	+/-1 dB	+/-3 dB

TABLE 7.8: ESTIMATIONS OF UNCERTAINTY IN ISO 9613-2

Notes: h – mean height of source and receiver;
d – distance between source and receiver; and
estimates made from situations where there are no effects due to reflection or attenuation due to screening

7.4.7 Rounding has been used in the derivation of the background sound levels and calculations, to avoid an impression of precision to decimal places. Rounding has been to integer values with 0.5 being rounded up on completion of the statistical analysis.

7.4.8 The calculations used in this assessment have been conducted using the CadnaA model with pre and post-processing of the data in Excel. Error checking in the calculations is conducted at all stages as part of Southdowns' quality control procedures.

7.5 Cumulative Impacts

Britannia Energy Recovery Facility

7.5.1 A new Recycling, Recovery and Renewable Energy Facility is proposed, and may be built at the time writing this report, to be constructed to the north of the Pondtail development site, beyond Wienberger's premises.

7.5.2 An operational noise and vibration assessment of the potential impacts generated by this incoming facility is presented in the Development's Environmental Statement (ES) [12]. The residential receptor in the ES considered to be approximately representative of the nearest residential receptors located within the Pondtail development site is No.11 Station Road. The operational assessment of the Energy Facility reports BS 4142 level differences (rating vs background noise levels) at this receptor of 6 dB below the background noise level during a daytime (07:00 to 19:00 hrs) period, 8 dB below the background noise level during an evening (19:00 hrs to 23:00 hrs) period and 0 dB below the background noise level during a night-time period.

7.5.3 According to BS 4142:2019, where the rating level does not exceed the background sound level this is an indication of the specific sound source having a low impact, depending on the context.

7.5.4 Specific ambient $L_{Aeq,1hr}$ noise levels calculated at No.11 station Street are reported to be 37 dB $L_{Aeq,1hr}$ during the day and night-time periods and 35 dB $L_{Aeq,1hr}$ during an evening period.

7.5.5 The assessment of these specific noise levels in the ES indicates that based on a sound attenuation of 15 dB for a partially open window, the specific sound levels generated by the new Energy Facility (not accounting for other existing sources of sound) fall below the internal ambient guideline noise levels for habitable rooms presented in BS 8233:2014. The specific sound levels are also reported to be below the guidance levels for outdoor amenity spaces.

7.5.6 The operational assessment concludes that at the closest noise sensitive receptors to the incoming development there could be a small change to baseline conditions during the daytime and night-time periods and a negligible change during the evening period.

7.5.7 The impact of noise from activities on site is forecast to be low, with the sensitivity of the residential receptors in the assessment categorised as 'medium'. The assessment therefore concludes that there could be a direct, permanent minor adverse effect due to noise from the operation of the facility.

7.5.8 The ES's conclusions go on to indicate that in the event that noise from the site is audible, it is unlikely to cause any changes in behaviour or attitude or a perceived change in quality of life. As such, noise from the operations on site are forecast to be at or below LOAEL (Lowest Observable Adverse Effect Level).

7.5.9 Cumulative operational noise effects with other consented developments are assessed to be of negligible to minor adverse significance, and cumulative effects from a change in noise levels due to road traffic on the local road network are reported to be minor adverse.

Biffa Brookhurst Wood Landfill

7.5.10 A Soil Heat Treatment Facility (SHTF) and Soil Washing Facility (SWF) have been approved for development, and may be built at the time writing this report, on land at Brookhurst Wood on Langhurstwood Road.

7.5.11 This incoming development is located to the north of the proposed Pondtail development site and to the north of the Britannia Energy Recovery Facility.

7.5.12 The permitted hours of operation of the development are understood to be 07:30-18:00 hours Monday to Friday and 07:00-13:00 hours on Saturdays.

7.5.13 The nearest noise sensitive receptor to the Pondtail development site assessed in the Environmental Statement (ES) [13] that accompanied the planning application for the development was labelled R3 – Bramblehurst.

7.5.14 The highest daytime noise rating level calculated at R3 from the combined operation of the SHTF and SWF was 43 dB $L_{Ar,T}$. This rating level was reported to fall below a daytime background noise assessment level of 55 dB $L_{A90,T}$ by 12 dB.

7.5.15 The noise assessment concludes that the operational noise levels assessed are below the Lowest Observable Adverse Effect Level (LOAEL) and sufficiently below existing background levels (which includes operations from the adjacent landfill), and as such that there is a low likelihood of any increase to the local noise environment.

8. VIBRATION ASSESSMENT

8.1 BS 6472-1:2008 Assessment

8.1.1 VDV magnitudes were found to be highest in the vertical Z-axis. The highest measured Z-axis daytime $VDV_{,16hr}$ and night-time $VDV_{,8hr}$ magnitudes are presented in Table 8.1.

8.1.2 Transfer functions from the ground surface to the floors of buildings can be dependent on the construction of the foundation and the floor type, span and depth. Shown additionally in Table 8.1 are the daytime $VDV_{,16hr}$ and night-time $VDV_{,8hr}$ magnitudes transfer functions of VDV x 1.0 and VDV x 2 which is taken as the worse-case scenario corresponding to ground and 1st floor respectively. VDV magnitudes are presented with the probability of adverse comment according to BS6472-1:2008.

Transfer Function	Representative Floor	Daytime 16hr (07:00 - 23:00) Vibration Dose Value, $ms^{-1.75}$	Night-time 8hr (23:00 - 07:00) Vibration Dose Value, $ms^{-1.75}$	BS 6472-1 Probability of Adverse Comment
X 1.0	Ground	0.03	0.02	Adverse comment not expected
X 2.0	1st	0.06	0.04	Adverse comment not expected

TABLE 8.1: ASSESSMENT OF VDV MAGNITUDES AT PONDTAIL FARM

8.1.3 The results of the vibration assessment indicate that VDV magnitudes would fall within the 'Adverse comment not expected' range of the BS 6472-1:2008 assessment criteria. Based on this assessment, no mitigation against human exposure to vibration has been deemed necessary for the proposed development on Pondtail Farm.

9. NOISE MITIGATION OPTIONS

9.1.1 The results of the noise assessment indicate that internal noise levels are likely to achieve the BS 8233 internal $L_{Aeq,T}$ noise criteria within habitable rooms with windows closed, provided that a suitable specification of façade sound insulation is used. It is recommended that the construction of the roof and any external façade walls are considered to ensure that these elements do not present a weakness in the sound insulation of the façade.

9.1.2 Optimisation of the development design and layout to incorporate methods that reduce the impact of road traffic and rail noise would allow more of the dwellings to achieve satisfactory internal levels with windows partially open, which would minimise the need for alternative means of ventilation. Orienting the glazed facades of habitable rooms (i.e. bedrooms and living rooms) away from the A264 and the railway line would provide a natural benefit from the acoustic screening provided by the building itself, with non-habitable rooms such as bathrooms, kitchens and circulation areas acting as buffers between the noise source and habitable rooms.

9.1.3 In dwellings where it is not possible to orientate habitable rooms away from noise sources in order to mitigate the effects of noise on occupants of the proposed development, windows will need to be kept closed. Whilst it is highly likely that desirable internal noise levels will be achievable when windows are closed, with the windows open, calculated noise levels exceed BS 8233 criteria. It will therefore be necessary to install alternative air flow/ventilation systems.

9.1.4 The ventilation strategy for living rooms and bedrooms is likely to be influenced by non-acoustical factors such as overheating or air quality constraints but may include options such as:

- trickle vents installed in the window units;
- acoustics air bricks installed in the façade; and/or
- passive or mechanical silenced ventilation (whole house or individual).

9.1.5 Calculations show that the ProPG requirements of no more than 10 events over 45 dB $L_{Amax,F}$ in a single night should be achieved with windows closed, subject to detailed frequency-dependent calculations during the detailed design stage.

9.1.6 An existing noise barrier runs along the majority of the A264 at the south of the proposed site. As this is already in place, an additional noise barrier at the south of the proposed site has not been investigated.

9.1.7 The railway to the west of the site is located on a raised embankment, approximately 2.4m above the local ground of the proposed site. A noise barrier along this noise source has not been investigated as it would need to exceed the height of the railway track before providing any significant sound reduction benefit.

9.2 Existing Fixed Plant Noise Sources

9.2.1 The assessment of the commercial noise indicates a potential exceedance of residual background sound levels measured onsite during night-time periods. This sound impact has been attributed to Wienerberger's night-time operations.

9.2.2 Following the guidance given in NPPF and the Sussex Noise Planning Guidance document, the developer may therefore be required to factor into their planning application suitable

mitigation measures to avoid potential significant adverse impacts on health and the quality of life for potential future occupiers of the development.

9.2.3 Both the NPPF and Sussex guidance refer to the "agent of change" principle. The Sussex guidance states:

"6.6.4 Where it is apparent to the LPA that existing noise from an existing industrial, commercial, entertainment premises, places of worship, sports clubs, airfields, airports and sea ports is likely to cause unreasonable or adverse effects to new residents, the development is unlikely to be supported unless the applicant (or 'agent of change') provides clear evidence that adequate noise attenuation to the existing noise sources can and will be provided. The applicant (or 'agent of change') will be required to provide a detailed noise mitigation plan with their acoustic assessment."

9.2.4 Generic noise control options to help mitigate the sound impact calculated at the residential receptors include:

- maximising the spatial separation between Wienerberger's premises and the nearest residential properties;
- the use of single aspect dwellings, with the orientation of glazed facades of habitable rooms facing away from Wienerberger's premises;
- the positioning of sleeping areas and other habitable areas on the side of the residential buildings furthest from the significant sources of noise affecting the development site;
- the positioning of rooms which are less sensitive (kitchens, bathrooms, storage rooms, corridors, stairwells, etc.) on the noisier side of a property;
- the installation of sound insulating window glazing units to the external facades of habitable rooms that face towards or have a line-of-sight to Wienerberger's premises;
- the provision of mechanical ventilation inside the habitable rooms of dwellings;
- minimising the number of doors and windows on the noisier side of dwellings;
- the installation of a noise barrier along the northern boundary of the development site to block, where possible, the line-of-sight between the residential dwellings and sources of noise upon Wienerberger's premises; and
- reducing Wienerberger's plant sound emission at source.

9.2.5 A combination of the above noise mitigation measures is likely to be required to reduce the potential noise impact on the proposed residential development.

9.2.6 It is understood that the project design team has evaluated the above mitigation measures and proposes to incorporate enhanced sound insulating window glazing units, mechanical ventilation and the installation of a bespoke noise barrier into the scheme to help mitigate the potential sound impact of Wienerberger's extract fan on the proposed residential development.

10. SUMMARY OF FINDINGS

10.1.1 A noise and vibration assessment has been undertaken to accompany a planning application for the proposed residential development at Pondtail Farm in Horsham, West Sussex.

10.1.2 Ambient ($L_{Aeq,T}$) and maximum ($L_{Amax,F}$) noise levels estimated inside habitable rooms of the proposed development and external noise levels in outdoor amenity areas have been considered as part of the assessment based on the indicative layouts presented in this report.

10.1.3 A baseline noise and vibration surveys were undertaken previously by Southdowns and is document in reference [1].

10.1.4 The main sources of transportation noise governing the noise environment across the development site are road traffic on the A264, rail traffic on the Sutton & Mole Valley line, whilst vehicle movements on Langhurst Road and Mercer Road are lower secondary sources of noise in the area.

10.1.5 Sources of commercial noise affecting the development site include plant associated with Wienerberger's (a brick manufacturer) day and night-time commercial operations and various car maintenance businesses located to the north of the development site.

10.1.6 The results of the internal noise assessment indicate that for the receptor locations considered across the development site, the daytime and night-time criteria of 35 dB $L_{Aeq,16hr}$ and 30 dB $L_{Aeq,8hr}$ set out in British Standard BS 8233 should be achieved inside habitable rooms with closed sound insulating windows.

10.1.7 The BS 8233 simplified calculation method can underestimate internal noise levels by up to 5 dB, therefore, whilst the calculated noise levels documented in this report indicate that desirable internal noise levels should be achieved in principle, it is recommended that further and more detailed façade calculations are carried out during the detailed design stage of the project. Such calculations should take into account the frequency dependent sound reductions of the finalised façade elements, including the glazing, external walls and roof constructions.

10.1.8 Following the guidance given in ProPG, individual noise events exceeding 45 dB $L_{Amax,F}$ should not exceed 10 occurrences per night with windows closed using generic façade sound insulation values, based on the baseline survey results and the estimated $L_{Amax,F}$ levels at the facades of the properties in the development.

10.1.9 The internal noise criteria presented in BS 8233:2014 are unlikely to be achieved inside rooms with windows partially open for natural air ventilation purposes at multiple properties across the development. As indicated in BS 8233, an alternative ventilation system to opening a window should therefore be incorporated into the building design that does not compromise the façade insulation or the resulting noise level when relying on closed windows to meet the guideline values.

10.1.10 Rear garden areas of dwellings within areas G and H are calculated to fall below the lower guideline level of 50 dB $L_{Aeq,16hr}$ contained in BS 8233. The majority of rear gardens of dwellings within the areas of D, E, and F external amenity noise levels are calculated to fall below 50 dB $L_{Aeq,16hr}$ and therefore achieve the desirable guideline value. However, a small number of gardens in these areas exceed 50 dB $L_{Aeq,16hr}$ but fall below 55 dB $L_{Aeq,16hr}$ and therefore achieve the upper guideline value. Some facades for dwellings F01, F02, F03, D01 and D02, also exceed the upper guideline value, however these properties have façades which fall below the 50 dB $L_{Aeq,16hr}$ guideline.

10.1.11 Many of the rear garden areas in dwelling areas A, B and C are calculated to fall below the 55 dB upper limit, however there are several external garden areas associated with these dwellings which exceed this the upper guideline level.

10.1.12 An assessment has been undertaken of the commercial sources of noise affecting the development site using the principles of BS 4142:2014+A1:2019.

10.1.13 The assessment indicates that daytime rating levels are calculated to equal or fall below the daytime background sound assessment level, which is an indication of a low noise impact, depending on the context.

10.1.14 Night-time rating levels are calculated to achieve or marginally the criterion at only 27 dwellings. 139 dwellings are calculated to exceed the criterion with the worst affected located in the northern area of the development site.

10.1.15 At these dwellings, night-time rating levels are predicted to exceed the night-time background sound level by up to +15 dB, which is an indication of an adverse noise impact, depending on the context. This sound impact has been attributed primarily to Wienerberger's commercial operations at night.

10.1.16 The 'agent of change' principle referred to in the local authority guidance and NPPF is applicable to the proposed development and describes that *"a person or business introducing a new land use is responsible for managing the impact of that change, will apply"* and that *"the development is unlikely to be supported unless the applicant (or 'agent of change') provides clear evidence that adequate noise attenuation to the existing noise sources can and will be provided. The applicant (or 'agent of change') will be required to provide a detailed noise mitigation plan with their acoustic assessment."*

10.1.17 Mitigation measures to reduce the potential sound impacts are discussed in Section 9.

10.1.18 Human exposure to vibration at the site has been assessed using measured Vibration Dose Values obtained near to the railway line that passes the development site. The results of the assessment indicate that vibration magnitudes fall below the 'low probability of adverse comment' range of BS 6472-1:2008. No mitigation against human exposure to vibration has therefore been deemed necessary at the site.

10.1.19 The potential noise impacts on the proposed Pondtail development from the permitted incoming Britannia Energy Recovery Facility and Biffa Brookhurst Wood Landfill are considered in Section 7.5.

11. REFERENCES

1. Southdowns Environmental Consultants Ltd. 2374w-SEC-00001-07. Pondtail Farm, Horsham, Noise and Vibration Assessment.

2. British Standards Institution. BS 8233: 2014 ‘Guidance on Sound Insulation and Noise Reduction for Buildings’. 2014.

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4. Association of Noise Consultants (ANC), Institute of Acoustics (IOA), Chartered Institute of Environmental Health (CIEH), ProPG: Planning & Noise, 2017.

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6. Sussex Local Authorities. Planning Noise Advice Document: Sussex. November 2023.

7. British Standards Institution. BS 6472-1:2008: Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting.

8. Department for Environment, Food and Rural Affairs (DEFRA). 2010. Noise Policy Statement for England (NPSE). March 2010.

9. Ministry of Housing, Communities & Local Government. National Planning Policy Framework. December 2023.

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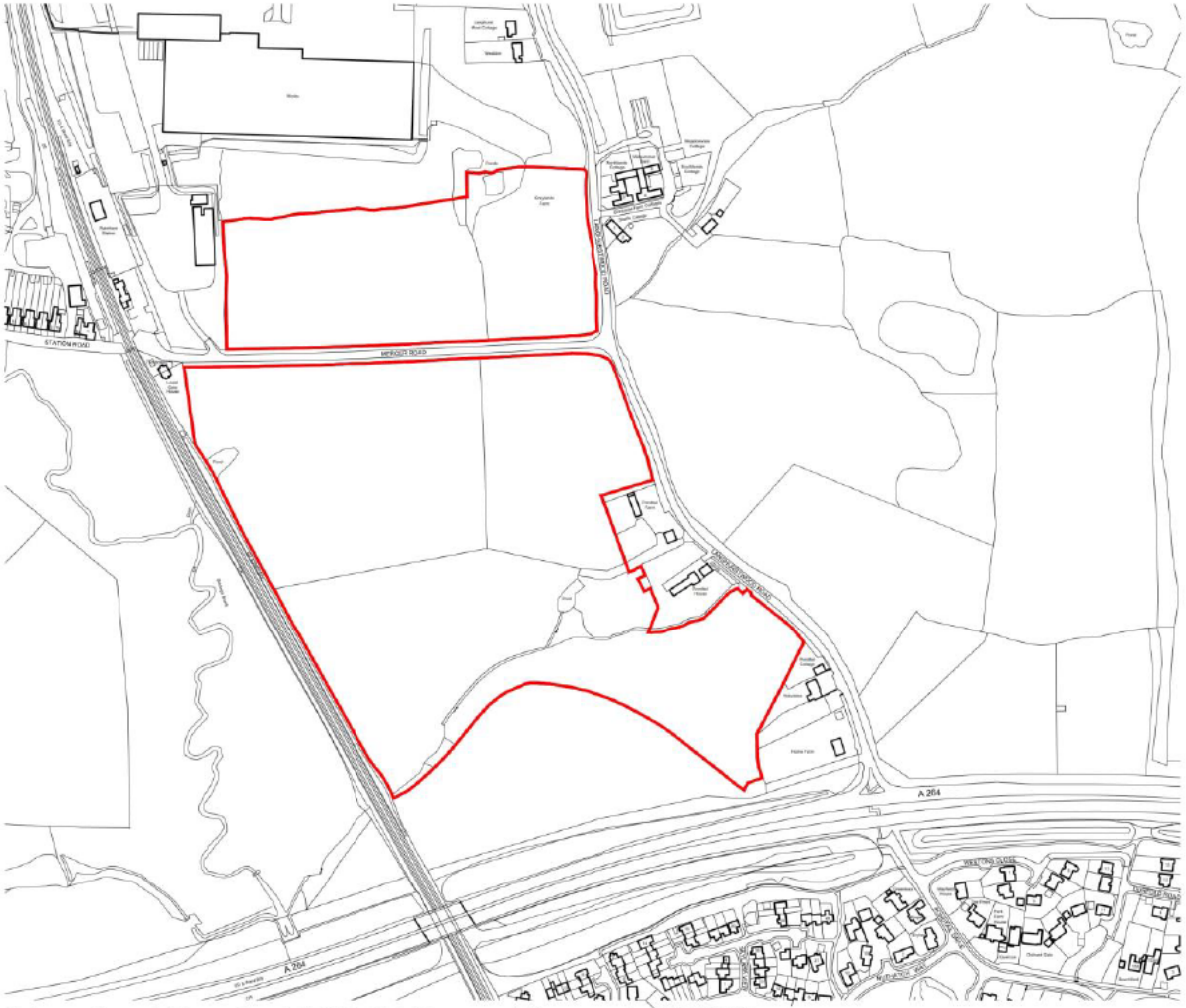
12. Wealden Recycling, Recovery and Renewable Energy Facility: Environmental Statement. Volume 1: Text. March 2018. RPS on behalf of Britaniacrest Recycling Ltd. RPS Reference: OXF9198.

13. Biffa Waste Services. Planning Application for a Soil Heat Treatment Facility. Land at Brookhurst Wood, Langhurstwood Road, Horsham. Environmental Statement. July 2019.

APPENDIX A: FIGURES



Key

Site Perimeter

cmyk PLANNING AND DESIGN

CMYK Planning & Design Ltd
5 The Quad Centre, Porters Wood
St Albans, Herts, AL3 6PQ

Riverdale Developments Ltd

Job: Mercer Road, Horsham
Title: Location Plan
Scale: 1:2500 @A2
Date: December 2022
Dig No: 1844 / P / 10.01
Rev:

FIGURE A1: PROPOSED SITE LOCATION PLAN

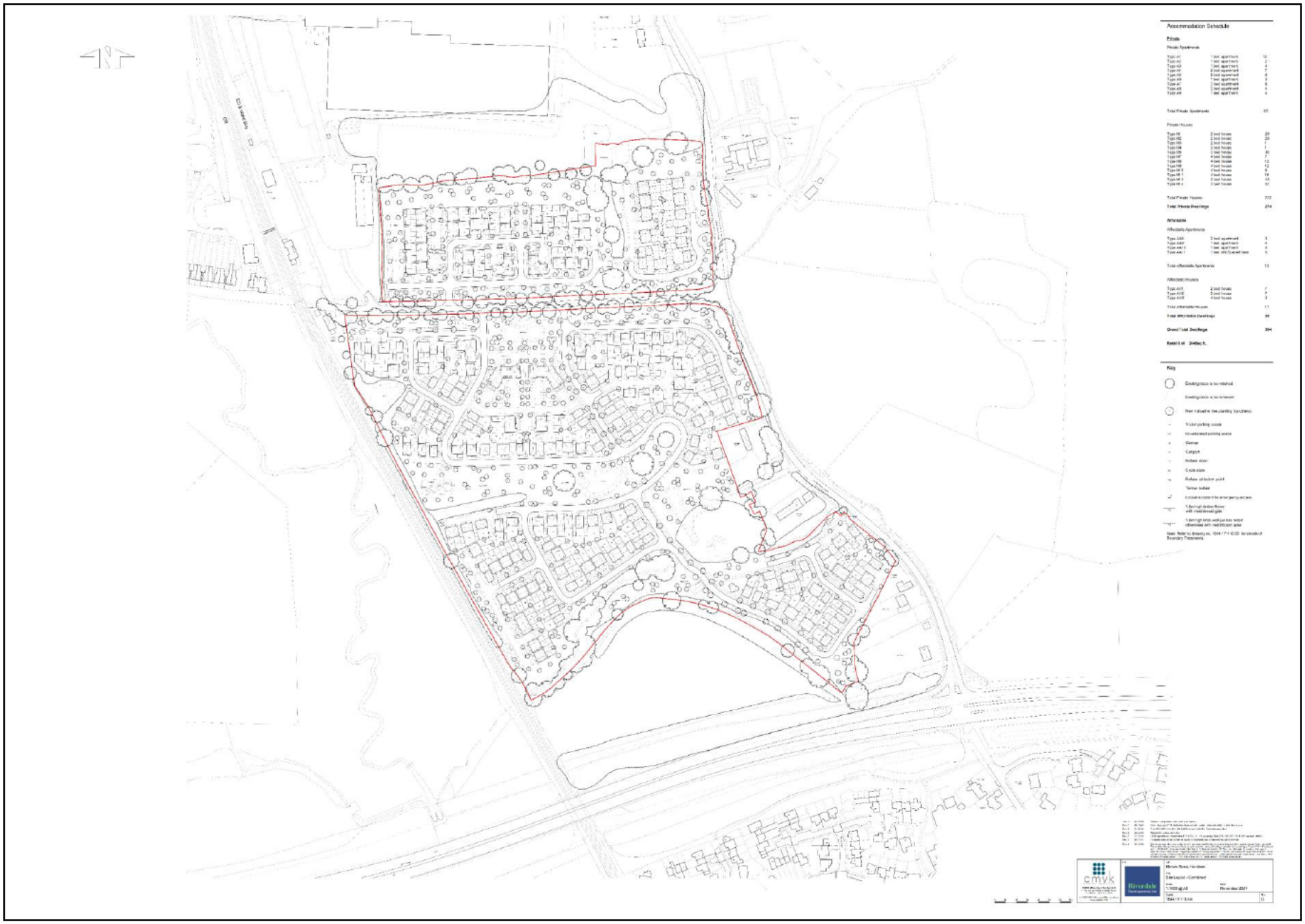


FIGURE A2: PLAN OF PROPOSED DEVELOPMENT AT PONDTAIL FARM

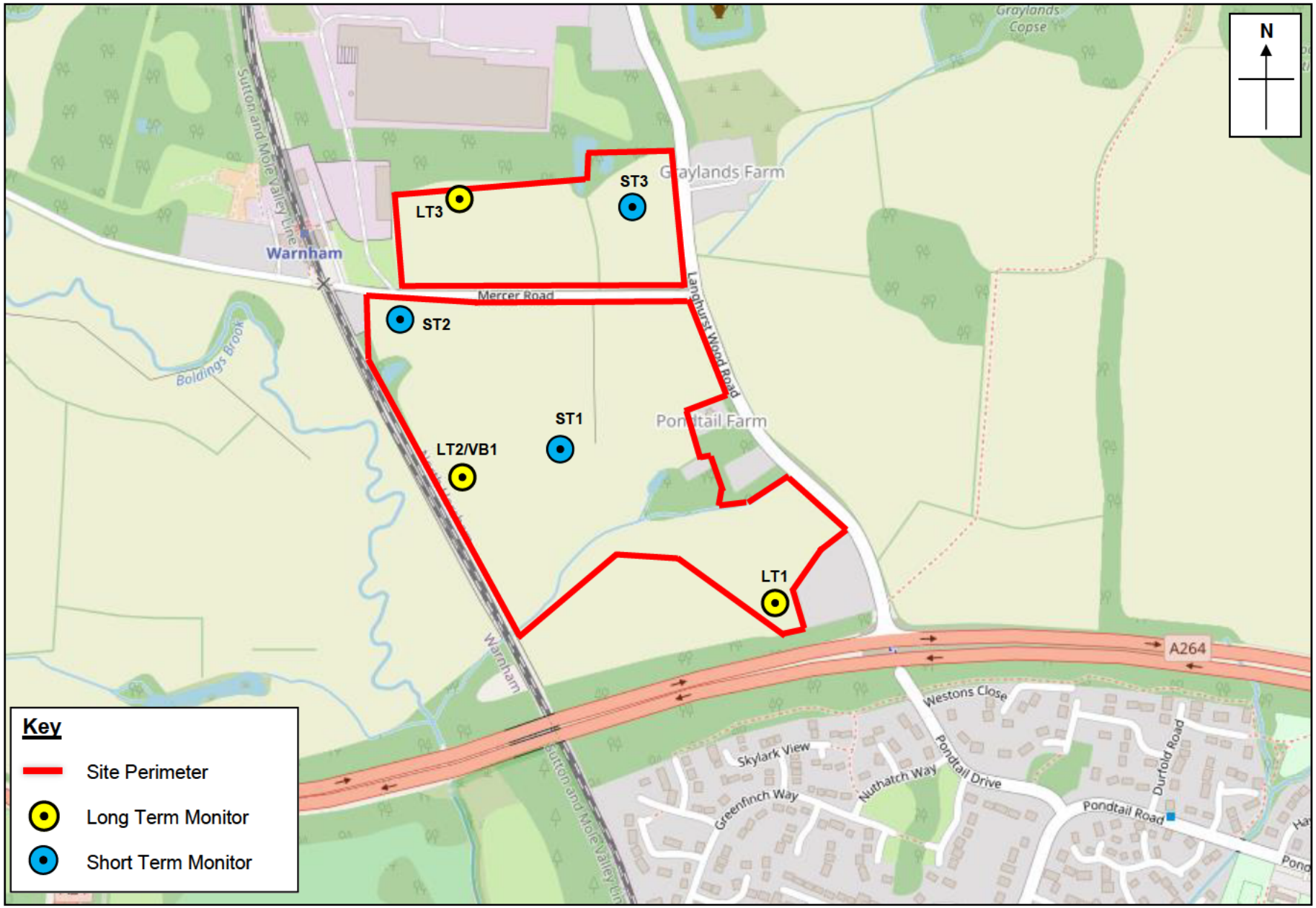


FIGURE A3: ATTENDED AND UNATTENDED NOISE AND VIBRATION MONITORING LOCATIONS

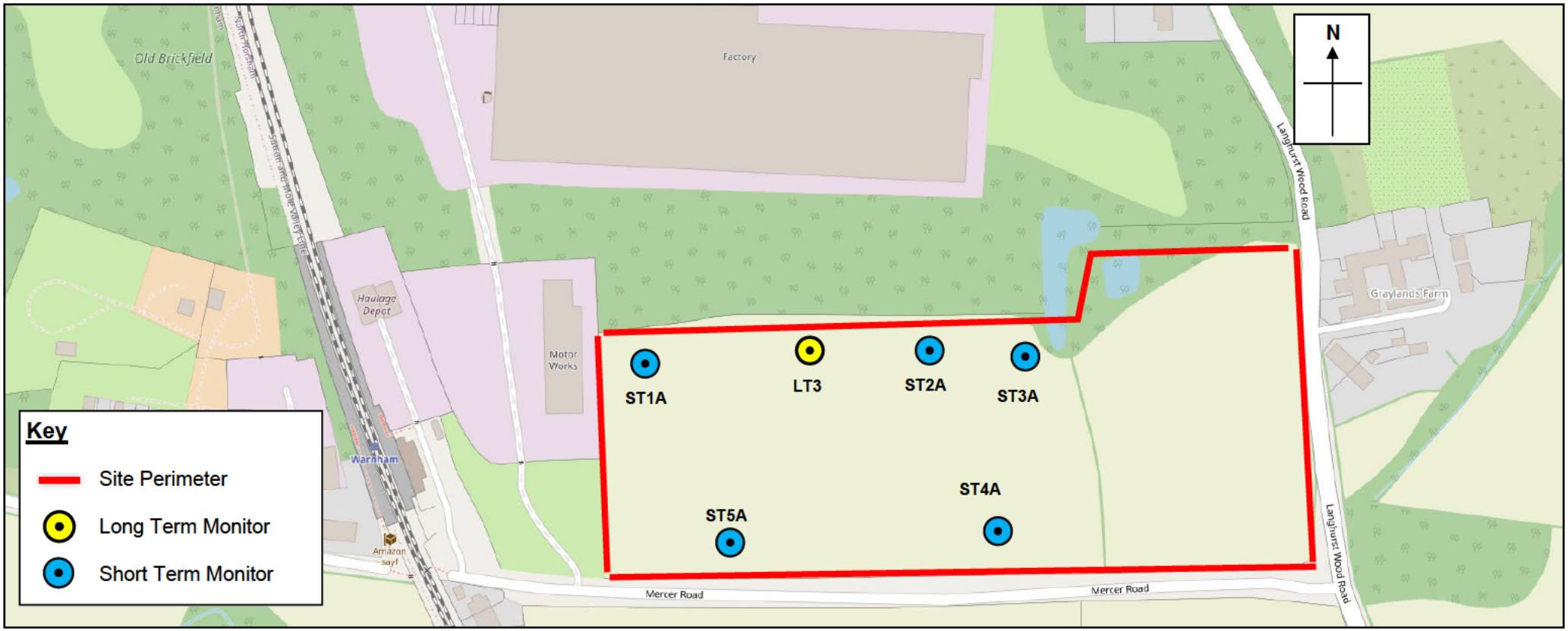


FIGURE A4: ATTENDED AND UNATTENDED NOISE MONITORING LOCATIONS

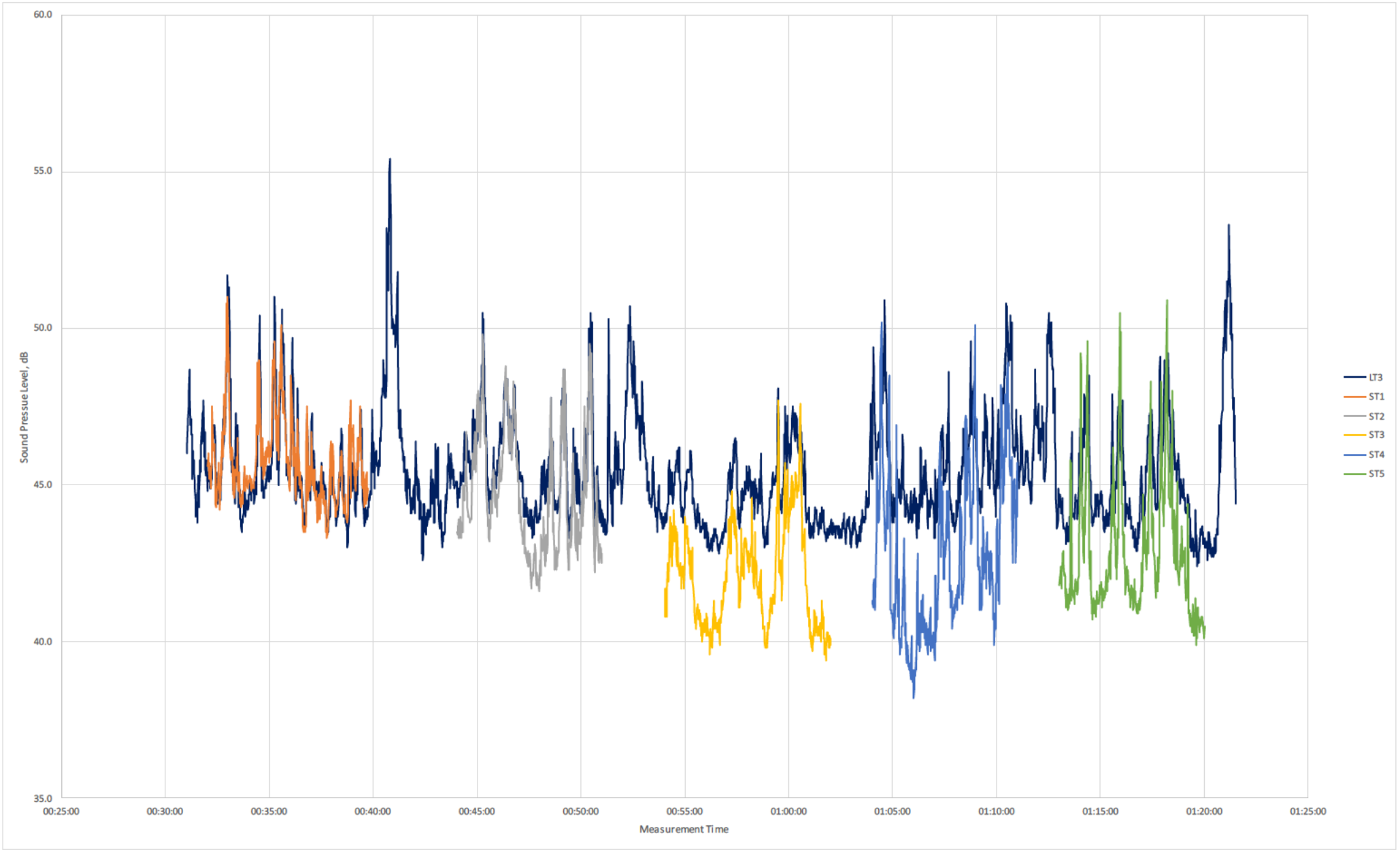


FIGURE A5: ATTENDED NOISE SURVEY – THURSDAY 18TH JULY 2024, LAEQ,1SEC

FIGURE A6: PLAN OF PROPOSED DEVELOPMENT AT PONDTAIL FARM – ASSESSMENT AREAS A, B & C

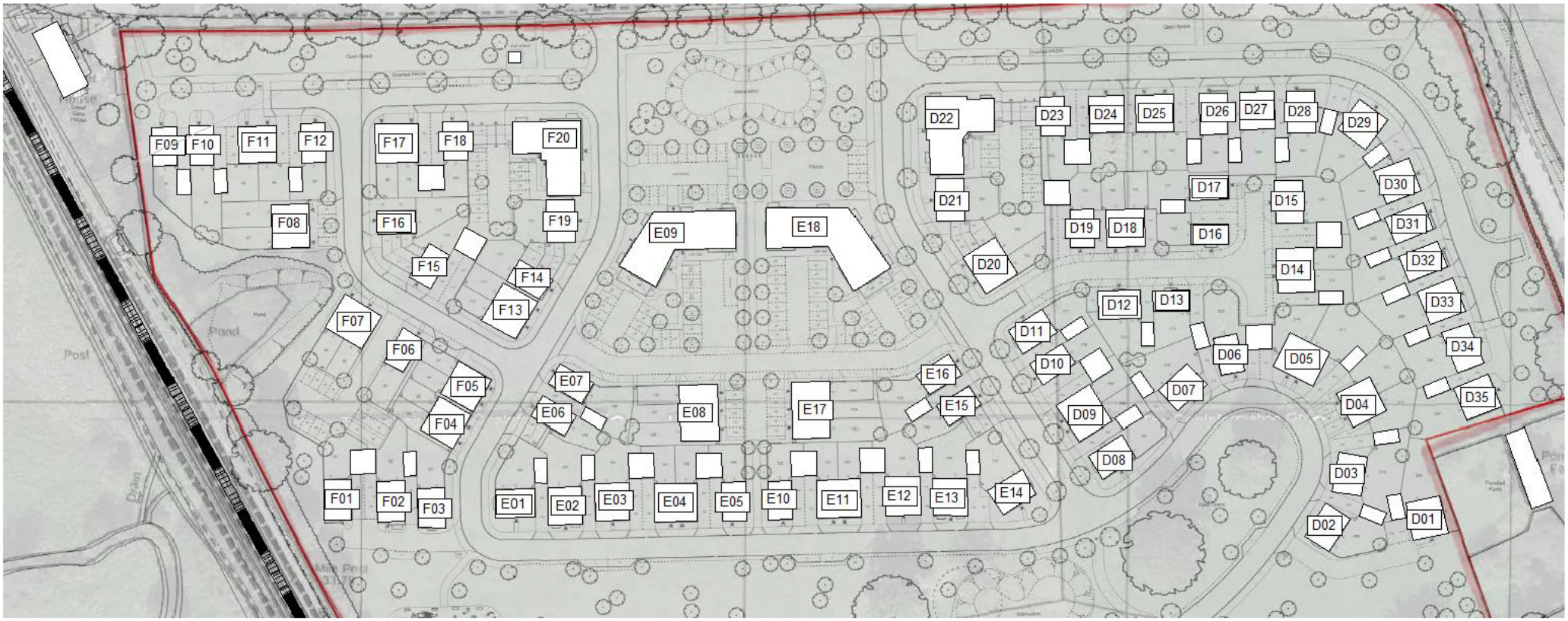


FIGURE A7: PLAN OF PROPOSED DEVELOPMENT AT PONDTAIL FARM – ASSESSMENT AREAS D, E & F

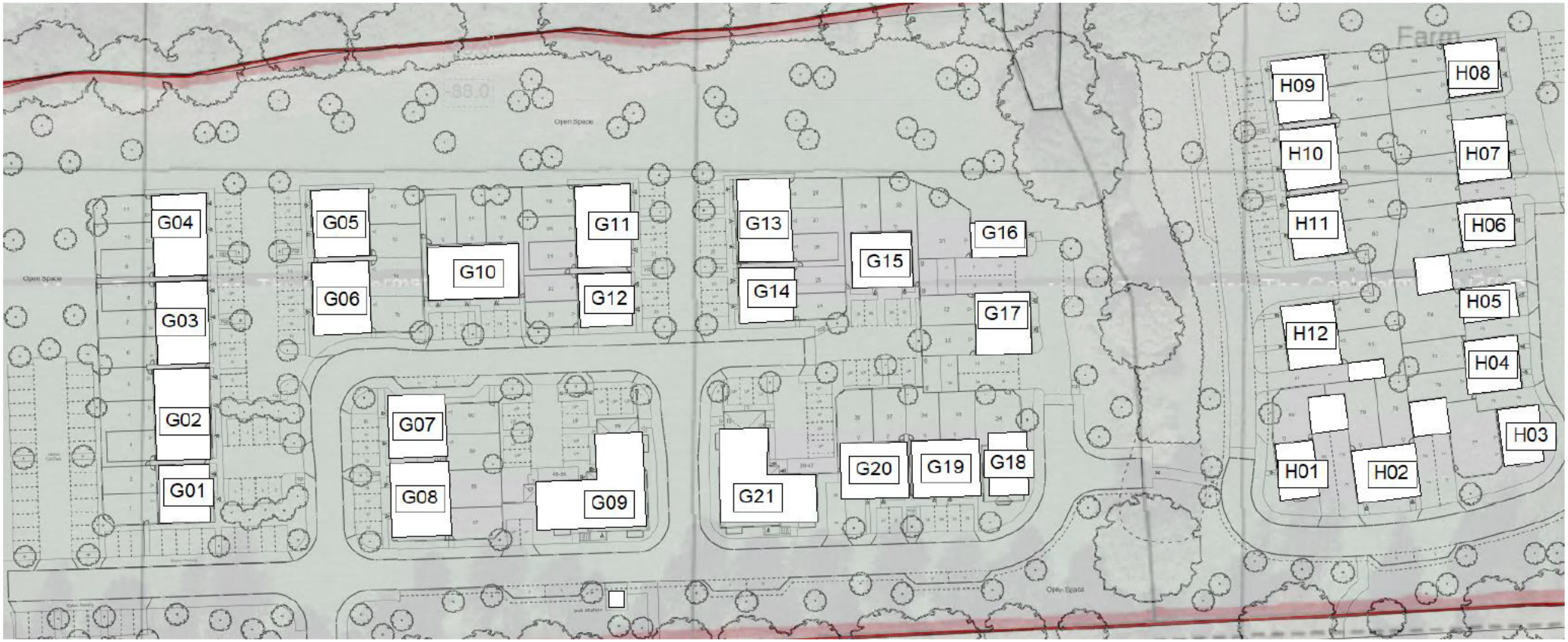


FIGURE A8: PLAN OF PROPOSED DEVELOPMENT AT PONDTAIL FARM – ASSESSMENT AREAS G & H

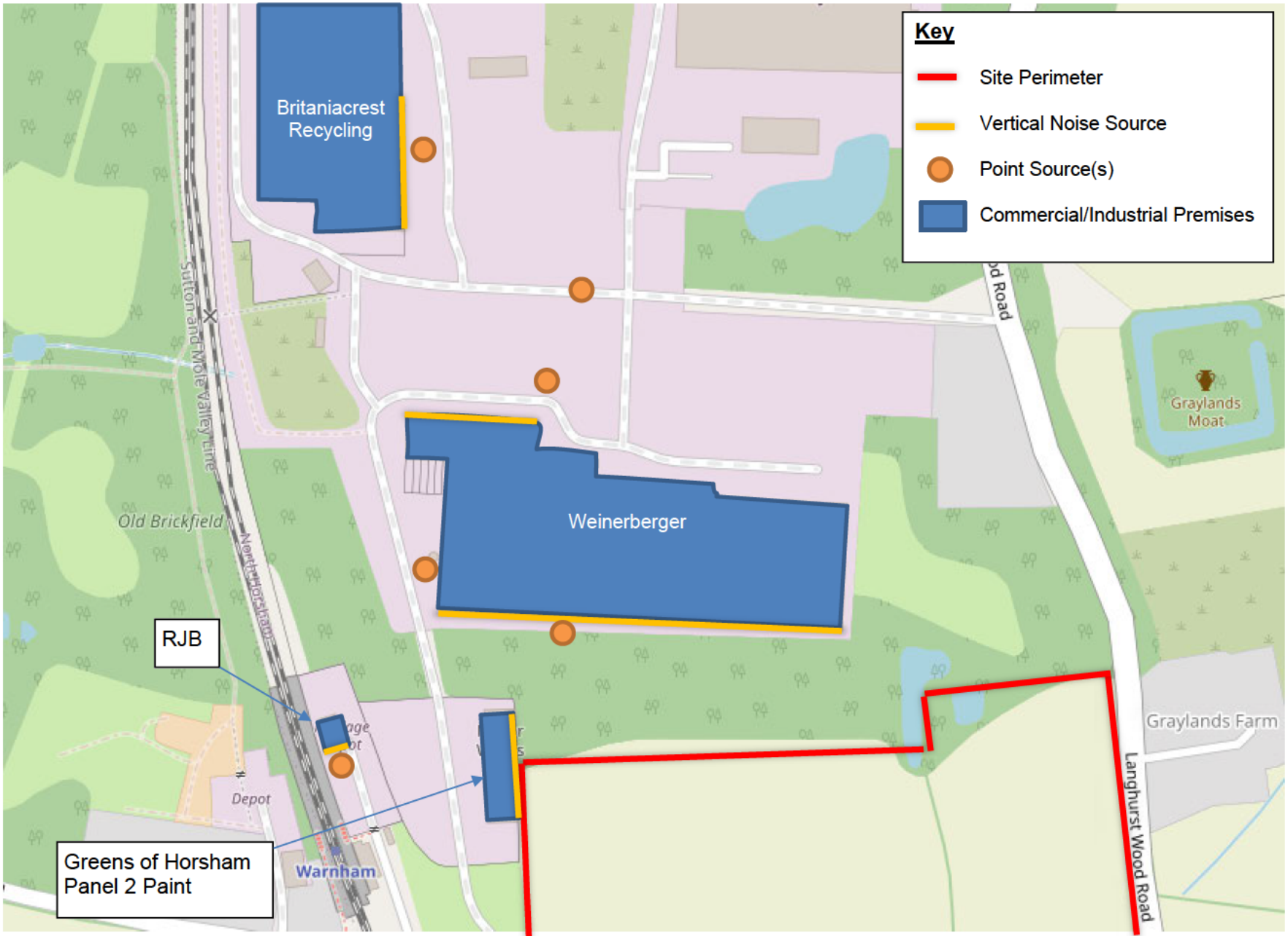


FIGURE A9: INDUSTRIAL & COMMERCIAL NOISE SOURCES

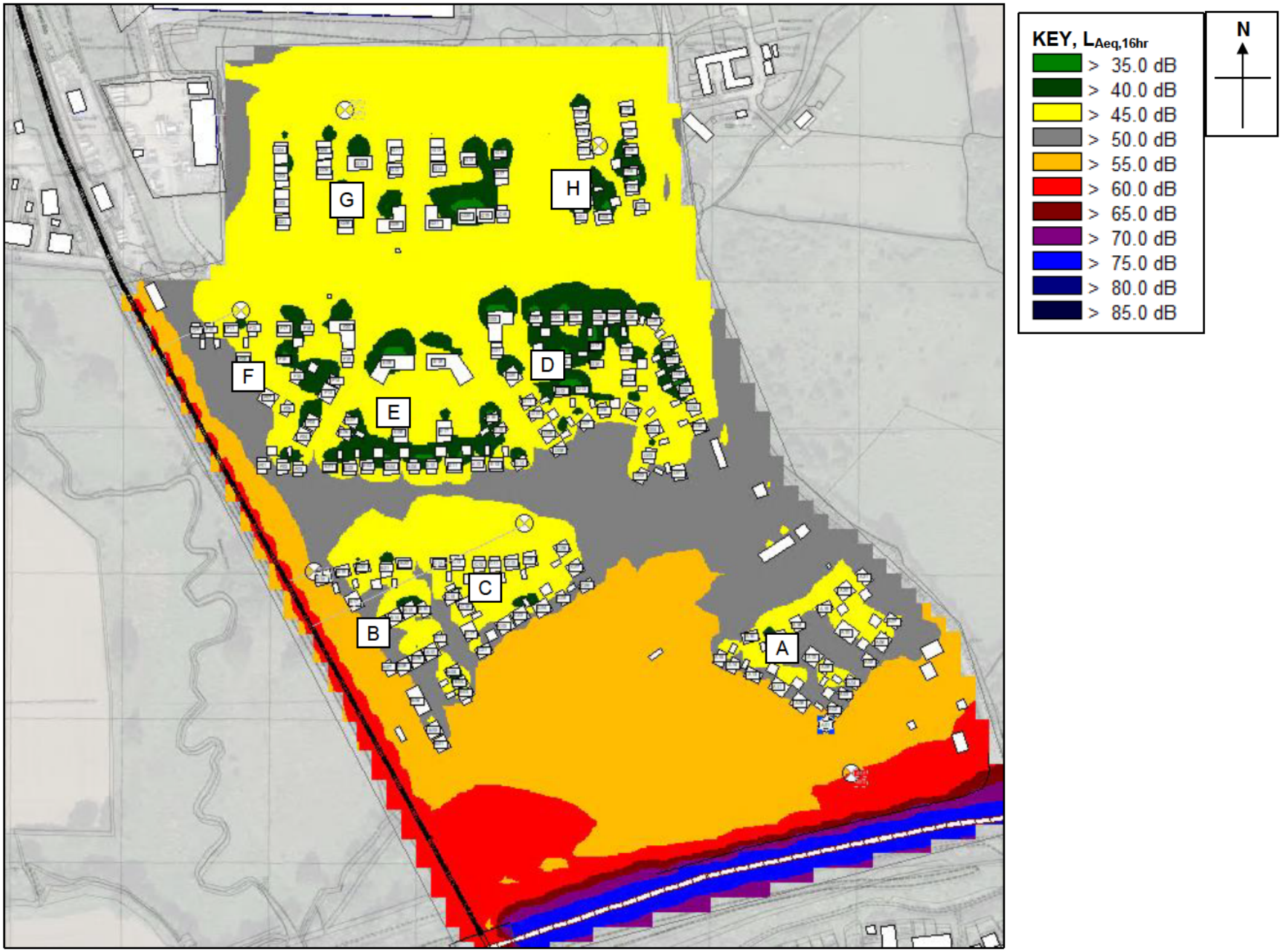


FIGURE A10: DAYTIME FREE-FIELD NOISE CONTOUR PLOT OF PROPOSED SITE AT 1.5M HEIGHT

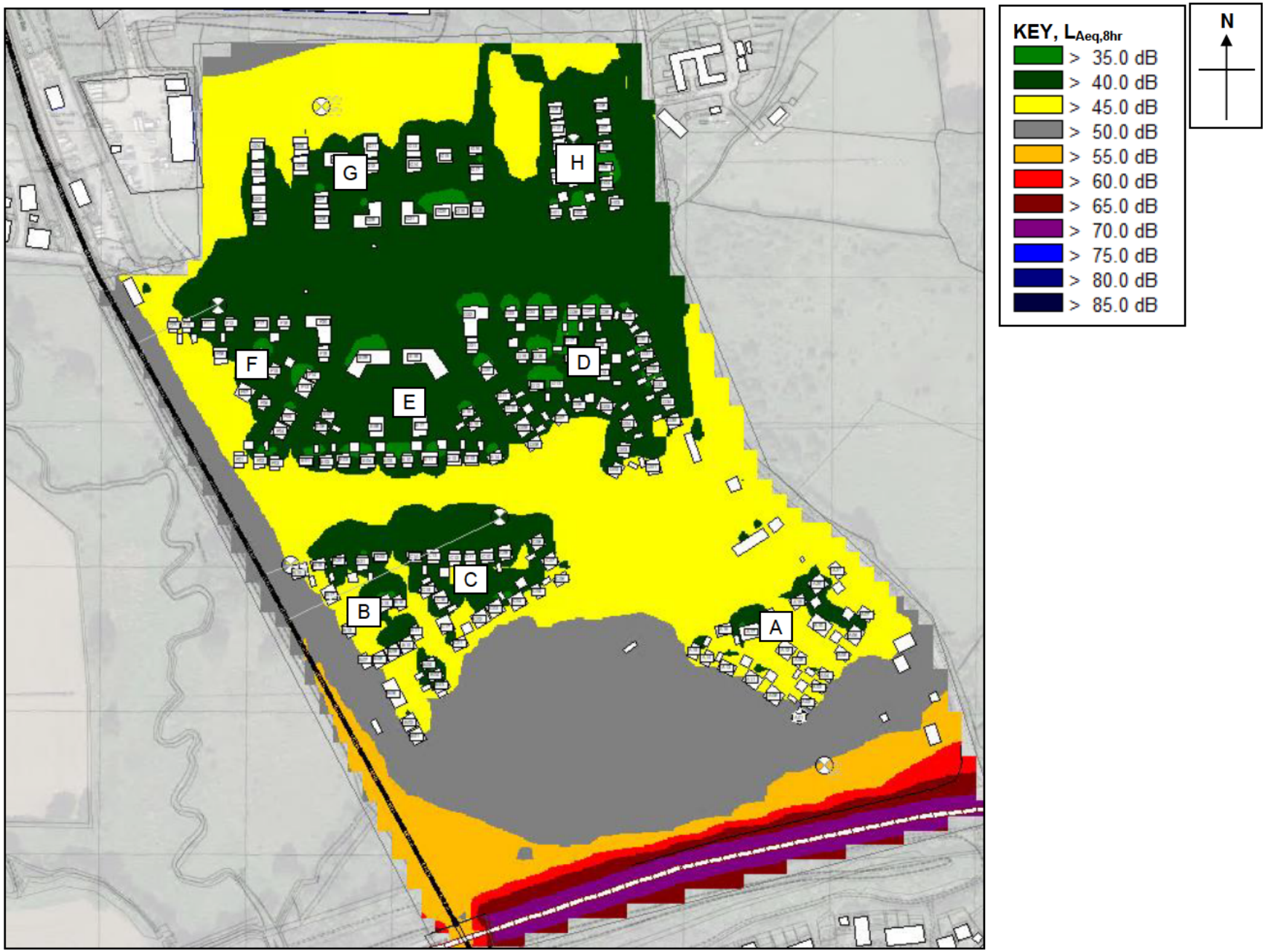


FIGURE A11: NIGHT-TIME FREE-FIELD NOISE CONTOUR PLOT OF PROPOSED SITE AT 4.0M HEIGHT

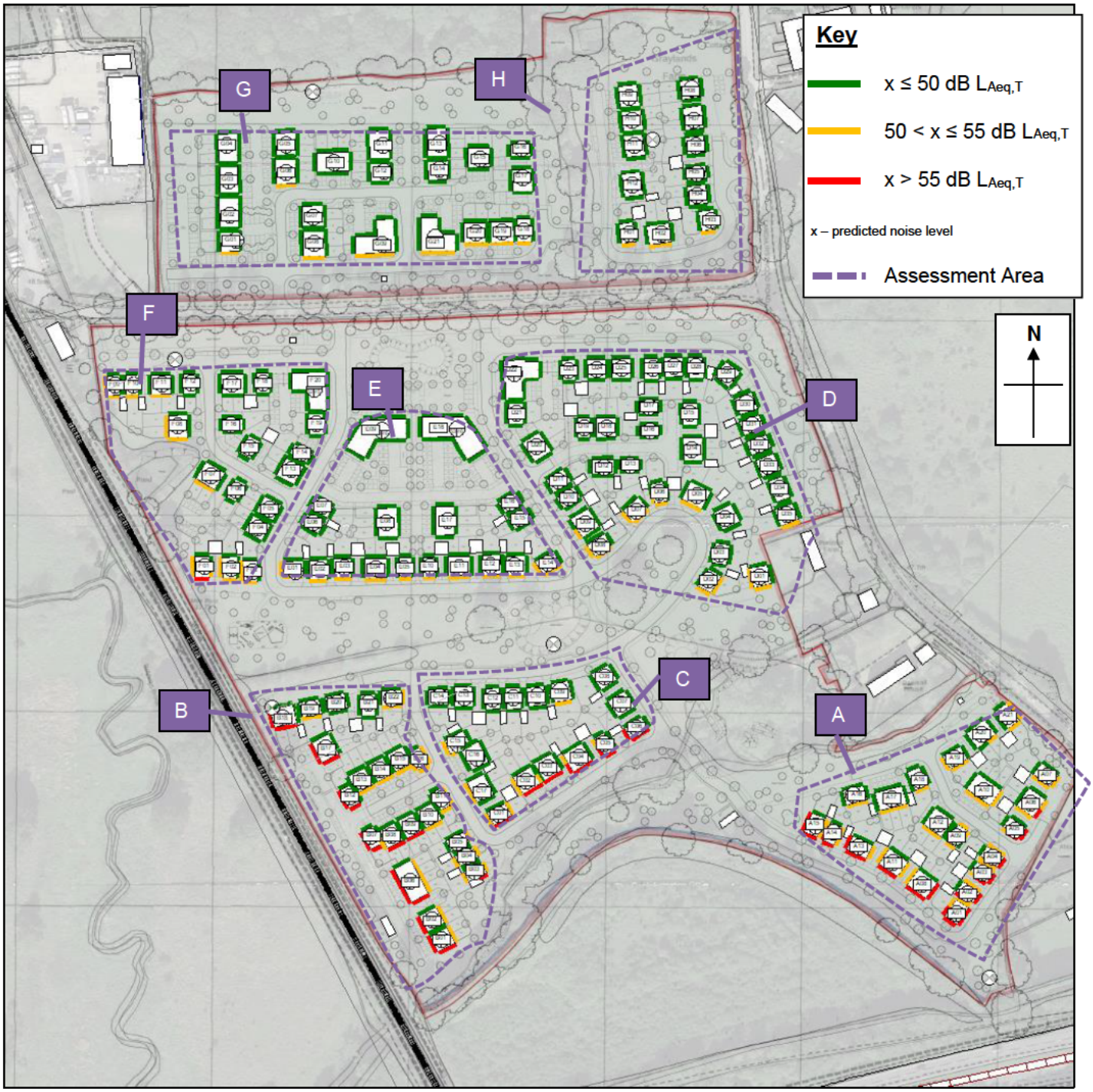


FIGURE A12: DAYTIME – PROPERTY FACADES - EXTERNAL AMENITY AREAS

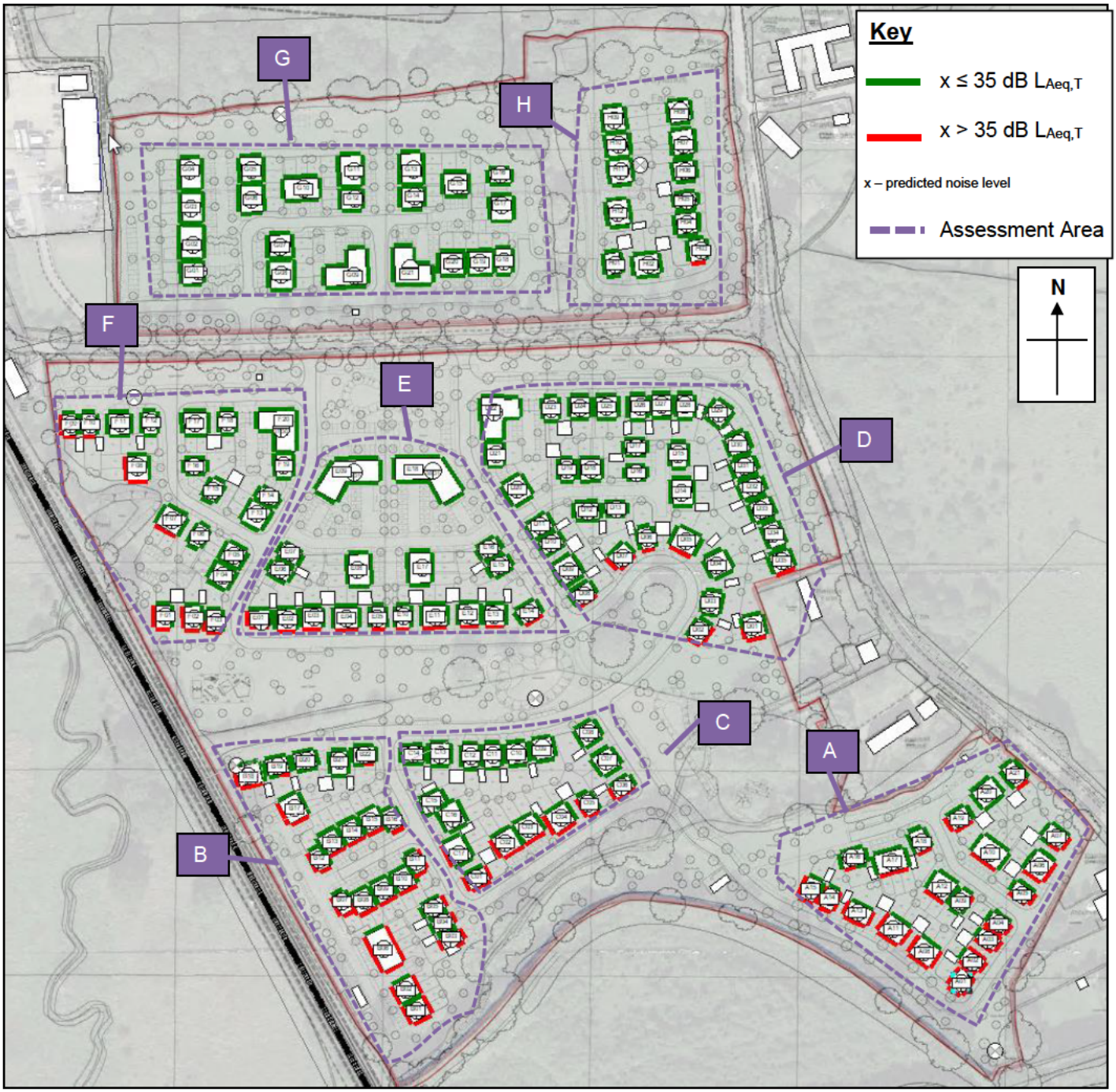


FIGURE A13: DAYTIME – GROUND FLOOR – PROPERTY FACADES – INTERNAL NOISE LEVEL

Note: Assuming windows partially open

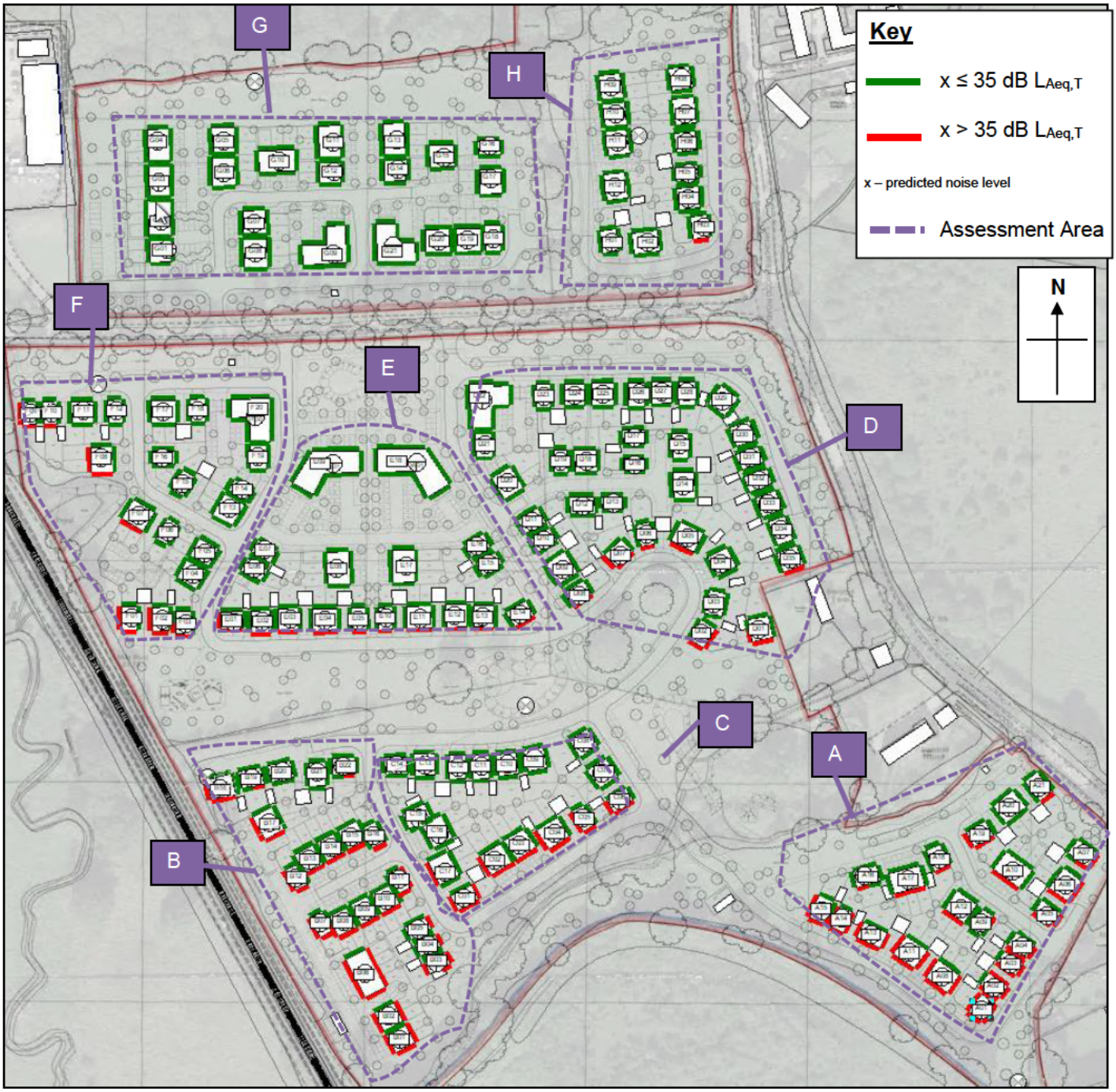


FIGURE A14: DAYTIME – 1ST FLOOR – PROPERTY FACADES – INTERNAL NOISE LEVEL

Note: Assuming windows partially open

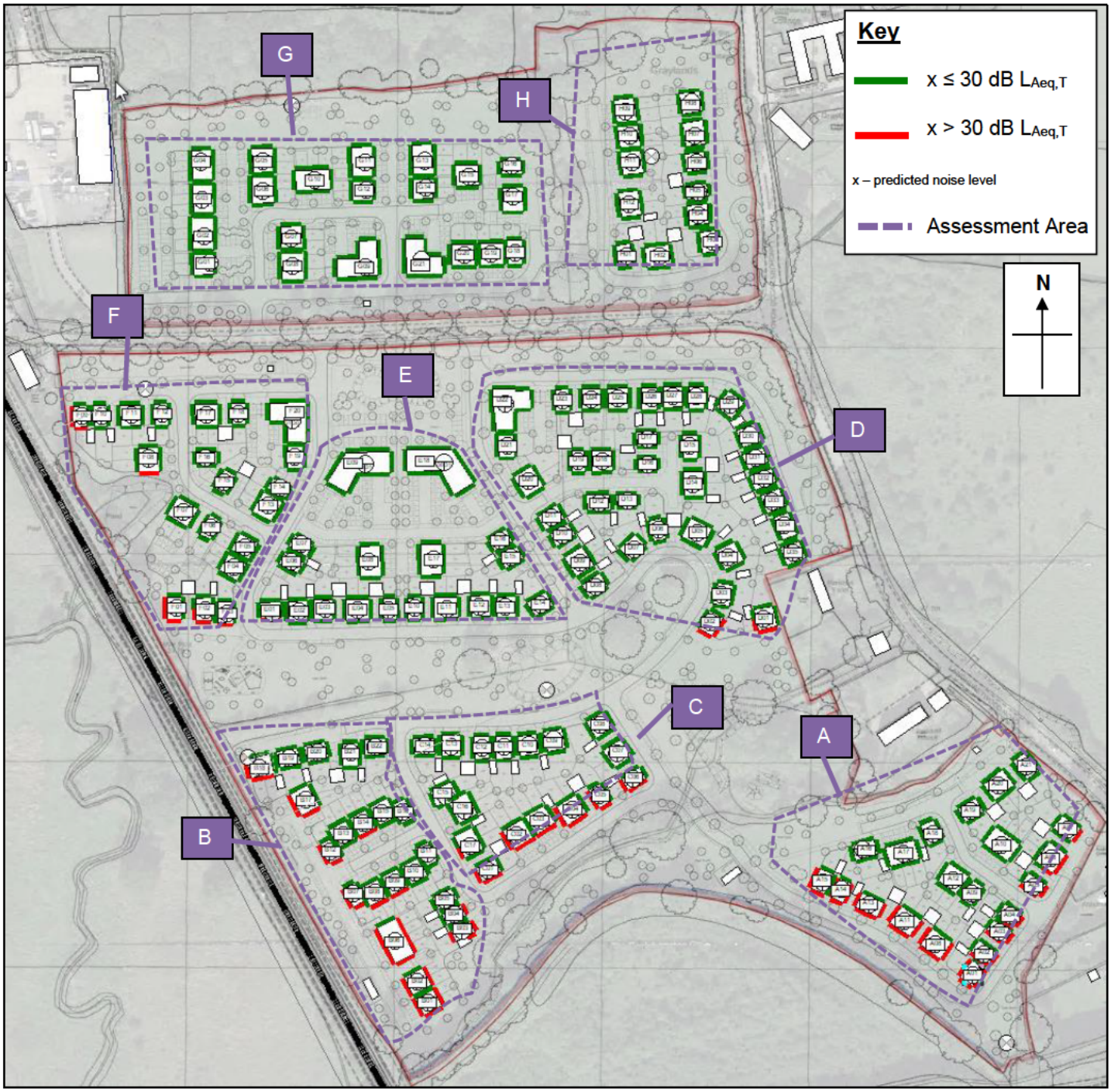


FIGURE A15: NIGHT-TIME – GROUND FLOOR – PROPERTY FACADES – INTERNAL NOISE LEVEL

Note: Assuming windows partially open

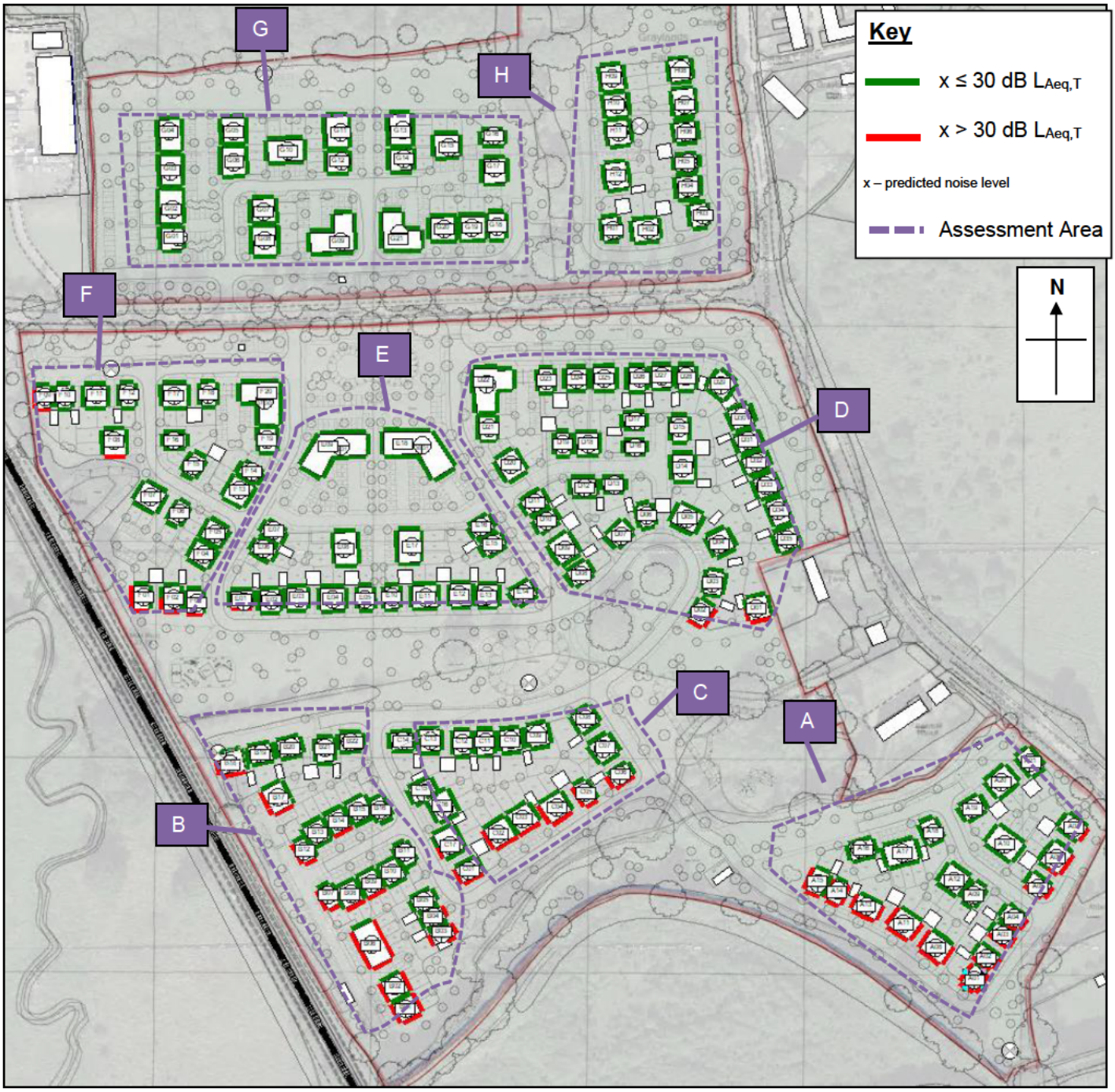


FIGURE A16: NIGHT-TIME – 1ST FLOOR – PROPERTY FACADES – INTERNAL NOISE LEVEL

Note: Assuming windows partially open

APPENDIX B: TABLES

Company	Source	% On-time correction	
		Day-Time 07:00-23:00	Night-Time 23:00-07:00
Britaniacrest Recycling	Breakout from industrial building	100%	0%
	HGV on weighbridge	100%	0%
	Truck Pass-by	100%	0%
	Dumper truck	100%	0%
	Luton Van	100%	0%
	JCB Grabber	100%	0%
Wienerberger	Breakout from building (north)	100%	0%
	Forklift trucks (north Yard)	100%	0%
	Dumper Truck	100%	0%
	Exhaust/Extract Flue	100%	100%
	Condenser Unit	100%	100%
	Breakout from building South #1	100%	100%
	Breakout from building South #2	100%	100%
	Breakout from building South #3	100%	100%
Panel 2 Paint	Breakout from East façade during angle grinding	100%	0%
RJB Commercials	Large Van	100%	0%
	Wheel Gun	100%	0%
	Van	100%	0%
	Breakout from workshop	100%	0%
	Truck	100%	0%
Greens of Horsham	Breakout at east façade	100%	0%

TABLE B1: % ON-TIME CORRECTION FOR INDUSTRIAL/COMMERCIAL NOISE SOURCES

Start Time	Measured Noise Levels, dB re. 2 x 10^{-5} Pa. (T = 1min)							
	ST Location				LT3			
	$L_{Amax,F}$	$L_{A10,T}$	$L_{Aeq,T}$	$L_{A90,T}$	$L_{Amax,F}$	$L_{A10,T}$	$L_{Aeq,T}$	$L_{A90,T}$
	ST1				LT3			
00:32	51.8	48.6	46.6	44.6	53.3	48.7	46.6	44.7
00:33	50.2	46.3	45.5	44.5	53.3	48.3	45.8	43.9
00:34	50.2	47.6	46.1	44.9	51.9	48.1	45.9	44.6
00:35	51.3	49.0	47.3	45.4	53.3	49.7	47.5	45.2
00:36	50.1	47.2	45.6	43.7	51.1	47.6	45.7	44.1
00:37	47.7	45.6	44.7	43.7	47.8	45.8	44.9	43.8
00:38	48.7	46.5	45.2	44.0	48.0	46.1	44.8	43.6
00:39	48.2	46.7	45.5	44.5	48.1	46.7	45.2	43.9
Cumul.	*51.8*	*47.2*	*45.9*	*44.4*	*53.3*	*47.6*	*45.9*	*44.2*
	ST2				LT3			
00:44	48.3	46.2	44.8	43.4	48.1	46.9	45.9	44.8
00:45	50.9	47.9	46	43.8	51.4	48.8	46.7	44.6
00:46	49.5	48	46.7	45.1	49.1	48.2	47.0	45.9
00:47	45.5	44	42.8	41.8	45.9	45.2	44.2	43.6
00:48	49.1	45.9	43.9	42.4	49.1	46.1	45.2	44.2
00:49	50	47.5	45	42.7	49.5	47.8	45.6	43.8
00:50	50.7	48.5	45.5	42.6	52.2	49.2	46.3	43.8
Cumul.	*50.9*	*46.9*	*45.1*	*43.1*	*52.2*	*47.5*	*45.9*	*44.4*
	ST3				LT3			
00:54	44.9	43.8	42.6	41.4	47.2	45.8	44.9	43.9
00:55	44.6	43.3	41.6	40.2	46.9	45.6	44.5	43.4
00:56	43.5	41.8	40.8	40	45.0	43.8	43.3	42.8
00:57	45.4	44.1	43.1	41.8	47.4	46.1	45.1	44.1
00:58	45.3	43	41.8	40	46.5	45.3	44.5	43.2
00:59	48.4	45.2	43.2	40.9	48.6	47.0	45.5	44.3
01:00	48.7	45.6	44.2	41.1	48.3	47.1	45.9	43.9
01:01	42.2	40.9	40.3	39.7	44.9	44.2	43.7	43.3
Cumul.	*48.7*	*43.5*	*42.4*	*40.6*	*48.6*	*45.6*	*44.8*	*43.6*

TABLE B2: ATTENDED NOISE SURVEY RESULTS - WEDNESDAY 18TH JULY 2024

Start Time	Measured Noise Levels, dB re. 2 x 10^{-5} Pa. (T = 1min)							
	ST Location				LT3			
	$L_{Amax,F}$	$L_{A10,T}$	$L_{Aeq,T}$	$L_{A90,T}$	$L_{Amax,F}$	$L_{A10,T}$	$L_{Aeq,T}$	$L_{A90,T}$
	ST4				LT3			
01:04	50.9	48	44.9	40.9	51.4	48.9	47.1	44.7
01:05	49	42.2	40.9	38.9	47.6	45.3	44.6	43.8
01:06	43.3	41.1	40.3	39.2	46.9	45.4	44.5	43.7
01:07	47.9	44.7	42.8	40.5	49.9	46.8	45.2	43.7
01:08	51.9	47.2	44.8	41.3	51.0	47.7	46.2	44.2
01:09	47.6	43.8	42.6	40.7	48.9	47.0	45.7	44.3
01:10	50.9	47.6	45.5	42.2	51.9	49.9	48.0	45.7
Cumul.	*51.9*	*44.9*	*43.5*	*40.5*	*51.9*	*47.3*	*46.1*	*44.3*
	ST5				LT3			
01:13	48.8	43	42.2	41.2	49.5	45.0	44.3	43.3
01:14	51.3	47.6	44.1	40.9	49.5	47.8	45.8	43.9
01:15	51.3	47.4	44.2	41.4	48.8	47.2	45.2	43.7
01:16	45.2	43.3	41.9	41	48.6	45.7	44.4	43.1
01:17	49.9	46.2	44.1	41.8	49.7	47.2	45.9	44.0
01:18	52	47.4	44.9	42.2	50.3	48.4	46.5	44.8
01:19	45	42.3	41	40.2	45.6	44.4	43.5	42.6
Cumul.	*52.0*	*45.3*	*43.4*	*41.2*	*50.3*	*46.5*	*45.2*	*43.6*

TABLE B2 (CTD): ATTENDED NOISE SURVEY RESULTS - WEDNESDAY 18TH JULY 2024

Property ID	Floor	Predicted Daytime External Free-field Noise Level $L_{Aeq,16hr}$	Predicted Internal Noise Level, dB $L_{Aeq,16hr}$		Predicted Night-Time External Free-field Noise Level $L_{Aeq,8hr}$	Predicted Internal Noise Level, dB $L_{Aeq,8hr}$	
			Windows Partially Open	Windows Closed		Windows Partially Open	Windows Closed
A01	GND	58	43	25	51	36	<25
A01	1st	59	44	26	52	37	<25
A02	GND	56	41	<25	49	34	<25
A02	1st	58	43	25	51	36	<25
A03	GND	56	41	<25	49	34	<25
A03	1st	58	43	25	51	36	<25
A04	GND	56	41	<25	49	34	<25
A04	1st	57	42	<25	50	35	<25
A05	GND	55	40	<25	48	33	<25
A05	1st	57	42	<25	50	35	<25
A06	GND	54	39	<25	47	32	<25
A06	1st	56	41	<25	49	34	<25
A07	GND	53	38	<25	46	31	<25
A07	1st	54	39	<25	47	32	<25
A08	GND	57	42	<25	50	35	<25
A08	1st	58	43	25	51	36	<25
A09	GND	51	36	<25	44	29	<25
A09	1st	54	39	<25	47	32	<25
A10	GND	52	37	<25	45	30	<25
A10	1st	54	39	<25	47	32	<25
A11	GND	57	42	<25	50	35	<25
A11	1st	58	43	25	51	36	<25
A12	GND	51	36	<25	44	29	<25
A12	1st	54	39	<25	47	32	<25
A13	GND	57	42	<25	50	35	<25
A13	1st	58	43	25	51	36	<25
A14	GND	57	42	<25	50	35	<25
A14	1st	58	43	25	51	36	<25
A15	GND	57	42	<25	50	35	<25
A15	1st	58	43	25	51	36	<25
A16	GND	50	35	<25	43	28	<25
A16	1st	53	38	<25	46	31	<25
A17	GND	51	36	<25	44	29	<25
A17	1st	54	39	<25	47	32	<25
A18	GND	50	35	<25	43	28	<25
A18	1st	53	38	<25	46	31	<25
A19	GND	51	36	<25	44	29	<25
A19	1st	53	38	<25	46	31	<25
A20	GND	49	34	<25	42	27	<25
A20	1st	53	38	<25	46	31	<25
A21	GND	52	37	<25	45	30	<25
A21	1st	55	40	<25	48	33	<25

TABLE B3: BS 8233 - SUMMARY OF CALCULATED DAYTIME AND NIGHT-TIME AMBIENT NOISE LEVELS WITHIN HABITABLE ROOMS AT THE FRONT AND REAR OF THE PROPOSED DEVELOPMENT

Notes:

- *Red text indicates internal predicted noise levels which exceed the criteria.*
- *With windows closed the assumed composite façade reduction is 33 dB from the free-field noise level.*
- *With an open window, the assumed façade reduction is 15 dB from the free-field noise level.*
- *For all buildings apart from the apartment building, night-time internal noise levels are not presented at ground floor height as it is assumed all bedrooms are on upper floors.*

Property ID	Floor	Predicted Daytime External Free-field Noise Level $L_{Aeq,16hr}$	Predicted Internal Noise Level, dB $L_{Aeq,16hr}$		Predicted Night-Time External Free-field Noise Level $L_{Aeq,8hr}$	Predicted Internal Noise Level, dB $L_{Aeq,8hr}$	
			Windows Partially Open	Windows Closed		Windows Partially Open	Windows Closed
B01	GND	59	44	26	52	37	<25
B01	1st	60	45	27	53	38	<25
B02	GND	58	43	25	51	36	<25
B02	1st	59	44	26	52	37	<25
B03	GND	55	40	<25	48	33	<25
B03	1st	56	41	<25	49	34	<25
B04	GND	52	37	<25	45	30	<25
B04	1st	53	38	<25	46	31	<25
B05	GND	52	37	<25	45	30	<25
B05	1st	53	38	<25	46	31	<25
B06	GND	57	42	<25	50	35	<25
B06	1st	58	43	25	52	37	<25
B07	GND	57	42	<25	50	35	<25
B07	1st	58	43	25	51	36	<25
B08	GND	56	41	<25	49	34	<25
B08	1st	57	42	<25	50	35	<25
B09	GND	54	39	<25	47	32	<25
B09	1st	56	41	<25	49	34	<25
B10	GND	52	37	<25	45	30	<25
B10	1st	54	39	<25	47	32	<25
B11	GND	51	36	<25	44	29	<25
B11	1st	53	38	<25	46	31	<25
B12	GND	56	41	<25	50	35	<25
B12	1st	57	42	<25	50	35	<25
B13	GND	52	37	<25	45	30	<25
B13	1st	53	38	<25	46	31	<25
B14	GND	52	37	<25	45	30	<25
B14	1st	54	39	<25	47	32	<25
B15	GND	51	36	<25	44	29	<25
B15	1st	53	38	<25	46	31	<25
B16	GND	50	35	<25	43	28	<25
B16	1st	52	37	<25	46	31	<25
B17	GND	56	41	<25	49	34	<25
B17	1st	56	41	<25	50	35	<25
B18	GND	56	41	<25	50	35	<25
B18	1st	57	42	<25	50	35	<25
B19	GND	50	35	<25	43	28	<25
B19	1st	53	38	<25	46	31	<25
B20	GND	48	33	<25	41	26	<25
B20	1st	51	36	<25	44	29	<25
B21	GND	47	32	<25	40	25	<25
B21	1st	51	36	<25	45	30	<25

TABLE B3 (CTD): BS 8233 - SUMMARY OF CALCULATED DAYTIME AND NIGHT-TIME AMBIENT NOISE LEVELS WITHIN HABITABLE ROOMS AT THE FRONT AND REAR OF THE PROPOSED DEVELOPMENT

Notes:

- *Red text indicates internal predicted noise levels which exceed the criteria.*
- *With windows closed the assumed composite façade reduction is 33 dB from the free-field noise level.*
- *With an open window, the assumed façade reduction is 15 dB from the free-field noise level.*
- *For all buildings apart from the apartment building, night-time internal noise levels are not presented at ground floor height as it is assumed all bedrooms are on upper floors.*

Property ID	Floor	Predicted Daytime External Free-field Noise Level $L_{Aeq,16hr}$	Predicted Internal Noise Level, dB $L_{Aeq,16hr}$		Predicted Night-Time External Free-field Noise Level $L_{Aeq,8hr}$	Predicted Internal Noise Level, dB $L_{Aeq,8hr}$	
			Windows Partially Open	Windows Closed		Windows Partially Open	Windows Closed
B22	GND	50	35	<25	43	28	<25
B22	1st	53	38	<25	46	31	<25
C01	GND	56	41	<25	49	34	<25
C01	1st	57	42	<25	50	35	<25
C02	GND	56	41	<25	49	34	<25
C02	1st	57	42	<25	50	35	<25
C03	GND	56	41	<25	49	34	<25
C03	1st	57	42	<25	50	35	<25
C04	GND	56	41	<25	49	34	<25
C04	1st	57	42	<25	50	35	<25
C05	GND	56	41	<25	49	34	<25
C05	1st	57	42	<25	50	35	<25
C06	GND	56	41	<25	49	34	<25
C06	1st	57	42	<25	50	35	<25
C07	GND	48	33	<25	41	26	<25
C07	1st	51	36	<25	44	29	<25
C08	GND	48	33	<25	41	26	<25
C08	1st	51	36	<25	44	29	<25
C09	GND	49	34	<25	42	27	<25
C09	1st	53	38	<25	46	31	<25
C10	GND	49	34	<25	42	27	<25
C10	1st	53	38	<25	46	31	<25
C11	GND	49	34	<25	42	27	<25
C11	1st	52	37	<25	45	30	<25
C12	GND	49	34	<25	42	27	<25
C12	1st	52	37	<25	45	30	<25
C13	GND	47	32	<25	40	25	<25
C13	1st	52	37	<25	45	30	<25
C14	GND	49	34	<25	42	27	<25
C14	1st	52	37	<25	45	30	<25
C15	GND	50	35	<25	43	28	<25
C15	1st	52	37	<25	45	30	<25
C16	GND	48	33	<25	41	26	<25
C16	1st	51	36	<25	44	29	<25
C17	GND	52	37	<25	45	30	<25
C17	1st	54	39	<25	47	32	<25
D01	GND	54	39	<25	47	32	<25
D01	1st	54	39	<25	47	32	<25
D02	GND	53	38	<25	46	31	<25
D02	1st	54	39	<25	47	32	<25
D03	GND	47	32	<25	40	25	<25
D03	1st	51	36	<25	44	29	<25

TABLE B3 (CTD): BS 8233 - SUMMARY OF CALCULATED DAYTIME AND NIGHT-TIME AMBIENT NOISE LEVELS WITHIN HABITABLE ROOMS AT THE FRONT AND REAR OF THE PROPOSED DEVELOPMENT

Notes:

- *Red text indicates internal predicted noise levels which exceed the criteria.*
- *With windows closed the assumed façade reduction is 33 dB from the free-field noise level.*
- *With an open window, the assumed façade reduction is 15 dB from the free-field noise level.*
- *For all buildings apart from the apartment building, night-time internal noise levels are not presented at ground floor height as it is assumed all bedrooms are on upper floors.*

Property ID	Floor	Predicted Daytime External Free-field Noise Level $L_{Aeq,16hr}$	Predicted Internal Noise Level, dB $L_{Aeq,16hr}$		Predicted Night-Time External Free-field Noise Level $L_{Aeq,8hr}$	Predicted Internal Noise Level, dB $L_{Aeq,8hr}$	
			Windows Partially Open	Windows Closed		Windows Partially Open	Windows Closed
D04	GND	47	32	<25	40	25	<25
D04	1st	50	35	<25	43	28	<25
D05	GND	51	36	<25	44	29	<25
D05	1st	53	38	<25	46	31	<25
D06	GND	51	36	<25	44	29	<25
D06	1st	53	38	<25	46	31	<25
D07	GND	51	36	<25	44	29	<25
D07	1st	53	38	<25	46	31	<25
D08	GND	51	36	<25	44	29	<25
D08	1st	53	38	<25	46	31	<25
D09	GND	49	34	<25	43	28	<25
D09	1st	51	36	<25	44	29	<25
D10	GND	49	34	<25	42	27	<25
D10	1st	51	36	<25	44	29	<25
D11	GND	48	33	<25	41	26	<25
D11	1st	50	35	<25	43	28	<25
D12	GND	47	32	<25	40	25	<25
D12	1st	50	35	<25	43	28	<25
D13	GND	47	32	<25	40	25	<25
D13	1st	50	35	<25	43	28	<25
D14	GND	47	32	<25	40	25	<25
D14	1st	51	36	<25	44	29	<25
D15	GND	46	31	<25	39	<25	<25
D15	1st	49	34	<25	42	27	<25
D16	GND	47	32	<25	40	25	<25
D16	1st	50	35	<25	43	28	<25
D17	GND	45	30	<25	38	<25	<25
D17	1st	48	33	<25	41	26	<25
D18	GND	45	30	<25	38	<25	<25
D18	1st	49	34	<25	42	27	<25
D19	GND	46	31	<25	39	<25	<25
D19	1st	49	34	<25	42	27	<25
D20	GND	47	32	<25	40	25	<25
D20	1st	49	34	<25	43	28	<25
D21	GND	47	32	<25	40	25	<25
D21	1st	49	34	<25	42	27	<25
D22	GND	46	31	<25	39	<25	<25
D22	1st	48	33	<25	41	26	<25
D23	GND	45	30	<25	39	<25	<25
D23	1st	49	34	<25	42	27	<25
D24	GND	46	31	<25	39	<25	<25
D24	1st	49	34	<25	42	27	<25

TABLE B3 (CTD): BS 8233 - SUMMARY OF CALCULATED DAYTIME AND NIGHT-TIME AMBIENT NOISE LEVELS WITHIN HABITABLE ROOMS AT THE FRONT AND REAR OF THE PROPOSED DEVELOPMENT

Notes:

- *Red text indicates internal predicted noise levels which exceed the criteria.*
- *With windows closed the assumed composite façade reduction is 33 dB from the free-field noise level.*
- *With an open window, the assumed façade reduction is 15 dB from the free-field noise level.*
- *For all buildings apart from the apartment building, night-time internal noise levels are not presented at ground floor height as it is assumed all bedrooms are on upper floors.*

Property ID	Floor	Predicted Daytime External Free-field Noise Level $L_{Aeq,16hr}$	Predicted Internal Noise Level, dB $L_{Aeq,16hr}$		Predicted Night-Time External Free-field Noise Level $L_{Aeq,8hr}$	Predicted Internal Noise Level, dB $L_{Aeq,8hr}$	
			Windows Partially Open	Windows Closed		Windows Partially Open	Windows Closed
D25	GND	46	31	<25	39	<25	<25
D25	1st	49	34	<25	42	27	<25
D26	GND	44	29	<25	38	<25	<25
D26	1st	48	33	<25	41	26	<25
D27	GND	47	32	<25	40	25	<25
D27	1st	50	35	<25	43	28	<25
D28	GND	47	32	<25	40	25	<25
D28	1st	50	35	<25	43	28	<25
D29	GND	47	32	<25	40	25	<25
D29	1st	50	35	<25	43	28	<25
D30	GND	47	32	<25	40	25	<25
D30	1st	49	34	<25	42	27	<25
D31	GND	47	32	<25	40	25	<25
D31	1st	49	34	<25	42	27	<25
D32	GND	47	32	<25	40	25	<25
D32	1st	49	34	<25	42	27	<25
D33	GND	47	32	<25	40	25	<25
D33	1st	49	34	<25	42	27	<25
D34	GND	47	32	<25	40	25	<25
D34	1st	50	35	<25	43	28	<25
D35	GND	51	36	<25	44	29	<25
D35	1st	52	37	<25	45	30	<25
E01	GND	52	37	<25	46	31	<25
E01	1st	53	38	<25	47	32	<25
E02	GND	52	37	<25	45	30	<25
E02	1st	53	38	<25	46	31	<25
E03	GND	51	36	<25	45	30	<25
E03	1st	53	38	<25	46	31	<25
E04	GND	51	36	<25	44	29	<25
E04	1st	53	38	<25	46	31	<25
E05	GND	51	36	<25	44	29	<25
E05	1st	53	38	<25	46	31	<25
E06	GND	46	31	<25	39	<25	<25
E06	1st	49	34	<25	42	27	<25
E07	GND	44	29	<25	38	<25	<25
E07	1st	48	33	<25	41	26	<25
E08	GND	45	30	<25	38	<25	<25
E08	1st	48	33	<25	41	26	<25
E09	GND	48	33	<25	41	26	<25
E09	1st	50	35	<25	43	28	<25
E10	GND	51	36	<25	44	29	<25
E10	1st	53	38	<25	46	31	<25

TABLE B3 (CTD): BS 8233 - SUMMARY OF CALCULATED DAYTIME AND NIGHT-TIME AMBIENT NOISE LEVELS WITHIN HABITABLE ROOMS AT THE FRONT AND REAR OF THE PROPOSED DEVELOPMENT

Notes:

- *Red text indicates internal predicted noise levels which exceed the criteria.*
- *With windows closed the assumed composite façade reduction is 33 dB from the free-field noise level.*
- *With an open window, the assumed façade reduction is 15 dB from the free-field noise level.*
- *For all buildings apart from the apartment building, night-time internal noise levels are not presented at ground floor height as it is assumed all bedrooms are on upper floors.*

Property ID	Floor	Predicted Daytime External Free-field Noise Level $L_{Aeq,16hr}$	Predicted Internal Noise Level, dB $L_{Aeq,16hr}$		Predicted Night-Time External Free-field Noise Level $L_{Aeq,8hr}$	Predicted Internal Noise Level, dB $L_{Aeq,8hr}$	
			Windows Partially Open	Windows Closed		Windows Partially Open	Windows Closed
E11	GND	51	36	<25	44	29	<25
E11	1st	53	38	<25	46	31	<25
E12	GND	51	36	<25	44	29	<25
E12	1st	53	38	<25	46	31	<25
E13	GND	51	36	<25	44	29	<25
E13	1st	53	38	<25	46	31	<25
E14	GND	51	36	<25	44	29	<25
E14	1st	53	38	<25	46	31	<25
E15	GND	48	33	<25	41	26	<25
E15	1st	50	35	<25	43	28	<25
E16	GND	45	30	<25	39	<25	<25
E16	1st	49	34	<25	42	27	<25
E17	GND	45	30	<25	38	<25	<25
E17	1st	49	34	<25	42	27	<25
E18	GND	48	33	<25	41	26	<25
E18	1st	50	35	<25	43	28	<25
F01	GND	55	40	<25	49	34	<25
F01	1st	55	40	<25	49	34	<25
F02	GND	54	39	<25	47	32	<25
F02	1st	55	40	<25	48	33	<25
F03	GND	53	38	<25	47	32	<25
F03	1st	54	39	<25	48	33	<25
F04	GND	49	34	<25	42	27	<25
F04	1st	50	35	<25	43	28	<25
F05	GND	49	34	<25	42	27	<25
F05	1st	50	35	<25	43	28	<25
F06	GND	48	33	<25	42	27	<25
F06	1st	50	35	<25	44	29	<25
F07	GND	51	36	<25	45	30	<25
F07	1st	52	37	<25	46	31	<25
F08	GND	52	37	<25	45	30	<25
F08	1st	52	37	<25	46	31	<25
F09	GND	53	38	<25	47	32	<25
F09	1st	54	39	<25	47	32	<25
F10	GND	50	35	<25	44	29	<25
F10	1st	52	37	<25	45	30	<25
F11	GND	50	35	<25	43	28	<25
F11	1st	51	36	<25	44	29	<25
F12	GND	47	32	<25	40	25	<25
F12	1st	49	34	<25	42	27	<25

TABLE B3 (CTD): BS 8233 - SUMMARY OF CALCULATED DAYTIME AND NIGHT-TIME AMBIENT NOISE LEVELS WITHIN HABITABLE ROOMS AT THE FRONT AND REAR OF THE PROPOSED DEVELOPMENT

Notes:

- *Red text indicates internal predicted noise levels which exceed the criteria.*
- *With windows closed the assumed composite façade reduction is 33 dB from the free-field noise level.*
- *With an open window, the assumed façade reduction is 15 dB from the free-field noise level.*
- *For all buildings apart from the apartment building, night-time internal noise levels are not presented at ground floor height as it is assumed all bedrooms are on upper floors.*

Property ID	Floor	Predicted Daytime External Free-field Noise Level $L_{Aeq,16hr}$	Predicted Internal Noise Level, dB $L_{Aeq,16hr}$		Predicted Night-Time External Free-field Noise Level $L_{Aeq,8hr}$	Predicted Internal Noise Level, dB $L_{Aeq,8hr}$	
			Windows Partially Open	Windows Closed		Windows Partially Open	Windows Closed
F14	GND	47	32	<25	40	25	<25
F14	1st	49	34	<25	42	27	<25
F15	GND	47	32	<25	40	25	<25
F15	1st	48	33	<25	42	27	<25
F16	GND	46	31	<25	40	25	<25
F16	1st	49	34	<25	42	27	<25
F17	GND	47	32	<25	41	26	<25
F17	1st	49	34	<25	43	28	<25
F18	GND	46	31	<25	40	25	<25
F18	1st	49	34	<25	42	27	<25
F19	GND	46	31	<25	39	<25	<25
F19	1st	49	34	<25	42	27	<25
F20	GND	45	30	<25	38	<25	<25
F20	1st	48	33	<25	41	26	<25
G01	GND	50	35	<25	43	28	<25
G01	1st	51	36	<25	45	30	<25
G02	GND	48	33	<25	42	27	<25
G02	1st	50	35	<25	44	29	<25
G03	GND	48	33	<25	43	28	<25
G03	1st	49	34	<25	44	29	<25
G04	GND	48	33	<25	44	29	<25
G04	1st	49	34	<25	45	30	<25
G05	GND	47	32	<25	43	28	<25
G05	1st	48	33	<25	45	30	<25
G06	GND	50	35	<25	43	28	<25
G06	1st	51	36	<25	44	29	<25
G07	GND	47	32	<25	40	25	<25
G07	1st	48	33	<25	42	27	<25
G08	GND	49	34	<25	43	28	<25
G08	1st	52	37	<25	45	30	<25
G09	GND	50	35	<25	43	28	<25
G09	1st	52	37	<25	45	30	<25
G10	GND	49	34	<25	42	27	<25
G10	1st	51	36	<25	44	29	<25
G11	GND	47	32	<25	43	28	<25
G11	1st	49	34	<25	45	30	<25
G12	GND	47	32	<25	42	27	<25
G12	1st	50	35	<25	43	28	<25
G13	GND	47	32	<25	43	28	<25
G13	1st	49	34	<25	45	30	<25
G14	GND	47	32	<25	42	27	<25
G14	1st	50	35	<25	43	28	<25

TABLE B3 (CTD): BS 8233 - SUMMARY OF CALCULATED DAYTIME AND NIGHT-TIME AMBIENT NOISE LEVELS WITHIN HABITABLE ROOMS AT THE FRONT AND REAR OF THE PROPOSED DEVELOPMENT

Notes:

- *Red text indicates internal predicted noise levels which exceed the criteria.*
- *With windows closed the assumed composite façade reduction is 33 dB from the free-field noise level.*
- *With an open window, the assumed façade reduction is 15 dB from the free-field noise level.*
- *For all buildings apart from the apartment building, night-time internal noise levels are not presented at ground floor height as it is assumed all bedrooms are on upper floors.*

Property ID	Floor	Predicted Daytime External Free-field Noise Level $L_{Aeq,16hr}$	Predicted Internal Noise Level, dB $L_{Aeq,16hr}$		Predicted Night-Time External Free-field Noise Level $L_{Aeq,8hr}$	Predicted Internal Noise Level, dB $L_{Aeq,8hr}$	
			Windows Partially Open	Windows Closed		Windows Partially Open	Windows Closed
G15	GND	48	33	<25	41	26	<25
G15	1st	51	36	<25	44	29	<25
G16	GND	47	32	<25	42	27	<25
G16	1st	49	34	<25	43	28	<25
G17	GND	48	33	<25	41	26	<25
G17	1st	50	35	<25	43	28	<25
G18	GND	49	34	<25	42	27	<25
G18	1st	52	37	<25	45	30	<25
G19	GND	49	34	<25	43	28	<25
G19	1st	52	37	<25	45	30	<25
G20	GND	50	35	<25	43	28	<25
G20	1st	52	37	<25	45	30	<25
G21	GND	50	35	<25	43	28	<25
G21	1st	52	37	<25	45	30	<25
H01	GND	49	34	<25	43	28	<25
H01	1st	51	36	<25	44	29	<25
H02	GND	50	35	<25	43	28	<25
H02	1st	51	36	<25	44	29	<25
H03	GND	50	35	<25	43	28	<25
H03	1st	52	37	<25	45	30	<25
H04	GND	47	32	<25	40	25	<25
H04	1st	50	35	<25	43	28	<25
H05	GND	48	33	<25	41	26	<25
H05	1st	48	33	<25	42	27	<25
H06	GND	48	33	<25	41	26	<25
H06	1st	49	34	<25	42	27	<25
H07	GND	48	33	<25	41	26	<25
H07	1st	49	34	<25	44	29	<25
H08	GND	47	32	<25	42	27	<25
H08	1st	49	34	<25	44	29	<25
H09	GND	49	34	<25	44	29	<25
H09	1st	50	35	<25	44	29	<25
H10	GND	49	34	<25	43	28	<25
H10	1st	49	34	<25	44	29	<25
H11	GND	48	33	<25	43	28	<25
H11	1st	49	34	<25	44	29	<25
H12	GND	47	32	<25	42	27	<25
H12	1st	50	35	<25	44	29	<25

TABLE B3 (CTD): BS 8233 - SUMMARY OF CALCULATED DAYTIME AND NIGHT-TIME AMBIENT NOISE LEVELS WITHIN HABITABLE ROOMS AT THE FRONT AND REAR OF THE PROPOSED DEVELOPMENT

Notes:

- *Red text indicates internal predicted noise levels which exceed the criteria.*
- *With windows closed the assumed composite façade reduction is 33 dB from the free-field noise level.*
- *With an open window, the assumed façade reduction is 15 dB from the free-field noise level.*
- *For all buildings apart from the apartment building, night-time internal noise levels are not presented at ground floor height as it is assumed all bedrooms are on upper floors.*

Receptor	Floor	Specific Sound Level, dB ($L_{Aeq,1hr}$)	Feature Correction	Rating Sound Level, dB ($L_{Ar,1hr}$)	Background Sound Level dB ($L_{A90,T}$)	Excess of rating over background sound level, dB
A01	Ground	24	3	27	49	-22
A02		29	3	32		-17
A03		23	3	26		-23
A04		32	3	35		-14
A05		24	3	27		-22
A06		28	3	31		-18
A07		27	3	30		-19
A08		24	3	27		-22
A09		29	3	32		-17
A10		25	3	28		-21
A11		27	3	30		-19
A12		26	3	29		-20
A13		32	3	35		-14
A14		23	3	26		-24
A15		34	3	37		-12
A16		33	3	36		-13
A17		33	3	36		-13
A18		33	3	36		-13
A19		30	3	33		-16
A20		31	3	34		-15
A21		34	3	37		-13

TABLE B4: BS 4142 - CALCULATED SPECIFIC AND CUMULATIVE RATING LEVELS - DAYTIME – PROPERTY AREA A

Receptor	Floor	Specific Sound Level, dB $L_{Aeq,1hr}$	Feature Correction	Rating Sound Level, dB $L_{Ar,1hr}$	Background Sound Level dB $L_{A90,T}$	Excess of rating over background sound level, dB
B01	Ground	29	3	32	46	-14
B02		28	3	31		-15
B03		31	3	34		-12
B04		32	3	35		-11
B05		32	3	35		-11
B06		26	3	29		-17
B07		26	3	29		-17
B08		27	3	30		-16
B09		27	3	30		-16
B10		26	3	29		-17
B11		33	3	36		-10
B12		28	3	31		-15
B13		29	3	32		-14
B14		28	3	31		-15
B15		31	3	34		-12
B16		32	3	35		-11
B17		26	3	29		-17
B18		34	3	37		-9
B19		34	3	37		-9
B20		34	3	37		-9
B21		34	3	37		-9
B22		33	3	36		-10
C01	Ground	26	3	29	44	-15
C02		29	3	32		-12
C03		28	3	31		-13
C04		27	3	30		-14
C05		31	3	34		-10
C06		34	3	37		-7
C07		34	3	37		-7
C08		32	3	35		-10
C09		32	3	35		-9
C10		32	3	35		-9
C11		32	3	35		-9
C12		33	3	36		-8
C13		33	3	36		-8

TABLE B5: BS 4142 - CALCULATED SPECIFIC AND CUMULATIVE RATING LEVELS - DAYTIME – PROPERTY AREAS B & C

Receptor	Floor	Specific Sound Level, dB $L_{Aeq,1hr}$	Feature Correction	Rating Sound Level, dB $L_{Ar,1hr}$	Background Sound Level dB $L_{A90,T}$	Excess of rating over background sound level, dB
C14	Ground	33	3	36	44	-8
C15		28	3	31		-13
C16		27	3	30		-14
C17		25	3	28		-17
D01	Ground	27	3	30	44	-14
D02		30	3	33		-11
D03		29	3	32		-12
D04		25	3	28		-16
D05		29	3	32		-12
D06		30	3	33		-12
D07		27	3	30		-14
D08		28	3	31		-13
D09		30	3	33		-11
D10		31	3	34		-10
D11		31	3	34		-10
D12		32	3	35		-9
D13		27	3	30		-14
D14		28	3	31		-13
D15		28	3	31		-13
D16		27	3	30		-14
D17		28	3	31		-13
D18		29	3	32		-12
D19		27	3	30		-14
D20		32	3	35		-9
D21		36	3	39		-5
D22		36	3	39		-5
D23		34	3	37		-7
D24		34	3	37		-7
D25		35	3	38		-6
D26		35	3	38		-6
D27		36	3	39		-5
D28		36	3	39		-6
D29		37	3	40		-4
D30		27	3	30		-14
D31		27	3	30		-14
D32		25	3	28		-16
D33		26	3	29		-15
D34		28	3	31		-13
D35		25	3	28		-16

TABLE B6: BS 4142 - CALCULATED SPECIFIC AND CUMULATIVE RATING LEVELS - DAYTIME – PROPERTY AREA C & D

Receptor	Floor	Specific Sound Level, dB $L_{Aeq,1hr}$	Feature Correction	Rating Sound Level, dB $L_{Ar,1hr}$	Background Sound Level dB $L_{A90,T}$	Excess of rating over background sound level, dB
E01	Ground	34	3	37	48	-12
E02		28	3	31		-17
E03		30	3	33		-15
E04		34	3	37		-11
E05		29	3	32		-16
E06		31	3	34		-14
E07		34	3	37		-11
E08		32	3	35		-13
E09		37	3	40		-8
E10		33	3	36		-12
E11		28	3	31		-17
E12		33	3	36		-13
E13		28	3	31		-17
E14		35	3	38		-10
E15		35	3	38		-10
E16		35	3	38		-10
E17		35	3	38		-10
E18		37	3	40		-8

TABLE B7: BS 4142 - CALCULATED SPECIFIC AND CUMULATIVE RATING LEVELS - DAYTIME – PROPERTY AREA E

Receptor	Floor	Specific Sound Level, dB $L_{Aeq,1hr}$	Feature Correction	Rating Sound Level, dB $L_{Ar,1hr}$	Background Sound Level dB $L_{A90,T}$	Excess of rating over background sound level, dB
F01	Ground	38	3	41	48	-7
F02		33	3	36		-12
F03		30	3	33		-15
F04		31	3	34		-14
F05		34	3	37		-11
F06		36	3	39		-9
F07		36	3	39		-9
F08		37	3	40		-8
F09		44	3	47		-1
F10		42	3	45		-3
F11		41	3	44		-4
F12		40	3	43		-5
F13		34	3	37		-11
F14		34	3	37		-11
F15		31	3	34		-14
F16		37	3	40		-8
F17		41	3	44		-4
F18		39	3	42		-6
F19		32	3	35		-13
F20		38	3	41		-8
G01	Ground	42	3	45	48	-3
G02		44	3	47		-1
G03		43	3	46		-2
G04		44	3	47		-1
G05		44	3	47		-1
G06		41	3	44		-4
G07		36	3	39		-9
G08		35	3	38		-10
G09		38	3	41		-7
G10		42	3	45		-3
G11		43	3	46		-2
G12		41	3	44		-4
G13		43	3	46		-2
G14		41	3	44		-4
G15		42	3	45		-3
G16		42	3	45		-3
G17		40	3	43		-3

TABLE B8: BS 4142 - CALCULATED SPECIFIC AND CUMULATIVE RATING LEVELS - DAYTIME – PROPERTY AREA F & G

Receptor	Floor	Specific Sound Level, dB $L_{Aeq,1hr}$	Feature Correction	Rating Sound Level, dB $L_{Ar,1hr}$	Background Sound Level dB $L_{A90,T}$	Excess of rating over background sound level, dB
G18	Ground	34	3	37	48	-11
G19		34	3	37		-11
G20		35	3	38		-10
G21		36	3	39		-9
H01	Ground	39	3	42	47	-5
H02		33	3	36		-11
H03		32	3	35		-12
H04		33	3	36		-11
H05		29	3	32		-16
H06		33	3	36		-11
H07		40	3	43		-4
H08		42	3	45		-3
H09		42	3	45		-2
H10		42	3	45		-2
H11		41	3	44		-3
H12		40	3	43		-4

TABLE B9: BS 4142 - CALCULATED SPECIFIC AND CUMULATIVE RATING LEVELS - DAYTIME – PROPERTY AREAS G & H

Receptor	Floor	Specific Sound Level, dB $L_{Aeq,15min}$	Feature Correction	Rating Sound Level, dB $L_{Ar,15min}$	Background Sound Level dB $L_{A90,T}$	Excess of rating over background sound level, dB
A01	1st	27	3	30	32	-2
A02		28	3	31		-1
A03		25	3	28		-4
A04		29	3	32		0
A05		25	3	28		-4
A06		29	3	32		0
A07		28	3	31		-1
A08		27	3	30		-2
A09		28	3	31		-1
A10		28	3	31		-1
A11		28	3	31		-1
A12		27	3	30		-2
A13		29	3	32		0
A14		26	3	29		-3
A15		30	3	33		+1
A16		30	3	33		+1
A17		30	3	33		+1
A18		30	3	33		+1
A19		29	3	32		0
A20		29	3	32		0
A21		30	3	33		+1

TABLE B10: BS 4142 - CALCULATED SPECIFIC AND CUMULATIVE RATING LEVELS - NIGHT-TIME – PROPERTY AREA A

Receptor	Floor	Specific Sound Level, dB $L_{Aeq,15min}$	Feature Correction	Rating Sound Level, dB $L_{Ar,15min}$	Background Sound Level dB $L_{A90,T}$	Excess of rating over background sound level, dB
B01	1st	29	3	32	32	0
B02		29	3	32		0
B03		30	3	33		+1
B04		30	3	33		+1
B05		30	3	33		+1
B06		27	3	30		-2
B07		28	3	31		-1
B08		28	3	31		-1
B09		28	3	31		-1
B10		27	3	30		-2
B11		32	3	35		+3
B12		29	3	32		0
B13		30	3	33		+1
B14		30	3	33		+1
B15		30	3	33		+1
B16		31	3	34		+2
B17		29	3	32		0
B18		33	3	36		+4
B19		33	3	36		+4
B20		32	3	35		+3
B21		32	3	35		+3
B22		32	3	35		+3
C01	1st	28	3	31	32	-1
C02		30	3	33		+1
C03		29	3	32		0
C04		28	3	31		-1
C05		30	3	33		+1
C06		30	3	33		+1
C07		31	3	34		+2
C08		31	3	34		+2
C09		31	3	34		+2
C10		31	3	34		+2
C11		32	3	35		+3
C12		32	3	35		+3
C13		32	3	35		+3

TABLE B11: BS 4142 - CALCULATED SPECIFIC AND CUMULATIVE RATING LEVELS - NIGHT-TIME – PROPERTY AREAS B & C

Receptor	Floor	Specific Sound Level, dB $L_{Aeq,15min}$	Feature Correction	Rating Sound Level, dB $L_{Ar,15min}$	Background Sound Level dB $L_{A90,T}$	Excess of rating over background sound level, dB
C14	1st	32	3	35	32	+3
C15		27	3	30		-2
C16		29	3	32		0
C17		26	3	29		-3
D01	1st	28	3	31	32	-1
D02		30	3	33		+1
D03		29	3	32		0
D04		24	3	27		-5
D05		29	3	32		0
D06		30	3	33		+1
D07		28	3	31		-1
D08		29	3	32		0
D09		29	3	32		0
D10		30	3	33		+1
D11		31	3	34		+2
D12		31	3	34		+2
D13		28	3	31		-1
D14		29	3	32		0
D15		30	3	33		+1
D16		29	3	32		0
D17		30	3	33		+1
D18		30	3	33		+1
D19		30	3	33		+1
D20		30	3	33		+1
D21		34	3	37		+5
D22		34	3	37		+5
D23		34	3	37		+5
D24		34	3	37		+5
D25		34	3	37		+5
D26		34	3	37		+5
D27		35	3	38		+6
D28		34	3	37		+5
D29		34	3	37		+5
D30		28	3	31		-1

TABLE B12: BS 4142 - CALCULATED SPECIFIC AND CUMULATIVE RATING LEVELS - NIGHT-TIME – PROPERTY AREA C & D

Receptor	Floor	Specific Sound Level, dB $L_{Aeq,15min}$	Feature Correction	Rating Sound Level, dB $L_{Ar,15min}$	Background Sound Level dB $L_{A90,T}$	Excess of rating over background sound level, dB
D31	1st	28	3	31	32	-1
D32		28	3	31		-1
D33		29	3	32		0
D34		31	3	34		+2
D35		29	3	32		0
E01	1st	33	3	36	32	+4
E02		30	3	33		+1
E03		32	3	35		+3
E04		33	3	36		+4
E05		30	3	33		+1
E06		32	3	35		+3
E07		34	3	37		+5
E08		32	3	35		+3
E09		35	3	38		+6
E10		33	3	36		+4
E11		30	3	33		+1
E12		33	3	36		+4
E13		30	3	33		+1
E14		31	3	34		+2
E15		33	3	36		+4
E16		33	3	36		+4
E17		34	3	37		+5
E18		34	3	37		+5

TABLE B13: BS 4142 - CALCULATED SPECIFIC AND CUMULATIVE RATING LEVELS - NIGHT-TIME – PROPERTY AREA D & E

Receptor	Floor	Specific Sound Level, dB $L_{Aeq,15min}$	Feature Correction	Rating Sound Level, dB $L_{Ar,15min}$	Background Sound Level dB $L_{A90,T}$	Excess of rating over background sound level, dB
F01	1st	35	3	38	32	+6
F02		34	3	37		+5
F03		31	3	34		+2
F04		33	3	36		+4
F05		34	3	37		+5
F06		34	3	37		+5
F07		35	3	38		+6
F08		34	3	37		+5
F09		38	3	41		+9
F10		38	3	41		+9
F11		37	3	40		+8
F12		37	3	40		+8
F13		34	3	37		+5
F14		34	3	37		+5
F15		31	3	34		+2
F16		35	3	38		+6
F17		37	3	40		+8
F18		36	3	39		+7
F19		31	3	34		+2
F20		36	3	39		+7
G01	1st	39	3	42	32	+10
G02		40	3	43		+11
G03		42	3	45		+13
G04		44	3	47		+15
G05		44	3	47		+15
G06		42	3	45		+13
G07		36	3	39		+7
G08		36	3	39		+7
G09		36	3	39		+7
G10		43	3	46		+14
G11		43	3	46		+14
G12		41	3	44		+12
G13		42	3	45		+13
G14		40	3	43		+11
G15		41	3	44		+12
G16		40	3	43		+11
G17		38	3	41		+9

TABLE B14: BS 4142 - CALCULATED SPECIFIC AND CUMULATIVE RATING LEVELS - NIGHT-TIME – PROPERTY AREA F & G

Receptor	Floor	Specific Sound Level, dB $L_{Aeq,15min}$	Feature Correction	Rating Sound Level, dB $L_{Ar,15min}$	Background Sound Level dB $L_{A90,T}$	Excess of rating over background sound level, dB
G18	1st	34	3	37	32	+5
G19		34	3	37		+5
G20		36	3	39		+7
G21		36	3	39		+7
H01	1st	37	3	40	32	+8
H02		34	3	37		+5
H03		34	3	37		+5
H04		34	3	37		+5
H05		31	3	34		+2
H06		34	3	37		+5
H07		38	3	41		+9
H08		40	3	43		+11
H09		41	3	44		+12
H10		40	3	43		+11
H11		39	3	42		+10
H12		38	3	41		+9

TABLE B15: BS 4142 - CALCULATED SPECIFIC AND CUMULATIVE RATING LEVELS – NIGHT-TIME – PROPERTY AREAS G & H