CHAPTER 9:
NOISE AND VIBRATION

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9.0 NOISE AND VIBRATION

9.1 Introduction

9.1.1 This chapter reviews the potential impacts of the Proposed Development with respect to noise and vibration.

9.2 Scope of Assessment

9.2.1 This chapter assesses the likely significant effects of the Proposed Development in terms of noise and vibration and is supported by **ES Volume 4, Appendix C**.

9.2.2 The chapter describes: the assessment methodology; the baseline conditions currently existing at the Site and in the surrounding area; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; the likely residual effects after these measures have been employed; and the cumulative effects associated with the Proposed Development.

9.2.3 Type 1 cumulative effects 'intra-project effects' which are the combined effects of individual topic impacts on a particular sensitive receptor are considered in **Volume 2, Chapter 14**: Effect Interactions.

9.2.4 The two types of cumulative effects considered in this assessment are:

- type 1, intra-project effects which are the combined effects of individual topic impacts on a particular sensitive receptor; and
- type 2, inter-project effects which are the combined effects of two or more development projects, which may, on an individual basis not be significant but, cumulatively, might have a significant effect alongside the Proposed Development.

9.2.5 Cumulative effects during both the construction and operational phases of the Proposed Development will be assessed in this Chapter. Cumulative effects will also be addressed in a discrete section of this ES Chapter.

9.3 Key Legislation, Policy and Guidance

9.3.1 The noise and vibration assessments have been undertaken within the context of relevant planning policies, guidance documents and legislative instruments. These are summarised below.

National Planning Policy

The National Planning Policy Framework

9.3.2 The National Planning Policy Framework[1] (NPPF) sets out the government's planning policies for England and how these are expected to be applied. The revised NPPF comments on noise in the following ways:

[1] Ministry of Housing, Communities and Local Government. (July 2021) *The National Planning Policy Framework*

9.3.3 Paragraph 174: *"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."*

9.3.4 Paragraph 185: *"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; and*
- *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."*

Noise Policy Statement for England (NPSE)

9.3.5 The Noise Policy Statement for England[2] (NPSE) seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The statement applies to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise.

9.3.6 The statement sets out the long-term vision of the government's noise policy, which is to *"promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development".*

9.3.7 The guidance promotes the effective management and control of noise, within the context of Government policy on sustainable development and thereby aims to:

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

9.3.8 The statement adopts established concepts from toxicology that are currently being applied to noise impacts. The concept details noise levels, at which the effects of an exposure may be classified into a specific category. The classification categories as detailed within NPSE are as follows:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and

[2] Department for Environment, Food and Rural Affairs (March 2010). *Noise Policy Statement for England*

- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

9.3.9 It is recognised that SOAEL does not have a single objective noise-based level that is applicable to all sources of noise in all situations and therefore the SOAEL is likely to be different for different sources, receptors and at different times of the day.

9.3.10 No guidance has been issued at the time of writing to identify the SOAEL and LOAEL for typical noise sources and receptors.

National Planning Practice Guidance (NPPG) – Noise

9.3.11 The National Planning Practice Guidance[3] (NPPG) expands on the use of SOAEL:

"if the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused."

9.3.12 The NPPG also goes on to identify unacceptable noise exposure:

"at the highest extreme, noise exposure would cause extension and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be prevented from occurring."/

9.3.13 In addition, NPPG refers to further considerations to mitigating noise on residential developments. NPPG states that the noise impact may be partially offset if the residents of those dwellings have access to:

- a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling, and/or;
- a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or;
- a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or;
- a relatively quiet, protected, external publicly accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance).

Local Planning Policy

Reading Borough Local Plan – November 2019

[3] Ministry of Housing, Communities and Local Government (March 2014). *National Planning Practice Guidance - Noise*

9.3.14 The Reading Borough Local Plan[4] was adopted on the 4th November 2019. This document set out the planning policies for development in Reading up to 2036 and is the main consideration in deciding planning applications.

9.3.15 Policy CC8 – Safeguarding Amenity states:

9.3.16 "Development will not cause a detrimental impact on the living environment of existing residential properties or unacceptable living conditions for new residential properties, in terms of […] Noise and disturbance […] Vibration;"

9.3.17 Policy EN16 – Pollution and Water Resources states:

9.3.18 *"Development will only be permitted where it would not be damaging to the environment and sensitive receptors through land, noise or light pollution..."*

9.3.19 *"Proposals for development that are sensitive to the effects of noise or light pollution will only be permitted in areas where they will not be subject to high levels of such pollution, unless adequate mitigation measures are provided to minimise the impact of such pollution".*

9.3.20 Policy EN17 (Noise Generating Equipment) relates to noise from mechanical plant:

9.3.21 *"Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor".*

Legislation and Regulation

Environmental Protection Act (EPA) [Sections 79 and 80]

9.3.22 The Environmental Protection Act[5] 1990 defines matters that constitute a statutory nuisance:

- *"g) noise emitted from premises so as to be prejudicial to health or a nuisance"*

9.3.23 When satisfied that a statutory nuisance exists or is likely to occur, the local authority shall serve an abatement notice requiring restriction or execution of such works.

Control of Pollution Act (CoPA) [Sections 60 and 61].

9.3.24 The Control of Pollution Act 1974[6] (CoPA) requires that 'Best Practicable Means' (as defined in section 72 or CoPA) are adopted to control construction noise on any given site.

9.3.25 CoPA makes reference to BS 5228 as best practicable means. Section 61 sets out the process for application to the local authority for prior consent to carry out works.

Technical Standards and Guidance

CIEH, IOA and ANC - ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise New Residential Development, May 2017.

[4] Reading Borough Council (November 2019). *Reading Borough Local Plan.*

[5] The Environmental Protection Act (1990)

[6] Control of Pollution Act. (1974).

9.3.26 Current Government guidance on planning and noise for new residential developments is found in the National Planning Policy Framework (NPPF). One of the strengths of the NPPF is that it sets clear objectives. However, the Institute of Acoustics, Association of Noise Consultants and the Chartered Institute of Environmental Health feel there is insufficient technical guidance for practitioners and developers on how to deliver the Government's objectives. Therefore, these professional bodies have jointly produced the Professional Practice Guidance on Planning and Noise[7] (ProPG) which aims to complement existing Government advice and provides a recommended approach that can be applied proportionately to each development site to encourage good acoustic design.

9.3.27 ProPG seeks to promote the use of good acoustic design to:

- enable new homes to be built in areas previously considered unsuitable because of noise by appropriate evaluation and careful use of suitable mitigation;
- allow rapid identification of sites where noise is unlikely to be a constraint for new residential developments;
- permit swift recognition of noisy sites that are very unlikely to be suitable for new residential developments; and
- help to reduce the harmful impacts of noise on those moving into the properties and the surrounding communities.

9.3.28 ProPG recommends the following:

"Where there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment. In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide "whole dwelling ventilation" in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position.

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

"In addition to providing purge ventilation, open windows can also be used to mitigate overheating. Therefore, should the scheme be assessed with windows closed, but this scheme is reliant on open windows to mitigate overheating, it is also necessary to consider the potential noise impact during the overheating condition".

British Standard 7445

[7] ProPG Planning and Noise: Professional Practice Guidance on Planning & Noise May 2017, ANC, IOA, CIEH

9.3.29 British Standard (BS) 7445-2:1991 'Description and measurement of Environmental Noise'[8] defines parameters, procedures and instrumentation required for noise measurement and analysis.

British Standard 8233

9.3.30 British Standard 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'[9] (BS 8233) provides criteria for the assessment of internal noise levels for various uses including dwellings and commercial properties.

British Standard 5228

9.3.31 British Standard 5228:2009+A1:2014, Part 1 and Part 2 'Code of practice for noise and vibration control on construction and open sites'[10] (BS 5228) provides a 'best practice' guide for noise and vibration control. It includes sound power level (SWL) data for individual plant as well as a calculation method for noise from construction activities. Part 1 of the standard relates to noise and part 2 relates to vibration.

British Standard 4142

9.3.32 British Standard 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'[11] (BS 4142) describes methods to assess the likely effect of sound of an industrial and/or commercial nature on people who might be inside or outside a dwelling or premises used for residential purposes upon which the sound is incident.

British Standard 6472

9.3.33 British Standard 6472-1:2008: 'Guidance to Evaluation of Human Exposure to Vibration in Buildings Part 1: Vibration Sources Other than Blasting[12]' (BS 6472) presents recommended frequency weighted vibration spectra (for continuous vibration) and vibration dose values (VDV) (for intermittent vibration) above which comment is likely to occur in residential properties.

Calculation of Road Traffic Noise

9.3.34 Department of Transport/Welsh Office Memorandum 'Calculation of Road Traffic Noise'[13] (CRTN) describes procedures for traffic noise calculation, it is suitable for environmental assessments of schemes where road traffic noise may have an impact.

[8] British Standard 7445-2: 1991 Description and measurement of environmental noise, Part 2: Guide to the acquisition of data pertinent to land use, BSI, London.

[9] British Standard 8233: 2014 'Guidance on Sound Insulation and Noise Reduction for Buildings', BSI, London.

[10] British Standard 5228-1: 2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise

[11] British Standard 4142: 2014 + A1 2019 Methods for rating and assessing industrial and commercial sound'. BSI, London

[12] British Standard 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings, Part 1: Vibration sources other than blasting. BSI, London

[13] Calculation of Road Traffic Noise, Department of Transport Welsh Office, HMSO, 1988

Design Manual for Roads and Bridges

9.3.35 The Highways Agency 'Design Manual for Road and Bridges Volume 11 Section 3 Part 7 – Traffic Noise and Vibration'[14] (DMRB) provides guidance on the appropriate level of assessment to be used when assessing the noise and vibration impacts arising from all road projects, including new construction, improvements and maintenance.

WHO Guidelines for Community Noise 1999

9.3.36 The World Health Organisation (WHO) Guidelines for Community Noise (1999)[15] provides recommendations aimed to limit the adverse effects of noise on health .

ISO 9613

9.3.37 ISO 9613 'Attenuation of sound during propagation outdoors – Part 2: A general method of calculation'[16] gives general methods of calculating sound propagation outdoors including attenuation due to geometrical divergence (distance); air and ground absorption; screening; reflections and other effects.

IEMA and IOA Guidelines for Noise Impact Assessment 2014

9.3.38 The Institute of Environmental Management and Assessment (IEMA) and IOA Guidelines for Noise Impact Assessment[17] sets good practice standards for scope content and methodology of noise impact assessment. The guidelines present categories of significance relating to the change of basic noise levels.

Acoustics Ventilation and Overheating (AVO) Residential Design Guide

9.3.39 'Acoustics Ventilation and Overheating: Residential Design Guide' (AVO Guide)[18] recommends an approach to acoustic assessments for new residential development that takes due regard of the interdependence of provisions for acoustics, ventilation, and overheating. Application of the AVO Guide is intended to form part of demonstrating good acoustic design as described in the ProPG when considering internal noise level guidelines.

9.4 Consultation

9.4.1 On the 7th February 2019, Ross Jarvis, the Environmental Protection Officer at Reading Borough Council, was contacted regarding the current noise assessment required to support the initial planning application. The aims and methodology of the assessment were outlined in an email from Lucia Rodriguez-Perez, a Temple Consultant to confirm the local noise sources being assessed were in agreement with the council's views, the following was stated:

[14] Design Manual for Roads and Bridges, Volume 11, Environmental Assessment, Section 3, Environmental Assessment Techniques, Part 7, LA 111, Noise and Vibration, (formerly HD 213/11, IAN 185/15), The Highways Agency, November 2019

[15] World Health Organisation (1995), WHO Guidelines for Community Noise.

[16] ISO 9613 Attenuation of sound during propagation outdoors – Part 2: A general method of calculation

[17] Institute of Environmental Management and Assessment, (2014) Guidelines for Environmental Noise Impact Assessment

[18] Acoustics Ventilation and Overheating: Residential Design Guide, January 2020, Version 1.1

"The planned survey aims to assess the impact of existing nose sources at the area of the proposed development, so far, we have identified the following existing dominant noise sources:

- Kidmore End Rd;
- Peppard Rd; and
- Grove Rd, Eric Ave.

Due to the above, we propose to carry out an unattended noise survey for at least 5 days including a weekend at three separate measurement locations. Locating monitors at the east, south and north-east borders of the site we aim to measure the areas of the development most affected by the dominant nose sources. We also plan to carry out further attended measurements to assess noise impacts from Emmer Green Primary School and Golf Club (taking into consideration this noise source impacts the baseline survey and not the future development). The survey will be carried out in accordance with BS 7445: 1991 'Description and Measurement of Environmental Noise'".

9.4.2 On the 11th February 2020 a formal request for a Scoping Opinion from Reading Borough Council was submitted by Temple Group. No specific requests relating to Noise and Vibration were identified in the Scoping Opinion issued by Reading Borough Council on the 1st April.

9.4.3 On the 21st September 2021, the Environmental Health team at Reading Borough Council were contacted regarding the use of the 2019 baseline survey data for the revised application. The correspondence stated:

9.4.4 "….

Observations during the survey visits confirmed the dominant noise sources at the site were road traffic (from Kidmore End Road, Grove Road, Brooklyn Drive, Eric Avenue, Goreslands and Highdown Hill Road) and outdoor activity noise associated with Emmer Green Primary School.

Due to the nature of these sources, significant changes in noise levels are not expected at the site since the baseline surveys were undertaken. I am writing to you to confirm the use of the 2019 baseline data in the revised application EIA Chapter. Should no response be received, we will proceed on the assumption that the use of the baseline data is also in agreement with the Councils views."

9.4.5 At the time of writing this (13th October 2021) no response has been received.

9.5 Assessment Methodology

Determination of Baseline

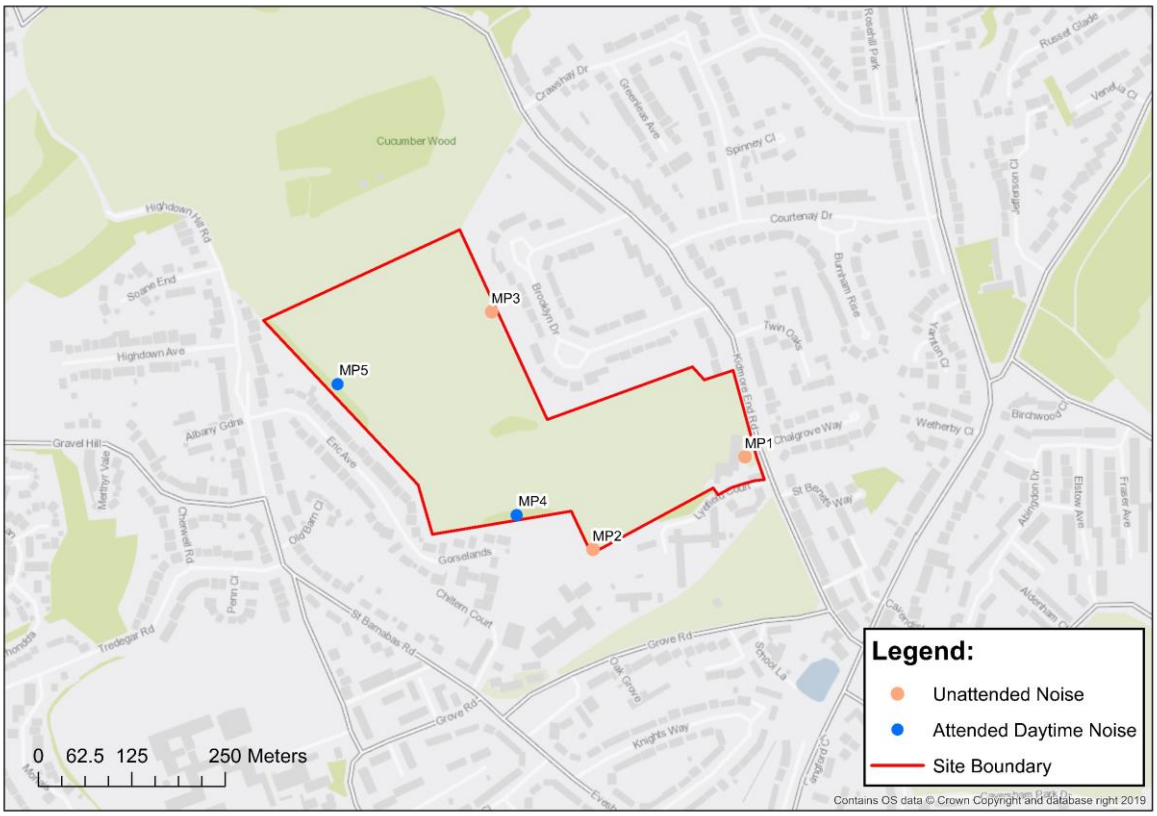
9.5.1 The Proposed Development is exposed to noise from the following sources:

- Road traffic noise from Kidmore End Road, Grove Road, Brooklyn Drive, Highdown Hill Road and Eric Avenue.
- Outdoor activity noise associated with Emmer Green Primary School.
- Intermittent aircraft noise from flights associated with Heathrow Airport.

9.5.2 A noise survey exercise was undertaken by Temple with an unattended survey between Tuesday 12th and Tuesday 19th February 2019 and supplemented by daytime attended surveys on Tuesday 12th and Tuesday 19th February 2019.

9.5.3 Three unattended sound level meters were installed on the Site and considered to be representative of the most exposed areas of the Proposed Development. The locations are shown as MP1, MP2 and MP3 in **Figure 9.1**. Subsequent attended measurements were carried out at locations MP4 and MP5.

Figure 9.1 - Unattended and Attended Noise Survey Locations



9.5.4 Distant road traffic noise was the dominant noise source at locations MP1 and MP3. Activity noise from Emmer Green Primary school was the dominant noise source at location MP2 when present, in the absence of this distant road traffic noise was the dominant noise

source. Intermittent distant aircraft noise was perceptible at all locations. The microphones were set up at a height of approximately 1.2 m above local ground level and the monitors were set to measure L_{Aeq}, $L_{A90,}$ L_{A10} and L_{AFmax} parameters.

9.5.5 Information collected regarding the meteorological conditions showed that the wind speeds were below 5 m/s throughout, and it was dry for the large majority of the survey period, with spells of light rain on Thursday 14th and Monday 18th February. For the periods where there was precipitation, there has been no observed effect on the measured data, consequently due to the consistency, no data has been removed.

Significance Criteria

9.5.6 A noise impact is a change in the acoustic environment. This may be through the introduction of a new noise source, a change to an existing source causing change to the noise climate at existing receptors or the introduction of a new noise sensitive development.

9.5.7 The magnitude of the noise impact can depend on the absolute noise level, change in noise level, duration of the exposure and the time of day at which it occurs.

9.5.8 Noise impacts can lead to effects on receptors, such as annoyance or sleep disturbance for residential receptors or disturbance to non-residential receptors.

9.5.9 The significance of a noise effect can vary depending on the type of receptor and its sensitivity to noise, such as residential, commercial or educational land uses.

9.5.10 The extent of the potential effects of the Proposed Development will be assessed using a five-point scale from ‘major adverse’ to ‘major beneficial’, a duration scale of short, medium and long term, and a geographic scale of local, district, regional, national and international. A ‘major’ or ‘moderate’ effect constitutes a ‘significant effect’.

9.5.11 **Table 9.1** below details how this relates to the national noise policy effect levels and therefore the action to be taken.

Table 9.1 Significance of Adverse Effect Related to National Noise Policy

Significance of Effect	Increasing Effect level	Action to be taken
Negligible	Noise impact exceeding NOEL	No Specific measures
Minor adverse	Noise impact exceeding LOAEL, just below SOAEL	Mitigate and reduce to a minimum
Moderate adverse	Noise impact exceeding SOAEL	Avoid
Major adverse	Unacceptable Adverse Effect	Prevent

Construction Noise

Prediction Methodology

9.5.12 To quantify potential construction noise impact, typical worst-case construction activity noise levels, $L_{Aeq,10hr}$, from the assumed construction activities have been predicted in accordance with BS 5228: Part 1 at a point 1 m from the façade of the relevant receptor. Calculations have been based on anticipated construction methods and mechanical plant likely to be used.

Impact Assessment Thresholds

9.5.13 Construction noise impacts have been assessed using the predicted noise levels in accordance with the evaluation criteria set out in **Table 9.2**. These criteria are based on the construction evaluation criteria set out in BS 5228: Part 1.

Table 9.2 Construction Evaluation Criteria

Assessment category and threshold value period	Threshold value, in decibels (dB) ($L_{Aeq,T}$)		
	Category A [A)]	Category B [B)]	Category C [C)]
Night-time (23:00 – 07:00)	45	50	55
Evening and weekends [D)]	55	60	65
Daytime (07:00 -19:00) and Saturdays (07:00 – 13:00)	65	70	75
Note 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. *Note 2: IIf the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.* *Note 3: Applied to residential receptors only.*			
[A)] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. [B)] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. [C)] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values. [D)]19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.			

9.5.14 The noise levels presented in **Table 9.2** are not intended to be used as a limit for noise emission from construction activities but rather as a guide to determine the significance or otherwise of the noise effects during the construction.

9.5.15 When rounding the ambient noise levels to the nearest 5 dB from all unattended monitoring positions, daytime noise levels are below 65 dBA. As a result, the threshold category for construction noise used for daytime assessment is category A.

9.5.16 The magnitude of impact from noise can be summarised as shown in **Table 9.3.**

Table 9.3 Magnitude of Impact from Construction Noise

Magnitude of Impact	Total Construction Noise Level
Negligible	< Assessment Category
Minor adverse	0 to 5 dB > Assessment Category
Moderate adverse	5 to 10 dB > Assessment Category
Major adverse	+10 dB > Assessment Category

9.5.17 The construction noise evaluation criteria shall apply to residential buildings and to occupied non-residential buildings for example commercial and educational institutions.

9.5.18 The SOAEL is considered to be the level at which the predicted construction noise level (based on professional judgement/ guidance and industry norms) exceeds the construction noise evaluation ‘Moderate Adverse’ criteria. Construction noise levels which fall into the ‘minor adverse’ criteria are considered to fall in between the SOAEL and the LOAEL.

9.5.19 Calculations have been carried out in accordance with BS 5228: Part 1 to calculate the likely noise levels at the closest receptors to the Site during the worst-case construction periods. The assessment includes corrections for facade reflections, any appropriate screening and likely percentage on times for the construction plant and assumes screening provided by site hoarding where required. Further information regarding the calculations is given in **ES Volume 4, Appendix C: Noise and Vibration**.

Construction Vibration

9.5.20 The Proposed Development will potentially introduce vibration from temporary construction plant and processes to the area. It is considered that the main sources of vibration during construction works relate to surface compaction and road construction works.

9.5.21 The vibration predictions have been undertaken in accordance with the methodologies described in BS 5228:2009 Part 2 for the closest residential receptors (at approximately 15 m).

9.5.22 Predicted vibration levels have been assessed utilising the example vibration criteria contained within BS 5228: Part 2 to assess the effect of perceptible vibration on people and BS 7385: Part 2 to assess the effect of vibration on buildings.

9.5.23 **Table 9.4** below is reproduced from BS 5228: Part 2. The vibration levels are in terms of Peak Particle Velocity (PPV) at the receptor. The 0.3 mm/s level is considered to be the LOAEL and 1 mm/s level to be the SOAEL.

Table 9.4 from BS 5228 Part 2 'Guidance on Effects of Vibration Levels'

Vibration Level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s	Vibration might just be perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if early warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

9.5.24 **Table 9.5** below is reproduced from BS 7385: Part 2. The levels given represent guide values for the onset of cosmetic damage in buildings.

Table 9.5 Table 8.1 form BS 7385 Part 2 'Transient Vibration Guide Values'

Type of Building	Peak Component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures industrial and heavy commercial buildings	50mm/s at 4 Hz and above	
Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	20mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Note 1 Values referred to are at the base of the building		

Note 2 for unreinforced, at frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) should not be exceeded

Off-Site Construction Traffic Noise

9.5.25 The change in noise associated with increased construction traffic on the surrounding road network has been calculated in accordance with the Calculation for Road Traffic Noise (CRTN). For roads with less than 1000 vehicles per 18 hours the methodology set out in the Noise Advisory Council measurement and prediction guide[19] has been used.

9.5.26 The potential impacts as a result of off-site road traffic have been evaluated in accordance with the Design Manual for Roads and Bridges (DMRB) short term traffic noise effect criteria given in **Table 9.6**. The change has been calculated as the difference between the baseline scenario and peak construction traffic.

Table 9.6 DMRB Short Term Traffic Noise Effect Criteria

Noise Change, $L_{A10,18hr}$ dBA	Magnitude of Effect
0	No Change
0.1 – 0.9	Negligible
1 – 2.9	Minor
3 – 4.9	Moderate
5+	Major

9.5.27 The SOAEL is considered to be equivalent to a 3 dB change and the LOAEL a 1 dB change. The change in noise level is calculated on individual road links, however the effect criteria apply to the total road traffic noise change at receptors, so in some cases additional calculations have been completed (e.g. if there are no noise sensitive receptors on the road, then there is no effect or the change at a receptor may be lower than the change on a road link due to the contribution from more than one road impacting the receptor).

Operational Noise

Mechanical Plant Noise

9.5.28 The operation of noise sources from the Proposed Development, including building services mechanical plant, has been assessed against BS 4142. The assessment is based on the difference between the rating noise level of the specific operational noise source and the measured background noise levels during periods of potential operation. The rating level includes corrections for acoustic character should these be present in the specific operational noise (such as tones or impulsiveness).

9.5.29 **Table 9.7** gives an indication of how the BS 4142 assessment may align with the national noise policy effect levels; however, the actual impact will depend on the context the new noise source is introduced into.

[19] The Noise Advisory Council (1978), A guide to measurement and prediction of the equivalent continuous sound level Leq. HMSO, London.

Table 9.7 BS 4142 Criteria

Difference between Rating Level and Background Level	BS 4142 Rating	NPSE effect level
- 10 dB*	N/A*	NOEL
0 dB	Indication of the specific sound source having a low impact depending on the context.	LOAEL
+ 10 dB	Likely to be an indication of a significant adverse impact depending on the context.	SOAEL

* The difference between rating level and background level of -10 dB was removed from BS 4142 in the 2014 revision however; this rating level can still be used as an indication of NOEL.

Off-Site Operational Traffic Noise

9.5.30 The change in noise associated with increased operational traffic on the surrounding road network has been calculated in accordance with CRTN. For roads with less than 1000 vehicles per 18 hours the methodology set out in the Noise Advisory Council measurement and prediction guide has been used.

9.5.31 The potential impacts as a result of off-site road traffic have been evaluated in accordance with DMRB traffic noise effect criteria. The change has been calculated as the difference between the future year 'do minimum' scenario and the future year 'do something' scenario, for the opening year 2026.

9.5.32 Short to medium term effects have been assessed against the short term DMRB criteria given in **Table 9.6**.

9.5.33 Long term effects of traffic noise from the Proposed Development have been assessed against the long-term DMRB criteria given in **Table 9.8**.

Table 9.8 DMRB Long Term Traffic Noise Effect Criteria

Noise Change, $L_{A10,18hr}$	Magnitude of Effect
0	No Change
0.1 – 2.9	Negligible
3 – 4.9	Minor
5 – 9.9	Moderate
10+	Major

9.5.34 The SOAEL is considered to be equivalent to be a 3 dB change for short to medium term effects and a 5 dB change for long term effects; the LOAEL is a 1 dB and 3 dB change respectively. The change in noise level is calculated on individual road links, however the effect criteria apply to the total road traffic noise change at receptors, so in some cases additional calculations have been completed.

Proposed Development Site Suitability

9.5.35 The introduction of a noise sensitive development into areas exposed to noise requires that a site suitability assessment is completed to assess whether the new noise sensitive uses would be undermined. The uses within the Proposed Development consist of residential units which have noise sensitive internal rooms and external spaces.

9.5.36 With the Proposed Development operational, the area will be exposed to noise from the existing noise sources. The area may also be exposed to new noise sources which will be implemented as part of the Proposed Development such as any mechanical plant installed on Site.

9.5.37 Assessment of the Proposed Development has been based on survey data from the unattended and attended baseline measurements.

9.5.38 The Site suitability assessment involves comparison of measured noise levels to various guideline internal and external guidelines which the Proposed Development should be designed to meet. Where the Proposed Development meets these guidelines, it is expected that the noise levels experienced by future users will be below the LOAEL and adverse effects will be unlikely to occur.

Residential Uses – Internal Rooms

9.5.39 The following guideline internal ambient noise levels for habitable rooms, shown in **Table 9.9.9** are given in BS 8233. The feasibility of the Proposed Development achieving these guideline levels has been assessed to determine the suitability of the Site for the proposed noise sensitive uses.

Table 9.9 BS 8233 Residential Internal Ambient Noise Level Criteria

Activity	Typical Situation	Average Ambient Day time Noise Level $L_{Aeq,16hrs}$, dB	Average Ambient Night-time Noise Level $L_{Aeq,8hrs}$, dB
Resting	Living rooms	35	N/A
Dining	Dining rooms	40	N/A
Sleeping (Daytime resting)	Bedrooms	35	30

9.5.40 In locations where regular individual noise events occur (such as scheduled aircraft or passing trains) which can cause sleep disturbance, BS 8233 recommends that a guideline value be set in terms of SEL or L_{AFmax} depending on the character and number of events per night. Where development is considered necessary or desirable, these may be relaxed (increased) by up to 5 dB.

9.5.41 The WHO Guidelines of Community Noise 1999 recommends that a 'Typical night-time L_{AFmax} dB' value of 45 dB should not be exceeded more than 10 to 15 times inside bedrooms during the night-time period to avoid potential sleep disturbance.

Residential Uses – External Spaces

9.5.42 The suitability of the use of outdoor amenity spaces within the Proposed Development has been assessed using BS 8233 criteria. BS 8233 states;

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making

efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."

"Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

Site Vibration Exposure

9.5.43 The nearest potential vibration source to the Site is local road traffic along Kidmore End Road which is adjacent to the eastern boundary.

9.5.44 Heavy road traffic would only be expected to cause significant vibration levels within 5 to 10 m if the roads are in poor condition. The roads surrounding the Site are in good condition and it is unlikely that traffic flow along Kidmore End Road would be high enough to cause significant vibration effects.

9.5.45 The closest railway line is approximately 2.8 km from the Site. At this distance it is highly unlikely that vibration levels will give rise to significant vibration effects as the propagation distance required to maintain significant levels of vibration at the receptor would be far lower than this.

9.5.46 Subsequently, no further assessment of vibration exposure on the Site has been completed.

Limitations and Assumptions

Construction Phase

Construction Noise

9.5.47 Detailed methodology for the construction of the Site is not available for any phase of the project and would be determined by the appointed contractor. However, an outline construction programme and construction information have been provided in **ES Volume 2, Chapter 5: The Proposed Development and Construction Overview**.

9.5.48 The construction of the Proposed Development is proposed to commence in 2022 and completed by the end of 2026.

9.5.49 Based on the current available works description, it is considered that the noise impact would be greatest during enabling and site preparation works, and general construction activities. These activities will take place at various locations across the Site.

9.5.50 Within **ES Volume 2, Chapter 5: The Proposed Development and Construction Overview** an indicative list of the mechanical plant and equipment likely to be used per

construction activity has been included. Noise generating activities during the works could include the following:

- enabling and site preparation works – may include tracked/wheeled 360 degree excavators, tipper lorries, dumpers and earth compaction equipment across the Site; and
- construction activities – may involve concrete pumps, mixer trucks and vibrating rollers at building foundations.

9.5.51 Noise impacts from services installation, fit-out and landscaping are likely to be lower than the enabling works and site preparation, and construction stages of works.

9.5.52 Detailed phasing of the activities is currently not available. The assessment considers the loudest activity for the overall construction process.

9.5.53 The core working hours for Site preparation and construction would be:

- 08:00 – 18:00 hours weekdays; and
- 08:00 – 13:00 hours Saturday.

9.5.54 The core hours are in line with guidance in BS 5228; any work outside these hours would be subject to prior agreement, and/or reasonable notice given to Reading Borough Council (RBC) and its respective Environmental Health Officer (EHO). These hours would be strictly adhered to unless or in the event of:

- an emergency demands continuation of works on the grounds of safety;
- works are being carried out within the containment of the building envelope; or
- completion of an operation that would otherwise cause greater interference with the environment / general public if left unfinished.

Construction Vibration

9.5.55 Of the works described above, it is assumed that surface compaction has the potential to lead to significant levels of vibration at receptors.

Construction Road Traffic Noise

9.5.56 HGV movements each day are not expected to exceed more than 10 and 25 during the normal construction phase and initial development phase respectively.

9.5.57 Therefore, the assessment has been based on the maximum number of 25 movements per day to represent the worst-case noise change on the surrounding roads as a result of the Site construction activities.

9.5.58 The assessment is based on traffic data provided by the Applicants Transport Consultants.

Operational Noise

Operational Mechanical Plant

9.5.59 Currently there is no detailed information on whether any proposed noise generating plant is to be used on Site once operational. RBC will require the Site to comply with noise limits

(specific sound level to be at least 10 dBA below background noise level at the nearest sensitive receptor) as set out in their Local Plan. It is assumed that sufficient embedded mitigation is employed so that the limits are complied with.

Operational Road Traffic

9.5.60 The assessment year 2027 (opening year) is assumed to represent the worst-case noise change on the surrounding roads, when the Site is fully operational, and all units are occupied.

9.5.61 The assessment is based on traffic data provided by the Applicant's Transport Consultants.

9.6 Baseline Assessment and Identification of Key Receptors

Noise Sensitive Receptors

9.6.1 The following existing noise sensitive receptors in proximity to the Site have been taken into consideration when assessing the impacts associated with noise and vibration from both the construction and operational phases of the Proposed Development.

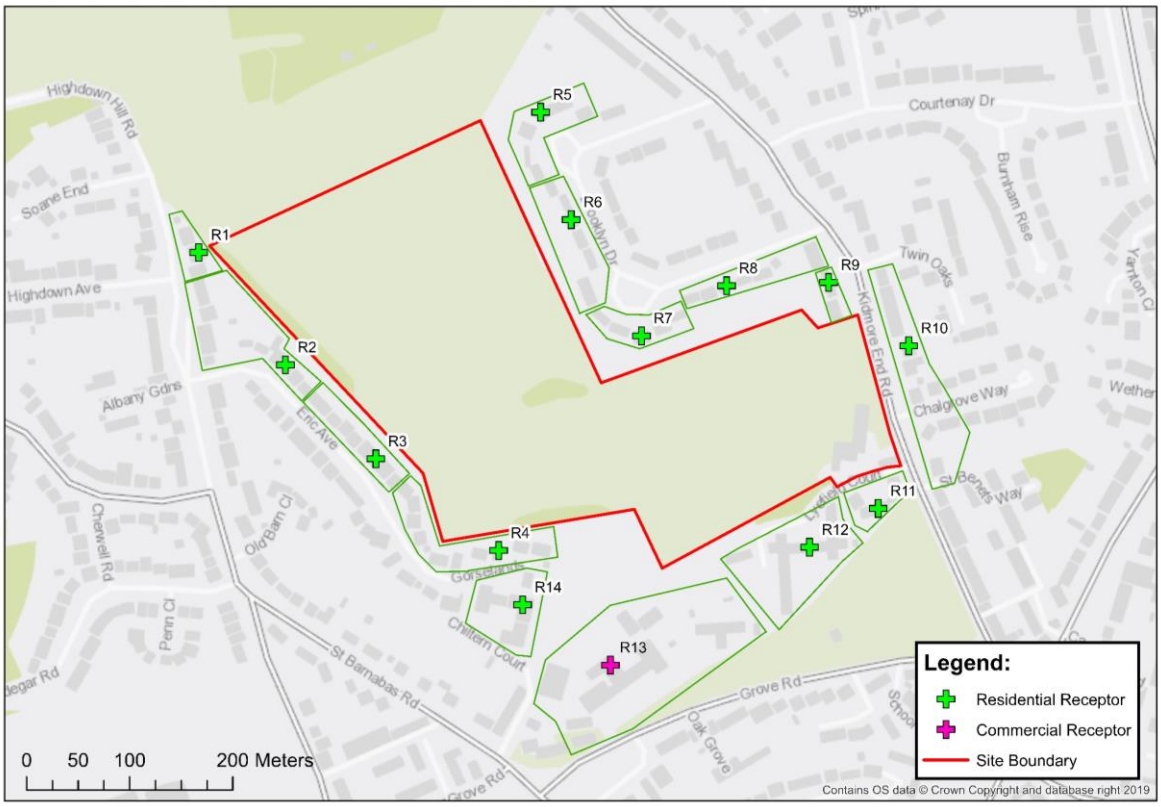
9.6.2 The existing receptors and type of receptor are presented in **Table 9.10** as follows:

Table 9.10 Existing Noise Sensitive Receptors

Receptor ID	Receptor	Type
R1	Properties on Highdown Hill Road	Residential
R2	Properties on Eric Avenue	Residential
R3	Properties on Eric Avenue	Residential
R4	Properties on Gorselands	Residential
R5	Properties on Brooklyn Drive	Residential
R6	Properties on Brooklyn Drive	Residential
R7	Properties on Brooklyn Drive	Residential
R8	Properties on Brooklyn Drive	Residential
R9	Properties on Kidmore End Road	Residential
R10	Properties on Kidmore End Road	Residential
R11	Properties on Lyefield Court	Residential
R12	Properties on Lyefield Court	Residential
R13	Emmer Green Primary School	Non Residential
R14	Chiltern Court Sheltered Housing	Residential

9.6.3 **Figure 9.2** shows the locations of the existing noise sensitive receptors.

Figure 9.2 Site Schematic of Existing Noise Sensitive Receptors



Noise Survey Results

9.6.4 The noise climate along the western boundary of the Site is dominated by continuous road traffic noise from Kidmore End Road, towards the north west corner there are also contributions from Brooklyn Drive. Distant road traffic noise from Eric Avenue and Highdown Hill Road are the dominant noise sources along the western boundary of the Site, domestic noise from properties along Eric Avenue is also perceptible. Along the southern boundary of the Site the noise climate is dominated by outdoor activity noise associated with Emmer Green Primary School when present (whilst playground is in use), in the absence of this the dominant noise source is distant road traffic noise from Grove Road and Kidmore End Road. Intermittent distant aircraft noise is also perceptible at all locations across the Site.

9.6.5 **Table 9.11** and **Table 9.12** present a summary of the results of the unattended and supplementary attended noise survey. The noise levels presented are representative of free field conditions. Full results of the baseline noise surveys are presented in **ES Volume 4, Appendix C: Noise and Vibration**.

9.6.6 The typical L_{A90} has been calculated by taking the most commonly occurring L_{A90} level from the relevant day/night periods throughout the survey.

Table 9.11 Summary of Unattended Noise Survey Results

Location	$L_{Aeq, T}$		10th Highest L_{Amax}		Typical L_{A90}	
	Day	Night	Day	Night	Day	Night
	07:00-23:00	23:00-07:00	07:00-23:00	23:00-07:00	07:00-23:00	23:00-07:00
MP1	55	48	82	70	45	45
MP2	47	37	74	58	41	33
MP3	39	33	54	43	42	32

Table 9.12 Summary of Attended Daytime Noise Survey Results

Location	Start Time	$L_{Aeq,10min}$	$L_{A90\ 10min}$	$L_{Amax\ 10min}$	School Playground
MP4	12/02/2019 12:10	52	47	67	In use
MP4	12/02/2019 12:40	55	50	67	In use
MP4	19/02/2019 11:38	42	34	57	-
MP5	12/02/2019 12:27	45	38	59	n/a
MP5	12/02/2019 12:54	45	38	64	n/a

9.7 Identification and Description of Changes Likely to Generate Effect

Construction Phase

9.7.1 Construction activities close to sensitive receptors could potentially generate noise impacts, particularly when more than one noisy activity coincide. These construction noise impacts can lead to temporary direct, reversible effects in the form of annoyance, speech interference and disturbance and are confined to the local scale (i.e. surrounding buildings).

9.7.2 Where compacting activities are to take place near sensitive receptors, vibration impacts may arise. This impact can lead to temporary direct, reversible effects in the form of annoyance from perceptible vibration of short to medium duration and are confined to the local scale (i.e. surrounding buildings). In more extreme cases, it can also lead to direct and permanent effects in the form of building damage (cosmetic and structural) which would be confined to the local scale (i.e. surrounding buildings).

9.7.3 Construction road traffic could potentially generate additional noise impacts at noise sensitive receptors surrounding the Site. These impacts can lead to temporary effects in the form of annoyance and disturbance of short to medium duration and are generally confined to the local scale (i.e. surrounding roads) but has the potential to lead to effects on the district scale (i.e. roads further afield).

Operational Phase

9.7.4 Noise from the operation of the Site (including any mechanical plant) could potentially generate noise impacts. This can lead to direct effects in the form of annoyance and disturbance of long-term duration and are confined to the local scale (i.e. surrounding receptors).

9.7.5 During the operation of the Site, a change in road traffic could potentially generate noise impact. This can lead to direct and temporary effects in the form of annoyance and disturbance of short to medium duration, then potentially lead to effects of long-term duration and are generally confined to the local scale (i.e. surrounding roads) but has the potential to lead to effects on the district scale (i.e. roads further afield).

9.8 Assessment of Likely Significant Effects

Construction Phase

Embedded Mitigation Measures

Construction Noise and Vibration

9.8.1 Impacts during the noisiest periods should be considered and addressed in terms of "Best Practicable Means" and controlled and managed through the Section 61 process of the Control of Pollution Act 1974.

9.8.2 BS 5228 does not state criteria for acceptable levels of construction noise; therefore, the preferred approach is to reduce noise levels where possible, but with due regard to practicability. Sometimes, a higher noise level may be acceptable if the overall construction time, and therefore length of disruption, is reduced.

9.8.3 A Code of Construction Practice (CoCP) will be implemented by the contractor during construction which will act as the means for delivering the mitigation described below. General construction noise and vibration mitigation measures include the following:

- unnecessary revving of engines should be avoided, and equipment switched off when not in use;
- internal haul routes should be kept well maintained;
- drop heights of materials should be minimised;
- plant and vehicles should be sequentially started up rather than all together;
- as far as reasonably practicable, sources of significant noise should be enclosed;
- plant should always be operated and maintained in accordance with manufacturers' instructions;
- care should be taken to site equipment away from noise-sensitive areas;
- where possible, loading and unloading should also be carried out away from such areas; and
- regular and effective maintenance by trained personnel should be undertaken to keep plant and equipment working to manufacturers specifications.

9.8.4 Screening such as noise barriers (in the form of site hoarding) will be used as appropriate.

Construction off-site Traffic Noise

9.8.5 A Construction Management Plan (CMP) will be implemented to manage vehicle routing, access to site, on site management and vehicle movements and working hours.

Anticipated Effects

Construction Noise

9.8.6 The assessment of construction impacts was undertaken regarding potential noise impacts at the nearest receptors to the Site.

9.8.7 Predictions of noise levels associated with construction activities listed in the indicative construction programme from **ES Volume 2, Chapter 5: The Proposed Development and Construction Overview** have been undertaken at distance representative of the closest receptor from the construction activities, circa 15 m.

9.8.8 The BS 5228 Part 1 prediction method uses the shortest distance from the receptor to the construction activities. The nearest boundary of respective working areas was used as the calculation point for equipment/plant classed as 'mobile' (including excavators) and from equipment/plant classed as 'fixed' (including generators).

9.8.9 Prediction of construction activity noise levels at each receptor consider features that may affect propagation, such as ground absorption. Other factors, such as the length of the working traverse and the machinery 'on-time', were also included within the calculations.

9.8.10 **Table 9.13** presents the predicted $L_{Aeq,10hr}$ levels for a working day ($L_{Aeq,5hr}$ for Saturdays) at distance representative of the closest receptor for each activity.

Table 9.13 Worst Case $L_{Aeq, 10hr}$ at Distance Representative of the Closest Receptor

Activity	**Construction noise level at** distance representative of the closest receptor, circa 15m*, **$L_{Aeq,10hr}$ ($L_{Aeq,5hr}$ for Saturdays) (dB)**
Enabling and Site Preparation	73
General Construction	74
Services Installation	68
Fit-out	67
Landscaping	73
Construction Traffic	67*

** - construction traffic noise calculated at distance of 5m from the closest receptor*

9.8.11 Noise levels relate only to isolated activities and do not consider other activities that may be working simultaneously across the Site. Where this were to occur, this may result in marginally higher noise levels at receptors, but this situation is considered unlikely.

9.8.12 Based on **Table 9.13** the assessment indicates that, with all plant working at the closest location, the predicted noise levels would have a moderate adverse impact at neighbouring sensitive receptors (i.e. Receptors located Eric Avenue, Gorselands and the north of Highdown Hill Road (R1, R4 and R9)).

9.8.13 There is a potential for short term minor adverse effects at the receptors between 15 m and 25 m to the Site perimeter (i.e. Receptors located on Eric Avenue (R2 and R3) Brooklyn Drive (R5 to R8), Kidmore End Road (R10), and Lyefield Court (R11 and R12)).

9.8.14 The effects of construction activities on receptors beyond 25 m to the Site perimeter are deemed to be negligible. Details of the calculations are presented in **ES Volume 4, Appendix C: Noise and Vibration**.

9.8.15 It should be noted that the calculation methodology used assumes that no screening or other forms of attenuation are provided (except site hoarding), and a worst-case distance has been used for all work activities.

9.8.16 Predicted noise levels are therefore conservative and in practice the actual noise levels may be lower than those predicted.

9.8.17 The nature of the construction works mean that the conservative situation predicted may only exist for a matter of days, or even hours. There would be regular periods, even during a single day, when the assumed plant would not be in operation, for example during breaks or changes of working routine. As discussed earlier, all works would be undertaken in accordance with best practice, and appropriate mitigation adopted where applicable.

Construction Vibration

9.8.18 According to the information provided within **ES Volume 2, Chapter 5: The Proposed Development and Construction Overview**, the most significant vibration generating activities associated with the works will be ground compaction during enabling works and road construction.

9.8.19 Based on assumptions of a typical vibratory roller, a double drum Bomag BW 135 AD vibratory roller, free-field resultant PPVs have been calculated from the following equation from TRL Report 429 'Groundborne vibration caused by mechanised construction works':

$$V_{res} = K_s\sqrt{n_d}\left[\frac{A}{x + L_d}\right]^{1.5}$$

Where:

V_{res} is the resultant Peak Particle Velocity

K_s is the scaling factor

n_d is the number of vibrating drums

A is the maximum amplitude of drum vibration

x is the ground distance measured along the ground distance, m

L_d is the vibrating roller drum width, m

9.8.20 The calculated resultant peak particle velocities for steady state operation are show in **Table 9.14**. Details of the calculations are presented in **ES Volume 4, Appendix C: Noise and Vibration.**

Table 9.14 Estimated Free-Field Vibratory Roller PPVs

Distance Between Receptor and vibratory roller, m	Resultant Peak Particle Velocity (mm/s)
15	0.78
25	0.38
50	0.14

9.8.21 The calculated PPVs suggest that, at a distance of circa.15 and 25 m from a building, the vibratory roller could generate PPVs in the region of circa. 0.78 and 0.38 mm/s respectively. This suggests there is a risk of vibration to have minor adverse effects at the nearest receptors to the Site within 25 m (i.e. Receptors located Eric Avenue (R2, R3), Gorselands (R4), Highdown Hill Road (R1), Brooklyn Drive (R5, R6, R7, R8), Kidmore End Road (R9 and R10), and Lyefield Court (R11 and R12)).

9.8.22 This potential vibration impact will be managed via planning for compacting activities to take place, where possible, during periods when occupants of the surrounding buildings are least likely to be sensitive to the construction vibration.

9.8.23 Vibration levels generated during all construction works would be significantly below the levels that may cause even cosmetic damage to properties.

Construction Off-site Traffic Noise

9.8.24 **Table 9.15** presents the predicted change in noise level associated with increased construction traffic on the surrounding road network during peak construction traffic. As no further detail has been provided on phased construction traffic data the assessment has been based on peak construction traffic levels. Details of the calculations are presented in **ES Volume 4, Appendix C: Noise and Vibration.**

Table 9.15 Peak Construction Road Traffic Noise Assessment

Road	Predicted Change in Traffic Noise Level, $L_{A10,18hr}$ dB	Short Term Impact Level
Kidmore End Road (North)	0.3	Negligible
Kidmore End Road (South)	0.3	Negligible
Peppard Road	0.0	No Change
Kiln Road	0.2	Negligible
Caversham Park Road	0.2	Negligible
Buckingham Drive	0.1	Negligible
Peppard Road Central	0.1	Negligible

9.8.25 The overall change in noise level along construction routes used to access the Site was calculated to be less than 1 dB on all roads and therefore is of negligible impact. DMRB states:

"In terms of permanent impacts, a change of 1 dB (A) in the short-term (e.g. when a project is opened) is the smallest that is considered perceptible. In the long-term a 3 dB (A) change is considered perceptible".

Operational Phase

Embedded Mitigation Measures

Mechanical Plant Noise

9.8.26 Currently there is no detailed information on the proposed noise generating plant to be used on Site once operational. Reading Brough Council will require the Site to comply with noise limits as set out in their respective Local Plan. It is assumed that sufficient embedded mitigation will be employed so that the limits are complied with if any mechanical plant is to be installed.

Operational Traffic Noise

9.8.27 There is no embedded mitigation proposed for operational traffic noise.

Anticipated Effects

Mechanical Plant Noise

9.8.28 **Table 9.16** identifies recommended operational noise limits based on the noise survey results.

9.8.29 The operational noise limit has been based on the specific sound level assessed at the receptor in accordance with Policy EN17 in the Reading Borough Local Plan. The limit applies to the measured or calculated total combined specific noise levels from the plant or equipment, associated with the mechanical units, at 1 m from the closest window of the relevant sensitive property during that stated time period.

Table 9.16 Recommended Operational Noise Limit Rating Levels

Receptor	Day (07:00-23:00)		Night (23:00-07:00)	
	Lowest Typical Background noise level, L_{A90} dB	Operational Noise Limit Specific Sound Level dB	Lowest Typical Background noise level, L_{A90} dB	Operational Noise Limit Specific Sound Level dB
All Receptors	41	31	32	22

9.8.30 Any plant to be installed on, or as part of, the Proposed Development should be subject to the above criteria. The collective sum of all plant operating under worst case conditions should not to exceed the above limits. Plant items should be located as far as possible or not overlooking any residential premises. Noise due to mechanical services equipment may need to be controlled by selecting low-noise items of plant, fitting acoustically louvred screens or enclosures, or erecting acoustic screens. An assessment of any proposed mechanical services plant should be undertaken, during the detailed design stage, to demonstrate that the limits proposed in **Table 9.16** will be achieved.

Operational Road Traffic Noise

9.8.31 **Table 9.17** presents the predicted change in noise level associated with increased development traffic on the surrounding road network during operational phase year 2026 Details of the calculations are presented in **ES Volume 4, Appendix C: Noise and Vibration**.

Table 9.17 Operational Road Traffic Noise Assessment

Road	Predicted Change in Traffic Noise Level, $L_{A10,18hr}$ dB	Short Term Impact Level	Long Term Impact Level
Kidmore End Road (North)	0.2	Negligible	Negligible
Kidmore End Road (South)	0.8	Negligible	Negligible
Peppard Road	0.0	No Change	No Change
Kiln Road	0.1	Negligible	Negligible
Caversham Park Road	0.1	Negligible	Negligible
Buckingham Drive	0.0	No Change	No Change
Peppard Road Central	0.0	No Change	No Change

9.8.32 The assessment indicates that changes in road traffic noise due to the Proposed Development during operational phase year 2026 will have a negligible affect along Kidmore End Road (North and South), Kiln Road and Caversham Park Road in both the short and long term. There will be no change on Peppard Road, Buckingham Drive and Peppard Road Central.

Proposed Development Site Suitability

Site Suitability

9.8.33 **Figure 9.3** and **Figure 9.4** show the results of the ProPG initial risk assessment from exposure to transport noise of the undeveloped site overlooking Kidmore End Road during daytime and night-time periods, respectively.

9.8.34 Due to the limitations of the noise model, predicted noise levels have only been used to inform the site risk assessment for areas dominated by transport noise i.e. the south east corner of the site (overlooking Kidmore End Road). For areas further into the Site away from Kidmore End Road the site risk assessment has been based on unattended and attended measured survey data to ensure a robust assessment.

9.8.35 Areas along the south east boundary (directly overlooking Kidmore End Road) vary from 'Medium' to 'Low' risk due to their proximity to the dominant noise source. Further into the Site away from Kidmore End Road there is a 'Negligible' risk across all other areas when noise levels are compared with the ProPG noise risk Values.

9.8.36 At 'Low' risk noise levels, the site is likely to be acceptable from the noise perspective provided that a good acoustic design process is followed and is demonstrated in an Acoustic Design Statement (ADS) which confirms how the adverse impacts of noise will be mitigated and minimised in the completed development.

9.8.37 As noise levels increase ('Medium' risk), the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless the ADS clearly demonstrate that significant adverse noise impacts will be avoided in the finished development.

9.8.38 **Table 9.18** presents a summary of the worst-case noise exposure levels identified for the Proposed Development. The typical $L_{Aeq,16hr}$, $L_{Aeq,8hr}$ and 10th highest L_{AFmax} noise exposure levels have been derived from the unattended noise survey results.

Table 9.18 Summary of Wort Case Noise Exposure at Proposed Development

Receptors	Daytime, $L_{Aeq,16hr}$ dB	Night time $L_{Aeq,8hr}$ dB	10th Highest Night time $L_{AFmax,T}$ dB
South East Boundary (overlooking Kidmore End Road) (MP1)	55	48	70
Southern Boundary (adjacent to Emmer Green Primary School) (MP2)	47	37	58
Northern Boundaries (MP3)	39	33	43

9.8.39 The guideline indoor noise levels which would be targeted are 35 dB $L_{Aeq,16hr}$ during the day in living rooms and 30 dB $L_{Aeq,8hr}$ and 45 dB L_{AFmax} during the night in bedrooms. Where development is considered necessary or desirable, these may be relaxed (increased) by up to 5 dB.

9.8.40 ProPG states that open windows typically reduce the sound insulation performance to no more than 10 to 15 dB(A), so windows would need to be closed to achieve the guidance indoor noise levels.

9.8.41 External noise ingress calculations have been undertaken and indicate that it is feasible to meet the internal noise level criteria outlined in BS 8233 at the most exposed facades using glazing with minimum weighted sound reduction index of 25 dB $R_w + C_{tr}$; this may typically be achieved using glazing with a 4/6/4 configuration, and typical sound insulation for walls and ventilation.

9.8.42 **Table 9.19** presents a summary of outline guidance on the required facade sound insulation to meet the BS 8233 level at the various buildings in the Proposed Development, however this can vary depending on room sizes and types, window sizes, wall construction and ventilation strategy.

Table 9.19 Summary of Required Facade Sound Insulation

Receptor	Room Type	Outline guidance on the required façade sound insulation to achieve BS 8223:2014 & WHO guidelines for Community Noise, $R_w + C_{tr}$, dB	
		Day	Night
South East Boundary (overlooking Kidmore End Road) (MP1)	Living Room	20	-
	Bedroom	20	25
Southern Boundary (adjacent to Emmer Green Primary School) (MP2)	Living Room	17	-
	Bedroom	17	13
Northern Boundaries (MP3)	Living Room	9	-
	Bedroom	9	3

9.8.43 Specific calculated assessment of the sound insulation for all elements of the building envelope should be completed based on detailed design proposals to demonstrate that the guideline internal noise levels can be met with the proposed design.

AVO Guide Site Risk Assessment

9.8.44 **Table 9.20** show the results of the initial AVO Guide site risk assessment of noise from transport noise sources relating to overheating condition. For developments on 'Negligible' risk sites Level 1 assessment is sufficient. For 'Low' and 'Medium' risk sites, a Level 2 assessment can optionally be undertaken to give more confidence regarding the suitability of internal noise conditions.

9.8.45 For the purposes of the Level 1 assessment, it is assumed that a partially open window will provide an outside-to-inside level difference of 13 dB. This level difference is considered representative of typical domestic rooms with simple façade openings of around 2% of the floor area.

Table 9.20 Assessment Considering Effect of Potential Overheating Mitigation Strategies on the Acoustic Conditions

Receptors	Daytime, $L_{Aeq,16hr}$ dB	Night time $L_{Aeq,8hr}$ dB	10th Highest Night time $L_{AFmax,T}$ dB
South East Boundary (overlooking Kidmore End Road) (MP1)	55	48	78
Southern Boundary (adjacent to Emmer Green Primary School) (MP2)	47	37	76
Northern Boundaries (MP3)	39	33	45
Receptors	Level 1 risk assessment (in line with Table 3-2 of AVO Guide)		
South East Boundary (overlooking Kidmore End Road) (MP1)	Low	Low	-
Southern Boundary (adjacent to Emmer Green Primary School) (MP2)	Negligible	Negligible	-
Northern Boundaries (MP3)	Negligible	Negligible	-
Receptors	Standard Opening Windows: outside-to-inside level difference of 13 dB (in line with Table B-5 of AVO Guide)		
South East Boundary (overlooking Kidmore End Road) (MP1)	42	35	65
Southern Boundary (adjacent to Emmer Green Primary School) (MP2)	34	24	63
Northern Boundaries (MP3)	26	20	32

9.8.46 The assessment indicates that the internal levels are expected to achieve BS 8233 reasonable conditions if overheating control is provided by means of partially open windows. The anticipated worst-case internal levels with a partially open window (13 dB attenuation) to control overheating would be 42 dB during the day and 35 dB at night, with overheating design case L_{AFmax} levels up to 65 dB.

9.8.47 The use of opening windows as primary means of mitigating overheating is not likely to result in an adverse effect. An overheating mitigation strategy may therefore assume opening windows without acoustic constraint, and no special facade sound insulation features are required. The Level 2 assessment is therefore not required on the basis of Level 1 assessment.

9.8.48 Any strategy for mitigating overheating should however be undertaken, during the detailed design stage, to demonstrate that the ventilation and thermal comfort requirements will be achieved.

External Amenity Areas Noise Levels

9.8.49 It is desirable that the external noise level in amenity spaces such as gardens does not exceed 50 dB $L_{Aeq,16hr}$, with an upper guideline value of 55 dB $_{LAeq,16hr}$ which would be acceptable in noisier environments.

9.8.50 The assessment of external noise levels to BS 8233 and WHO guideline levels indicate that the guideline level of 50 dB $L_{Aeq,16hr}$ would be achieved in the majority of gardens and external amenity areas under typical ambient noise conditions. In areas directly overlooking Kidmore End Road, an upper guideline value of 55 dB $L_{Aeq,16hr}$ would be achieved.

Figure 9.3 ProPG Daytime Risk Assessment

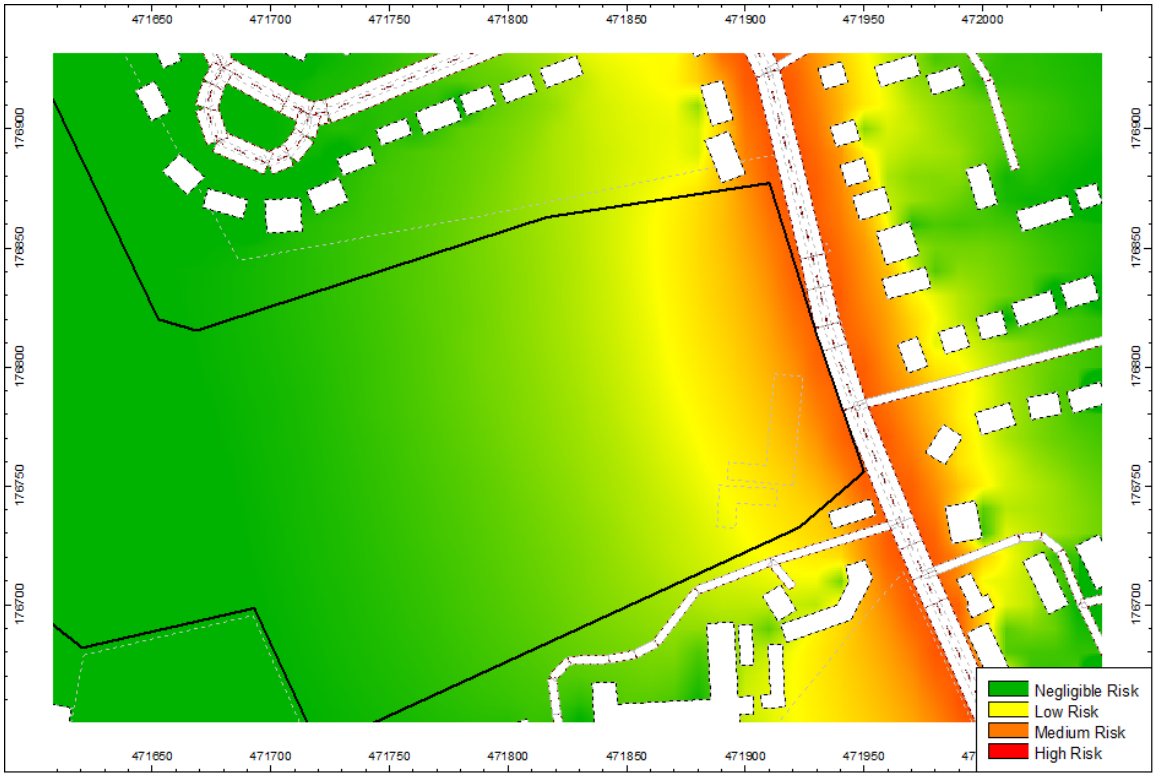
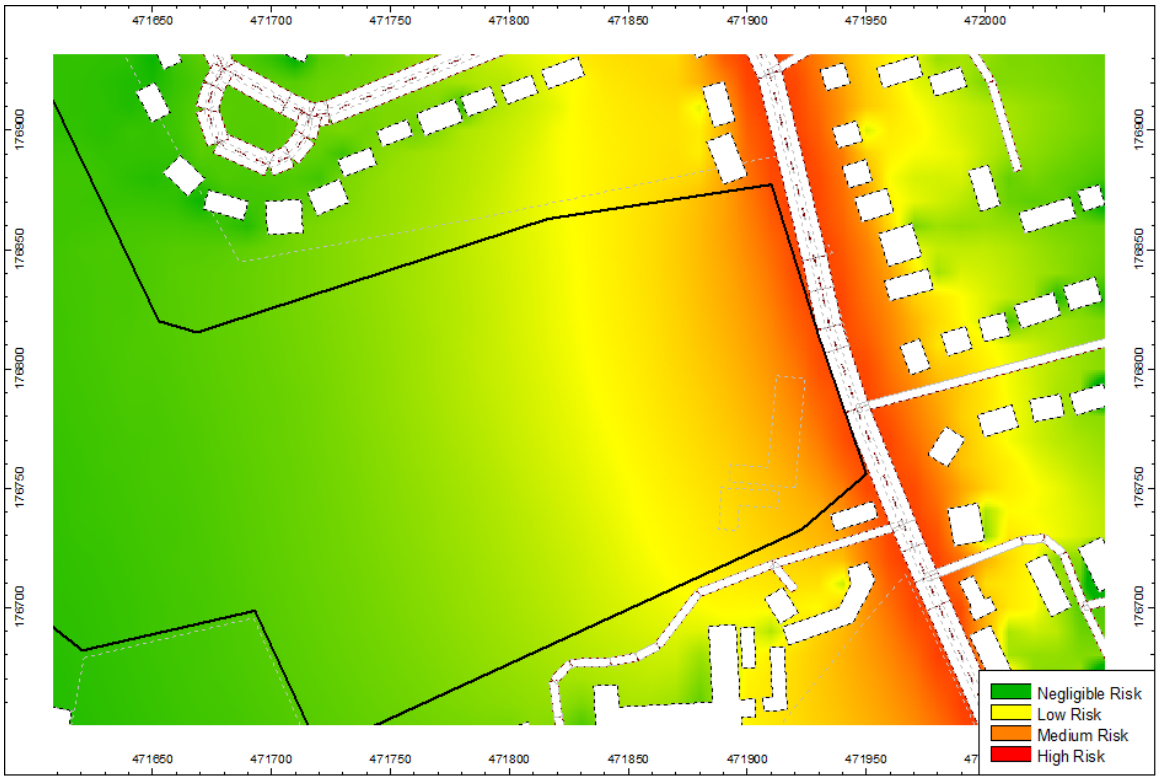


Figure 9.4 ProPG Night-time Risk Assessment



9.9 Scope for Additional Mitigation Measures

Potential Additional Mitigation Measures

Construction Phase

Construction Noise and Vibration

9.9.1 Prior warning and sufficient information about the nature of the works should be given to residents who are likely to be impacted by vibration from construction activities.

9.9.2 A risk assessment identifying the probability of vibration from compaction activities should also be carried out prior to commencement of construction activities, to determine the need for vibration monitoring. The contractor should use techniques least likely to cause vibration or impact damage to the surrounding properties.

Construction Off Site Traffic Noise

9.9.3 No additional mitigation measures are proposed for construction road traffic noise.

Operational Phase

Operational Mechanical Plant Noise

9.9.4 No additional mitigation measures are proposed for operational mechanical plant noise.

Operational Traffic Noise

9.9.5 No additional mitigation measures are proposed for operational road traffic noise.

Likely Effectiveness of Additional Mitigation Measures

Construction Phase

Construction Noise and Vibration

9.9.6 With the additional mitigation measures listed above, minor adverse effects are still likely at the closest residential and non-residential properties surrounding the Site along with the new residential receptors on the Proposed Development; however, they will be minimised as far as is practicable and, in some cases, reduced to negligible effects.

Construction Off Site Traffic Noise

9.9.7 No additional mitigation is proposed. The assessment shows that changes in road traffic noise due to the Proposed Development during construction phases are likely to be negligible.

9.10 Residual Effects

9.10.1 **Table** 9.21 provides a summary of the residual effects resulting from the Proposed Development after effective implementation of the embedded and additional mitigation measures proposed above.

Table 9.21 Significant Residual Effects

Phase	Resource or Receptor affected	Residual Effect
Construction	Existing residential and non-residential receptors within 15 m of the Site perimeter. (R1, R4, and R9)	Temporary minor adverse effect from construction noise and vibration due to close proximity to site boundary. Negligible effect from construction traffic noise.
	Existing residential and non-residential receptors within 15 m and 25 m of the Site perimeter. (R2, R3, R5, R6, R7, R8, R10, R11, R12)	Negligible effect from construction noise and vibration. Negligible effect from construction traffic noise.
Operation	All existing and future noise sensitive receptors.	Negligible effect from any operational mechanical plant.
	All existing and future noise sensitive receptors.	Negligible effect from operational road traffic noise along Kidmore End Road, Kiln Road and Caversham Park Road. No change from operational road traffic along all other road links.

9.11 Cumulative Effects

9.11.1 Cumulative effects are the combined effects of several development schemes (in conjunction with the Proposed Development) which may, on an individual basis be insignificant but, cumulatively, have a significant effect.

9.11.2 The ES has given consideration to 'Cumulative 'Effects' for schemes likely to cause significant effects. These committed schemes have been listed in **Volume 2, Chapter 3: EIA Methodology Table 3.7**.

9.11.3 The closest of these schemes is Henley Road and Land to the Rear of 205-207 Henley Road (Ref: 190835) which is located approximately 1.8 km south east from the Proposed Development.

9.11.4 Due to the large distance between the schemes, cumulative construction and operational impacts of an adverse nature are highly unlikely.

9.12 Summary and Conclusions

9.12.1 The assessment has been based on environmental surveys, predictions and calculations undertaken for the Site.

9.12.2 The main sources of noise incident on the Site and surrounding receptors are distant road traffic noise with distant aircraft and rail noise also audible to a lesser degree.

9.12.3 The impact of noise and vibration during construction of the Proposed Development has been predicted and assessed in accordance with BS 5228. Impacts from construction activities are predicted at the closest noise sensitive receptors to the works with temporary minor to moderate adverse effect likely. Best practicable means measures have been recommended to minimise noise and vibration from the construction site, which when implemented are capable of ensuring that the impact of noise and vibration during the construction is reduced to minor to negligible effect.

9.12.4 The assessment of the increase in road traffic noise change due to Proposed Development has been assessed. It is predicted that changes in road traffic noise are unlikely to give rise to additional adverse effects and would be of negligible significance due to the Proposed Development.

9.12.5 For the operational phase, a site suitability assessment has been completed in accordance with the adopted criteria to determine whether the new sensitive receptors would be undermined by exposure from existing noise and vibration sources. The assessment indicate that it is feasible to meet required criteria using appropriate glazing and sound insulation for walls and ventilation.

9.12.6 The assessment of external noise levels indicates that the guideline level of 50 dB $L_{Aeq\ 16hr}$ would be achieved in the majority of gardens and external amenity areas under typical ambient noise conditions. In areas directly overlooking Kidmore End Road, an upper guideline value of 55 dB $L_{Aeq,16hr}$ would be achieved.

9.12.7 As currently there is no detailed information on whether any proposed noise generating plant to be used on site once operational, RBC will require the Site to comply with noise limits as set out in their respective Local Plans. It is assumed that sufficient embedded mitigation is employed so that the limits are complied with. No likely significant effects are likely to occur if these limits are complied with.

9.12.8 Schemes that are located within approximately 200 m of the identified sensitive receptors can give rise to a potential cumulative noise and vibration impacts should construction works take place simultaneously on all sites. There are no developments within this distance

of the proposed development, and therefore, cumulative noise and vibration impacts of an adverse nature are highly unlikely during the construction and operation phases.

9.12.9 A summary of effects is presented in **Table 9.22**.

Table 9.22 Summary of Effects

Receptor/ Affected Group	Value or Sensitivity (Significance) of Receptor	Activity or Impact	Embedded Design Mitigation	Magnitude/ Spatial Extent/ Duration/ Likelihood of Occurrence	Significance of effect	Additional Mitigation	Residual Magnitude of Impact	Significance of Residual effect
Construction								
Existing residential and non-residential receptors within 15m of the site perimeter. (R1, R4, and R9)	High	Construction Noise	Screening Section 61	Moderate Direct Local Temporary Likely	Moderate adverse	Engagement and prior warning to local receptors.	Minor	Minor adverse
Existing residential and non-residential receptors within 15m and 25m of the site perimeter. (R2, R3, R5, R6, R7, R8 R10, R11, R12)	High	Construction Noise	Screening Section 61	Minor Direct Local Temporary Likely	Minor to moderate adverse	Engagement and prior warning to local receptors.	Negligible	Negligible
Existing residential and non-residential receptors within 15m of the site perimeter. (R1, R4, and R9)	High	Construction Vibration	None	Moderate Direct Local Temporary Likely	Minor adverse	Engagement and prior warning to local receptors.	Minor	Minor adverse
Existing residential and non-residential receptors within 15m and 25m of the site	High	Construction Vibration	None	Minor Direct Local Temporary	Minor adverse	Engagement and prior warning to local receptors.	Minor	Minor adverse

Receptor/ Affected Group	Value or Sensitivity (Significance) of Receptor	Activity or Impact	Embedded Design Mitigation	Magnitude/ Spatial Extent/ Duration/ Likelihood of Occurrence	Significance of effect	Additional Mitigation	Residual Magnitude of Impact	Significance of Residual effect
perimeter. (R2, R3, R5, R6, R7, R8 R10, R11, R12)				Likely Direct Local Temporary Likely				
All existing and future noise sensitive receptors.	High	Construction Traffic	Construction traffic management plan.	Minor Direct Local Temporary Likely	Negligible	None	Negligible	Negligible
Operation								
All existing and future noise sensitive receptors.	High	Operational Mechanical Plant	Plant Noise Limits	Negligible Direct Local Permanent Likely	Negligible	None	Negligible	Negligible
All existing and future noise sensitive receptors.	High	Operational Traffic Noise	None	Negligible Direct Local Permanent Likely	Negligible	None	Negligible	Negligible
Cumulative Effects - Construction								

Receptor/ Affected Group	Value or Sensitivity (Significance) of Receptor	Activity or Impact	Embedded Design Mitigation	Magnitude/ Spatial Extent/ Duration/ Likelihood of Occurrence	Significance of effect	Additional Mitigation	Residual Magnitude of Impact	Significance of Residual effect
No cumulative effects likely.								
Cumulative Effects – Operational								
No cumulative effects likely.								