

11. Noise and Vibration

11.1. Introduction

11.1.1. This Chapter of the Environmental Statement (ES) has been prepared by Hoare Lea on behalf of Hallam Land Management Ltd (the Applicant). It assesses the Proposed Development described in Chapter 4 in relation to Noise and Vibration.

11.1.2. The baseline situation is considered before the likely environmental effects of the Proposed Development are identified during its construction and operational phases. Mitigation measures to reduce any negative environmental effects are identified as appropriate, before the residual environmental effects are assessed.

11.1.3. This chapter is supported by the following appendices and/or figures:

- **Appendix 11.1:** Environmental noise survey
- **Figure 11.1:** Locations of identified sensitive receptors
- **Figure 11.2:** Environmental noise survey measurement positions
- **Figure 11.3:** Ventilation and overheating acoustic strategy
- **Figure 11.4:** Noise mapping – External noise levels

11.1.4. This Chapter, and its associated appendices, is intended to be read as part of the wider ES with particular reference to the introductory chapters (Chapter 1 to Chapter 4), as well as to Chapter 9: Transport and Access.

About the Author

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11.1.6. The document has been reviewed by Phil Mann, an Associate Director at Hoare Lea and a corporate Member of the Institute of Acoustics (MIOA). Phil holds a BSc(Hons) in Acoustics from The University of Salford, and has previous experience of preparing EIA chapters over the last seventeen years; including Broad Street, Reading (residential led) and Westgate Hill, Bradford (residential led).

11.1.7. Assistance has been provided by Al Plail, Associate Acoustics Engineer at Hoare Lea and a corporate Member of the Institute of Acoustics (MIOA). Al holds a BEng in Audio Technology / Acoustics from The University of Salford. Al has previous experience of preparing EIA chapters over the last ten years; including Princess Street, Manchester (residential led) and Kampus, Manchester (residential led).

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11.2. Assessment Approach

Methodology

Scope of the Assessment

- 11.2.1. The assessment considers impacts in relation to noise and vibration arising from operational & construction activities and operational & construction road traffic associated with the Proposed Development on identified sensitive receptors.

Construction Phase

Noise from Construction Activities

- 11.2.2. Construction noise and vibration is temporary and cannot be assessed in the same way as more permanent operational effects. BS 5228-1 indicates a number of factors that are likely to affect the acceptability of construction noise including Site location, the existing ambient sound levels, duration of Site operations, hours of work, attitude of the Site operator and noise characteristics of the work being undertaken.
- 11.2.3. Full details of the exact construction method and plant are not available at this stage of the development proposals. The construction noise impact assessment considers the typical activity based upon the type and scale of the Proposed Development, alongside the proposed construction programme detailed within Chapter 4 of this ES.
- 11.2.4. The following table sets out the sound pressure levels for typical activities during each work stage. Assumptions have been made in terms of what plant items will be in operation based on experience.

Table 11.1: Assumed construction activity sound pressure levels ($L_{Aeq,T}$)

Plant equipment assumed to be in operation	BS 5228-1 reference	Sound pressure level at 10m, dB $L_{Aeq,T}$
Dozer	C.2	L_{wA} 109 dB
Muck Away Lorries	D.7-41	L_{wA} 106 dB
Mini tracked excavator 5t trenching	C.4-68	L_{wA} 93 dB
6t Dumper distributing material	C.4-6	L_{wA} 97 dB
Roller	C.2-37	L_{wA} 97 dB
Wagon	C.8-19	L_{wA} 106 dB
360 deg Excavators (mini)	C.4-67	L_{wA} 102 dB
Face Shovel	C.10-1	L_{wA} 108 dB
Cement mixer truck (discharging)	C.4-18	L_{wA} 103 dB
Cement mixer truck (idling)	C.4-19	L_{wA} 99 dB
Loading scaffolding	D.7-2	L_{wA} 100 dB
Circular saw for cutting timber	D.7-78	L_{wA} 106 dB
Hammering	D.7-80	L_{wA} 103 dB

Table 11.2: Assumed Equipment Types, Quantities and Operational Times

Plant equipment assumed to be in operation	Plant assumptions predicted noise levels	
	No. of plant items	Assumed operational time percentage (over core working hours)
Earth Works		
Dozer	1	20
Muck Away Lorries	4	10
Road Construction		
Mini tracked excavator 5t trenching	1	50
6t Dumper distributing material	1	30
Roller	1	40
Wagon	2	20
Substructure		
360 deg Excavators (mini)	2	40
Face Shovel	2	20
Superstructure		
Cement mixer truck (discharging)	2	10
Cement mixer truck (idling)	2	20
Loading scaffolding	2	10
Circular saw for cutting timber	3	10
Fit-out		
Circular saw for cutting timber	3	20
Hammering	3	30

- 11.2.5. Noise from each type of construction activity has been predicted at the nearby noise sensitive receptors. The predictions account for sound attenuation due to distance between the source and receiver and assume an unobstructed line of sight.
- 11.2.6. Regarding distance attenuation, a reasonable 'worst-case' distance has been assumed during each work stage. The distance has been taken as the minimum between the receptor and the closest part of the Site designated for building development.
- 11.2.7. Note that the assessment does not include for noise from equipment such as generators. These are mobile and can be situated in appropriate locations within the Site such that they are away from noise sensitive receptors. Localised noise control measures, such as screening, can be employed to reduce the adverse effects.

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- 11.2.8. The predicted noise levels are then compared against fixed limiting levels to determine the impact magnitude. BS 5228-1 informative Annex E provides example criteria of absolute noise limits for construction activities, and these have been used to determine the significance of any construction noise impacts within this assessment.
- 11.2.9. The assessment for residential receptors has been based upon the 'ABC' method of BS 5228-1. Threshold criteria have been determined based upon the existing ambient sound levels present at the Site, which are described in the baseline conditions section of this chapter (Section 11.3). Thresholds for each residential receptor are outlined in the following table.

Table 11.3: ABC method thresholds for each residential receptor

Receptor ID	Category	Threshold values, dB $L_{Aeq,T}$ during the daytime period (Monday–Friday 07:00–19:00, Saturday 07:00–13:00)
R1	A	65
R2	A	65
R3	A	65
R5	A	65
R6	A	65

- 11.2.10. Impact magnitude will be determined based upon comparison of the predicted noise levels against the thresholds with additional consideration of the likely duration of the construction activity. The impact magnitudes are described in the table below.

Table 11.4: Impact magnitude for construction noise assessment

Impact magnitude	Description
High	Predicted noise levels exceed the thresholds in Table 11.3 for a prolonged period
Medium	Predicted noise levels exceed the thresholds in Table 11.3 for a 'short' period
Low	Predicted noise levels are between 0–10 dB below the thresholds in Table 11.3
Negligible	Predicted noise levels are more than 10 dB below the thresholds in Table 11.3

Vibration from Construction Activities

- 11.2.11. Piling operations during the early phases of construction present the main risk of vibration effects to surrounding buildings. Other construction activities are unlikely to generate significant levels of vibration over prolonged periods.
- 11.2.12. Although no construction information is available at this stage, it is assumed that no piling will be required at the proposed Site, and therefore all construction vibration effects are anticipated to be negligible. No further assessment has been carried out on this basis.

Construction Traffic Noise

- 11.2.13. Changes in noise levels attributed to construction traffic associated with the Proposed Development have been calculated using traffic data provided by the transport consultant (Astute Transport).
- 11.2.14. As per the guidance within the Design Manual for Road and Bridges ¹ (DMRB), assessment has been undertaken for road links where road traffic associated with the Proposed Development, or number of HGVs, is increased by more than 30%. Where assessment has been undertaken, the predictions have been made in accordance with the methodology set out within Calculation of Road Traffic Noise ² (CRTN).
- 11.2.15. The number of additional trips associated with construction have been provided for the worst-case construction year. The assessment is undertaken with respect to the 18-hour Average Annual Weekday Traffic (AAWT) data.
- 11.2.16. The magnitude of impact is determined by comparison of the resultant change in noise levels for the construction year baseline with and without the Proposed Development. The change in noise level is compared against DMRB criteria for short-term impacts with impact magnitudes for the construction traffic assessment to be derived from the table below.

Table 11.5: Impact magnitude for assessment of changes in road traffic noise during Construction Phase

Impact magnitude	Noise change, dB L _{A10,18hr}
High	≥ 5.0
Medium	3.0 – 4.9
Low	1.0 – 2.9
Negligible	< 1.0

Operational Phase*Changes in Noise due to Operational Road Traffic*

- 11.2.17. Operational road traffic noise levels as a result of the Proposed Development have been calculated using the methodology set out within CRTN. The operational road traffic noise levels have been compared in accordance with the short-term methodology guidance in DMRB, and their impact has been assessed in accordance with IEMA guidance.
- 11.2.18. Traffic flow data has been provided by the Transport Consultant (Astute Transport) for the following scenarios:
- Baseline traffic flows (2025)
 - Future traffic flow without Proposed Development at opening year (2028).

¹ Standards for Highways, 2020, Design Manual for Roads and Bridges: LA111 – Noise and vibration.

² Department of Transport / Welsh Office Memorandum: 1998, Calculation of road traffic noise.

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- Future traffic flow with Proposed Development at opening year (2028).

11.2.19. The magnitude of impact is determined by comparison of the resultant change in noise levels for the construction year baseline with and without the Proposed Development. The change in noise level is compared against DMRB criteria for short-term impacts with impact magnitudes for the operational road traffic assessment to be derived from the table below.

Table 11.6: Impact magnitude for assessment of changes in road traffic noise during Operational Phase

Impact magnitude	Noise change, dB $L_{A10,18hr}$
High	≥ 5.0
Medium	3.0 – 4.9
Low	1.0 – 2.9
Negligible	< 1.0

Noise from Operational Activity

11.2.20. It is common to apply a rating noise limit for the introduction of new commercial and industrial noise sources, inclusive of any new fixed plant items, which is set relative to the existing background sound levels in the noise sensitive areas. This is in line with the assessment methodology provided in BS 4142 ³, and the criteria used to determine the magnitude of impact for operational activity are set out in the table below.

Table 11.7: Impact magnitude for assessment of operational activity

Impact magnitude	Rating noise level dB
High	$L_{Ar,Tr} > +5.0$
Medium	$+0.0 < L_{Ar,Tr} \leq +5.0$
Low	$-5.0 < L_{Ar,Tr} \leq +0.0$
Negligible	$L_{Ar,Tr} \leq -5.0$

Site Suitability

- 11.2.21. Although site suitability is outside the remit of the EIA, it is a planning consideration, and therefore this assessment has been included within the Noise and Vibration Chapter for completeness.
- 11.2.22. Suitable internal noise levels within residential dwellings across the Site are assessed against the criteria in the table below, from BS 8233 ⁴.

³ British Standards Institution: 4142 2014 + A1 2019, Methods for rating and assessing industrial and commercial sound.

⁴ British Standards Institution: 8223 2014, Guidance on sound insulation and noise reduction for buildings.

Table 11.8: Impact magnitude for internal noise levels within residential dwellings

Impact magnitude	Site suitability noise criteria – internal
High	Day: > 50 dB L _{Aeq, 16hour} Night: > 40 dB L _{Aeq, 8hour} and > 55 dB L _{Amax}
Medium	Day: > 40 dB L _{Aeq, 16hour} Night: > 35 dB L _{Aeq, 8hour} and > 50 dB L _{Amax}
Low	Day: ≤ 40 dB L _{Aeq, 16hour} Night: ≤ 35 dB L _{Aeq, 8hour} and ≤ 50 dB L _{Amax}
Negligible	Day: ≤ 35 dB L _{Aeq, 16hour} Night: ≤ 30 dB L _{Aeq, 8hour} and ≤ 45 dB L _{Amax}

- 11.2.23. Suitable external noise levels across proposed residential amenity areas across the Site are assessed against the criteria within the table below, based on BS 8233 guidance.

Table 11.9: Impact magnitude for internal noise levels within external residential amenity areas

Impact magnitude	Site suitability noise criteria – external
High	> 65 dB L _{Aeq, 16hour}
Medium	> 55 dB L _{Aeq, 16hour}
Low	≤ 55 dB L _{Aeq, 16hour}
Negligible	≤ 50 dB L _{Aeq, 16hour}

Assessment of Significance

- 11.2.24. Noise sensitive receptors have been classified into different categories of sensitivity, which are summarised in the table below. Categories have been determined through professional judgement based upon the likely activities taking place within the type of building, and the likely noise tolerance of the occupant.

Table 11.10: Description of receptor sensitivity

Sensitivity	Typical receptors
High	Concert halls, recording studios, residential dwellings, schools, Healthcare buildings with sleeping facilities, hotels
Medium	Healthcare buildings without sleeping facilities (e.g. GP's office) museums, libraries, places of worship
Low	Commercial buildings (e.g. retail or office), industrial buildings

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- 11.2.25. While the specific thresholds and assessment parameters will vary depending on the nature of the impact being assessed, magnitudes of impact can be classified into four categories based on professional assessment experience and guidance provided by NPSE ⁵. These are presented in the following table.

Table 11.11: Description of impact magnitude

Magnitude	General threshold and description
High (H)	Above SOAEL thresholds. Effect significantly above appropriate guidance thresholds, clearly perceptible change, adverse impact expected requiring extensive mitigation measures.
Medium (M)	At SOAEL thresholds. Effect above appropriate guidance thresholds, may be perceptible under normal circumstances, adverse impact likely without mitigation measures.
Low (L)	Between LOAEL and SOAEL. Effect at or just above appropriate guidance thresholds, could be perceptible in certain scenarios only but still considered unlikely to draw adverse impact.
Negligible (N)	At LOAEL threshold or below. Effect at or below appropriate guidance thresholds, likely to be imperceptible and unlikely to draw adverse impact.

- 11.2.26. The significance of effect will then be determined using the matrix presented in the following table.
- 11.2.27. Effects that are 'Moderate', or 'Major' will be considered as Significant in the context of the noise impact assessment (highlighted in blue in the following table). 'Negligible' or 'Minor' effects will be considered Not Significant.

Table 11.12: Effect significance matrix

Impact Magnitude	Receptor sensitivity		
	High	Medium	Low
High (H)	Major	Moderate	Minor
Medium (M)	Moderate	Minor	Negligible
Low (L)	Minor	Negligible	Negligible
Negligible (N)	Negligible	Negligible	Negligible

⁵ Department for Environment, Food & Rural Affairs: 2010, Noise Policy Statement for England.

- 11.2.28. In addition to the sensitivity and magnitude of change, consideration is also given to other factors that may affect the significance of effect. For example, a 'high' impact may be considered to have a lower effect if it is highly localised. Conversely, a 'medium' impact may have a greater effect if the resultant change in noise is experienced over a prolonged period.

Legislative and Policy Framework

- 11.2.29. This section sets out legislation, national and local policy and guidance of relevance to the technical assessment in this Chapter.

Legislation

- 11.2.30. The Noise at Work Regulations 2005⁶ provide legal limits for noise exposure to employees. It sets thresholds at which employers need to undertake workplace noise risk assessments and provide training, a further threshold at which employers must provide mandatory hearing protection, and a limiting noise exposure value not to be exceeded on a daily, or weekly, basis.

National Planning Policy

National Planning Policy Framework 2024

- 11.2.31. The National Planning Policy Framework⁷ (NPPF) sets out the Government's planning policies for England and how they are expected to be applied. Paragraph 187 of the NPPF states:

"Planning policies & 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 & 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 & the quality of life;*
- b. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;..."*

National Policy Statement for England

- 11.2.32. The NPSE advises that the effects of noise should be assessed based upon adverse and significant adverse effects but does not provide any specific guidance on assessment methods or limiting noise levels. The NPSE introduces the concepts set out within the table below, which can be applied when considering the significance of noise impacts.

⁶ Health and Safety Executive. 2005. The Control of Noise at Work Regulations 2005.

⁷ Ministry of Housing, Communities, and Local Government: 2024, National Planning Policy Framework.

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Table 11.13: Summary of Effects Observed effect levels described in the NPSE

Effect level	Description
No Observed Effect Level (NOEL)	This is the noise level below which no effect can be detected. In simple terms, below this level of noise, there is no detectable effect on health and quality of life due to the noise being assessed.
Lowest Observed Adverse Effect Level (LOAEL)	This is the level of noise above which adverse effects on health and quality of life can be detected.
Significant Observed Adverse Effect Level (SOAEL)	This is the level of noise above which significant adverse effects on health and quality of life occur.

Planning Practice Guidance

- 11.2.33. Online Planning Practice Guidance ⁸ (PPG) provides further details in relation to the relevance of noise in the planning process following the publication of NPPF and NPSE.
- 11.2.34. The PPG explains that “where noise is not perceived to be noticeable, there is by definition no effect”. As noise exposure increases, a point will be reached where it becomes noticeable. PPG sets out a hierarchy of noise exposure which relates example responses back to the effect levels set out within the NPSE. This is summarised in the following table.
- 11.2.35. As with the NPSE, PPG does not provide any specific guidance on numeric limits or specific noise parameters.
- 11.2.36. It is explained that there is no simple relationship between noise levels and the impact on those affected, and that the impact could be affected by other factors such as:
- The source and absolute level of the noise, together with the time of day that noise is occurring;
 - For a new noise source, how the noise from it relates to the existing sound environment;
 - For non-continuous sources of noise, the number of noise events and the frequency and pattern of occurrence of the noise;
 - The spectral content of the noise (i.e. whether the noise contains particular tonal characteristics or other features); and
 - Cumulative impacts of more than one noise source.
- 11.2.37. The PPG also sets out that there are several approaches that can be taken to mitigate noise; whether through engineering methods to reduce noise at source, optimising layouts to reduce

⁸ Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 2021, Planning Practice Guidance.

noise effects, securing mitigation with planning conditions, or the introduction of physical mitigation to reduce noise (e.g. building envelope design, acoustic screens).

Table 11.14: Example responses to increased noise effect

Response	Examples of outcomes	Increasing effect level	Action
No observed effect level (NOEL)			
Not present	No effect	No observed effect	No specific measures required
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 (LOAEL)			
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 that there is a small actual or perceived change in the quality of life	Observed adverse effect	Mitigation and reduce to a minimum
Significant observed adverse effect level (SOAEL)			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological 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

The Development Plan

- 11.2.38. Knowsley Council have two adopted documents that pertain to the development. The Knowsley Local Plan, titled "Knowsley Local Plan: Core Strategy"⁹ was adopted in 2016 and superseded

⁹ Knowsley Council. 2016. Knowsley Local Plan: Core Strategy.

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the existing document, titled “Knowsley Replacement Unitary Development Plan”¹⁰. Several policies within the Unitary Development Plan were however carried over. All relevant policies from these document are provided below.

Local Plan: Core Strategy

- 11.2.39. The “Knowsley Local Plan: Core Strategy” was adopted in January 2016. This includes one policy relating to noise within the proposed development, and one additional paragraph with supplementary guidance. These are presented below:

Policy CS2: Development Principles

- 11.2.40. “New development in Knowsley and the preparation of subsequent stages of the Local Plan will be expected to support the following development principles:

- 11.2.41. **Principle 4:** *Recognise environmental limits, protect and enhance environmental assets, enhance local character and promote quality of place by:*

- 11.2.42. *e) Mitigating potential negative impacts of traffic growth and road traffic on highway safety, air quality, noise and health;*

- 11.2.43. *j) Minimising negative impact upon flood risk, air quality, water quality, land quality, soil quality, and noise or vibration levels and ensuring ant negative impacts are appropriated mitigated.*

- 11.2.44. *Development that will have an unacceptable impact upon any of the above will only be permitted where the benefits of the proposal clearly outweigh the harm.”*

Section 9.6 Promoting Quality of Place – Protecting Local Amenity

- 11.2.45. Paragraph 9.6: *“The design of new development should avoid unacceptable impacts which affect the amenity and living conditions of occupiers of buildings. Such effects can include generation of noise, light and air pollution and harmful overbearing and loss of privacy through overlooking.”*

Unitary Development Plan

- 11.2.46. The “Knowsley Replacement Unitary Development Plan” was adopted in June 2006. This includes three saved policies relating to noise within the proposed development. These are presented below:

Policy T8: Transport Assessment

- 11.2.47. *“Development proposals that would prejudice the primary function of any part of the highway network (i.e. the motorway, trunk road, primary and local highway network) by generating a material increase in traffic, which would overload the access to, or any part of the network, will not be permitted, unless the necessary mitigation measures required are undertaken.*

- 11.2.48. *Planning applications for the following forms of development will be required to be accompanied by a Transport Assessment:*

¹⁰ Knowsley Council. 2006. Knowsley Replacement Unitary Development Plan.

- 11.2.49. *C) Proposals which are likely to significantly increase pollution and/or noise as a result of traffic generation; or cause pollution levels in Air Quality Management areas to exceed guideline levels;"*

Policy DQ5: Development in Conservation Areas

- 11.2.50. *1. Development within or close to a Conservation Area must preserve or enhance the character or appearance of the Area, having regard to the following:*

- 11.2.51. *E) Likely levels of noise, pollution, traffic, parking or disturbance that may be caused by the development; and..."*

Policy ENV2: Noise and Vibration

- 11.2.52. *"1. Development that will either cause an unacceptable increase in noise or vibration levels or itself be subject to unacceptable noise or vibration from an existing source will not be permitted.*

- 11.2.53. *2. Where developments are permitted, conditions may be attached to the planning permission to ensure effective noise insulation or other required mitigation measures are carried out."*

Recognised Guidance

British Standard 7445-1 2003

- 11.2.54. BS 7445-1 ¹¹ 'Description and measurement of environmental noise' defines the basic quantities to be used for the description of environmental sound. The standard also sets out the procedures to be followed when undertaking measurements of sound.

British Standard 5228 2008 + A1 2014

- 11.2.55. BS 5228-1 ¹² 'Noise control on construction and open sites' provides guidance on a range of considerations relating to construction noise including the legislative framework, general control measures, example methods for estimating construction noise levels and example criteria which may be considered when assessing the significance of any effects. Similarly, BS 5228-2 ¹³ provides information relating to construction vibration.

British Standard 4142:2014 + A1 2019

- 11.2.56. BS 4142 'Methods for rating and assessing industrial and commercial sound' describes an objective method for the assessment of sound from commercial activities; including noise emissions from fixed building services plant.

- 11.2.57. The standard is based upon the evaluation of a 'rating level' of sound from a new source experienced at a noise sensitive receiver. The rating level is assessed against the prevailing background sound levels at the same receiver.

¹¹ British Standards Institution: 7745-1 2003, Description and measurement of environmental noise.

¹² British Standards Institution: 5228-1 2009 + A1 2014, Code of practice for noise and vibration control on construction and open sites Part 1: Noise.

¹³ British Standards Institution: 5228-2 2009 + A1 2014, Code of practice for noise and vibration control on construction and open sites Part 2: Vibration.

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- 11.2.58. Where the sound displays a particular acoustic characteristic, such as tonality, the sound rating attracts a penalty. The size of the penalty is relative to the significance of the acoustic feature. The corrections are presented in the following table.

Table 11.15: Acoustic feature corrections within BS 4142:

Chapter Descriptor	Acoustic feature correction
Tonality	+2 dB: Just perceptible +4 dB: Clearly perceptible +6 dB: Highly perceptible
Impulsivity	+3 dB: Just perceptible +6 dB: Clearly perceptible +9 dB: Highly perceptible
Intermittency	+3 dB: Readily distinctive
Other sound characteristics	+3 dB: Readily distinctive

- 11.2.59. The general principle is that the lower the rating level relative to the existing background sound, the less likely that the new sound source will have an adverse effect on the noise sensitive receiver.

- 11.2.60. The standard states that:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse effect, depending upon the context,
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context,
- 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.

- 11.2.61. In addition to the above, the document states that *'where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background.'*

- 11.2.62. It is noted within the standard that not all adverse impacts will lead to complaint, and equally that not every complaint is proof of an adverse impact.

British Standard 8233:2014

- 11.2.63. BS 8233 'Guidance on sound insulation and noise reduction for buildings' provides criteria for the assessment of internal sound levels for various types of development and building uses.

Table 11.16: Indoor ambient noise levels for dwellings (BS 8233 – Table 4)

Activity	Location	Time Period	
		Day (07:00 – 23:00)	Night (23:00 – 07:00)
Resting	Living rooms	35 dB $L_{Aeq,16hour}$	–

Dining	Dining Room / Area	40 dB $L_{Aeq,16hour}$	–
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

- 11.2.64. BS 8233 also refers to the requirement to control noise intrusion from individual events during the night to reduce the risk of sleep disturbance but does not stipulate a specific criterion to achieve this. Accepted acoustic best practice draws on reference to the World Health Organisation ¹⁴ (WHO) 1999: 'Guidelines for Community Noise' document, where it is stipulated that internal noise levels of 45 dB L_{Amax} from individual events should not be exceeded more than 10–15 times per night.
- 11.2.65. BS 8233 further advises that a partially open window can result in a sound reduction from outside to inside of 15 dB.
- 11.2.66. With respect to external amenity space such as gardens and patios it is stated that it is desirable that the 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. It is then confirmed that higher external noise criteria may be appropriate under certain circumstances such as within city centres, urban areas, and locations adjoining the strategic transportation network, where it may be necessary to compromise between elevated noise levels and other factors such as convenience of living, and efficient use of land resource.

Building Bulletin 93

- 11.2.67. Building Bulletin 93 'Acoustic Design of Schools: Performance Standards' ¹⁵ (BB93), first published in 2003 and last revised in 2015 sets out the minimum performance standards for the acoustic design of school buildings.
- 11.2.68. Table 1 of BB93 provides upper limits for indoor ambient noise levels for a range of different noise activities and sensitivity levels. The upper limit for newbuild nursery, primary and secondary school general teaching areas is 35 dB $L_{Aeq,30mins}$, assuming a mechanical ventilation strategy. This can be relaxed by 5 dB should a natural ventilation strategy be employed.

Calculation of Road Traffic Noise

- 11.2.69. In the UK, the Calculation of road traffic noise ¹⁶ (CRTN) document provides the standard method for predicting noise from road traffic. Predictions are made using input parameters, such as traffic flow, composition, speed and type of road, and distance of the receptor from the road. This method enables the calculation of average noise levels over a period of either 18 hours or 1 hour, presented in terms of the parameter L_{A10} .

¹⁴ World Health Organisation, 1999, Guidelines for Community Noise.

¹⁵ Education Funding Agency, 2014, BB93: acoustic design of schools – performance standards.

¹⁶ Department of Transport / Welsh Office Memorandum: 1998, Calculation of road traffic noise.

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Design Manual for Roads and Bridges

- 11.2.70. The Design manual for roads and bridges ¹⁷ (DMRB) was originally published by the Department of Transport in 1993 and last revised in 2020. Document LA 111 within the DMRB sets out procedures for undertaking the design of road schemes.
- 11.2.71. Although the DMRB scope strictly applies to new road schemes, the methodology approach contained within is also applicable to the assessment of noise from road traffic over time generally.
- 11.2.72. The methodology suggests that the magnitude of noise changes from a project should be classified into levels of impact. The classification scale for short term changes provided within the document is the most stringent and therefore most conservative approach for assessing the acoustic impact of a change in road traffic along existing roads. This approach has been adopted to provide an acoustically robust assessment framework for the road traffic changes associated with the Proposed Development.
- 11.2.73. The DMRB guidance on the magnitude of short-term road traffic noise impacts is reproduced below.

Table 11.17: Classification of magnitude of short-term road traffic noise impacts in accordance with DMRB

Noise change, dB L _{A10,18hr}	Magnitude of impact
Less than 1.0	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
Greater than or equal to 5.0	Major

IEMA Guidelines for Environmental Noise Impact Assessment 2014

- 11.2.74. The Guidelines for Environmental Noise Impact Assessment published by the Institute for Environmental Management and Assessment ¹⁸ (IEMA) in 2014 provide guidance on all aspects of environmental noise impact assessment.
- 11.2.75. The guidance advises that, for broadband sounds that are similar in all but magnitude, a change in noise level of 1 dB may be just perceptible under laboratory conditions, whilst a change of 3 dB is perceptible under most normal conditions.

¹⁷ Standards for Highways, 2020, Design Manual for Roads and Bridges: LA111 – Noise and vibration.

¹⁸ Institute of Environmental Management and Assessment: 2014, Guidelines for environmental noise impact assessment.

IEMA Guidelines: Environmental Assessment of Traffic and Movement 2023

- 11.2.76. The Guidelines for the environmental assessment of traffic and movement published by the IEMA ¹⁹ advises further on the assessment of noise from road traffic; including direction on when assessment is required, methodology, and significance effects.
- 11.2.77. In particular, the document advises that assessment should be undertaken where the overall traffic flows will increase by more than 30%, or the Heavy Goods Vehicles (HGVs) percentage increases significantly; and to include any other specifically sensitive areas where traffic flows have increased by 10% or more.
- 11.2.78. The document goes on to explain that differences of less than 10% have no discernible impact; the accuracy of daily flow data is generally considered to be of equal magnitude.
- 11.2.79. Regarding the 30% threshold; this would typically result in a change in road traffic noise of just over 1 dB; considered to be the smallest change in level that can be detected by the human ear. It should be noted, however, that simply because there is a detectable change, this does not imply there would be a significant effect; simply that further assessment is necessary.

Approved Document O

- 11.2.80. The residential elements of the Site must comply with the requirements of Approved Document O (2021 Edition) to the Building Regulations 2010 ²⁰ (ADO).
- 11.2.81. ADO requires the overheating strategy to take account of the likelihood that windows will be closed in bedrooms during sleeping hours (23:00 – 07:00) due to external noise. The document states the internal noise level above which occupants are likely to close windows to avoid noise disturbance / sleep disruption. These are defined in Paragraph 3.3 as follows:
- 11.2.82. Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.
- 40 dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
 - 55 dB L_{AFmax} more than 10 times a night (between 11pm and 7am).
- 11.2.83. The ventilation strategy to mitigate overheating in line with the requirements of ADO must therefore be developed such that there is no reliance on open windows in bedrooms between 23:00 to 07:00 if this would cause the above noise levels to be exceeded.

Professional Practice Guidance on Planning and Noise

¹⁹ Institute of Environmental Management and Assessment: 2023, Guidelines: Environmental Assessment of Traffic and Movement.

²⁰ Building Regulations (2010) Approved Document O: Overheating. 2021 edition.

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- 11.2.84. Professional Practice Guidance on Planning and Noise ²¹ (ProPG) is a document aimed at providing practitioners guidance on a recommended approach to the management of noise in the context of the planning system.
- 11.2.85. The document was published jointly by the three main professional bodies in the acoustics industry: Acoustics and Noise Consultants (ANC); the Institute of Acoustics (IOA); and the Chartered Institute of Environmental Health (CIEH).
- 11.2.86. The guide is focused on new residential development being affected by transport noise. Its primary goal is to assist in the delivery of sustainable development by promoting good health and wellbeing through the effective management of noise. It seeks to do this by encouraging good acoustic design processes in and around proposed new residential development, having particular regard to national policy on planning and noise.
- 11.2.87. The guidance recommends that an Acoustic Design Statement be provided using a two-stage approach comprising: an initial Site noise risk assessment (stage 1); and a full assessment and systematic consideration of four elements (stage 2) as follows, thereby encouraging early consideration of noise issues.
- Stage 2: Element 1 – Good Acoustic Design Process
 - Stage 2: Element 2 – Internal Noise Level Guidelines
 - Stage 2: Element 3 – External Amenity Area Noise Assessment
 - Stage 2: Element 4 – Assessment of Other Relevant Issues

Acoustic Ventilation and Overheating Residential Design Guide

- 11.2.88. The Acoustics Ventilation and Overheating Residential Design Guide ²² (AVO Guide) serves to inform acousticians as to a recommended approach for assessing noise impacts of transport noise impacting on residential development, whilst giving due attention to how any advice serving this goal may impact on ventilation and overheating strategies.
- 11.2.89. The AVO Guide makes various references to statements in BS 8233 and ProPG that internal noise limits may be relaxed by up to 5 dB where a development is desirable and natural ventilation is used. Further relaxations could be considered for proposed development occupants where contextually appropriate. However, this is a holistic consideration, more relevant to detailed design than at planning stage, incorporating overheating analyses, etc.

EIA Scoping Process

- 11.2.90. As discussed in Chapter 2, a request for a Scoping Opinion was submitted on behalf of the Applicant to Knowsley Metropolitan Borough Council (KMBC) on 26th March 2025, which set out the proposed scope of assessment for the project (see **Appendix 2.1**). KMBC issued their Scoping Opinion on 22/05/2025 and is summarised in Chapter 2 and included in full at **Appendix 2.2**.

²¹ Professional Practice Guidance on planning and noise: New Residential Development, Acoustics & Noise Consultants, Institute of Acoustics, Chartered Institute of Environmental Health, May 2017.

²² Acoustics Ventilation and Overheating: Residential Design Guide version 1.1, Acoustics & Noise Consultants, Institute of Acoustics, January 2020.

- 11.2.91. With regards to Noise and Vibration matters, relevant responses were received from the consultees including KMBC Environmental Health, Natural England, National Highways, and KMBC Public Health, and comments have been addressed accordingly, as follows in Table 11.18 below.

Table 11.18: Relevant EIA Scoping Consultation Comments

Consultee	Summary of Comment	Response or location within the ES where comments are addressed
KMBC Environmental Health	Should air source heat pumps be included for the dwellings, the assessment would need to consider the possible noise generated by the compressor and fan units.	Cumulative plant noise limits are to be set in accordance with BS 4142 within Section 11.4.
Natural England	Schedule 4 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 specifically includes the need to address expected noise emissions generated by the operation of the proposed development.	Operational road traffic noise and plant noise emissions have been considered within this ES Chapter (Section 11.4). There is not anticipated to be any other significant noise sources within the operational phase of the proposed development.
National Highways	Environmental assessments must evaluate the likely noise impacts resulting from traffic generated by a development, as well as any noise associated with proposed works to the strategic road network and identify measures to mitigate these effects.	Construction road traffic noise and operational road traffic noise have been considered within this ES Chapter (Section 11.4).
KMBC Public Health	The need for cooling must be considered.	An assessment against the noise requirements within Approved Document O has been carried out (Section 11.4).

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Limitations to the Assessment

- 11.2.92. It should be noted that this report has been produced on the basis of 750 proposed dwellings. The total number of proposed dwellings has since been reduced to 700 and as such, a slightly lower impact would typically be anticipated on the existing sensitive receptors than presented. This is not considered substantial enough to change the assessment outcomes.
- 11.2.93. Calculations relating to road traffic noise associated with the Proposed Development are based upon traffic flow information provided by the Transport Consultant (Astute Transport). These figures will have inherent uncertainty associated with them. Further details are set out in 'Chapter 9: Transport and Access' and associated technical appendices.
- 11.2.94. Details of specific construction activity and plant used, are not available at this stage. The construction noise assessment assumes typical activity for the type and scale of the Proposed Development and assumes that all plant is operated over limited periods within the full 10-hour working day. It is also assumed that all plant is located at the same distance to the noise sensitive receptor. This is considered unlikely to occur in practice, and therefore represents a worst-case scenario.
- 11.2.95. The need for piling to any area of the Proposed Development is unknown, but given the proposal for traditional build houses, it is considered unlikely to be required. It has therefore been assumed that no piling is to be carried out during the construction phase.
- 11.2.96. Although construction traffic flows have been provided by the Transport Consultant (Astute Transport), the routes that these vehicles will take to/from the site are unknown. For a worst-case assessment, all construction traffic has been assumed to route through all roads within the assessment area that could reasonably be assumed to act as an access road. Small residential roads, cul-de-sacs, and private roads are therefore excluded as construction traffic is not likely to access the site via these routes.

11.3. Baseline Conditions

Site Description and Context

Identification of Receptors and Data Gathering

- 11.3.1. A desktop review of the local area has been carried out to identify the type of receptors surrounding the Site. The review was progressively widened in all directions until the nearest high sensitivity receptors to the Site were identified.
- 11.3.2. The location of the identified receptors is indicated in **Figure 11.1**, and a tabulated list of the identified receptors is presented in the following table for added context.

Table 11.19: Nearest identified receptors around the Proposed Development

Receptor Reference	Receptor Type	Receptor Description	Assumed Sensitivity
R1	Residential	Home Farm Road/Whitestone Close/ Longborough Road/ Riding Hill Road	High
R2	Residential	Berry Hill Avenue/Sugar Lane/Ross Close	High

R3	Residential	Ross Close/Sugar Lane/Parklands	High
R4	Commercial	Stanley Grange	Low
R5	Residential	Shannons Lane/ Knowsley Lane	High
R6	Residential	Fluker's Brook Lane	High

- 11.3.3. Only the most sensitive uses of the Proposed Development are to be assessed. This is considered to be the nearby residential dwellings. Other less sensitive uses would be subject to lesser effects.
- 11.3.4. An environmental noise survey has been undertaken around the Site to establish the baseline environmental noise conditions in the surrounding area.
- 11.3.5. The noise survey exercise comprised a combination of long-term unattended measurements carried out over a period of 4no. days between 17/04/2025 and 21/04/2025 in combination with a series of short term attended measurements carried out at different positions across the Site on 17/04/2025 between 10:40 and 11:30 and on 21/04/2025 between 13:45 and 15:05.
- 11.3.6. Details of the survey are provided in **Appendix 11.1**, including details of the methodology and equipment, measurement positions as well as a full set of measured sound levels.

Baseline Survey Information

- 11.3.7. Baseline environmental sound surveys were undertaken by Hoare Lea in April 2025. One monitoring station was set up on Site between Wednesday 17 April and Monday 21 April 2024 to determine the prevalent ambient and background sound levels across the Site and surrounding area. These were complemented by three attended sample positions to further assess sound variations across the Site.
- 11.3.8. The noise measurement positions used during the survey exercise carried out on Site are shown in **Figure 11.2**.
- 11.3.9. Measurements were undertaken in line with the principles set out within BS 7445 and full details of the survey method, equipment used, and extensive noise level results are presented in **Appendix 11.1** to this ES document.

11.4. Assessment of Likely Significant Effects

Construction

Changes in noise due to construction road traffic

- 11.4.1. Construction traffic passing to and from the Site via Knowsley Lane represents a potential source of noise to surrounding properties. The maximum volume of construction traffic assumed for the purposes of the EIA is 99 cars/LGVs and 23 HGVs per day, as provided by the Transport Consultant (Astute Transport). This number of additional vehicles would result in 0.2 dB or less increase in road traffic noise on all roads within the assessment area which may reasonably be assumed to act as an access route to/from the Site entrances on Knowsley Lane. This equates to a temporary negligible magnitude of change. Such a magnitude of impact, which on highly sensitive receptors creates a Negligible Effect, is **Not Significant**.

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Noise from construction activity

- 11.4.2. Noise generated during the construction works of the Proposed Development has the potential to affect nearby noise-sensitive receptors. Without due consideration and management, activities relating to these works may have a high magnitude of impact at highly sensitive receivers, which could potentially result in a Significant Effect.
- 11.4.3. The construction works are considered to be similar throughout the Proposed Development, with no particular area generating higher levels of noise. On this basis, only the closest (and most sensitive i.e. residential) receptors to the Site have been considered.
- 11.4.4. BS 5228-1 does not provide guidance on what is considered a 'Short' or 'Long' duration. In addition, the construction proposals are not sufficiently detailed at this outline stage to provide durations for different construction activities. The duration of different activities has therefore been determined based on experience.
- 11.4.5. Based on the range of construction activities presented in Tables 11.1 and 11.2, the noise levels have been calculated at the worst-affected noise-sensitive receptors and presented within the following table. The values highlighted in yellow exceed the threshold values set out in Table 11.3.

Table 11.20: Assessment of construction activity noise high sensitivity receptor locations

Receptor Reference	Predicted construction levels for each respective stage of construction $L_{Aeq,T}$ (dB)					Magnitude of impact
	Earth Works	Road Construction	Sub-structure	Super-structure	Fit-out	
R1	65	66	69	66	67	High
R2	63	64	67	64	65	Medium
R3	74	75	78	75	76	High
R5	49	50	53	50	51	Negligible
R6	62	63	66	63	64	Medium

- 11.4.6. As presented, activity noise from construction is calculated to exceed the criteria within Table 11.3 (i.e. 65 dB) at four different high sensitivity off-site receptors.
- 11.4.7. At receptors R2 and R6, the criterion is only anticipated to be exceeded for a single work stage, and only for limited periods. On this basis, these have been considered medium magnitudes of impact. This corresponds with a Moderate Adverse temporary Effect which is **Significant**.
- 11.4.8. For receptors R1 and R3, the exceedance is predicted for several work stages, and potentially for longer periods. On this basis, this is considered to constitute a high magnitude of impact. This corresponds with a Major Adverse temporary Effect which is **Significant**.
- 11.4.9. For receptor R5, a Negligible Effect is predicted which is **Not Significant**.
- 11.4.10. It should be noted that the above assessment is based on the assumption that all activity takes place in close proximity to the receptors. In reality, this will typically be at greater distances as

construction moves around the site. In addition, the loudest construction activities are only anticipated to occur for short periods of time. For other periods, whilst activity is further from each receptor, and whilst quieter construction activities are carried out, a lower impact would be expected.

Vibration from construction activity

- 11.4.11. It is assumed that no piling will be required at the proposed Site, and therefore construction vibration has been scoped out.

Operation

Changes in noise due to operational road traffic

- 11.4.12. IEMA guidance advises that assessment should be undertaken where traffic flows increase by more than 30% (where this could lead to increases above 1 dB in road traffic noise levels), and to include any other specifically sensitive areas where traffic flows have increased by 10% or more.
- 11.4.13. The traffic flow data provided by the Transport Consultant (Astute Transport) has been reviewed to determine the changes in noise due to operational road traffic. For the purposes of the assessment and in line with the IEMA guidance, any of the identified roads that lead to less than a 10% increase in road traffic have not been considered.
- 11.4.14. In all cases, the change in traffic is the difference between the baseline 2025 flows without development, and the future 2028 flows with development. This includes future development and is therefore inherently cumulative.
- 11.4.15. Within the assessment areas, all roads identified are bordered by residential dwellings, which are considered high sensitivity receptors, with the exception of those stated within the table below.

Table 11.21: Summary of links without nearby residential receptors

Link Name	Sensitivity	Receptor
School Ln J2 Westbound	Low	Commercial
School Ln J1 Eastbound	Low	Commercial
Kitling Road	Low	Commercial
Caddick Road	Low	Commercial

- 11.4.16. Where an increase in road traffic of at least 10% is stated within the traffic assessment, the percentage increase in terms of AAWT is summarised in the following table.

Table 11.22: Summary of increase in traffic with development where this exceeds 10%

Link Name	Increase in road traffic with development, %AAWT
School Ln J2 Westbound	23.2
School Ln J1 Eastbound	15.4

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School Ln J2 Eastbound	37.0
School Ln J3 Westbound	36.5
Knowsley Ln J4 Northbound	18.5
Sugar Lane	11.9
Knowsley Ln J4 Southbound	19.2
Home Farm Rd	18.3
Knowsley Ln J5 Southbound	18.1
Knowsley Ln Site Southbound	13.0

- 11.4.17. The resulting increase in road traffic noise for the roads identified above has been calculated in accordance with the CRTN calculation method and is presented in the following table.

Table 11.23: Predicted increase in road traffic noise

Link Name	Predicted increase in road traffic noise, dB $L_{A10.18hr}$
School Ln J2 Westbound	0.9
School Ln J1 Eastbound	0.8
School Ln J2 Eastbound	1.4
School Ln J3 Westbound	1.4
Knowsley Ln J4 Northbound	0.7
Sugar Lane	0.5
Knowsley Ln J4 Southbound	0.8
Home Farm Rd	0.7
Knowsley Ln J5 Southbound	0.7
Knowsley Ln Site Southbound	0.5

- 11.4.18. The magnitude of impact associated with the increase in road traffic noise is presented in the following table in accordance with DMRB guidance.

Table 11.24: Magnitude of impact associated with the predicted increase in road traffic noise

Link Name	Magnitude of impact	Significance
School Ln J2 Westbound	Negligible	Negligible
School Ln J1 Eastbound	Negligible	Negligible
School Ln J2 Eastbound	Low	Minor
School Ln J3 Westbound	Low	Minor
Knowsley Ln J4 Northbound	Negligible	Negligible

Sugar Lane	Negligible	Negligible
Knowsley Ln J4 Southbound	Negligible	Negligible
Home Farm Rd	Negligible	Negligible
Knowsley Ln J5 Southbound	Negligible	Negligible
Knowsley Ln Site Southbound	Negligible	Negligible

11.4.19. For all assessed roads, there is an increase in %HGVs of no more than 8%. This is a small increase and is therefore expected to lead to a **negligible impact**.

11.4.20. The magnitude of impact is between negligible and low for the roads requiring assessment. Any changes in road traffic noise on other roads would result in lesser impacts.

11.4.21. This will result in a Minor Adverse Effect to high sensitivity receptors on School Lane, which is **Not Significant**.

Noise from operational activity

11.4.22. Noise produced by building services equipment must be controlled to achieve acceptable levels of environmental noise, both within the Site itself and the surrounding areas.

11.4.23. At this stage, the types of plant equipment for the Proposed Development, and location within the Site, are not finalised. It is likely there will be air source heat pumps and extract fans.

11.4.24. Cumulative noise from fixed building services plant will be designed to achieve limiting rating noise levels no higher than background levels in line with the guidance set out within BS 4142.

11.4.25. The representative background sound levels based on the environmental noise survey are presented in the table below.

Table 11.25: Representative background sound levels at identified noise sensitive receptors

Receptor Reference	Receptor name	Daytime background sound level, dB L _{A90,T}	Night-time background sound level, dB L _{A90,T}
R1	Home Farm Road/Whitestone Close/ Longborough Road/ Riding Hill Road	45	31
R2	Berry Hill Avenue/Sugar Lane/Ross Close	45	31
R3	Ross Close/Sugar Lane/Parklands	45	31
R5	Shannons Lane/ Knowsley Lane	45	31
R6	Fluker's Brook Lane	45	31

11.4.26. Proposed limits for the rating noise level of new building services plant are set in the following table.

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Table 11.26: Cumulative plant noise limits at identified noise sensitive receptors

Receptor Reference	Receptor name	Daytime plant noise limit, dB $L_{Ar,1h}$	Night-time background sound level, dB $L_{Ar,15min}$
R1	Home Farm Road/Whitestone Close/ Longborough Road/ Riding Hill Road	45	31
R2	Berry Hill Avenue/Sugar Lane/Ross Close	45	31
R3	Ross Close/Sugar Lane/Parklands	45	31
R5	Shannons Lane/ Knowsley Lane	45	31
R6	Fluker's Brook Lane	45	31

11.4.27. It is deemed that compliance with the proposed plant noise limits set in the table above will result in a worst-case Minor Adverse magnitude impact, and therefore a **Not Significant Effect** at the identified noise sensitive receptors.

11.4.28. It should be noted that the above fixed building services plant noise limits are cumulative and applicable to the whole of the Site once the Proposed Development is completed and operational.

Site suitability

Internal noise levels

11.4.29. To provide suitable internal noise levels for the future residential properties within the Development, an appropriate sound insulation performance of the building envelope would be required. Glazing is typically the weakest part of the building façade and as such would need to adequately control noise ingress.

11.4.30. During the survey, road noise from Knowsley Lane and the motorway were the dominant noise sources. There was not considered to be any other noise sources at the Site worthy of consideration.

11.4.31. Given that the predominant noise across the site is attributable to road traffic noise, ProPG guidance indicates that façades facing Knowsley Lane would have a 'Low to 'Medium' noise risk assessment for daytime and night-time periods, and on this basis, the principles of good acoustic design will need to be followed by providing suitable mitigation. Away from this elevation, the remaining dwellings across the site would be expected to have a 'Negligible' to 'Low' noise risk assessment for both daytime and night-time due to increased distance and sound reduction from screening.

11.4.32. A Level 1 risk assessment has also been carried out in accordance with the AVO Guide. The dwellings with façades facing Knowsley Lane would be considered to be in the 'Medium' to 'High' Risk category. All other façades would be in the 'Negligible' to 'Low' Risk category. A Level 2 risk assessment has therefore been carried out regarding noise and overheating, considering the internal noise levels directly as recommended within the document.

- 11.4.33. Calculations have been undertaken to determine the sound insulation performance for the windows to achieve appropriate internal noise levels. To all areas, a sound insulation performance of $R_w + C_{tr}$ 29 dB is expected to be suitable, assuming that the solid elements of the façades achieve a minimum sound insulation performance of $R_w + C_{tr}$ 40 dB. This requires a full review during detailed design to ensure suitable internal noise levels are achieved but is likely to allow for standard construction forms.
- 11.4.34. To maintain the acoustic performance of the façades, attenuated passive ventilators or mechanical ventilation methods are likely to be required to areas of the site to provide background ventilation. The areas this applies are presented in **Appendix 11.3**, with suitable means of ventilation to be developed during detailed design.
- 11.4.35. To the most exposed elevations of the Site, close to Knowsley Lane, reliance on openable windows to alleviate overheating would cause unacceptably high internal noise levels as presented within the AVO Guide and ADO, so alternative ventilation methods (e.g. mechanical ventilation) should be considered. The areas this applies is presented within **Appendix 11.3**.
- 11.4.36. With adequately selected glazing installed and suitable ventilation strategy, the internal noise levels of all the Proposed Development façades would comply with the requirements of BS 8233, resulting in a **Not Significant** Effect inside the future residential units.

External noise levels

- 11.4.37. The calculated external noise levels are less than 50 dB $L_{Aeq,16hr}$ for the majority of the site, with limited areas close to Knowsley Lane above 55 dB $L_{Aeq,16hr}$.
- 11.4.38. A noise model has been produced, with the calculated external noise levels presented within **Figure 11.4**. This includes for screening from standard two storey houses within the highlighted areas.
- 11.4.39. Although the design is not yet sufficiently advanced to specifically determine the noise level within residential garden areas, it is considered possible for all garden areas to meet the 'upper guideline' value within BS 8233 in all cases, and the 'desirable' value in most if not all cases.
- 11.4.40. This would result in a Low impact, leading to a **Not Significant** Effect in the external garden areas.

11.5. Mitigation, Enhancement and Residual Effects

Mitigation by Design

During Construction

- 11.5.1. Details of the proposed construction methodology has not yet been developed. On this basis, no specific mitigation measures have been included within the design.

During Operation

- 11.5.2. Buildings within the Proposed Development will inherently provide beneficial acoustic screening between the existing and proposed road traffic noise sources and noise sensitive uses not immediately adjacent to these elements.
- 11.5.3. It is likely that building services equipment will be located within the Proposed Development, but the design is not sufficiently developed to provide a noise assessment. To control noise

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emissions from future building services plant at the nearby noise-sensitive receptors, noise limits have been proposed such that no higher than a Minor Adverse Effect (**not significant**) will be achieved once the development is operational.

Additional Mitigation.

During Construction

- 11.5.4. Prior to construction, a Construction Environmental Management Plan (CEMP) will be implemented.
- 11.5.5. Implementation of measures therein will address construction effects, including in relation to noise and vibration, on the environment, existing surrounding communities, businesses, and residents of the area.
- 11.5.6. The details of this will be dependent on the specific constructions proposed, but are likely to include the following:
- All Sites are to be totally surrounded by fencing or hoarding, where possible. These are to be to the required height and density appropriate to the noise sensitivity of the location in order to reduce noise breakout from the Site. All Site gates are to be controlled to give the minimum amount of time open for passage of vehicles in order to minimise stray noise to external surrounding areas.
 - Fixed items of construction plant are to be electrically powered rather than diesel or petrol driven, wherever possible. Where this is not practicable suitable attenuation measures are to be provided, such as acoustic enclosures.
 - Vehicles and mechanical plant are to be fitted with effective exhaust silencers, be maintained in good and efficient working order, and are to be operated in such a manner so as to minimise noise emissions.
 - Machines that are in intermittent use are to be shut down when not in use. Where machinery is in continuous use consideration is to be given to housing it in a suitable acoustic enclosure.
 - Noisy plant and equipment are to be sited as far away as is possible from residential or other noise sensitive properties. Barriers such as soil banks, materials stockpiles, Site portacabins, and proprietary acoustic barriers are to be employed to ensure that the impact of Site activities on noise sensitive premises is kept to a minimum.
 - Care is to be taken when loading and unloading vehicles, dismantling scaffolding, or moving materials to reduce noise impact.
 - All deliveries of materials, plant and machinery to the Site, and any removals of waste or other material is to take place within the permitted hours.
 - Employees, sub-contractors, or other persons employed on the Site are not to cause unnecessary noise from their activities. Excessive revving of engines, music from radios, shouting and noisy or rowdy behaviour should all be avoided.
- 11.5.7. Noisy-construction work related to the development is to be restricted to the following hours:
- Monday to Friday 7.30 a.m. to 6 p.m.
 - Saturday 8.00 a.m. to 1 p.m.
 - Night-time or 24-hour working is to be agreed with the Local Authority if required.

During Operation

- 11.5.8. Noise limits have been provided in accordance with BS 4142 which will be considered as the design progresses, and a full assessment will be required once final equipment is selected to ensure that these limits are achieved.
- 11.5.9. The need to achieve these limits can be enforced with a suitably worded planning condition attached to any decision notice for the Proposed Development.

Table 11.27: Mitigation

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured		
		By Design	By S.106	By Condition
1	Construction noise: CEMP to be implemented			X
2	Plant noise limits to be achieved.			X

Enhancements.

- 11.5.10. There are no proposed enhancements relating to noise or vibration.

Residual Effects

During Construction

- 11.5.11. With the introduction of a suitably worded and agreed CEMP, this will act to reduce the potential Adverse Effects at the nearby sensitive receptors. It is however anticipated that construction noise will lead to a Moderate Adverse temporary Effect which is **Significant** at receptor R3. All other sensitive receptors are likely to be subject to a worst-case Minor Adverse temporary Effect which is **Not Significant**.
- 11.5.12. In addition, the above assessment is based on the assumption that all activity takes place in close proximity to the receptors. In reality, this will typically be at greater distances as construction moves around the site. The loudest construction activities are only anticipated to occur for short periods of time. For other periods, whilst activity is further from each receptor, and whilst quieter construction activities are carried out, a lower impact would be expected.

During Operation

- 11.5.13. The design of any future building services equipment is to ensure compliance with the noise limits provided. A detailed assessment is to be carried out following final equipment selections to ensure the noise limits are achieved.
- 11.5.14. Compliance with these noise limits would ensure a worst-case Minor Adverse Effect is achieved. This would therefore be a **Not Significant** effect at the identified existing noise sensitive receptors.

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11.6. Cumulative and In-Combination Effects

During Construction

- 11.6.1. There are no additional construction phase effects anticipated relating to cumulative developments.

During Operation

- 11.6.2. The assessment of change in operational road traffic including cumulative development inherently. On this basis, no additional effects are predicted.
- 11.6.3. For plant noise emissions, it is assumed that plant noise limits will be conditioned within other cumulative developments such that a worst-case Minor Adverse Effect is achieved (**Not Significant**).

11.7. Summary

Introduction

- 11.7.1. This chapter assesses the likely significant noise and vibration effects upon sensitive receptors from the Proposed Development, during its construction and operation. An acoustic survey has been carried out to quantify the existing baseline sound climate. Traffic data has been used to predict the change in noise levels from the existing road network on existing receptors.

Baseline Conditions

- 11.7.2. The baseline sound environment in the vicinity of the Proposed Development is dominated by road traffic from Knowsley Lane (B5202) and the M57 motorway, with traffic on these roads during the daytime and night-time periods. There was no other major contributing noise sources identified at the Site.
- 11.7.3. The noise levels were reasonably loud at the western Site boundaries, close to the major roads, with lower noise levels to the remainder of the Site.

Likely Significant Effects

- 11.7.4. The assessment shows that construction noise has the potential to result in a Major Adverse temporary Effect at receptors R1 and R3, and Moderate Adverse temporary Effect at receptors R2 and R6, which are **Significant**. A detailed Construction Environmental Management Plan is to be submitted to establish the best practical means of reducing the adverse effects, such as low noise equipment, limiting operating hours, erection of site hoarding and general good practice. With this mitigation in place, a worst-case Moderate Adverse temporary Effect, which is **Significant**, is anticipated at receptors R1, R2, and R3.
- 11.7.5. It should be noted that the above assessment is based on the assumption that all activity takes place in close proximity to the receptors. In reality, this will typically be at greater distances as construction moves around the site. In addition, the loudest construction activities are only anticipated to occur for short periods of time. For other periods, whilst activity is further from each receptor, and whilst quieter construction activities are carried out, a lower impact would be expected.
- 11.7.6. Vibration from construction activities and road traffic associated with the construction are both predicted to lead to a **Negligible Effect**.
- 11.7.7. There are **no Significant Effects** predicted within the operation phase of the development.
- 11.7.8. Changes in road traffic associated with the operational phase of the Proposed Development are predicted to result in a Minor Adverse Effect which is **not Significant**.
- 11.7.9. Noise produced by building services equipment is to be controlled to achieve acceptable levels of environmental noise within the area surrounding the Proposed Site. The design is not sufficiently progressed to fully assess potential effects, but noise limits have been provided such that no higher than a Minor Adverse effect (**Not Significant**) would be expected.
- 11.7.10. For the proposed dwellings, the façade elements are to be selected to ensure that internal noise levels comply with the criteria within BS 8233 and WHO guidance. In addition, reliance on opening windows is to be limited to the less exposed areas of the development, with alternative

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means of ventilation and control of overheating required to the more exposed elevations. This ensures that a **Not Significant** Effect would be expected inside the future residential units.

- 11.7.11. The site layout is not sufficiently developed at this stage to fully assess the external noise levels within garden areas. Based on an initial assessment however, all back gardens are likely to meet the upper guideline value within BS 8233, with most, if not all, meeting the desirable criteria from the document without any specific mitigation. This ensures no higher than a Minor Adverse effect, which is **Not Significant**.

Mitigation and Enhancement

- 11.7.12. It is recommended that conditions are to be enforced, for the submission of a detailed CEMP to ensure construction noise is suitably controlled and to reduce the adverse effects as far as practical.
- 11.7.13. With regards the operational phase, plant equipment is to be designed such that the proposed plant noise limits are to be achieved which can be secured by condition.
- 11.7.14. For the proposed dwellings, façade sound insulation performances have been provided to comply with BS 8233 and WHO guidance internal noise level criteria. These are anticipated to be achievable with standard products such as standard thermal double-glazed windows. This is to be developed as the design progresses.
- 11.7.15. The strategy for ventilation and for the control of overheating are to ensure that the requirements of Approved Document O are met, and the guidance within the AVO Guide are followed. This requires an alternative means of cooling to be developed for the most exposed elevations, and reliance on open windows to only be considered for the most sheltered elevations.

Conclusion

- 11.7.16. The acoustic assessment shows that there are no anticipated Significant effects associated with the operational phase of the development.
- 11.7.17. Mitigation via the implementation of a CEMP is to reduce construction noise impacts as far as practicable.
- 11.7.18. Plant noise levels are to be suitably conditioned to ensure no greater than a Minor adverse effect (Not Significant) at the nearby sensitive receptors.
- 11.7.19. Table 11.28 provides a summary of effects, mitigation and residual effects.

Table 11.28: Summary of Effects, Mitigation and Residual Effects

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
Construction								
Construction noise	Noise generated by construction activities.	Temporary Direct	High	High	Local	Major adverse	CEMP to be submitted.	Moderate Adverse (Significant) (when activities occur at greater distances from the high sensitivity receptors, lower levels would be anticipated.)
Construction vibration	Vibration generated by construction activities.	Temporary Direct	High	Negligible	Local	Negligible	–	Negligible (not significant)

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Construction road traffic	Change in road traffic noise caused by additional trips associated with the construction phase.	Temporary Direct	High	Negligible	Local	Negligible	-	Negligible (not significant)
Operation								
Operational road traffic	Change in road traffic noise caused by additional trips associated with the operational phase.	Permanent Direct	High	Low	Local	Minor Adverse	-	Minor Adverse (not significant)
Operation noise	Noise generated by operational activities, primarily considering plant noise.	Permanent Direct	High	Low	Local	Minor Adverse	Plant noise limits to be conditioned.	Minor Adverse (not significant)

Cumulative and In-Combination								
Construction								
Construction noise	Noise generated by construction activities.	Temporary Direct	High	High	Local	-	No cumulative or in-combination Effects anticipated.	-
Construction vibration	Vibration generated by construction activities.	Temporary Direct	High	Negligible	Local	-	No cumulative or in-combination Effects anticipated.	-
Construction road traffic	Change in road traffic noise caused by additional trips associated with the construction phase.	Temporary Direct	High	Negligible	Local	-	No cumulative or in-combination Effects anticipated.	-
Operation								
Operational road traffic	Change in road traffic noise caused by additional trips	Permanent Direct	High	Low	Local	Minor Adverse	Previous assessment includes cumulative	Minor Adverse

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	associated with the operational phase.						and in-combination effects inherently.	(not significant)
Operation noise	Noise generated by operational activities, primarily considering plant noise.	Permanent Direct	High	Low	Local	Minor Adverse	Plant noise limits to be conditioned.	Minor Adverse (not significant)