

11. Noise and Vibration

11.1. Introduction

- 11.1.1. This chapter assesses the likely significant noise and vibration effects upon sensitive receptors in the vicinity of the Site, during the construction and operational phases of the Proposed Development. It details the methodology followed, a review of the baseline conditions in the defined study area, and the results of the assessment are contained in this chapter. The suitability of the Site for dwellings/apartments has also been considered.
- 11.1.2. Construction activity associated with the Site will be phased as the Proposed Development progresses and as such, whilst any noise associated with the construction activities has the potential to temporarily elevate noise and vibration levels in the surrounding area, these levels will be temporary. Estimated construction traffic flow data has been made available by the Applicant (see Chapter 4 'the Proposed Development') and as such, the assessment of construction noise and vibration has also been considered.
- 11.1.3. The Proposed Development would be noise and vibration sensitive and potentially noise generating. Therefore, the following potential effects are to be assessed within this chapter:
- The influence of traffic associated with operation of the Proposed Development on overall traffic flows in the area (as defined by the Applicant's Transport Consultant) and the subsequent influences on ambient sound levels at sensitive receptors.
 - Surrounding environmental noise adversely affecting occupants of the Proposed Development both internally and externally.
- 11.1.4. The following appendices accompany this chapter:
- **Appendix 11.1:** Acoustic survey summary.
 - **Appendix 11.2:** Planning noise assessment report for the Site.
 - **Appendix 11.3** Road traffic data.

11.2. Assessment Approach

Methodology

- 11.2.1. The assessment considers impacts in relation to noise from operational road traffic associated with the Site and other 'scoped in cumulative sites' on the identified sensitive receptors. The 'scoped in cumulative sites' considered are presented below.
- Southfields Farm, Bramcote – 24/00066/FUL – Construction and operation of two adjacent Battery Energy Storage Systems (BESS) facilities.
 - Land at Toton North – 880 homes, link road (means of access only), local centre, country park, education provision (forest school) and associated infrastructure.
 - Land at Toton East – 155 homes and associated open space and infrastructure.

Assessment of Significance

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- 11.2.2. Noise sensitive receptors have been classified into different categories of sensitivity, which are summarised in **Table 11.1** below. Categories have been determined through professional judgement based upon the likely activities taking place within the type of building, and the likely tolerance of the occupant.

Table 11.1: 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), libraries, places of worship
Low	Commercial buildings (e.g. retail or office), industrial buildings

- 11.2.3. 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 the Noise Policy Statement for England (NPSE¹). These are presented in **Table 11.2** below.

Table 11.2: Description of impact magnitude.

Magnitude of Change	General threshold and description
High (H)	Above SOAEL thresholds. Effect significantly above appropriate guidance thresholds, clearly perceptible change, adverse impact expected regarding 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 perceptible and unlikely to draw adverse impact.

- 11.2.4. The significance of effect will then be determined using the matrix presented in **Table 11.3**.
- 11.2.5. Effects that are 'Moderate' or 'Major' will be considered as Significant within this chapter (highlighted in blue in **Table 11.3**). 'Negligible' or 'Minor to Moderate' effects will be considered Not Significant.

¹ Department for Environment, Food & Rural Affairs: 2010, Noise Policy Statement for England

Table 11.3: Effect significance matrix.

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

- 11.2.6. 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

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

National Planning Policy

National Planning Policy Framework 2024

- 11.2.8. The National Planning Policy Framework² ('NPPF') sets out the Government's planning policies for England and how they are expected to be applied. Paragraph 198 of the NPPF states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions & 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;..."*

² Ministry of Housing, Communities, and Local Government: 2024, National Planning Policy Framework

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National Policy Statement for England

- 11.2.9. 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 **Table 11.4**, which can be applied when considering the significance of noise impacts.

Table 11.4: Summary of Effects Observed 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

- 11.2.10. Online Planning Practice Guidance¹ ('PPG') provides further details in relation to the relevance of noise in the planning process following the publication of NPPF and NPSE.
- 11.2.11. 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 **Table 11.5**.
- 11.2.12. As with the NPSE, PPG does not provide any specific guidance on numeric limits or specific noise parameters.
- 11.2.13. 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.

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

Table 11.5: 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	Mitigate 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,	Unacceptable adverse effect	Prevent

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Response	Examples of outcomes	Increasing effect level	Action
	significant, medically definable harm, e.g. auditory and non-auditory.		

Local Policy*The Local Plan*

- 11.2.15. Broxtowe Borough Council ('BBC') adopted their Core Strategy document (Part 1 Local Plan)³ in September 2014 which sets out the vision, objectives, spatial strategy and the strategic policies for the Borough up to 2028.
- 11.2.16. BBC adopted the Part 2 Local Plan⁴ in October 2019, following examination by an independent inspector from the Planning Inspectorate. The adopted Part 2 Local Plan includes specific site allocations to meet the housing need as set out in the Core Strategy, as well as the policies against which planning applications will be assessed.
- 11.2.17. Policy 19 of Part 2 of the Local Plan, 'Policy 19: Pollution, Hazardous Substances and Ground Conditions', states that

1. Permission will not be granted for development which would result in:

a) An unacceptable level of pollution, or is likely to result in unacceptable exposure to sources of pollution or risks to safety;

- 11.2.18. Justification 19.4 states that,

"Noise can be an unwanted intrusion that adversely impacts on quality of life, affecting an individual's health and well-being. Commercial or industrial premises and construction sites are common sources of noise pollution and therefore a restriction on working hours often needs to be applied as part of the planning permission. Noise needs to be considered both in the context of the additional noise generated by new development and when new development would be sensitive to the prevailing acoustic environment."

Other Guidance and Policy*BS 5228*

- 11.2.19. BS 5228-1⁵ '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

³ Broxtowe Borough Council Part 1 Local Plan (2014–2028), Broxtowe Borough Council, September 2014

⁴ Broxtowe Borough Council Part 2 Local Plan (2018–2028), Broxtowe Borough Council, October 2019

⁵ The British Standards Institution, 2009+A1:2014, BS 5228-1 'Code of practice for noise and vibration control on construction and open sites –Part 1: Noise'.

may be considered when assessing the significance of any effects. Similarly, BS 5228-2⁶ provides relating to construction vibration. Calculation of Road Traffic Noise.

Calculation of Road Traffic Noise

- 11.2.20. In the UK, the Calculation of Road Traffic Noise⁷ ('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} .

Design Manual for Roads and Bridges

- 11.2.21. The Design Manual for Roads and Bridges⁸ ('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.
- 11.2.22. Although the DMRB scope strictly applied to new road schemes, the methodology approach contained within is also applicable to the assessment of noise from road traffic over time generally.
- 11.2.23. 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.
- 11.2.24. The DMRB guidance on the magnitude of short-term road traffic noise impacts is reproduced in **Table 11.6**.

Table 11.6: Description of receptor sensitivity.

Magnitude of impact	Noise change, $\text{dB } L_{A10,18\text{hr}}$	Details
High	Greater than or equal to 5.0	Change in short term noise would be clearly perceptible. Considered in DMRB to be a major magnitude.
Medium	3.0 – 4.9	Change in short term level may be perceptible under normal conditions. Considered in DMRB to be a moderate magnitude.
Low	1.0 – 2.0	Change in short term level may be perceived at the upper end of the range under certain conditions. Described in DMRB to be a minor magnitude.

⁶ The British Standards Institution, 2009+A1:2014, BS 5228-2 'Code of practice for noise and vibration control on construction and open sites –Part 2: Vibration'.

⁷ Department of Transport Welsh Office, 1988, Calculation of Road Traffic Noise, HMSO.

⁸ Highways England, Transport Scotland, Welsh Government, Department for Infrastructure, 2020, Design Manual for Roads and Bridges – LA111 Noise and vibration, Highways England.

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Magnitude of impact	Noise change, dB L _{A10,18hr}	Details
Negligible	Less than 1.0	Imperceivable change. Described in DMRB to be of negligible magnitude.

IEMA Guidelines for Environmental Noise Impact Assessment 2014

- 11.2.25. The Guidelines for Environmental Noise Impact Assessment⁹ published by the Institute for Environmental Management and Assessment ('IEMA') in 2014 provide guidance on all aspects of environmental noise impact assessment.
- 11.2.26. The guidance advises that, for broadband sounds that are similar in all but magnitude, a change in noise level of 1 decibel (dB) may be just perceptible under laboratory conditions, whilst a change of 3 dB is perceptible under most normal conditions.

IEMA Guidelines: Environmental Assessment of Traffic and Movement 2023

- 11.2.27. The Guidelines for the Environmental Assessment of Traffic and Movement¹⁰ published by IEMA advises further on the assessment of noise from road traffic; including direction on when assessment is required, methodology, and significance of effects.
- 11.2.28. 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 ('HGV's) percentage increases significantly; and to include any other specifically sensitive areas where traffic flows have increased by 10% or more.
- 11.2.29. 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.
- 11.2.30. 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.

BS 4142:2014

- 11.2.31. Noise egress from any plant and machinery associated with the Site should not cause disturbance at nearby residential areas, therefore noise limits will be set in accordance with the guidance given in line with BS 4142:2014 'Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas'¹¹.

⁹ Institute of Environmental Management and Assessment, 2014, Guidelines for environmental noise impact assessment, IEMA.

¹⁰ Institute of Environmental Management and Assessment: 2023, Guidelines: Environmental Assessment of Traffic and Movement

¹¹ The British Standards Institution, 2019, BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound.

11.2.32. The rating level for all new plant and machinery should be no more than equal to the existing minimum background noise levels. Further corrections should be applied if the plant noise contains tonal and/or impulsive characteristics. The magnitude of these corrections is dependent upon the subjective perceptibility of the tones/impulses present. These corrections as stated in BS 4142:2014 are as follows:

- Tonality:
 - +2 dB for a tone which is *just* perceptible
 - +4 dB for a tone which is *clearly* perceptible
 - +6 dB for a tone which is *highly* perceptible
- Impulsivity:
 - +3 dB for impulsivity which is *just* perceptible
 - +6 dB for impulsivity which is *clearly* perceptible
 - +9 dB for impulsivity which is *highly* perceptible
- Intermittency:
 - +3 dB for intermittency which is readily distinctive against the residual acoustic environment.

11.2.33. Where the Rating Level exceeds the background, the level of impact increases as shown below in **Table 11.7**.

Table 11.7: BS 4142:2014 assessment criteria.

Comparison with background	Assessment
+0 dB or below measured background	Low impact
+ 5 dB	Adverse impact
+ 10 dB or more above measured background	Significant adverse impact

Other guidance and policy

11.2.34. Other relevant policy and guidance documents are reviewed within the Hoare Lea baseline noise assessment report, included at **Appendix 11.2**.

Scoping Criteria

11.2.35. As set out in Chapter 2 of this ES, EIA Scoping is not a statutory requirement, when committing a scheme to EIA. The Applicants have not requested a formal Scoping Opinion in relation to Toton West in isolation, however have instead followed the scope of that agreed in relation to the larger, separate 'Toton North' scheme, which lies to the north east of the Site. Given the primary reason for undertaking an EIA is in relation to the potential significant cumulative effects that could occur with Toton West (and other potential schemes), this is considered appropriate and robust.

11.2.36. On the basis of the above, **Table 11.8** lists the noise and vibration sensitive receptors that have been included in the assessment, along with their corresponding assumed sensitivities to noise/vibration. The nearest sensitive receptors spread around the Site have been assessed.

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Other receptors, further away, are assumed to be subject to lower levels of effect. This holds true for all noise and vibration effects assessed except operational road traffic noise, for which any receptor close to a road with meaningful changes in road traffic flows has been assessed. Only the most sensitive uses of the Site have been assessed, as other less sensitive uses would be subject to lesser effects.

Table 11.8: Nearest identified receptor where road traffic has been assessed.

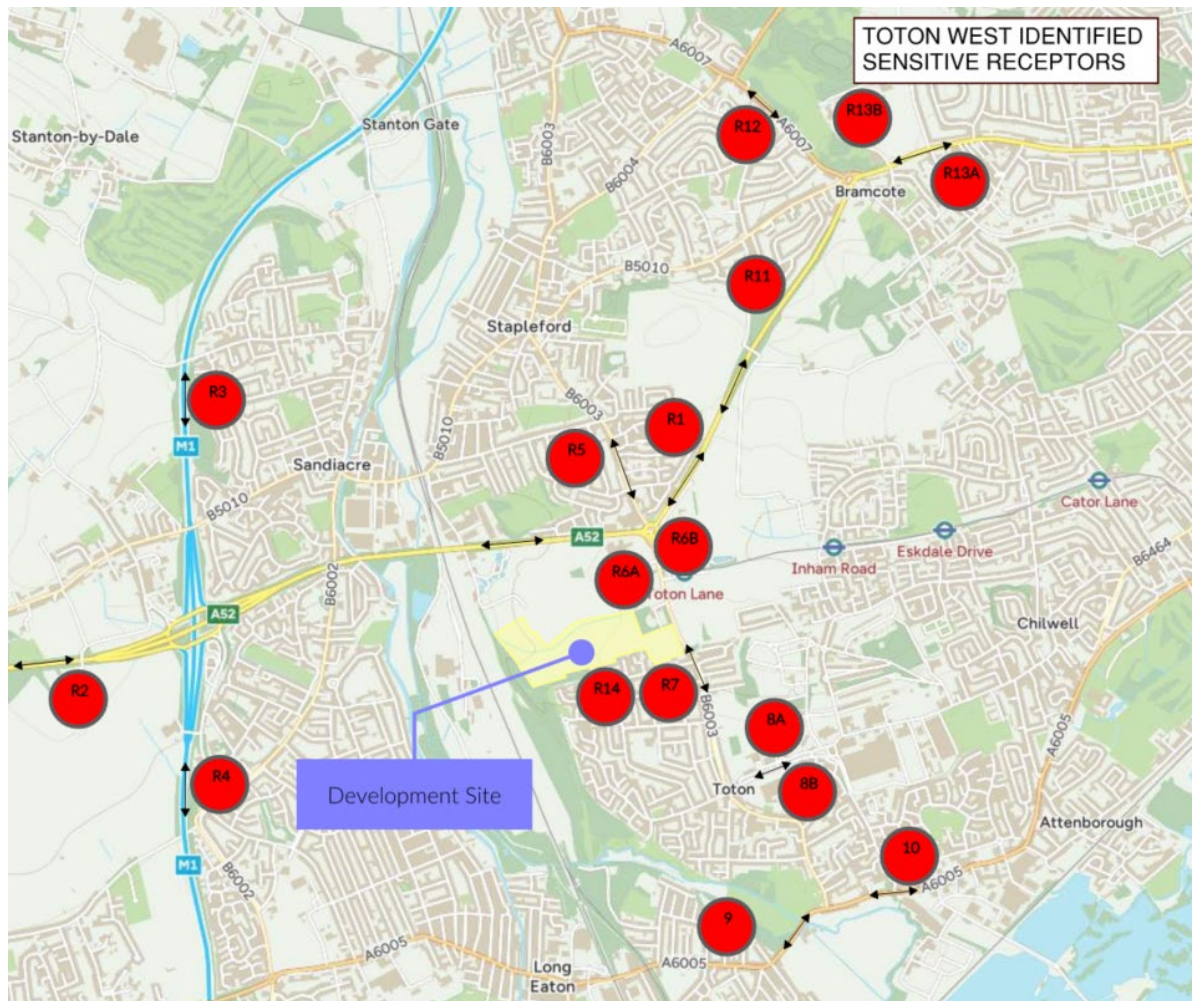
Receptor Reference	Receptor Type	Receptor description	Assumed sensitivity
R1	Residential Dwellings	North of the A52, West of Bardills Roundabout	High
R2	Residential Dwellings	North and south of the A52, West of M1 Junction 25	High
R3	Residential Dwellings	West and east of the M1, North of M1 Junction 25	High
R4	Residential Dwellings	West and east of the M1, South of M1 Junction 25	High
R5	Residential Dwellings	West and east of the B6003, North of Bardills Roundabout	High
R6A	School	West of the B6003, South of Bardills Roundabout	High
R6B	Park and Ride	West of the B6003, South of Bardills Roundabout	Low
R7	Residential Dwellings	West and east of the B6003, South of Toton Lane Park & Ride	High
R8A	Residential Dwellings	South of Swiney Way	High
R8B	HMS Sherwood	North of Swiney Way	High
R9	Residential Dwellings	North and south of the A6005, West	High
R10	Residential Dwellings	North and south of the A6005 East	High
R11	Residential Dwellings	West of the A52, North of Bardills Roundabout	High
R12	Residential Dwellings	South west of the A6007	High
R13A	Residential Dwellings	North and south of the A52 East of Bramcote Island	High
R13B	Leisure centre	North of the A52 East of Bramcote Island	Low

Receptor Reference	Receptor Type	Receptor description	Assumed sensitivity
R14	Residential Dwellings	South of site on Cleve Avenue, Edale Rise, Spinney Rise, Whitburn Road and Selby Close.	High

11.2.37. The nearest sensitive receivers as identified above are shown in **Plate 11.1**.

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Plate 11.1 Identified Sensitive Receptors to the Site (indicated in light red below).



- 11.2.38. Noise and vibration effects are predominantly treated as potentially adverse, as no beneficial effects will be observed for vibration and any benefits to the sound climate will be limited and complex to predict. Nevertheless, the contributions of positive sound sources have been considered within the Site suitability assessment.
- 11.2.39. The criteria for deriving the likely magnitude of impact for each potential noise and vibration effect are summarised in turn below.

Noise from Construction Activities

- 11.2.40. 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.
- 11.2.41. Full details of the exact construction method and plant are not available at this stage of the design of the Proposed Development. The construction noise impact assessment considers the typical activity based upon the type and scale of the Proposed Development.

- 11.2.42. **Table 11.9** 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 11.9: Assumed construction activity sound pressure levels ($L_{Aeq,T}$ at 10 m)

Plant equipment assumed to be in operation	BS 5228-1 reference	Sound pressure level at 10 m, dB $L_{Aeq,T}$
Sheet piling – vibratory piling rig	Table C3 Ref No. 8	88
Cutting of paving slabs	Table C5 Ref No. 36	87
Hand – held Tools	Table C4 Ref No. 93	80
Road roller	Table C5 Ref No. 19	80
Scaffolding	Table D7 Ref No. 1	80
Tracked Excavator	Table C2 Ref no. 14	79
Dumper trucks	Table C2 Ref No. 30	79
Roller – rolling fill	Table C2 Ref No. 37	79
Loader / Forklift truck	Table D7 Ref No. 94	79
Concrete mixing and pumping	Table C3 Ref No. 32	78
Cutting and welding	Table C3 Ref No. 31	73
Wheeled mobile crane	Table C4 Ref No. 43	70

- 11.2.43. 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.
- 11.2.44. Regarding distance attenuation, a reasonable ‘worst-case’ distance has been assumed during each work stage. For groundworks, this is a minimum distance of 30m between the receptor and the Site boundary.
- 11.2.45. 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 minimise the potential for significant effects.
- 11.2.46. 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.
- 11.2.47. 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. For all locations, a threshold value of 65 dB $L_{Aeq,T}$ has been targeted based upon the baseline noise levels of the Site. This represents the most stringent condition to be achieved in accordance with BS5228-1.

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- 11.2.48. Impact magnitude will be determined based upon comparison of the predicted noise levels against the threshold of 65 dB $L_{Aeq, T}$ with additional consideration of the likely duration of the construction activity. The impact magnitudes are described in **Table 11.10**.

Table 11.10: Impact magnitude for construction noise assessment

Impact magnitude	Description
High	Predicted noise levels exceed the threshold of 65 dB $L_{Aeq, T}$ for a prolonged period
Medium	Predicted noise levels exceed the threshold of 65 dB $L_{Aeq, T}$ for a 'short' period
Low	Predicted noise levels are between 0-10 dB below the threshold of 65 dB $L_{Aeq, T}$
Negligible	Predicted noise levels are more than 10 dB below the threshold of 65 dB $L_{Aeq, T}$

Vibration from Construction Activities

- 11.2.49. Piling activities 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.
- 11.2.50. Based on a preliminary intrusive ground investigation to provide an initial indication of ground conditions, the Applicant's structural engineer has stated that traditional strip foundations are considered to be the most suitable foundation option on this Site.
- 11.2.51. Although it is highly unlikely that piling will be required, allowance for a limited amount of vibratory piling has been considered to provide a conservative assessment. BS 5228-2 provides an empirically derived formula for prediction of this type of piling method, although it notes that the relationship tends to overpredict the ground borne vibration levels that would be experienced in practice.
- 11.2.52. In addition to providing a method for predicting vibration from piling, BS 5228-2 also advises of the effects to different levels of vibrations both in terms of human response, and the potential for building damage. Vibration is described in terms of the parameter Peak Particle Velocity ('PPV').
- 11.2.53. According to BS 5228-2, the thresholds at which cosmetic damage could occur in buildings (15 mm/s for light framed structures, or 50 mm/s for reinforced or heavy framed buildings) are significantly higher than the values for adverse human response to vibration. Consequently, the latter has been used to define impact magnitudes for construction vibration; as summarised in Table 11.11.

Table 11.11: Impact magnitude for construction vibration assessment

Impact magnitude	Vibration level, PPV, mm/s	Description
High	≥ 10.0 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.
Medium	< 10.0 mm/s ≥ 1.00 mm/s	It is likely that vibration above 1.00 mm/s in residential environments will cause complaint but can be tolerated over short periods if prior warning and explanation has been given to residents.
Low	< 1.00 mm/s ≥ 0.30 mm/s	The threshold at which vibration might be just perceptible in residential environments. The upper value may cause complaint if prior warning is not given to residents.
Negligible	< 0.30 mm/s	Vibration may be just perceptible in the most sensitive situations for most vibration frequencies associated with construction.

Construction and Operational Road Traffic Noise

- 11.2.54. Relative changes in road traffic noise have been assessed based on the short-term criteria contained in DMRB, as shown in **Table 11.12**. The assessment scenarios considered are described under the subheading Assumptions and Limitations.

Table 11.12: Impact Magnitude of Operational Road Traffic Noise.

Magnitude of impact	Noise change, dB $L_{A10,18hr}$	Details
High	Greater than or equal to 5.0	Change in short term noise would be clearly perceptible. Considered in DMRB to be a major magnitude.
Medium	3.0 – 4.9	Change in short term level may be perceptible under normal conditions. Considered in DMRB to be a moderate magnitude.
Low	1.0 – 2.9	Change in short term level may be perceived at the upper end of the range under certain conditions. Described in DMRB to be a minor magnitude.
Negligible	Less than 1.0	Imperceptible change. Described in DMRB to be of negligible magnitude.

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Site Suitability

- 11.2.55. The Planning Noise Assessment Report is provided in **Appendix 11.2**, which assesses and facilitates site suitability in terms of noise in accordance with BS 8233¹² and ProPG¹³.

Suitable internal noise levels within the Site are assessed against the criteria in **Table 11.13**.

Table 11.13: Description of receptor sensitivity.

Magnitude of impact	Site suitability noise criteria – internal
High	≥ 50 dB L_{Aeq} 16hour day ≥ 42 dB L_{Aeq} 8hour night
Medium	> 35 dB L_{Aeq} 16hour day > 30 dB L_{Aeq} 8hour night
Low	≤ 35 dB L_{Aeq} 16hour day ≤ 30 dB L_{Aeq} 8hour night
Negligible	≤ 30 dB L_{Aeq} 16hour day ≤ 25 dB L_{Aeq} 8hour night

- 11.2.56. **Table 11.14** shows the criteria used to assess the likely magnitudes of external noise on users of external areas for amenity on the Site.

Table 11.14 Magnitude of impact criteria for external noise levels within the Site dwellings

Magnitude of impact	Site suitability noise criteria – external
High	≥ 65 dB L_{Aeq} 16hour
Medium	≥ 55 dB L_{Aeq} 16hour
Low	≥ 50 dB L_{Aeq} 16hour
Negligible	< 50 dB L_{Aeq} 16hour

Limitations to the assessment

- 11.2.57. Calculations relating to road traffic noise associated with the Proposed Development are based upon traffic flow information provided by the Applicant, and the Applicant's Transport Consultant (ADC Infrastructure Ltd). These figures will have inherent uncertainty associated

¹² British Standards Institution: 8223 2014, Guidance on sound insulation and noise reduction for buildings

¹³ Professional Practice Guidance on planning and noise: New Residential Development, Acoustics & Noise Consultants, Institute of Acoustics, Chartered Institute of Environmental Health, May 2017

with them. Further details are set out in **Chapter 4 ‘The Proposed Development’** and **Chapter 9 ‘Transport and Access’** of this ES.

11.3. Baseline Conditions

Site Description and Context

- 11.3.1. The Site is allocated for mixed-use development within BBC’s Local Plan Part 2. Situated within the administrative area of BBC, the Site is located to the west of the B6003 Stapleford Lane, which leads northwards, and southwards, towards the suburbs of Stapleford, and Toton, respectively.
- 11.3.2. The Site comprises three irregularly shaped and connected field parcels that are in arable agricultural use.
- 11.3.3. The majority of the northern extent of the Site is bound by hedgerow, beyond which are further field parcels in arable agricultural use. The north-eastern extent of the Site is bound by well-established trees and hedgerow, with an electricity transmission substation beyond. A series of electricity pylons and associated overhead lines traverse the Site in an approximate north-east to south-west direction, from the electricity transmission substation.
- 11.3.4. The east of the Site is adjoined by the B6003 Stapleford Lane, beyond which is the Land at Toton East site for which a planning application has just been submitted by the Applicant (in conjunction with others).
- 11.3.5. To the south, the Site is bound by sporadic hedgerow and tree line, beyond which are gardens and existing residential dwellings associated with the suburb of Toton. The south-western most extent of the Land at Toton West Site is adjoined by Toton Fields Local Nature Reserve (LNR).
- 11.3.6. Finally, the west of the Land at Toton West Site is bound by the Toton Sidings Local Wildlife Site (LWS), beyond which lies the DB Toton Cargo Railway Terminus.
- 11.3.7. The George Spencer Academy is located 500m to the north-west of the Site, within the suburb of Stapleford. The Bispham Drive Junior School is located 525m to the south-west of the Site.
- 11.3.8. The Land at Toton West Site is accessed from Stapleford Lane.

Baseline Survey Information

- 11.3.9. An environmental noise survey has been undertaken around the Site to establish the baseline environmental noise conditions. Full details of the survey are presented within **Appendix 11.2, ‘Acoustic Planning Report’**.
- 11.3.10. Baseline environmental sound surveys were undertaken by Hoare Lea in December 2023. Two monitoring stations were set up on Site between Friday 01 December to Tuesday 05 December 2023 and Monday 07 October 2024 to Wednesday 09 October 2024 to determine the prevalent ambient and background sound levels across the Site and surrounding area.
- 11.3.11. The baseline sound environment across the Site is currently road traffic on the nearby roads with localised noise along the western site boundary from train pass-bys, trains idling, and occasional train horns associated with the railway sidings to the west. There was no audible noise from either the park and ride, the electrical sub-station, nor the Water Treatment Works

Noise and Vibration

at any time during the attended portions of the survey work. The noise measurement positions used during the survey exercise carried out on Site are shown in **Plate 11.2**.

Plate 11.2 Survey Measurement positions in relation to the Site (indicated in yellow)



Source: Google, Maxar Technologies (2024); Hoare Lea annotations

11.3.12. 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 11.2** to this ES document, with a summary of the main ambient, background and maxima noise levels presented in **Table 11.15**.

Table 11.15 Summary of measured noise levels during baseline noise survey

Measurement Location	Average ambient noise level, $L_{Aeq,T}$ dB		Maximum noise level, $L_{Amax,(fast)}$ dB	Background noise level, $L_{A90,15-min}$ dB	
	Daytime (07:00 – 23:00)	Night time (23:00 – 07:00)	Night time (23:00 – 07:00)	Daytime (07:00 – 23:00)	Night time (23:00 – 07:00)
Location 1	65	58	78	45	33
Location 2	54	54	78	43	43

11.3.13. The maximum noise level is the level not typically exceeded for more than 10 times during the night (23:00 – 07:00) in line with the requirement of ProPG.

11.3.14. As a conservative basis for assessment, the ‘typical’ background sound level during daytime and night-time periods has been selected based on the levels exceeded for 90% of the time. This is considered a reasonable assumption, as the lowest 10% of background sound levels at night are observed to be in the middle of the night, when any residential receptors will be asleep inside and a minor change to steady-state background sound levels inside will not be perceptible. Any non-residential receptors will not be in operation or will not be sensitive to noise during the night.

- 11.3.15. All traffic data used for assessment of Construction Traffic Noise has been provided by the Applicant. These construction traffic estimates have been informed by previous experience in developing similar schemes to the Proposed Development, based on likely construction materials and construction methodology. A detailed construction programme is not given at this stage, however, estimates of the of the likely number of vehicles generated for the construction of the Proposed Development, together with potential staff movements have been made. The estimated construction traffic trip generation is set out **Chapter 4 'The Proposed Development'** of this ES, and for ease is replicated again in **Table 11.16** below.

Table 11.16: Estimated Daily Construction Traffic

Vehicle Type	Average Trips Per Day
Heavy Goods Vehicles (HGVs)	14
Cars and Light Goods Vehicles	50

- 11.3.16. All traffic data used for assessment of Operational Traffic Noise are 18-hour Annual Average Daily traffic flows (AADTs) as provided by the Applicant's transport consultant (ADC Infrastructure Ltd). These are listed in **Table 11.17** below.

Table 11.17: Operational road traffic from the road traffic assessment.

Road	Existing Baseline (2022)	With Toton East development
A52 West of Bardills Roundabout	39,768	+773
A52 West of M1 Junction 25	33,116	+290
M1 North of M1 Junction 25	104,194	+97
M1 South of M1 Junction 25	109,632	+386
B6003 North of Bardills Roundabout	12,677	+193
B6003 South of Bardills Roundabout	20,142	+1353
B6003 South of Toton Lane Park & Ride	19,991	+386
Swiney Way	9,018	+97
A6005 West	24,710	+97
A6005 East	19,741	+97
A52 North of Bardills Roundabout	32,484	+387
A6007	13,890	+97
A52 East of Bramcote Island	33,262	+483

Future Baseline

- 11.3.17. It is recognised that there is potential for baseline sound levels to change in the future should there be any significant changes in the environmental sound sources around the Site.

Noise and Vibration

- 11.3.18. The primary sound source is road traffic. The traffic flow data provided by the Applicant's transport consultant includes both current baseline data (2022), and future baseline data with no development (2041). This has been referenced in the assessment of future operational road traffic noise.
- 11.3.19. According to IEMA Guidelines (Environmental Assessment of Traffic and Movement 2023 as detailed in Sections 11.2.27 to 11.2.30), changes in traffic flows of less than 10% have no discernible impact. Therefore, it is considered that there will likely be a negligible increase in the future baseline sound levels from environmental sources provided this threshold is not exceeded.
- 11.3.20. A review of the data indicates an increase in road traffic flows of less than 10% for all roads within the assessed area. The existing baseline conditions measured therefore are representative of future baseline conditions in the absence of the Proposed Development.

11.4. Assessment of Likely Significant Effects

Construction

Noise from construction activity

- 11.4.1. Noise generated during the construction works of the Site 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, resulting in a significant effect.
- 11.4.2. The construction works are considered to be similar throughout the Site, with no particular phase or area generating higher levels of noise. On this basis, only the closest receptors to the Site have been considered. Lesser effects would be experienced for the other phases and receptors due to additional distance attenuation.
- 11.4.3. Based on the Illustrative Masterplan (see **Figure 4.2**), a nominal distance of 30m has been assumed between the closest building under construction and the closest noise-sensitive receptors.
- 11.4.4. Based on the range of construction activities presented in **Table 11.8**, the noise levels have been calculated at the worst-affected noise-sensitive receptors and presented within **Table 11.18** below.
- 11.4.5. BS 5228-1 does not provide guidance on what is considered a 'Short' or 'Long' duration. The duration of different activities has therefore been determined based on experience.
- 11.4.6. For piling works, BS 5228-1 states that the duration is usually short in relation to the length of construction work as a whole, and the amount of time spent working near to noise-sensitive areas might represent only a part of the piling period.
- 11.4.7. From experience, the cutting of paving slabs is only likely to only be for a short duration in relation the construction work.

Table 11.18: Assessment of construction activity noise at worst-affected receptor locations

Plant equipment	Calculated sound level at receptor, dB L _{Aeq,T}	Magnitude of impact
Sheet piling – vibratory piling rig	78	Medium
Cutting of paving slabs	77	Medium
Hand – held Tools	70	Medium
Road roller	70	Medium
Scaffolding	70	Medium
Tracked Excavator	69	Medium
Dumper trucks	69	Medium
Roller – rolling fill	69	Medium
Loader / Forklift truck	69	Medium
Concrete mixing and pumping	68	Medium
Cutting and welding	63	Low
Wheeled mobile crane	60	Low

11.4.8. As presented, activity noise from the majority of activities are calculated to exceed the criteria of 65 dB. As these activities are likely to only occur for short periods, this is considered to equate to a Medium magnitude of impact on high sensitivity receptors. This corresponds with a **Moderate Adverse** temporary Effect which is **Significant**.

11.4.9. For all other construction works, the magnitude of impact is predicted to lower.

11.4.10. For short periods, construction activity may be at closer proximity to the noise-sensitive receptors. During these periods, higher levels would be anticipated. As the duration of these activities will be short, the activities are not anticipated to exceed a Medium magnitude of impact on high sensitivity receptors. This corresponds with a **Moderate Adverse** temporary Effect which is **Significant**. For the remainder of the time when activities occur at greater distances from the high sensitive receptors, lower levels would be anticipated.

11.4.11. Mitigation to reduce the adverse effects as far as practical in the form of a CEMP are detailed in Sections 11.5.1 to 11.5.6.

Vibration from construction activity

11.4.12. Traditional strip foundations are considered the most likely for the Site, as based upon the Proposed Development. It has however been stated that a limited amount of piling should be considered as a worst-case assessment in the absence of detailed intrusive ground investigations.

11.4.13. If piling is to be undertaken, this will likely be the main source of vibration during construction. As the location and type of piling are unknown, it has been assumed that vibratory piling is proposed at a distance of 30 metres from the closest sensitive receptor.

Noise and Vibration

11.4.14. Calculations have been undertaken based on the 5% probability of exceedance value from BS 5228-2 and start up/run down conditions as a worst-case scenario.

11.4.15. The result of the assessment is presented within **Table 11.19**.

Table 11.19: Assessment of construction activity vibration at worst-affected receptor locations

Receptor Reference	Predicted PPV at closest sensitive receptor, mm/s	Magnitude of impact
R14, R15, R16	4.49	Medium

11.4.16. Based on the assessment undertaken, the PPV at the closest noise-sensitive receptors is predicted to equate to a Medium magnitude of impact on high sensitivity receptors. This corresponds with a **Moderate Adverse** temporary Effect which is **Significant**. Where there is no piling undertaken at the Site, there are no other sources of vibration anticipated on the Site. This corresponds with a **Negligible** effect, which is **not significant**.

11.4.17. Mitigation to reduce the adverse effects as far as practical in the form of a CEMP are detailed in Sections 11.5.1 to 11.5.6.

Construction Traffic Noise

11.4.18. Construction road traffic noise levels as a result of the Proposed Development have been calculated using the methodology set out within CRTN, summarised in Paragraph 11.2.20. The operational road traffic noise levels have been compared in accordance with the short-term methodology guidance in DMRB, as summarised in 11.2.21 to 11.2.26 and their impact has been assessed in accordance with IEMA guidance as summarised in 11.2.27 to 11.2.30.

11.4.19. Traffic flow data has been provided by the Applicant for the construction phase of the Proposed Development.

Road Traffic Assessment

11.4.20. The predicted change in road traffic noise levels on relevant sensitive receptors during the construction stage of development has been assessed in accordance with the IEMA Guidelines, which states that changes in traffic flows of less than 10% have no discernible impact. Therefore, it is considered that there will likely be negligible increase in the future baseline sound levels from environmental sources provided this threshold is not exceeded.

11.4.21. A review of the data as summarised in **Table 11.5** indicates an increase in road traffic flows of less than 10% for all roads within the assessed area and therefore, the predicted change in road traffic noise levels as a result of construction traffic will have no discernible impact.

11.4.22. Negligible magnitudes of impact are predicted in all cases with high sensitivity receptors.

11.4.23. Based on the sensitivity of the nearby receptors, this corresponds to a **negligible effect** at all receptor locations (**not significant**).

Operation

Operational Traffic Noise

- 11.4.24. Operational road traffic noise levels as a result of the Proposed Development have been calculated using the methodology set out within CRTN, summarised in 11.2.20. The operational road traffic noise levels have been compared in accordance with the short-term methodology guidance in DMRB, as summarised earlier and their impact has been assessed in accordance with the IEMA guidance as summarised in Section 11.2.27 to 11.2.30.
- 11.4.25. Traffic flow data has been provided by the Applicant's Transport Consultant for the following scenarios:
- 2022: Existing traffic levels; and
 - Increased traffic levels with the development of the Site at proposed year of completion (2041).

Road Traffic Assessment

- 11.4.26. The predicted change in road traffic noise levels on relevant sensitive receptors during the operational stage of development has been assessed in accordance with IEMA Guidelines, which states that changes in traffic flows of less than 10% have no discernible impact. Therefore, it is considered that there will likely be negligible increase in the future baseline sound levels from environmental sources provided this threshold is not exceeded.
- 11.4.27. A review of the data as summarised in **Appendix 11.3** indicates an increase in road traffic flows of less than 10% for all roads within the assessed area and therefore, the predicted change in road traffic noise levels will have no discernible impact.
- 11.4.28. In all cases, the change in number of HGV's is equal to or less than the change in total vehicles.
- 11.4.29. Negligible magnitudes of impact are predicted in all cases with high sensitivity receptors.
- 11.4.30. Based on the sensitivity of the nearby receptors, this corresponds to a **negligible effect** at all receptor locations (**not significant**).

Site Suitability

- 11.4.31. Site suitability in terms of noise is based on providing: suitable internal noise levels in dwellings/apartments in accordance with BS 8233 and ProPG and suitable noise levels in external areas for amenity being in accordance with BS 8233 and ProPG.
- 11.4.32. Criteria for suitable internal noise levels are derived based on significant effects being observed above the desirable internal noise levels contained within BS 8233. However, for site suitability, where the design of the building is under developer control, the assessment assumes that windows are closed and façade acoustic performance requirements will be derived during design to facilitate suitable internal noise levels. Management of ventilation and overheating is therefore to be provided by means other than opening windows.
- 11.4.33. Facade elements are designed to achieve the minimum acoustic performances shown in **Table 11.20**.

Table 11.20: Assumed façade acoustic performances

Noise and Vibration

Location	Glazing acoustic performance, R_w dB	Other solid element acoustic performance, R_w dB
Habitable rooms overlooking Stapleford Lane	33	43
Habitable rooms railway sidings to the west	33	43
All remaining habitable windows	30	30

- 11.4.34. Both internal and external noise levels are assessed against the total noise levels, including for: the contributions of existing sources of noise determined from the baseline survey; the predicted uplifts to road traffic noise based on the road traffic flows provided by the Applicant's Transport Consultant.
- 11.4.35. Achieving suitable internal noise levels is considered feasible, provided the energy strategy provides means for managing ventilation and overheating without occupants having to rely on open windows. The eventual façade acoustic performance requirements will be determined during design.
- 11.4.36. The indicative acoustic performance requirements of facades, used for assessment can be achieved by 'off the shelf' products, provided suitable design procedures are followed. Complying with the BS 8233 desirable internal noise levels is considered to correspond to low magnitudes of impact.
- 11.4.37. Criteria for suitable external noise levels are derived based on significant effects being observed above the desirable external noise levels contained within BS 8233, and ProPG. However, for site suitability, where the design of the Site is under developer control, the assessment assumes that external private gardens can be relocated behind dwellings or that suitable perimeter fencing design will be developed to facilitate suitable external noise levels.
- 11.4.38. The calculated external noise levels are less than 50 dB $L_{Aeq\ 16\text{hour}}$ for the majority of the Site, with limited areas close to the main roads above 55 dB $L_{Aeq\ 16\text{hour}}$. Acoustic screening will be provided by buildings and garden fences that will reduce the external noise levels within garden areas. This is to be considered within the design to ensure that garden areas are to be subject to noise levels of less than 55 dB $L_{Aeq\ 16\text{hour}}$ where possible. This would result in a Minor to Moderate impact, leading to a **Not Significant Effect** in the external garden areas. It is also considered that the matter of external noise levels will be considered fully at either Reserved matters stage, or at the Detailed design stage as the final layout of the Proposed Development established.
- 11.4.39. Complying with the ProPG and WHO guidelines for external noise levels is considered to correspond to low magnitudes of impact.
- 11.4.40. Therefore, Site suitability in terms of noise and vibration is considered to be a low magnitude of impact on highly sensitive receptors, corresponding to a permanent **Minor to Moderate adverse effect (not significant)**.

11.5. Mitigation, Enhancement and Residual Effects

Mitigation by Design

Construction Phase

- 11.5.1. Construction noise and vibration is predicted to lead to a **Significant** effect at the closest receptors, when activities are taking place in close proximity to these receptors. For the remainder of the time when activities occur at greater distances from the high sensitive receptors, lower levels would be anticipated. .
- 11.5.2. Details of the embedded mitigation are provided below and include noise and vibration mitigation at source, and acoustic screening.
- 11.5.3. Prior to construction, CEMP will be implemented on the Site.
- 11.5.4. 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.
- 11.5.5. In order to reduce the level of noise and vibration on the nearest sensitive dwellings during the construction phase of the Proposed Development, a series of measures are to be implemented which will form part of the CEMP (to be secured via condition) and will include measures such as:
- Noisy-construction work associated with the Proposed Development is to be restricted to the following hours as set out in Chapter 4 'The Proposed Development' of this ES:
 - Monday to Friday 08:00. to 18:00;
 - Saturday 8:00. to 13:00; and
 - No working or noisy activities during Sundays and Bank Holidays.
 - Night-time or 24-hour working is to be agreed with BBC if required.
 - The Site would be 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 gates into the Site 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.
 - 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.

Noise and Vibration

- 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 behaviour should all be avoided.

11.5.6. These measures are to be provided to reduce the adverse effects as far as practical.

11.5.7. The predicted noise impacts of construction road traffic noise are **not significant** and are unlikely to be observable and therefore, mitigation for construction road traffic noise will not be necessary. Nonetheless, a CEMP (which will contain a CTMP as set out in Chapter 4 'the Proposed Development' of this ES) will be employed on the Site.

Operational Phase

Operational road traffic noise

11.5.8. The predicted noise impacts of operational road traffic noise are not significant and are unlikely to be observable and therefore, mitigation for operational road traffic noise will not be necessary.

Site Suitability

11.5.9. 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.

11.5.10. The Acoustic Planning Report at **Appendix 11.2** details that appropriate double glazing, selected to provide a sound reduction performance of at least R_w 33 dB, internal noise levels would be anticipated to be acceptable for the most exposed elevations of the Proposed Development close to the B6003 and the railway sidings during both day and night-time. Where dwellings are set back further from the surrounding roads and the railway sidings, a sound reduction performance of at least R_w 30 dB will be selected.

11.5.11. Section 5.2 of the Acoustic Planning report at **Appendix 11.2** confirms that the sound levels predicted for dwellings overlooking the B6003 to the east and the railway sidings to the west fail in terms of compliance with recognised guidance with open windows. On this basis, residential dwellings overlooking the B6003 and the railway sidings will be provided with background ventilators (trickle vents) with a sound reduction performance equivalent to that of the glazing. To achieve the criteria within Approved Document O, an alternative means of cooling which does not rely on open windows, such as mechanical ventilation, may also be required.

11.5.12. 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.

11.5.13. Section 5.2 of the Acoustic Planning report at **Appendix 11.2** confirms that the sound levels across the site are likely to meet the BS8233 'acceptable' criteria for some of the Site, with this level likely to be exceeded to the elevations facing the B6003 to the east. This is

considered within the design which will ensure that garden areas with an open view of the B6003 benefit from perimeter fencing of minimum height 1.8 metres which will enable external noise levels of less than 55 dB $L_{Aeq,16hour}$.

Additional Mitigation.

Construction noise activity

- 11.5.14. Construction noise and vibration is predicted to lead to a **Significant** effect at the closest receptors, when activities are taking place in close proximity to these receptors. For the remainder of the time when activities occur at greater distances from the high sensitive receptors, lower levels would be anticipated. .
- 11.5.15. Details of the embedded mitigation are provided within Paragraph 11.5.5, including noise and vibration mitigation at source, and acoustic screening. These measures are to be provided to reduce the adverse effects as far as practical. No further mitigation is therefore proposed.

Construction road traffic noise

- 11.5.16. The predicted noise impacts of construction road traffic noise are not significant and are unlikely to be observable. Therefore, no mitigation measures are proposed for construction road traffic noise.

Operational road traffic noise

- 11.5.17. The predicted noise impacts of operational road traffic noise are not significant and are unlikely to be observable. Therefore, no mitigation measures are proposed for operational road traffic noise. Nonetheless, **Chapter 9 'Transport and Access'** of this ES identifies a Travel Plan as additional mitigation for that topic which when implemented, will minimise operational vehicular noise emissions.

Site Suitability

- 11.5.18. The limits for internal noise levels in **Table 11.13** are in accordance with the BS 8233 and ProPG requirements and facilitate Minor to Moderate effects (or less) that are not significant. These limits can be secured via a condition and achieving these limits is considered feasible through design. Therefore, no additional mitigation measures are considered to be warranted.
- 11.5.19. The limits for external noise levels as detailed in **Table 11.14** are in accordance with the BS 8233 requirements and facilitate Minor to Moderate effects (or less) that are not significant. These limits can be secured via a condition and achieving these limits is considered feasible through design. Therefore, no additional mitigation measures are considered to be warranted.
- 11.5.20. With consideration of the above, suitable internal noise levels are predicted and external levels measured corresponding to **Minor to Moderate effects (or less) that are not significant**. Therefore, no addition mitigation measures are considered to be warranted.

Summary of Additional Mitigation

- 11.5.21. A summary of measures intended to avoid, reduce or manage any adverse effects is shown in **Table 11.21**.

Noise and Vibration

Table 11.21: 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 Phase Construction Noise Construction phase Construction Noise will be controlled through a suitably worded CEMP	–	–	X

Residual EffectsConstruction Phase*Construction activity noise*

- 11.5.22. There is no additional mitigation proposed and therefore the residual effects are as set out in the assessment of likely significant effects.

Construction road traffic noise

- 11.5.23. No mitigation measures are proposed for construction road traffic noise. Therefore, construction traffic noise associated with the Site remains a low magnitude of impact on highly sensitive receptors, corresponding to a temporary **Negligible effect (not significant)**.

Operational Phase*Operational road traffic noise*

- 11.5.24. No mitigation measures are proposed for operational road traffic noise. Therefore, road traffic noise associated with the Site remains a low magnitude of impact on highly sensitive receptors, corresponding to a permanent **Negligible effect (not significant)**.

Site Suitability

- 11.5.25. The planning report as attached in **Appendix 11.2** details that with appropriate double glazing, selected to provide a sound reduction performance of at least R_w 33 dB, internal noise levels will be acceptable for the most exposed elevations of the Proposed Development close to the B6003 and the railway sidings during both day and night-time. Where dwellings are set back further from the surrounding roads and Tramway, or are acoustically screened from them, lower façade sound insulation performances are specified.
- 11.5.26. Section 5.2 of the Acoustic Planning report at **Appendix 11.2** confirms that the sound levels predicted for dwellings overlooking the B6003 to the east and the railway sidings to the west fail in terms of compliance with recognised guidance with open windows. On this basis, residential dwellings on the more exposed elevations will be provided with background ventilators in the form of trickle vents for habitable rooms. To achieve the criteria within Approved Document O, an alternative means of cooling which does not rely on open windows, such as mechanical ventilation, may also be required.
- 11.5.27. With adequately selected glazing installed and suitable ventilation strategy, the internal noise levels of all the Proposed Development facades would comply with the requirements of BS 8233,

resulting in a **Minor to Moderate adverse effect (Not Significant)** inside the future residential units.

- 11.5.28. With the proposed site layout which incorporates a barrier screening strategy, the external noise levels of all the Proposed Development private gardens will comply with the requirements of BS 8233, resulting in a **Minor to Moderate adverse effect (Not Significant)** at the future residential external areas.

11.6. Cumulative and In-Combination Effects

- 11.6.1. The cumulative effects of related developments, as set out in Chapter 2, Assessment Scope and Methodology and agreed with the LPA through the Scoping process, have been considered. These include:

- Southfields Farm, Bramcote – 24/00066/FUL – Construction and operation of two adjacent Battery Energy Storage Systems (BESS) facilities.
- Land at Toton North: 880 homes, link road (means of access only), local centre, country park, education provision (forest school) and associated infrastructure.
- Land at Toton East: Residential development of 155 homes and associated open space and infrastructure.

- 11.6.2. Each of the effects previously assessed in Sections 11.4 and 11.5 above at both the construction and operational phases have included the relevant cumulative sites and as such, these for assessments for road traffic noise and site suitability inherently already include any cumulative impact. For construction road traffic noise during the Construction Stage, this corresponds to **a negligible effect** at all receptor locations (**not significant**).

- 11.6.3. For operational road traffic noise during the Operational Stage, this corresponds to **a negligible effect** at all receptor locations (**not significant**).

- 11.6.4. Site suitability in terms of noise and vibration remains a low magnitude of impact on high sensitivity receptors, corresponding to a permanent **Minor to Moderate adverse effect (not significant)**.

11.7. Summary

Introduction

- 11.7.1. An assessment of the likely significant noise and vibration effects upon sensitive receptors within and in the vicinity of the Site, during the construction and operation phase has been undertaken. 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 prevalent noise source on the Site is road traffic on the nearby roads with localised noise along the western site boundary from train pass-bys, trains idling, and occasional train horns associated with the railway sidings to the west. There was no audible noise from either the park and ride, nor the electrical sub-station, nor the Water Treatment Works at any time during the attended portions of the Site survey.

Noise and Vibration

Likely Significant Effects

- 11.7.3. Noise and vibration generated during the construction phase of the Proposed Development at the nearest sensitive receptors identified above in the baseline conditions have been considered based upon a range of construction activities deemed possible to occur at the Site. Although the noise from the majority of activities are calculated to exceed the criteria set in accordance with BS 5228-1, these activities are likely to only occur for short periods and as such, this is considered to equate to a Medium magnitude of impact on high sensitivity receptors, corresponding with a **Moderate Adverse temporary Effect** which is **Significant** when activities are taking place in close proximity to these receptors. For the remainder of the time when activities occur at greater distances from the high sensitive receptors, lower levels would be anticipated. Vibration levels at the closest noise-sensitive receptors are predicted to equate to a Medium magnitude of impact on high sensitivity receptors which corresponds with a **Moderate Adverse temporary Effect** which is **Significant**. Where there is no piling undertaken at the Site, there are no other sources of vibration anticipated, corresponding within a **Negligible** effect, which is **not significant**.
- 11.7.4. The increase in traffic at the nearest sensitive receptors identified above in the baseline conditions has been considered during both the construction and operational phases based upon predicted traffic flow levels as provided by the Applicant and by their Transport Consultant. When looking at traffic increases cumulatively, and allowing for general growth, increases in road traffic noise levels are, at worst, a negligible magnitude of impact on high sensitivity receptors, corresponding to a **negligible** effect, which is **not significant**.

Mitigation and Residual Effects

- 11.7.5. Prior to construction, a CEMP will be implemented on the Site which will detail the implementation of measures therein to address construction effects relating to noise and vibration, on the environment, existing surrounding communities, businesses, and residents of the area.
- 11.7.6. In order to reduce the level of noise and vibration on the nearest sensitive dwellings during the construction phase of the Proposed Development, a series of measures are to be implemented which will form part of the CEMP (to be secured via condition) which will include measures detailed in Section 11.5.5. These measures are to be provided to reduce the adverse effects as far as practical.
- 11.7.7. Façade acoustic performances can be designed to comply with the relevant British Standard desirable internal noise levels through standard products such as standard thermal double glazed windows which will be specified at the more detailed stages. This would correspond to, at a worst, a low magnitude of impact. Noise levels in external areas are expected to have a **negligible impact**. There is potential for external areas to be acoustically positive environments that facilitate wellbeing, particularly if suitable greenery is incorporated into the design. Therefore, Site suitability is, at worst, a low magnitude of impact on high sensitivity receptors, corresponding to a permanent **Minor to Moderate adverse effect (not significant)**. The Site suitability assessment has been carried out based on the future sound climate, allowing for traffic increases associated with other developments. Therefore, cumulative considerations are already accounted for to an appropriate extent.

Conclusion

- 11.7.8. **Table 11.22** provides a summary of effects, mitigation and residual effects.

Table 11.22: 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								
R14	Noise and vibration from construction activity	Temporary	High	Medium	Local	Moderate	CEMP to be provided.	Adverse effect. (Significant) (when activities occur at greater distances from the high sensitive receptors, lower levels would be anticipated).
R1, R2, R3, R4, R5, R6A, R6B, R7, R8A, R8B, R9, R10, R11, R12, R13A, R13B	Construction road traffic noise	Temporary	High	Negligible	Local	Negligible	None	Negligible (not significant)
Operation								
R1, R2, R3, R4, R5, R6A, R6B, R7, R8A, R8B, R9, R10, R11,	Operational road traffic noise	Permanent	High	Negligible	Local	Negligible	None	Negligible (not significant)

Noise and Vibration

Receptor / Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value**	Magnitude of Effect**	Geographical Importance ***	Significance of Effects ****	Mitigation / Enhancement Measures	Residual Effects ****
R12, R13A, R13B								
R1, R2, R3, R4, R5, R6A, R6B, R7, R8A, R8B, R9, R10, R11, R12, R13A, R13B	External building services noise	Permanent	High	Low	Local	Minor	None	Minor to Moderate (not significant)
Cumulative and In-Combination								
R1, R2, R3, R4, R5, R6A, R6B, R7, R8A, R8B, R9, R10, R11, R12, R13A, R13B	Operational road traffic noise	Permanent	High	Negligible	Local	Negligible	None	Negligible (not significant)
R1, R2, R3, R4, R5, R6A, R6B, R7, R8A, R8B, R9, R10, R11, R12, R13A, R13B	External building services noise	Permanent	High	Low	Local	Minor to Moderate	None	Minor to Moderate (not significant)

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