

A46 Newark Bypass

TR010065/APP/6.1

6.1 Environmental Statement Chapter 11 Noise and Vibration

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**The Infrastructure Planning
(Applications: Prescribed Forms
and Procedure) Regulations 2009**

A46 Newark Bypass

Development Consent Order 202[x]

ENVIRONMENTAL STATEMENT

CHAPTER 11 NOISE AND VIBRATION

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11 Noise and vibration

11.1 Introduction

- 11.1.1 This Chapter presents the information required by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) to be provided in the Environmental Statement (ES) to enable the identification and assessment of likely significant effects on noise and vibration.
- 11.1.2 The Scheme has the potential to cause both adverse and beneficial effects. This assessment considers construction and operational phase effects including the effects on human health by reference to the concepts from toxicology of adverse effect levels for both daytime and night-time periods and has been prepared in accordance with the Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration¹.
- 11.1.3 This Chapter has been undertaken in compliance with the Planning Inspectorate's Scoping Opinion received for this Scheme **(TR010065/APP/6.10)**. Appendix 4.3 Scoping Opinion Schedule of Comments and Responses of the ES Appendices **(TR010065/APP/6.3)** contains further information on how each of the matters raised in the Scoping Opinion have been addressed.
- 11.1.4 Chapter 2 (The Scheme) of this ES contains a detailed description of the Scheme. The drawings referenced in this Chapter can be found in the ES Figures **(TR010065/APP/6.2)**, and the technical appendices referred to in this Chapter are presented in the ES Appendices **(TR010065/APP/6.3)**.

11.2 Competent expert evidence

- 11.2.1 The competent expert has a BA(Hons) in Engineering Science from the University of Oxford and is a Chartered Engineer and Fellow of the Institute of Acoustics (FIOA). The competent expert has over 30 years' experience in noise and vibration including preparation of ES chapters, has acted as an Expert Witness in the examination of Development Consent Orders (DCOs) applications for other highways schemes, and has experience in civil and criminal litigation as an expert witness.

¹ National Highways, Design Manual for Roads and Bridges (DMRB) LA 111 - Noise and Vibration (Revision 2), 2020.

11.3 Legislative and policy framework

Legislation

11.3.1 The principal legislative and planning context for the assessment of the environmental effects of the Scheme on noise and vibration is presented below. The relevant legislation and policies listed below have been taken account of in the assessment.

The Land Compensation Act 1973 Part 1

11.3.2 The Land Compensation Act 1973 Part 1² includes provision for compensation for owners of land or property which has experienced a loss in property value from physical factors, including noise and vibration, resulting from the use of public works, such as new or improved roads. Noise and vibration are two of the factors which would be considered in any claim for compensation; the claim should consider all changes and effects, including betterment. However, the provisions within the Act do not directly affect the assessment methodology or outcomes.

The Noise Insulation Regulations 1975 (amended 1988)

11.3.3 The Noise Insulation Regulations 1975 (amended 1988)³ were made under Part 2 of the Land Compensation Act 1973 for the obligatory and discretionary provision, by the relevant Highway Authority, of noise mitigation measures for dwellings affected by a new or altered highway. Where there is an 'additional carriageway', the Highway Authority has a duty to (i.e. they must) carry out insulation work or make grants. For an 'altered highway', the Highway Authority has a power to (i.e. they can) carry out insulation work or make grants. Among the criteria for a property to qualify for insulation in living rooms and bedrooms is the façade noise level is at least 68 decibels (dB) $LA_{10,18hr}$ (the arithmetic average of the 18 $LA_{10,1hr}$ levels for the period between 06:00 and 00:00 on any day), and that noise from the new or altered highway increases by at least 1 dB. $LA_{10,1hr}$ is the noise level, in dB, that is exceeded 10% of the time in the time period of interest and is the index used to assess daytime road traffic noise in the UK. The value 68 dB $LA_{10,18hr}$ has been adopted as the Significant Observable Adverse Effect Level (SOAEL) for this assessment (see Table 11-7 of this Chapter).

² Her Majesty's Stationery Office, Land Compensation Act, 1973.

³ Her Majesty's Stationery Office, Noise Insulation Regulations. Building and Buildings, 1975.

The Control of Pollution Act 1974 (sections 60 and 61)

- 11.3.4 Whilst people that live near to construction activities may accept that there would be some disturbance caused to them, the Control of Pollution Act 1974⁴ offers further protection.
- 11.3.5 Section 60 of the Act enables a local authority to serve a notice specifying its noise control requirements covering plant or machinery (which is or is not being used), hours of working, and levels of noise that can be emitted. Breaching the terms of the notice is an offence.
- 11.3.6 Section 61 relates to prior consent in which the Principal Contractor consults with the local authority and provides an application prior to construction works commencing to obtain approval for the methods to be used and the steps proposed to minimise noise and vibration resulting from the works.
- 11.3.7 In serving a notice under Section 60, a local authority takes account of the need for ensuring that the best practicable means (BPM) are employed to minimise noise and vibration. Within this assessment these measures are set out in paragraph 11.10.15 of this Chapter.

The Environmental Noise (England) Regulations 2006 (amended 2018)

- 11.3.8 The Environmental Noise (England) Regulations⁵ implement European legislation requiring the Secretary of State to develop noise action plans on a five-year rolling programme. Action plans have to be developed for the major noise sources (including road surfaces) and areas for which maps have been produced and that identified 'Important Areas' for future mitigation. The action plans seek to manage noise issues and effects including noise reduction, if necessary, based on the results obtained through the mapping process. This assessment considers the noise and vibration effects on sensitive receptors within Important Areas in paragraph 11.11.131 of this Chapter.

The Environmental Protection Act 1990

- 11.3.9 The Environmental Protection Act (EPA) 1990⁶ places a duty on local authorities to serve abatement notices where noise from premises, vehicles and machinery are judged to constitute a statutory nuisance. Compliance with these controls is required, although the requirements fall outside the planning system. The use of best practicable means to control emissions can constitute a ground of defence against charges that such a nuisance arises. Within this assessment these measures are set out in paragraph 11.10.15 of this Chapter.

The Highways Noise Payments and Movable Homes Regulations 2000

⁴ Her Majesty's Stationery Office, The Control of Pollution Act, 1974.

⁵ Her Majesty's Stationery Office, Environmental Noise Regulations, 2006 (Amended 2018).

⁶ Her Majesty's Stationery Office, Environmental Protection Act 1990

11.3.10 The Highways Noise Payments and Movable Homes Regulations 2000⁷ makes provision for mobile home noise payments and limitations on these. The regulations define movable homes as being caravans or/and house boats. Mobile homes, caravans, and houseboats are treated as residential receptors, as set out in paragraph 11.8.81 of this Chapter.

National policy

The National Policy Statement for National Networks 2014

- 11.3.11 The National Policy Statement for National Networks (NPSNN) sets out the policy which the Scheme should comply with. It is also the basis for informing a judgement on the impacts of the Scheme, for example whether the Scheme is consistent with the requirements of the NPSNN. Compliance of the Scheme with the NPSNN is detailed within the NPSNN Accordance Tables **(TR010065/APP/7.2)**.
- 11.3.12 A draft NPSNN was published for consultation in March 2023. The consultation period ended in June 2023. The draft NPSNN may be subject to change following the consultation and once published in its designated form. Although this is currently in draft it may still be an important consideration for the Secretary of State for Transport when determining whether to consent the DCO for this Scheme. Accordingly, the Draft NPSNN Accordance Tables **(TR010065/APP/7.3)** summarise compliance of the Scheme with the draft NPSNN.
- 11.3.13 The NPSNN states that excessive noise can have wide-ranging impacts on the quality of human life and health, for example owing to annoyance or sleep disturbance, use and enjoyment of areas of value, for example quiet places, and areas with high landscape quality. It also notes that similar considerations apply to vibration.
- 11.3.14 Principle policies of relevance to noise within the NPSNN together with details on how they have been addressed in the assessment are provided below.
- 11.3.15 Paragraph 5.191 notes that operational noise should be assessed using the principles of the relevant British Standards and other guidance. The prediction of road traffic noise should be based on the method described in the Calculation of Road Traffic Noise (CRTN). The prediction, assessment and management of construction noise, should make reference to relevant British Standards and other guidance which also give examples of mitigation strategies. This requirement has been addressed in this Chapter in Section 11.5, where the assessment methodology is described.

⁷ The Highways Noise Payments and Movable Homes Regulations 2000.

- 11.3.16 Paragraph 5.193 states: “Due regard must have been given to the relevant sections of the Noise Policy Statement for England, National Planning Policy Framework and the Government’s associated planning guidance on noise”. These requirements have been addressed in this Chapter in Section 11.5 where the assessment methodology is described, Section 11.10, where relevant mitigation measures are described, and Section 11.11 where the assessment results are presented.
- 11.3.17 Paragraph 5.198 states *“Mitigation measures for the project should be proportionate and reasonable and may include one or more of the following:*
- *Engineering: containment of noise generated.*
 - *Materials: use of materials that reduce noise (for example low noise road surfacing).*
 - *Lay-out: adequate distance between source and noise-sensitive receptors; incorporating good design to minimise noise transmission through screening by natural or purpose-built barriers.*
 - *Administration: specifying acceptable noise limits or times of use (e.g. in the case of railway station PA systems)”.*
- 11.3.18 This requirement has been addressed in this Chapter in Section 11.10 where relevant mitigation measures are described.
- 11.3.19 Paragraph 5.200 states: *“Applicants should consider opportunities to address the noise issues associated with the Important Areas as identified through the noise action planning process”.* This requirement has been addressed in this Chapter in Section 11.10, where relevant mitigation measures are described, and Section 11.11 where the assessment results are presented (paragraph 11.11.131 specifically refers to residual noise impacts within Noise Important Areas).

The National Planning Policy Framework 2023

- 11.3.20 The National Planning Policy Framework (NPPF) (December 2023) sets out the Government’s planning policy framework for the whole of England, including the Government’s expectation for content and quality of planning applications and local plan policy. The overall strategic aims of the NPSNN and NPPF are consistent. The NPPF may be an important and relevant matter but does not form the basis for a decision on a NSIP.
- 11.3.21 Paragraph 180 of the National Planning Policy Framework⁸ (NPPF) states that: *“Planning policies and decisions should contribute to and enhance the natural and local environment by...preventing new and existing development from contributing to, being put at unacceptable*

⁸ Department for Levelling Up, Housing & Communities (December 2023). National Planning Policy Framework [online] available at: [National Planning Policy Framework \(publishing.service.gov.uk\)](https://www.gov.uk/publishing.service.gov.uk) (last accessed March 2024).

risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.”

11.3.22 Paragraph 191 of the NPPF states that planning policy and decisions should aim to: *“Mitigate, and reduce to a minimum, potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life; Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”*

11.3.23 These requirements have been addressed in this Chapter in Section 11.11 where potentially significant effects are assessed and in Section 11.10 where mitigation is described.

Planning Practice Guidance 2014

11.3.24 Planning Practice Guidance (PPG)⁹ provides a noise exposure hierarchy which describes the perception and outcomes associated with increasing effect levels.

11.3.25 PPG provides guidance on how the policy set out in NPPF may be interpreted in practice for a wide range of issues. There is a subsection of PPG relating specifically to noise:

“Local planning authorities’ plan-making and decision taking should take account of the acoustic environment and in doing so consider:

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

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during construction wherever applicable) is, or would be, above or below the significant observed adverse effect level...”

11.3.26 Among the specific factors to consider, where relevant, the guidance states: *“In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur”*.

11.3.27 These requirements have been addressed in this chapter in Section 11.11 where effects are assessed.

⁹ Department for Communities and Local Government, Planning Practice Guidance, 2019.

The Noise Policy Statement for England 2010

11.3.28 The Noise Policy Statement for England (NPSE)¹⁰ purpose is to promote “*good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.*” The three main aims are to:

1. Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
2. Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
3. Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

11.3.29 Within the aims stated above there are several key phrases that lead to additional concepts now considered in the assessment of noise impact; these and their definitions are detailed below:

- Lowest Observed Adverse Effect Level (LOAEL): this is the level above which adverse effects on health and quality of life can be detected.
- Significant Observed Adverse Effect Level (SOAEL): this is the level above which significant adverse effects on health and quality of life occur.

11.3.30 There are no pre-defined levels for these effect levels as it is acknowledged that they will generally be different for different sources, different receptors and at different times of the day. The LOAEL and SOAEL values used in this assessment, informed by DMRB LA 111 (paragraph 11.3.35) are set out in Table 11-1 for construction noise, Table 11-4 for construction vibration and Table 11-7 for operational noise.

11.3.31 Compliance with the first aim of the NPSE has been addressed in this Chapter in Section 11.11 where potentially significant effects are assessed. Mitigation to demonstrate compliance with the second aim is discussed in Section 11.10. Some dwellings would be subject to noise decreases supporting the third aim of the NPSE as set out in paragraph 11.3.28.

¹⁰ Department for Environment Food and Rural Affairs. The Noise Policy Statement for England, 2010.

Local policy

Nottinghamshire Local Transport Plan 2011-2026 (Nottingham Agglomeration Noise Action Plan)

11.3.32 The Nottinghamshire Local Transport Plan 2011-26¹¹ presents considerations on road induced noise affecting the health, wellbeing and quality of life of communities, also stating: “...*Priority will be given to highway measures that reduce noise in areas where there are high levels of road traffic and significant noise sensitive properties affecting a high number of people. However, greater priority will be given to measures that will lead to both the biggest noise benefits and other transport objectives (such as tackling congestion and encouraging active travel) as it is essential to ensure that resources are targeted appropriately.*”

11.3.33 This requirement has been addressed in this Chapter in Section 11.11 where the potential for significant effects are assessed.

National Highways policy

11.3.34 Noise is one of the environmental topic areas where the six strategic levers of the National Highways’ Environment Strategy¹² will be applied. The strategic levers will make a contribution towards the organisation’s environment vision. The six strategic levers are as follows:

- Leadership and Culture
- Health, Safety and Wellbeing
- Engaging Stakeholders
- Design Quality
- Asset Knowledge
- Appraisal, Evaluation and Performance

Standards and guidance

DMRB LA 111 Noise and Vibration

11.3.35 The DMRB LA 111 ‘Noise and Vibration’¹³ provides the assessment requirements for highway schemes in the UK and reflects Environmental Impact Assessment (EIA) methodology as applied to highways. It includes requirements for the classification of magnitude of impact, assessment of both long and short-term effects and

¹¹ Nottinghamshire Local Transport Plan 2011-2026, Nottingham County Council.

¹² National Highways (2015) National Highways Environment Strategy [online]. Available at: [Environment Strategy 21 .pdf \(publishing.service.gov.uk\)](#) (Last accessed December 2023).

¹³ National Highways, Design Manual for Roads and Bridges (DMRB) LA 111 - Noise and Vibration (Revision 2), 2020.

determination of significance for both construction and operational phases.

Calculation of Road Traffic Noise 1988

11.3.36 Calculation of Road Traffic Noise¹⁴ provides procedures for predicting noise levels for a given flow of road traffic at sensitive receptors. These methodologies are used in the determination of entitlement under the Noise Insulation Regulations and for traffic noise assessment undertaken in accordance with DMRB LA 111.

Transport Research Laboratory 2014

11.3.37 The Transport Research Laboratory (TRL) produced a report¹⁵ that sets out a methodology for the conversion of UK traffic noise indices into EU noise indices for noise mapping purposes. This includes TRL Method 3, a conversion from the UK road traffic noise index $LA_{10,18h}$ into the daytime $LA_{eq,16h}$ and the night-time noise level L_{night} .

British Standard 5228:2009+A1:2014

11.3.38 British Standard (BS) 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' Part 1: Noise¹⁶ provides a methodology for calculating noise levels generated by fixed and mobile plant used for a range of typical construction operations.

11.3.39 BS 5228-1 provides guidance for the determination of significance of noise effects due to construction activities which combine both an exceedance of noise level thresholds and time period of works. The guidance also recommends mitigation and measures that can be applied to minimise noise impacts from construction works.

11.3.40 British Standard 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' Part 2: Vibration¹⁷ details that even when it is of a very low magnitude, vibration generated as the result of construction or operation of a development can be perceptible to people living or working close by. Nuisance associated with vibration is frequently associated with the assumption that, if vibrations can be felt, then damage is inevitable. However considerably greater levels of vibration over the perceptible threshold are required before damage to buildings at either a cosmetic or structural level will occur.

¹⁴ Department of Transport, Calculation of Road Traffic Noise, 1988.

¹⁵ Transport Research Laboratory, P G Abbott and P M Nelson. TRL PR/SE/451/02, 'Converting the UK traffic noise index $LA_{10,18h}$ to EU noise indices for noise mapping', 2014.

¹⁶ British Standards Institution, BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise, 2014.

¹⁷ British Standards Institution, BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration, 2014.

World Health Organization Night Noise Guidelines for Europe, 2009

11.3.41 The World Health Organization (WHO) Night Noise Guidelines (NNG) for Europe¹⁸ suggest on a very precautionary basis, that the population should not be exposed to a NNG value greater than 40 dB L_{night} , outside (defined as the night noise level outside in free field conditions) during the part of the night when most people are sleeping. However, the precautionary nature of this target is fully appreciated by the WHO and a noise level of 55 dB L_{night} , outside is therefore recommended relating to the onset of heart disease.

World Health Organization Environmental Noise Guidelines for the European Region, 2018

11.3.42 The WHO Environmental Noise Guidelines (ENG) for the European Region¹⁹ provide evidence-based recommendations on the health effects of noise. The guidelines complement the expert-based recommendations of the WHO 'Night Noise Guidelines'.

11.3.43 The guidelines provide source specific recommendations for road traffic, railway, aircraft and wind turbine noise, and indoor as well as outdoor exposure levels for leisure noise.

11.1.49 The recommendations use a risk-based approach and the guidance states that the *"guideline exposure levels presented are therefore not meant to identify effect thresholds (the lowest observed adverse effect levels for different health outcomes). This is a difference in approach from prior WHO guidelines, like the night noise guidelines for Europe (WHO Regional Office for Europe, 2009), which explicitly aimed to define levels indicating no adverse health effects."* This means that the recommendations in the guidelines should not be directly associated with adverse effect levels such as LOAEL and SOAEL. It is also noted that, unlike other guidance and the aims of the NPSE, the WHO ENG recommendations do not take context or sustainability policies into account.

11.4 Consultation

11.4.1 The Environmental Health team at Nottinghamshire County Council were contacted via email on 17 February 2022 providing information on the proposed noise monitoring methodology and locations. No objections to the monitoring approach (see Appendix 11.2 (Baseline Noise Survey) of the ES Appendices **(TR010065/APP/6.3)**) were received.

11.4.2 Consultation with local authority Environmental Health Officers (EHOs) has progressed through the key stakeholder engagement

¹⁸ World Health Organization, Night Noise Guidelines for Europe, 2009.

¹⁹ World Health Organization, Environmental Noise Guidelines for the European Region, 2018.

exercises as part of the ongoing EIA and preparation of the ES. A meeting with the Newark & Sherwood District Council EHOs was held on the 14 September 2022 where noise and vibration, including baseline conditions, assessment methodology, and sensitive receptor locations, were discussed. There were no requests from Newark & Sherwood District Council as a result of this meeting.

- 11.4.3 Further consultation was undertaken on 21 June 2023 to provide the EHOs from both Newark & Sherwood District Council and Nottinghamshire County Council with an overview of the assessment findings and proposed mitigation for noise. No objections were raised to either the methodology followed or the associated results.

11.5 Assessment methodology

- 11.5.1 The assessment of construction noise and vibration, and operational noise impacts has been undertaken in accordance with DMRB LA 111 to identify potential significant effects. Operational vibration has been scoped out in accordance with paragraph 1.4 of DMRB LA 111 on the basis that regular maintenance of the road surface will not allow significant effects to occur, and with the agreement of the Planning Inspectorate in the Scoping Opinion (paragraph 3.6.1 of the Scoping Opinion) **(TR010065/APP/6.10)**.
- 11.5.2 DMRB LA 111 is informed by the NPSNN and provides a methodology for the determination of significance that gives consideration to the LOAEL and SOAEL values which are concepts that were introduced by the Noise Policy Statement for England²⁰ and referenced by NPSNN²¹.

Construction noise

- 11.5.3 DMRB LA 111 sets out an approach for the assessment of construction noise effects at sensitive receptors which utilises the BS 5228-1:2009 +A1:2014 'Example Method 1 - ABC Method' calculation methodology to establish LOAEL/ SOAEL thresholds. DMRB LA 111 sets out an approach for the determination of the magnitude of impact and significance of effects due to construction noise including noise from additional construction activities such as construction traffic and diversion routes. The LOAEL and SOAEL values for construction noise are defined in Table 11-1. The magnitude of impact is classified as negligible, minor, moderate or major by comparison of the construction noise levels with LOAEL and SOAEL values for all

²⁰ Department for Environment Food and Rural Affairs. The Noise Policy Statement for England, 2010.

²¹ National Policy Statement for National Networks.

relevant receptor properties as per DMRB LA 111 Table 3.16 and as reproduced in Table 11-2.

Table 11-1: Summary of construction noise level LOAEL and SOAEL values

Period	LOAEL	SOAEL
Construction Noise		
Day (07:00-19:00) weekday and Saturday morning (07:00-13:00)	Baseline noise levels L _{Aeq,T}	Threshold level determined as per BS 5228-1 Section E3.2 and BS 5228-1 Table E.1
Night (23:00-07:00)	Baseline noise levels L _{Aeq,T}	Threshold level determined as per BS 5228-1 Section E3.2 and BS 5228-1 Table E.1
Evening and weekends (periods not covered above)	Baseline noise levels L _{Aeq,T}	Threshold level determined as per BS 5228-1 Section E3.2 and BS 5228-1 Table E.1
Construction Vibration		
Anytime	0.3 mm/s	1.0 mm/s

Source: DMRB LA 111 Tables 3.12 and 3.31

Table 11-2: Magnitude of impact and construction noise descriptions

Magnitude of impact	Construction noise level
Major	Above or equal to SOAEL +5 dB
Moderate	Above or equal to SOAEL and below SOAEL +5 dB
Minor	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL

Source: DMRB LA 111 Table 3.16

11.5.4 The magnitude of impact from noise due to construction traffic and diversion routes is classified by considering changes in the basic noise level (BNL)²² to be negligible, minor, moderate or major as per DMRB LA 111 Table 3.17 as reproduced in Table 11-3. The BNL is defined by CRTN as the calculated noise level at a reference distance of 10 metres from the nearside carriageway edge obtained from traffic flow, speed, composition, gradient and road surface.

Table 11-3: Magnitude of impact at receptors for construction traffic and diversion routes

Magnitude of impact	Increase in BNL of closest public road used for construction traffic (dB)
Major	Greater than or equal to 5.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Minor	Greater than or equal to 1.0 and less than 3.0
Negligible	Less than 1.0

Source: DMRB LA 111 Table 3.17

²² The Basic Noise Level (BNL) refers to the LA_{10,18hr} noise level from road traffic at 10m from the nearside carriageway edge as defined within the Calculation of Road Traffic Noise (CRTN).

- 11.5.5 For diversion routes used at night, a major magnitude of impact for construction noise is determined at any noise sensitive receptors within the diversion route study area.
- 11.5.6 Construction noise and construction traffic noise is determined to cause a significant effect where a moderate or major magnitude of impact will occur for a duration exceeding: 10 or more days or nights in any 15 consecutive days or nights; or a total number of days exceeding 40 in any six consecutive months as per DMRB LA 111 Section 3.19.

Construction vibration

- 11.5.7 DMRB LA 111 sets out an approach for the assessment of construction vibration effects at sensitive receptors which refers to BS5228 ‘Code of construction practice for noise and vibration control on construction and open sites - Part 2: Vibration’.
- 11.5.8 The construction vibration magnitude of impact is determined to be negligible, minor, moderate or major by comparison of construction vibration levels with LOAEL and SOAEL values for all relevant receptor properties as per DMRB LA 111 Table 3.33 and Section 3.34 and reproduced in Table 11-4. The LOAEL and SOAEL values for construction vibration are defined in Table 11-1.
- 11.5.9 To put the values in Table 11-4 into context, a major impact corresponds in BS5228-2 to a vibration level at which *“Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments”*. A moderate impact at or above SOAEL corresponds in BS5228-2 to a vibration level at which *“It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents”*. A minor impact above or equal to LOAEL corresponds in BS5228-2 to a vibration level at which *“Vibration might just be perceptible in residential environments”*.

Table 11-4: Construction vibration level – magnitude of impact

Magnitude of impact	Vibration level
Major	Above or equal to 10 mm/s PPV
Moderate	Above or equal to SOAEL and below 10 mm/s PPV
Minor	Above equal to LOAEL and below SOAEL
Negligible	Below LOAEL

Source: DMRB LA 111 Table 3.33

- 11.5.10 A potential significant effect due to construction vibration is identified where a moderate or major magnitude of impact is predicted to occur for a duration exceeding: 10 or more days or nights in any 15 consecutive days or nights; or a total number of days exceeding 40 in any six consecutive months as per DMRB LA 111 Section 3.34.

Operation

- 11.5.11 DMRB LA 111 sets out an approach for the assessment of operational noise effects at sensitive receptors. This methodology has been adopted for the quantitative assessment of operational noise effects.
- 11.5.12 Receptors which are potentially sensitive to noise include dwellings, hospitals, healthcare facilities, education facilities, community facilities, designated sites, public rights of way and cultural heritage assets.
- 11.5.13 The level of road traffic noise from the road network is predicted using CRTN methodology from forecast traffic data provided in terms of 18-hour Annual Average Weekday Traffic (AAWT) flow between the hours of 06:00 to 00:00, along with speed pivoted vehicle speed and percentage of heavy vehicles. A correction factor for the road surfacing for each scenario will be included as required and detailed in DMRB LA 111. The factor is dependent on road surface type and speed of traffic and may vary between scenarios.
- 11.5.14 Calculations determine road traffic noise levels using noise descriptors $LA_{10,18hr}$ and L_{night} . L_{night} values are derived from daytime noise levels using TRL Method 3 in accordance with DMRB LA 111.
- 11.5.15 Calculations of the road traffic noise level are carried out for four scenarios:
- Do Minimum (DM) Opening Year (2028)
 - Do Minimum (DM) Future Year (2043)
 - Do Something (DS) (Opening Year) (2028)
 - Do Something (DS) Future Year (2043)
- 11.5.16 Both DM and DS consider traffic growth with committed development. The only difference being that DM is without the Scheme and DS includes the Scheme. The future assessment year is opening year (2028) +15 years (2043). In accordance with DMRB LA 111 the assessment of road traffic noise effects requires the following comparisons:
- DM scenario in the opening year against DS in the opening year (short-term change with the Scheme).
 - DM scenario in the opening year against DS in the future year (long-term change with the Scheme).
 - DM scenario in the opening year against DM in the future year (long-term change without the Scheme).
- 11.5.17 DMRB LA 111 classifies the magnitude of noise level change as negligible, minor, moderate or major and applies different criteria in the short-term and long-term. These changes may be beneficial (noise decrease) or adverse (noise increase). These classifications

are set out in DMRB LA 111 Tables 3.54a and 3.54b, which are summarised in Table 11-5.

Table 11-5: Short-term and long-term magnitude of change

Magnitude	Short-term noise change (dB L _{A10,18hr} or L _{night})	Long-term noise change (dB L _{A10,18hr} or L _{night})
Major	Greater than or equal to 5.0	Greater than or equal to 10.0
Moderate	3.0 to 4.9	5.0 to 9.9
Minor	1.0 to 2.9	3.0 to 4.9
Negligible	Less than 1.0	Less than 3.0

Source: DMRB LA 111 Table 3.54a and Table 3.54b

11.5.18 The initial assessment of operational noise significance is based on the short-term magnitude of change as per DMRB LA 111 Table 3.58 which is reproduced in Table 11-6. The initial assessment considers negligible and minor short-term change likely not to be significant and moderate and major short-term change to be significant.

Table 11-6: Initial assessment of operational noise significance

Significance	Short-term magnitude of change
Significant	Major
Significant	Moderate
Not significant	Minor
Not significant	Negligible

Source: DMRB LA 111 Table 3.58

11.5.19 In all cases where the magnitude of noise level change in the short-term is classified as minor, moderate or major, additional factors described in DMRB LA 111 Table 3.60 are considered to determine final significance. The factors that influence this judgement include the magnitude of change with respect to minor and moderate boundaries, the magnitude of impact in the long-term and short-term, the consideration of absolute noise levels with respect to the LOAEL and SOAEL, the location of noise sensitive parts of the receptor, the acoustic context, and the perception of change. Operational noise LOAEL and SOAEL values are provided in Table 11-7. DMRB LA 111 Table 3.60 is reproduced in Table 11-8.

Table 11-7: Summary of operational noise LOAEL and SOAEL values

Period	LOAEL	SOAEL
Operational Noise		
Daytime (06:00-24:00)	55 dB L _{A10,18hr} (facade)	68 dB L _{A10,18hr} (facade)
Night-time (23:00-07:00)	40 dB L _{night,outside} (free-field)	55 dB L _{night,outside} (free-field)

Source: DMRB LA 111 Table 3.49.1

Table 11-8: Determining final operational significance on noise sensitive buildings

Local circumstances	Influence on significance judgement
Noise level change (is the magnitude of change close to the minor/moderate boundary?)	1) Noise level changes within 1 dB of the top of the 'minor' range can indicate that it is more appropriate to determine a likely significant effect. Noise level changes within 1 dB of the bottom of a 'moderate' range can indicate that it is more appropriate to consider a change is not a likely significant effect.
Differing magnitude of impact in the long-term to magnitude of impact in the short-term	1) Where the long-term impact is predicted to be greater than the short-term impact, it can be appropriate to conclude that a minor change in the short-term is a likely significant effect. Where the long-term impact is predicted to be less than the short-term it can be appropriate to conclude that a moderate or major change in the short-term is not significant. 2) A similar change in the long-term and non- scheme noise change can indicate that the change is not due to the Scheme and not an indication of a likely significant effect.
Absolute noise level with reference to LOAEL and SOAEL (by design this includes sensitivity of receptor)	1) A noise change where all DS absolute noise levels are below SOAEL requires no modification of the initial assessment. 2) Where any DS absolute noise levels are above the SOAEL, a noise change in the short-term of 1.0 dB or over results in a likely significant effect.
Location of noise sensitive parts of a receptor	1) If the sensitive parts of a receptor are protected from the noise source, it can be appropriate to conclude a moderate or major magnitude change in the short-term and/or long-term is not a likely significant effect. 2) Conversely, if the sensitive parts of the receptor are exposed to the noise source, it can be more appropriate to conclude a minor change in the short-term and/or long-term is a likely significant effect. 3) It is only necessary to look in detail at individual receptors in terms of this circumstance where the decision on whether the noise change gives rise to a significant environmental effect is marginal.
Acoustic context	1) If a scheme changes the acoustic character of an area, it can be appropriate to conclude a minor magnitude of change in the short-term and/or long-term is a likely significant effect.
Likely perception of change by residents	1) If the Scheme results in obvious changes to the landscape or setting of a receptor, it is likely that noise level changes will be more acutely perceived by the noise sensitive receptors. In these cases it can be appropriate to conclude that a minor change in the short-term and/or long-term is a likely significant effect. 2) Conversely, if the project results in no obvious changes for the landscape, particularly if the road is not visible from the receptor, it can be appropriate to conclude that a moderate change in the short-term and/or long-term is not a likely significant effect.

Source: DMRB LA 111 Table 3.60

11.6 Assessment assumptions and limitations

Scheme design

- 11.6.1 The assessment has been based on the Scheme description and construction strategy presented in Chapter 2 (The Scheme) of this ES and has taken into account the lateral limits of deviation illustrated on the Works Plans **(TR010065/APP/2.3)** and vertical limits of deviation secured under Article 10 of the draft DCO **(TR010065/APP/3.1)** to establish a realistic worst case assessment scenario.
- 11.6.2 The associated noise model has been developed from the 18-hour AAWT flow forecasts derived from the traffic model for the Scheme and does not include provision for variations in flow during the day or between seasons. Committed developments with potential to generate traffic have been incorporated into the traffic model, and the cumulative effect of the Scheme with these committed developments has therefore been accounted for within this chapter for operational effects. Traffic model assumptions and limitations, including a discussion on committed developments, are detailed within the Transport Assessment **(TR010065/APP/7.4)**.
- 11.6.3 Any potential noise and vibration impacts on protected species and wildlife are addressed within Section 8.9 Potential Impacts and Section 8.11 Assessment of Likely Significant Effects within Chapter 8 (Biodiversity) of this ES.
- 11.6.4 In addition, the following assumptions and limitations have been identified. The uncertainty associated with each assumption has been reduced as far as possible. The assessment is considered appropriate for the purposes of identifying likely significant adverse noise effects.

Construction noise and vibration

- 11.6.5 The assessment is based on Chapter 2 (The Scheme) of this ES and the Construction Strategy information presented in Section 2.6 (Construction, operation and long-term management) in particular. Construction plant assumptions as advised by the Principal Contractor are contained within Appendix 11.1 (Construction Activities and Plant for Noise Assessment) of the ES Appendices **(TR010065/APP/6.3)**.
- 11.6.6 While the exact construction methods and programme may be further refined at the detailed design stage of the Scheme, the assessment of significant effects has been carried out with the appropriate level of robustness to ensure results are representative of a reasonable worst case scenario for the planned works and to ensure adequate mitigation can be provided.

- 11.6.7 Construction noise levels are initially calculated without accounting for any noise reduction benefit of noise barriers, local topography or existing screening between construction works and nearby sensitive receptors. Ground absorption has been implemented in calculations on the basis of a semi-soft ground type (50% absorptive) in accordance with the approach described in section F2.2.2 of BS5228-1. Construction noise calculations and assessment has considered the potential noise impacts at representative assessment locations (listed in Table 11-13) within 300 metres of construction activities within the study area (as defined in Section 11.7 of this Chapter). Calculations have been filtered to summarise results for receptors which have the potential to result in significant adverse effects.
- 11.6.8 For construction noise levels exceeding SOAEL, a detailed BS 5228-1 assessment of construction noise has been carried out to include the noise reduction effect of barriers that shield receptors from construction activity. Barriers would be designed to prevent direct line of sight between the noise source and receptor, and in these cases the noise reduction provided by the barrier is 10 dB in accordance with BS 5528-1 guidance.
- 11.6.9 Should certain activities that have currently been assumed to be carried out in the pre-commencement phase be carried out during the main works phase, the Second Iteration EMP would contain the necessary mitigation measures required.

Operational noise

- 11.6.10 Operational noise from the road network is predicted using CRTN and DMRB LA 111 methodology from forecast traffic data, along with speed pivoted vehicle speed and percentage of heavy goods vehicles, as implemented in the noise modelling software.
- 11.6.11 Traffic data used for noise predictions was based upon traffic data from the associated validated traffic model, further details of which are contained within the Transport Assessment (**TR010065/APP/7.4**). For a 1 dB change (all other variables being equal) traffic flows need to increase by 25% or decrease by 20%, therefore small errors in forecasting or prediction are unlikely to materially affect results.
- 11.6.12 Night-time road traffic noise levels have been calculated from the daytime 18-hour data using TRL Method 3 which is based on empirical relationships between day and night-time noise levels.
- 11.6.13 As detailed in DMRB LA 111, a correction factor for the road surfacing is included. The factor is dependent on road surface type and speed of traffic and may vary between scenarios. A low noise road surface has been incorporated into the modelling between the Friendly Farmer and Winthorpe Roundabout for the DM scenarios.
- 11.6.14 The definition of residential receptors has been based upon Ordnance Survey (OS) Address-point data. Where buildings have been

allocated more than one residential unit, these have been incorporated into the calculations. Building heights and footprints have also been derived from the OS MasterMap data, where available.

11.6.15 LiDAR topographical data is used within the acoustic model.

11.7 Study area

- 11.7.1 DMRB LA 111 requires the definition of study areas during the construction and operational phase of a Scheme.
- 11.7.2 The study areas for construction and operation of the Scheme are shown in Figure 11.1 (Operational Noise Study Area) and Figure 11.2 (Construction Noise Study Area) of the ES Figures **(TR010065/APP/6.2)**.

Construction

- 11.7.3 The construction noise and vibration study areas that are defined and used in the assessment, include all sensitive receptors potentially affected by construction noise or vibration and areas where there is a reasonable stakeholder expectation that a construction noise and vibration assessment would be undertaken.
- DMRB LA 111 notes that a study area of 300 metres from the closest construction activity is normally sufficient to encompass noise sensitive receptors.
 - DMRB LA 111 requires that the diversion route study area will include a 25 metre width from the kerb line of any diversion routes (as a result of a project requiring full carriageway closures during the night (23:00-07:00) to enable construction works to take place). The Outline Traffic Management Plan **(TR010065/APP/7.7)** Appendix A presents and describes the diversion routes for the Scheme.
 - DMRB LA 111 requires that a study area of 100 metres from the closest construction activity with the potential to generate vibration is defined.
 - DMRB LA 111 requires that the construction traffic noise study area will include a 50 metre width from the kerb line of public roads with the potential for an increase in basic noise level (BNL) of 1 dB(A) or more as a result of the introduction of construction traffic. The BNL is the noise level at a reference 10 metre distance from the nearest carriageway.

Operation

- 11.7.4 The operational noise study area includes noise sensitive receptors that are potentially affected by operational noise changes generated by the Scheme (either on the route of the Scheme or other roads not

physically changed by the Scheme), or are in areas where there is a reasonable stakeholder expectation that an operational noise assessment would be undertaken:

- DMRB LA 111 advises the study area to be within 600 metres of new road links or road links physically changed or bypassed by the Scheme.
- Beyond 600 metres, the area within 50 metres of other road links with potential to experience a short-term BNL change of more than 1.0 dB(A), as a result of the Scheme.

11.7.5 The approach described above has been used to define the study area which includes all relevant sensitive receptors within 600 metres of the Scheme and where there is potential for a short-term noise level change of 1 dB or more.

11.8 Baseline conditions

Noise sensitive receptors

11.8.1 The study area around the Scheme consists of discrete groups of residential receptors separated by more rural, agricultural areas with isolated properties. There are also recreational and industrial/commercial receptors in the area. In addition to the existing A46, there are more trunk roads in the area (A1, A17, A616, A617) and two railways, thus background noise consists largely of road traffic noise (the level being dependent on time of day and distance from the road network), as well as noise from the railways. The residential areas surrounding the Scheme may be grouped as follows:

- The residential area at the southern end of the Scheme, between the existing A46 and the B6166, at its closest, is approximately 50 metres from the existing A46.
- A gypsy and traveller community off Tolney Lane, at its closest is approximately 130 metres from the existing A46 (it is acknowledged mobile houses may provide a lesser degree of sound insulation; context will be considered as part of the standard DMRB LA 111 methodology).
- A residential area between Great North Road, Kelham Lane and the existing A46, at its closest is approximately 80 metres from the existing A46 and 80 metres from the Great North Road.
- Kings Waterside and Marina and dwellings to the east. At its closest, the Marina and dwellings to the east are approximately 90 metres and 130 metres respectively from the existing A46.
- A large residential area on the approach to where the existing A46 intersects the A1, at its closest is approximately 30 metres from the A46.

- The community of Winthorpe to the north of the A46/A1 junction, at its closest, the main community is approximately 180 metres from the A46 although on Hargon Lane, there are properties approximately 70 metres from the A46. There are also properties within 100 metres of the A1.
- 11.8.2 There are further residential areas adjacent to roads subject to a change in noise level of 1 dB or more (see Figure 11.1 (Operational Noise Study Area) of the ES Figures, **TR010065/APP/6.2**), established using traffic forecasts.

Noise Important Areas

- 11.8.3 The Environmental Noise (England) Regulations 2006 implement the Environmental Noise Directive (END)²³ in England. This requires that noise from major sources of environmental noise is mapped to calculate the exposure of populated areas, identifying Noise Important Areas (NIAs)²⁴ that are at risk of experiencing significant adverse impacts to health and quality of life as a result of their exposure to road traffic noise and that the management of noise is required to promote wellbeing. This is set out in the Noise Action Plans which are developed and implemented by the authorities responsible for the sources of noise affecting the NIAs. Where road schemes have the potential to affect the exposure of populated areas within an NIA, this should be assessed and measured to avoid adverse changes as a result of the Scheme or opportunities to create beneficial impacts should be considered.
- 11.8.4 Several highways NIAs are located in the vicinity of the Scheme, as presented in Figure 11.3 (Noise Important Areas) of the ES Figures (**TR010065/APP/6.2**) and referred to within paragraph 11.11.131 and Table 11-37 of this Chapter, eleven of which are within the study area:
- 7832 (North Muskham, Vicarage Lane)
 - 7834 (Langford, A46)
 - 7838 (Newark-on-Trent, A1)
 - 7839 (Newark-on-Trent, A46)
 - 7840 (Newark-on-Trent, A46)
 - 7842 (Newark-on-Trent, A1)
 - 7843 (Balderton, A1)
 - 7846 (Farndon, A46)
 - 8220 (Newark-on-Trent, A46/A1)
 - 11255 (Hockerton)

²³ European Commission (2002). Environmental Noise Directive [online] available at: Noise - Environment - European Commission (europa.eu) (Last accessed March 2022).

²⁴ Department for Environment, Food and Rural Affairs (DEFRA), Noise Action Planning Important Areas Round 3 England (2022).

- 11256 (Kelham)

Noise monitoring

- 11.8.5 Baseline noise monitoring for the Scheme was undertaken between 29 March and 8 April 2022 and between 5 May and 13 May 2022. The baseline noise survey is documented in detail within Appendix 11.2 (Baseline Noise Survey) of the ES Appendices (**TR010065/APP/6.3**).
- 11.8.6 Noise monitoring was undertaken at seven long-term (LT) and two short-term (ST) locations to facilitate a more complete understanding of the local noise environment in relation to anticipated traffic flow changes. Monitoring locations are presented within Figure 11.4 (Noise Monitoring Locations) of the ES Figures (**TR010065/APP/6.2**). All monitoring locations are considered to be directly affected by noise from the existing road network in their vicinity.
- 11.8.7 Monitoring locations were chosen as representative of sensitive receptor groups closest to the Scheme and communicated to relevant stakeholders in advance of the noise monitoring works, see paragraph 11.4.1 and paragraph 11.4.2. Residential stakeholder requests for particular monitoring locations, notably within Winthorpe, were considered at the time the monitoring strategy was being developed and were included where feasible.
- 11.8.8 The aim of the surveys was to:
- Inform baseline noise modelling results by providing a useful cross-check at discrete locations.
 - Enable ambient noise levels to be used as the basis of the construction impact assessment.
- 11.8.9 A summary of the noise monitoring results is presented in Table 11-9, Table 11-10 and Table 11-11.

Table 11-9: Summary of free field LT data

Location	Range L _{A10,18h} dB	Range L _{Aeq,12h} daytime dB ⁱ	Range L _{Aeq,4h} evening dB ⁱⁱ	Range L _{Aeq,8h} night dB ⁱⁱⁱ	L _{Aeq,6h} daytime dB ^{iv}	L _{Aeq,10h} weekend dB ^v	L _{Aeq,8h} night dB ^{vi}	L _{Aeq,16h} weekend dB ^{vii}	L _{Aeq,8h} night dB ^{viii}
	Weekdays				Saturday		Sunday		
LT1	55-60	55-59	52-58	49-56	54	53	51	54	56
LT2	62-67	63-66	59-63	58-61	61	59	57	63	61
LT3	66-71	67-69	63-67	60-64	64	62	57	65	62
LT4	52-57	51-56	47-59	45-54	50	50	49	51	52
LT5	62-69	62-69	59-64	60-64	61	60	58	64	64
LT6	66-70	67-69	64-65	62-64	67	64	59	64	63
LT7	56-59	55-60	52-57	50-54	53	54	49	57	53

ⁱ Monday to Friday 07:00 to 19:00

ⁱⁱ Monday to Friday 19:00 and 23:00

ⁱⁱⁱ Monday to Friday 23:00 and 07:00

^{iv} Saturday 0700 to 1300

^v Saturday 13:00 to 23:00

^{vi} Saturday 23:00 and 07:00

^{vii} Sunday 0700 to 23:00

viii Sunday 23:00 to 0700

Table 11-10: Summary of free field ST1 data

Location	Date	Start time	L _{Aeq,15min} dB	L _{Amax,15min} dB	L _{A10,15min} dB	L _{A90,15min} dB
ST1	30/03/2022	09:30	64	70	67	59
	30/03/2022	11:00	65	72	67	61
	30/03/2022	11:20	66	73	68	61
	07/04/2022	15:25	65	71	67	61
	07/04/2022	15:45	64	71	67	60
	08/04/2022	09:43	65	71	67	59
	08/04/2022	10:01	64	72	67	58

Table 11-11: Summary of free field ST2 data

Location	Date	Start time	LA _{eq,15min} dB	LA _{max,15min} dB	LA _{10,15min} dB	LA _{90,15min} dB
ST1	30/03/2022	09:30	64	70	67	59
	30/03/2022	11:00	65	72	67	61
	30/03/2022	11:20	66	73	68	61
	07/04/2022	15:25	65	71	67	61
	07/04/2022	15:45	64	71	67	60
	08/04/2022	09:43	65	71	67	59
	08/04/2022	10:01	64	72	67	58

Construction

11.8.10 BS 5228-1 provides relevant time periods for construction noise impact assessment, referring to different times of the day, and days of the week to reflect the differences in the sensitivity of receptors. Measurement data reported in Table 11-9 has been analysed to consider the time periods accordingly:

- LA_{eq,daytime}:
 - LA_{eq,12h daytime} - between 07:00 and 19:00 from Monday to Friday
 - LA_{eq,6h daytime} - between 07:00 and 13:00 on Saturday
- LA_{eq,evening}, LA_{eq,weekend}:
 - LA_{eq,4h evening} - between 19:00 and 23:00 from Monday to Friday
 - LA_{eq,10h weekend} - between 13:00 and 23:00 on Saturday
 - LA_{eq,16h weekend} - between 07:00 and 23:00 on Sunday
- LA_{eq,8h night-time} - between 23:00 and 07:00.

Operation

- 11.8.11 Noise monitoring data include $L_{A10,18h}$ values, the index used in the UK for highway noise assessment, to inform the operational modelling for the Scheme.
- 11.8.12 The DM Opening Year noise modelling results inform the baseline noise conditions for the assessment of operational noise impacts in accordance with DMRB LA 111.

11.9 Potential impacts

- 11.9.1 The following potential impacts from the Scheme have been identified for both the construction and operational stages.

Construction

- 11.9.2 During construction, the Scheme has the potential to directly alter the noise and vibration baseline for sensitive receptors for a temporary period. Construction activities such as piling and use of heavy machinery during earthworks such as excavators, dozers, or rollers may result in adverse impacts and temporary disturbance at sensitive receptors. The greatest impacts are likely to occur at the closest receptors to the Scheme where construction activities occur. However, adverse noise impacts may also extend along elements of the existing road network, depending on haul routes and the quantity of construction-related traffic.
- 11.9.3 Factors which have the potential to affect construction phase noise and vibration impacts include:
- Construction plant inventory and utilisation
 - The programme and the duration of activities with noise and vibration impacts exceeding relevant thresholds
 - Hours of work
 - Proximity of the works to receptors
 - Frequency and routing of the movement of construction vehicles
 - The location of compounds
 - The routing of temporary diversions, the volumes of traffic using them and duration they are applied.

Operation

- 11.9.4 During operation there is the potential for changes to traffic flows and road alignment to result in noise changes at noise sensitive receptors, particularly from increased road traffic. Impacts due to changes in noise may affect residential, and other sensitive receptors (for example commercial or community uses). Impacts can be beneficial

or adverse. Factors which have the potential to affect road traffic noise include:

- Overall traffic volume
- Proportion of heavy vehicles
- Traffic speed i.e. changes in free-flow conditions and waiting times at junctions
- Road alignment (vertical and horizontal alignment)
- Acoustic screening features (for example earthworks, acoustic barriers, cutting, and structures)
- The type of carriageway surfacing material
- Change to the noise character of the existing area or non-acoustic factors (for example vegetation removal).

11.10 Design, mitigation and enhancement measures

- 11.10.1 The Scheme has been designed, as far as reasonably practicable, to minimise noise and vibration effects on sensitive receptors. Embedded mitigation for the Scheme is set out in Chapter 2 (The Scheme) of this ES.
- 11.10.2 Embedded mitigation measures incorporated in the Scheme design include landscape earthworks, noise barriers and bridge safety parapets. These features are described below and shown on Figure 2.3 Environmental Masterplan of the ES Figures **(TR010065/APP/6.2)**.
- 11.10.3 Three landscape bunds at a height of 2.0-2.5 metres would be included north of the A46 section between the A1 and Winthorpe Roundabout which will also provide noise screening.
- 11.10.4 Six noise barriers at a height of 2 metres from the road surface (or from local ground, if not positioned along the A46) would be included along the Scheme, including:
- Two located along the southbound entry slip from Cattle Market Roundabout extending part way down the west side of the Great North Road south of Cattle Market Roundabout;
 - One located at the southbound entry slip road at Brownhills Junction;
 - One along the northbound carriageway from the Brownhills Junction to the Esso Service Station;
 - Two located from the Esso Service Station to the Winthorpe Roundabout at the northern extreme of the Scheme, transitioning at the midpoint from barrier at the roadside to barrier on the crest of the adjacent bund.
- 11.10.5 Standard height parapets with infill panels would be included along the west side of the new viaduct and the east side of the existing viaduct (the parapet along the western side of the viaduct to extend

further south towards Farndon Roundabout, transitioning in form in to a 2 metre barrier).

- 11.10.6 The existing dual carriageway between the Friendly Farmer Roundabout and Winthorpe Roundabout would be retained and a new link would be introduced to the south to optimise A46 positioning in relation to distance from Winthorpe.
- 11.10.7 A thin surface course would be applied to new carriageways associated with the Scheme to reduce operational road surface noise.

Mitigation measures - Construction

- 11.10.8 Mitigation measures of relevance during construction are included within the First Iteration Environmental Management Plan (EMP) **(TR010065/APP/6.5)** which will be developed into a Second Iteration EMP for implementation during construction of the Scheme. A Noise and Vibration Management Plan will also be prepared in full as part of the Second Iteration EMP prior to construction commencing. Details on the First and Second Iteration EMPs, including how mitigation is secured within the draft DCO **(TR010065/APP/3.1)**, is provided within Section 4.4 of Chapter 4 (Environmental Assessment Methodology) of this ES.
- 11.10.9 Any works carried out during the pre-commencement period will be undertaken in accordance with the mitigation measures contained in the Pre-Commencement Plan **(TR010065/APP/6.9)**.
- 11.10.10 Normal workings hours would be 07:00 to 18:00 on weekdays, and from 07:00 to 13:00 on Saturdays, avoiding work being undertaken during Sundays and Bank Holidays. Any work outside of the core hours and the exceptions to these core working hours listed in Chapter 2 (The Scheme) of this ES and the First Iteration EMP **(TR010065/APP/6.5)** would be agreed with the relevant local planning authority prior to carrying out certain operations. In addition, any Section 61 of the Control of Pollution Act 1974 consents will be obtained where required. Further information is contained within Chapter 2 (The Scheme) of the ES **(TR010065/APP/6.5)** and the First Iteration EMP **(TR010065/APP/6.5)**.
- 11.10.11 The design of mitigation for the construction assessment is undertaken using construction information to represent a reasonable worst case, therefore any uncertainties surrounding any specific or exact methods for construction will be reflected in the design of mitigation.
- 11.10.12 Table 11-12 provides a simplified summary of the location of acoustic barriers required for mitigation during each construction phase. All other construction mitigation is presented under the heading of each construction phase. Section 11.11 provides a more detailed breakdown of barrier positioning and requirements for all construction activities.

- 11.10.13 Where temporary acoustic barriers are proposed, earth bunds would be considered as alternative mitigation to provide equivalent acoustic screening for relevant activities, for example during earthworks and borrow pit phases.
- 11.10.14 Assessment locations are presented in Figure 11.11 (Construction Noise and Vibration Assessment Locations) of the ES Figures **(TR010065/APP/6.2)** with further details presented in Table 11-13.

Table 11-12: A summary of the locations of acoustic barriers required for construction noise mitigation

	Works visible from Sandhills Park	Works visible from Alexander Avenue	Adjacent to Windmill Viaduct	Adjacent to Cattle Market Roundabout	Adjacent to Nether Lock Viaduct	Adjacent to the proposed grade-separated junction at Brownhills	Adjacent to construction activities in Winthorpe	Adjacent to borrow pit excavation	Adjacent to site compounds	Adjacent to Kelham and Averham FCA construction
Pre-commencement works	x	x		x		x			x	x
Earthworks and floodplain compensation		x	x	x	x	x	x*	x		
Ground improvement works		x	x		x					
Bridge structures		x	x		x					
Drainage				x		x				
Roadworks			x	x**		x	x***			
Construction compounds									x	

*Barriers must be adjacent to the bund construction.

**Barriers must also be adjacent to the tie in to the Great North Road (B6326) and receptors at Kelham Road

***Barriers must be adjacent to the northern tie in to the existing A46

Pre-commencement works

- Control the on-time of, or acoustically treat, the excavator with breaker attachment and the hydro demolition equipment (a major contributor of noise during demolition).
- Control the quantity and/or on-time of the excavators and dozers (the main contributors of noise during parts of the Kelham and Averham FCA related works that occur during the pre-commencement phase) operating within 300 metres of affected receptors. If it is unfeasible to restrict the excavators and dozers in this way they must be fitted with efficient exhaust reduction equipment and manufacturers' enclosure panels must be kept closed.
- Control the quantity and/or on-time of the strimmers and chainsaws (the main contributors of noise during site clearance) operating within 300 metres of affected receptors.

Earthworks and floodplain compensation

- Control the quantity and/or on-time of the excavators and dozers (the main contributors of noise during this activity) operating within 300 metres of affected receptors. If it is unfeasible to restrict the excavators and dozers in this way then they must be fitted with efficient exhaust reduction equipment and manufacturers' enclosure panels must be kept closed.

Ground improvement works

- No specific mitigation in addition to the proposed acoustic barriers in Table 11-12.

Bridge structures

- If piling activities are elevated such that any temporary acoustic barriers would need to be unfeasibly tall to break line of sight then they would be fitted with appropriate measures to control noise generation at the source, for example muffler or sound reduction equipment.
- Reduce the quantity and / or the on-time of the mobile concrete pump, the concrete wagons, and the poker vibrator (the main contributors of noise during this activity) operating within 300 metres of affected receptors during night-time bridge deck construction.

Drainage

- No specific mitigation is proposed in addition to the acoustic barriers in Table 11-12.

Roadworks

- No specific mitigation is proposed in addition to the acoustic barriers in Table 11-12.

Construction compounds

- No specific mitigation is proposed in addition to the acoustic barriers in Table 11-12.

Construction vibration

- Where vibration levels would exceed SOAEL the Principal Contractor will: use alternative piling methods and/or plant if practicable; keep occupiers informed of the likely times and duration of works through letterbox drops; monitor the vibration level at the nearest receptors (or at an equivalent offset distance) to enable the vibration level at receptors to be determined; and carry out a condition survey at nearby structures where necessary to ensure works can progress without causing permanent damage, and to ensure any current damage to buildings is accounted for ahead of time.

11.10.15 The use of Best Practicable Means (BPM) would be applied for noise and vibration control at all times during construction. These should include the selection of the most appropriate method and plant for the job, adequate maintenance of plant, optimum siting of stationary plant, local screening and the education of the workforce. Restrictions may also be placed on early/late delivery times.

Enhancement Measures

11.10.16 No enhancement measures have been identified for noise and vibration.

11.11 Assessment of likely significant effects

11.11.1 The assessment of likely significant effects considers effects on noise and vibration receptors, during construction and operation.

Construction

11.11.2 The following sections describe potential noise and vibration effects from the Scheme during the construction phase.

11.11.3 The assessment considers potential construction noise and vibration impacts at relevant sensitive receptors on the basis of representative assessment locations to determine significance of effect during the construction phase. The representative assessment locations are the closest point for communities or receptor groups next to construction activities that represent a reasonable worst case for assessment of noise and vibration impacts. The representative assessment locations, as depicted in Figure 11.11 (Construction Noise and Vibration Assessment Locations) of the ES Figures **(TR010036/APP/6.2)**, are detailed in Table 11-13.

11.11.4 Baseline noise levels have been informed by measured data, where available, and calculated levels (via noise modelling) using road traffic flow information. DEFRA strategic noise mapping of England²⁵ data for rail noise emission have also been compared with the model.

11.11.5 LOAEL and SOAEL are derived in line with the methodology described in paragraph 11.5.2.

Table 11-13: Assessment locations

ID	Address	Baseline noise level reference	Representative of noise sensitive receptors	Approximate number of noise sensitive receptors
91227	13 Kelham Road, Newark-on-Trent, Nottinghamshire, NG24 1BU	Noise model	Residential receptors on Kelham Road	20
92784	Unit 4 Trentside Business Village, Farndon Road, Newark-on-Trent, Nottinghamshire, NG24 4XB	Noise model/ LT3	Residential and non-residential receptors on The Ivies and The Osiers	50
92827	9 Green Park, Tolney Lane, Newark-on-Trent, Nottinghamshire, NG24 1DA	Noise model	Residential receptors on the Western side of the Caravan Park on Tolney Lane	10
93218	15 Foundry Close, Newark-on-Trent, Nottinghamshire, NG24 1FE	Noise model	Residential receptors on Foundry Close	15
94254	26 Fosse Road, Farndon, Nottinghamshire, NG24 4ST	Noise model	Residential receptors on Fosse Road and Brockton Avenue	25
94502	Maidstone Cottage, The Close, Averham, Nottinghamshire NG23 5RP	Noise model	Residential receptors on The Close and Pinford Lane	20
94806	6 Trent Villas, Farndon Road, Trent Villas, Newark-on-Trent, Nottinghamshire, NG24 4SL	Noise model	Residential receptors adjacent to the River Trent on The Weavers and Lamb Close	25
95146	21 Sandhills Park, Newark-on-Trent, Nottinghamshire, NG24 1DG	Noise model/ LT2	Residential receptors on the North-Western side of Sandhills Park	5

²⁵ Department for Environment, Food and Rural Affairs (DEFRA), Strategic noise mapping (2017).

ID	Address	Baseline noise level reference	Representative of noise sensitive receptors	Approximate number of noise sensitive receptors
95185	2 Hawthorne House, The Close, Averham, Nottinghamshire, NG23 5RP	Noise model	Residential receptors on The Close and Pinford Lane	10
95253	School Farm Bungalow, Staythorpe Road, Averham, Nottinghamshire, NG23 5QZ	Noise model	Residential and non-residential receptors on Staythorpe Road	4
95702	Crees House, Crees Lane, Farndon, Newark-on-Trent, Nottinghamshire, NG24 4TJ	Noise model	Residential receptors on Crees Lane	7
96519	Rectory Farm, Staythorpe Road, Averham, Nottinghamshire NG23 5QY	Noise model	A stand-alone noise sensitive receptor	1
96732	9 Sandhills Close, Newark-on-Trent, Nottinghamshire, NG24 1FH	Noise model	Residential and non-residential receptors on the Western side of Sandhills Park	10
97471	24 Sandhills Park, Newark-on-Trent, Nottinghamshire, NG24 1DG	Noise model	Residential receptors on the Northern side of Sandhills Park	6
99153	39 Sandhills Park, Newark-on-Trent, Nottinghamshire, NG24 1DG	Noise model	Residential receptors on the Eastern side of Sandhills Park	10
99217	19 Sandhill Sconce, Tolney Lane, Newark-on-Trent, Nottinghamshire, NG24 1DA	Noise model	Residential receptors on the Eastern side of the Caravan Park on Tolney Lane	50
99312	Land on Kelham Road, Newark-on-Trent, Nottinghamshire, NG24 1DP	Noise model	Non-residential receptors North West of the Newark Cattle Market Roundabout	3
101467	1 The Rutlands, Kelham Nottinghamshire, NG23 5QU	Noise model	Residential and non-residential receptors on The Rutlands	50
125789	W A Rainbow and Sons Ltd, Quibells Lane, Newark-on-Trent, Nottinghamshire, NG24 2AL	Noise model	Non-residential receptors on Quibells Lane	10

ID	Address	Baseline noise level reference	Representative of noise sensitive receptors	Approximate number of noise sensitive receptors
125965	The Lodge, Fosse Road, Lincoln Road, Winthorpe, Nottinghamshire, NG24 2NZ	Noise model	A stand-alone noise sensitive receptor	1
126002	7 Fleming Drive, Newark-on-Trent, Nottinghamshire, NG24 2BA	Noise model	Residential receptors on Fleming Drive and Wolsey Road	100
126187	7 Waters Edge, Kings Sconce Avenue, Newark-on-Trent, Nottinghamshire, NG24 1FS	Noise model	Residential receptors on King Sconce Avenue	50
126201	65 Alexander Avenue, Newark-on-Trent, Nottinghamshire, NG24 2BB	Noise model	Residential receptors on Alexander Avenue and Stephen Road	25
126649	Low Wood, Gainsborough Road, Winthorpe, Nottinghamshire, NG24 2NR	Noise model/ LT5	A stand-alone noise sensitive receptor	1
126728	The Lodge, Lincoln Road, Langford, Nottinghamshire, NG23 7RS	Noise model	A stand-alone noise sensitive receptor	1
126809	24 Wормingford, The Spinney, Winthorpe, Nottinghamshire, NG24 2NT	Noise model/ LT1	Residential receptors on the Eastern side of The Spinney	8
126813	20 Hollywood Cottage, Hargon Lane, Winthorpe, Nottinghamshire, NG24 2NP	Noise model/ LT4	Residential receptors on Hargon Lane	8
126829	16 Barley Way, Newark-on-Trent, Nottinghamshire, NG24 2FR	Noise model	Residential receptors on Barley Way and Wheatsheaf Avenue	12
126858	Pineham, The Spinney, Winthorpe, Nottinghamshire, NG24 2NT	Noise model	Residential receptors on the Western side of The Spinney	5
127039	79 Low Wood Lodge, Gainsborough Road, Winthorpe, Nottinghamshire, NG24 2NR	Noise model/ LT6	A stand-alone noise sensitive receptor	1
127111	15 Branston Close, Winthorpe, Nottinghamshire, NG24 2PQ	Noise model	Residential receptors on the Western side of Winthorpe	25

ID	Address	Baseline noise level reference	Representative of noise sensitive receptors	Approximate number of noise sensitive receptors
127213	24 Robert Dukeson Avenue, Newark-on-Trent, Nottinghamshire, NG24 2FF	Noise model	Residential receptors on Robert Dukeson Avenue and Halliwell Close	20
127293	22 Wheatsheaf Avenue, Newark-on-Trent, Nottinghamshire, NG24 2FL	Noise model	Residential receptors on Wheatsheaf Avenue	11
127460	Brae Barn, Hargon Lane, Winthorpe, Nottinghamshire, NG24 2NP	Noise model/ LT7	A stand-alone noise sensitive receptor	1
127825	The Bungalow, Nether Lock, Trent Lane, Nether Lock, Newark-on-Trent, Nottinghamshire, NG24 2EE	Noise model	A stand-alone noise sensitive receptor	1

11.11.6 Given the level of detail available to describe the construction programme the assessment of construction noise and vibration impacts considers relevant phases and activities sequentially at each location. The following construction phases have been assessed:

- Pre-commencement works
- Earthworks and floodplain compensation
- Ground improvement works
- Bridge structures
- Sheet piling
- Drainage
- Roadworks
- Construction compounds
- Kelham and Averham FCA
- Traffic on haul roads not part of the public highway
- Construction traffic in public highway.

11.11.7 Appendix 11.1 (Construction Activities and Plant for Noise Assessment) of the ES Appendices (**TR010065/APP/6.3**) provides indicative construction plant and activity assumptions used within calculations and assessment.

11.11.8 The construction methodology plan provides an indicative construction programme leading to reasonable worst case noise and vibration levels. The plan summarises that most works will take place between August 2025 and November 2028, however detailed information relating to the timing and duration of construction activities is not available currently. This section therefore considers each activity sequentially over the construction programme to evaluate

potential impacts based on a reasonable worst case scenario and to propose indicative mitigation measures.

11.11.9 This assessment provides a reasonable worst case by determining the highest noise and vibration levels per activity without mitigation at locations representative of the most affected receptors.

Construction noise

Pre-commencement works

11.11.10 The following pre-commencement works activities have the potential to result in adverse noise impacts:

- Archaeological works
- Utilities works
- Construction compound establishment
- Temporary bridge over the River Trent
- Site clearance works
- Haul roads and access works
- Demolition
- Temporary fencing

11.11.11 Activities related to daytime pre-commencement works are likely to occur within 300 metres of all 35 of the representative assessment locations and therefore noise levels at the worst affected façade arising from activities during pre-commencement works have been predicted at these locations.

11.11.12 The daytime free-field construction noise levels are presented in Table 11-14 and Table 11-15.

Table 11-14: Daytime free-field construction noise levels ($L_{Aeq,T}$ dB) and noise thresholds during the pre-commencement works phase (1 of 2)

ID	LOAEL	SOAEL	Daytime free-field construction noise levels ($L_{Aeq,T}$ dB)			
			Archaeological works	Utilities works	Construction compound establishment	Temporary bridge over the River Trent
91227	59	65	51	46	67*	-
92784	64	70	65	50	69	-
92827	57	65	52	46	56	-
93218	58	65	54	45	58	-
94254	64	70	46	49	63	-
94806	55	65	47	45	-	-
95146	61	65	60	53	64	-
95702	57	65	57	59	58	-
96732	62	65	60	50	58	-

ID	LOAEL	SOAEL	Daytime free-field construction noise levels (L _{Aeq,T} dB)			
			Archaeological works	Utilities works	Construction compound establishment	Temporary bridge over the River Trent
97471	63	70	64	56	69	-
99153	56	65	57	51	73*	-
99217	59	65	52	53	53	-
99312	60	65	55	47	51	-
125789	74	75	-	55	62	54
125965	71	75	57	47	61	-
126002	57	65	-	49	53	-
126187	60	65	-	50	60	57
126201	64	70	67	45	50	-
126649	65	70	-	49	56	-
126728	73	75	-	46	-	-
126809	59	65	-	48	54	-
126813	57	65	-	45	-	-
126829	63	70	56	51	58	-
126858	61	65	58	47	53	-
127039	68	75	56	53	57	-
127111	58	65	-	45	-	-
127213	61	65	67*	47	-	-
127293	65	70	51	46	54	-
127460	65	70	66	56	55	-
127825	66	70	-	50	62	50
94502	62	65	63	-	-	-
95185	62	65	64	-	50	-
95253	63	70	62	-	56	-
96519	45	65	49	-	51	-
101467	58	65	52	-	-	-

* Representative assessment locations subject to potential Moderate or Major Adverse impacts due to values matching or exceeding SOAEL.

11.11.13 For all activities, impacts which are found to be less than LOAEL or assessed to be Minor or Negligible are not considered significant.

11.11.14 During the archaeological works of the pre-commencement works construction phase, representative receptor 127213 is likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects, temporary acoustic barriers would be constructed for mitigation of noise that block line-of-sight between the affected receptor and the proposed grade-separated junction at Brownhills.

11.11.15 During the construction of the site compounds, representative receptors 91227, and 99153 are likely to be subject to Moderate or

Major Adverse impacts. To avoid significant effects, temporary acoustic barriers would be constructed for mitigation of noise that block line-of-sight between the affected receptor and Cattle Market Roundabout.

11.11.16 No receptors are likely to be subject to Moderate or Major Adverse impacts during the utilities works or temporary bridge installation construction activities during the pre-commencement works.

Table 11-15: Daytime free-field construction noise levels ($L_{Aeq,T}$ dB) and noise thresholds during the pre-commencement works phase (2 of 2)

ID	LOAEL	SOAEL	Daytime free-field construction noise levels ($L_{Aeq,T}$ dB)			
			Site clearance works	Haul roads and access works	Demolition	Temporary fencing
91227	59	65	72*	59	-	-
92784	64	70	74*	67	74*	51
92827	57	65	74*	60	62	-
93218	58	65	63	64	61	-
94254	64	70	68	59	-	56
94806	55	65	71*	56	-	-
95146	61	65	69*	78*	65*	50
95702	57	65	65*	63	62	56
96732	62	65	68*	76*	62	49
97471	63	70	75*	81*	69	52
99153	56	65	78*	67*	63	49
99217	59	65	61	58	62	54
99312	60	65	63	63	57	52
125789	74	75	77*	62	79*	56
125965	71	75	66	71	61	-
126002	57	65	60	60	57	53
126187	60	65	66*	64	63	59
126201	64	70	74*	65	76*	51
126649	65	70	61	65	61	-
126728	73	75	79*	68	-	54
126809	59	65	64	65*	57	-
126813	57	65	55	56	-	-
126829	63	70	64	71*	63	-
126858	61	65	65*	66*	60	-
127039	68	75	65	62	60	-
127111	58	65	58	56	-	-
127213	61	65	75*	64	57	-
127293	65	70	59	66	59	-
127460	65	70	73*	71*	-	55
127825	66	70	67	62	67	52

ID	LOAEL	SOAEL	Daytime free-field construction noise levels (L _{Aeq,T} dB)			
			Site clearance works	Haul roads and access works	Demolition	Temporary fencing
94502	62	65	73*	-	-	61
95185	62	65	73*	58	-	51
95253	63	70	71*	64	-	54
96519	45	65	57	56	-	50
101467	58	65	61	55	-	50

* Representative assessment locations subject to potential Moderate or Major Adverse impacts due to values matching or exceeding SOAEL.

11.11.17 During the site clearance works of the pre-commencement works construction phase, representative receptors 91227, 92784, 92827, 94502, 94806, 95146, 95185, 95253, 95702, 96732, 97471, 99153, 125789, 126187, 126201, 126728, 126858, 127213, and 127460 are likely to be subject to Moderate or Major Adverse impacts. Site clearance works would not impact any particular receptor over periods of 10 days or more in any 15 consecutive days or a total number of days equalling or exceeding 40 in any 6 consecutive months as they would be limited in duration, thus a significant effect is not considered to arise. Temporary acoustic barriers that block line-of-sight between the affected receptors and the site clearance works would however be constructed around all site compounds, FCA construction areas, and for site works visible from Sandhills Park (representative receptor 95146) and Alexander Avenue (representative receptor 126201) to reduce noise levels as reasonably practicable, as the same measures would be used at later stages (demolition) of construction to avoid potentially significant effects associated with these subsequent activities. No further mitigation is considered necessary.

11.11.18 During the haul roads and temporary works platforms activity of the pre-commencement works phase, representative receptors 95146, 96732, 97471, 99153, 126809, 126829, 126858, and 127460 are likely to be subject to Moderate or Major Adverse impacts. Associated construction activity within 100 metres of these receptors during this phase would be limited to fewer than 10 days in any 15 consecutive days or a total number of days fewer than 40 in any 6 consecutive months (works would be adjacent to impacted receptors for a limited period of time compared to the total duration of the associated works). The haul roads and temporary works platforms activity is thus not expected to result in a significant effect (the duration of works impacting representative receptors 95146, 96732, 97471, 126858 and 127460 will consider the total duration of the haul roads and temporary works platforms activity and the vegetation clearance activity, as both activities relate to these locations).

11.11.19 During demolition of the pre-commencement works construction phase, representative receptors 92784, 95146, 125789, and 126201 are likely to be subject to Moderate or Major Adverse impacts.

Temporary acoustic barriers used during vegetation clearance would be retained to avoid significant effects in the vicinity of Sandhills Park (representative receptor 95146) and Alexander Avenue (representative receptor 126201). Given the elevated position of the demolition work associated with the Windmill Viaduct and existing Nether Lock Viaduct it is however unlikely to be feasible to construct temporary acoustic barriers that break line-of-sight between the works and representative receptor 92784 and 125789. To avoid significant effects, demolition work associated with the Windmill Viaduct and Nether Lock Viaduct would include the following additional control measures:

- Controlling the on-time of the excavator with breaker attachment (the main contributor of noise during this activity) operating within 300 metres of representative receptors 92784 and 125789; or
- Fitting an appropriate muffler or sound reduction equipment, ensuring all leaks in the air line are sealed, and using a dampening bit to eliminate ringing; or
- Limiting active construction within 300 metres of representative receptors 92784 and 125789 to fewer than 10 days in any 15 consecutive days and a total number of days fewer than 40 in any 6 consecutive months (limiting the duration of works impacting representative receptors 92784 and 125789 will consider the total duration in combination with the vegetation clearance activity).

11.11.20 No receptors are likely to be subject to Moderate or Major Adverse impacts during the fencing construction activities.

11.11.21 The demolition of the Nottingham to Lincoln Line bridge is proposed to take place during the night-time. Activities related to night-time pre-commencement works are likely to occur within 300 metres of two of the 35 representative assessment locations and therefore noise levels at the worst affected façade arising from activities during pre-commencement work have been predicted at these receptors.

11.11.22 The night-time free-field construction noise levels are presented in Table 11-16.

Table 11-16: Night-time free-field construction noise levels ($L_{Aeq,T}$ dB) and noise thresholds during the pre-commencement work phase

ID	LOAEL	SOAEL	Night-time free-field construction noise levels ($L_{Aeq,T}$ dB)
			Demolition works to Nottingham to Lincoln Line bridge
93218	50	55	64*
99217	51	55	65*

* Representative assessment locations subject to potential Moderate or Major Adverse impacts due to values matching or exceeding SOAEL.

11.11.23 During the demolition works to Nottingham to Lincoln Line bridge, representative receptors 93218 and 99217 are likely to be subject to

Moderate or Major Adverse impacts. Given the elevated position of the railway bridge deck construction it is unlikely to be feasible to construct temporary acoustic barriers that break line-of-sight between works and these receptors. To avoid significant effects, railway bridge decks construction would therefore adopt the following additional control measures:

- Controlling the on-time of the hydro demolition equipment (the main contributor of noise during this activity); or
- Limiting active construction to fewer than 10 days or nights in any 15 consecutive days or nights and a total number of days fewer than 40 in any 6 consecutive months.

11.11.24 Relevant mitigation measures, as discussed in this section, are detailed within the First Iteration EMP (**TR010036/APP/6.5**) which will be developed into a Second Iteration EMP for implementation during construction of the Scheme. Should any of the relevant pre-commencement activities be undertaken post commencement, the Second Iteration EMP will account for these to retain the necessary mitigation. Mitigation measures described in this section are considered suitable to prevent any significant effects arising as a result of the works.

Earthworks and floodplain compensation

11.11.25 The following activities are to occur during earthworks and floodplain compensation:

- Topsoil strip
- Borrow pit excavation
- Bulk fill activities
- Sub-base
- Re-soil

11.11.26 Activities related to daytime earthworks and floodplain compensation are likely to occur within 300 metres of 29 of the 35 representative assessment locations and therefore noise at the worst affected façade arising from activities during earthworks and floodplain compensation have been predicted at these receptors.

11.11.27 The daytime free-field construction noise levels are presented in Table 11-17.

Table 11-17: Daytime free-field construction noise levels ($L_{Aeq,T}$ dB) and noise thresholds during the earthworks and floodplain compensation phase

ID	LOAEL	SOAEL	Daytime free-field construction noise levels ($L_{Aeq,T}$ dB)				
			Topsoil strip	Borrow pit excavation	Bulk fill activities	Sub-base	Re-soil
91227	59	65	59	-	61	56	56

ID	LOAEL	SOAEL	Daytime free-field construction noise levels (L _{Aeq,T} dB)				
			Topsoil strip	Borrow pit excavation	Bulk fill activities	Sub-base	Re-soil
92784	64	70	73*	65	76*	70*	71*
92827	57	65	60	74*	63	57	58
93218	58	65	62	-	64	59	59
94806	55	65	-	72*	-	-	-
95146	61	65	69*	-	71*	66*	66*
95702	57	65	65*	62	67*	62	63
96732	62	65	68*	-	70*	65*	66*
97471	63	70	72*	-	74*	69	69
99153	56	65	65*	-	67*	62	62
99217	59	65	60	-	63	57	58
99312	60	65	64	-	66*	61	61
125789	74	75	68	-	70	65	65
125965	71	75	65	-	68	62	63
126002	57	65	56	-	58	53	53
126187	60	65	64	-	66*	61	61
126201	64	70	74*	66	77*	72*	72*
126649	65	70	61	57	64	59	59
126728	73	75	80*	-	82*	77*	77*
126809	59	65	65*	-	67*	62	62
126813	57	65	56	-	58	53	53
126829	63	70	64	58	67	62	62
126858	61	65	66*	-	68*	63	63
127039	68	75	64	66	66	61	62
127111	58	65	59	-	61	56	56
127213	61	65	75*	65*	77*	72*	73*
127293	65	70	58	-	61	56	56
127460	65	70	74*	-	76*	71*	71*
127825	66	70	65	-	67	62	62

* Representative assessment locations subject to potential Moderate or Major Adverse impacts due to values matching or exceeding SOAEL.

11.11.28 For all activities, impacts which are found to be less than LOAEL or assessed to be Minor or Negligible are not considered significant.

11.11.29 During the topsoil strip activity of the earthworks and floodplain compensation construction phase, representative receptors 92784, 95146, 95702, 96732, 97471, 99153, 126201, 126728, 126809, 126858, 127213, and 127460 are likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects, temporary acoustic barriers would be constructed during topsoil strip activities at the earthworks south of Windmill Viaduct, adjacent to Cattle Market Roundabout, earthworks north of Nether Lock Viaduct, adjacent to the proposed grade-separated junction at Brownhills, adjacent to bund construction close to Winthorpe, and at site works visible from

dwellings in the vicinity of Alexander Avenue (representative receptor 126201) that block line-of-sight between the affected receptors and associated construction activities.

11.11.30 During the borrow pit excavation activity of the earthworks and floodplain compensation construction phase, representative receptors 92827, 94806, and 127213 are likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects, temporary acoustic barriers would be constructed for mitigation of noise at borrow pits that block line-of-sight between the affected receptors and the borrow pit excavation construction activities.

11.11.31 During the bulk fill activity of the earthworks and floodplain compensation construction phase, representative receptors 92784, 95146, 95702, 96732, 97471, 99153, 99312, 126187, 126201, 126728, 126809, 126858, 127213, and 127460 are likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects temporary acoustic barriers that are constructed for mitigation of noise during topsoil strip would be retained, with additional temporary acoustic barriers at earthworks south of Nether Lock Viaduct. However, at representative receptor 127213 this is not likely to provide sufficient mitigation thus additional control measures would be provided as follows:

- Controlling the quantity and/or on-time of the excavators, dozers, and vibrating compacting rollers (the main contributors of noise during this activity) operating within 300 metres of representative receptor 127213; or
- Fitting the excavators and dozers operating within 300 metres of representative receptor 127213 with efficient exhaust reduction equipment and keeping manufacturers' enclosure panels closed; or
- Limiting active construction within 300 metres of representative receptor 127213 to fewer than 10 days in any 15 consecutive days and a total number of days fewer than 40 in any 6 consecutive months.

11.11.32 During the sub-base activity of the earthworks and floodplain compensation construction phase, representative receptors 92784, 95146, 96732, 126201, 126728, 127213, and 127460 are likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects, temporary acoustic barriers that are constructed for mitigation of noise during topsoil strip would be retained.

11.11.33 During the re-soil activity of the earthworks and floodplain compensation construction phase, representative receptors 92784, 95146, 96732, 126201, 126728, 127213, and 127460 are likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects, temporary acoustic barriers that are constructed for mitigation of noise during topsoil strip would be retained.

11.11.34 There are no earthworks and floodplain compensation activities proposed during the night-time and therefore no associated noise impacts during the night-time for this phase of work.

11.11.35 Relevant mitigation measures, as discussed in this section, will be secured via the First Iteration EMP (TR010065/APP/6.5) which will be developed into a Second Iteration EMP for implementation during construction of the Scheme. Mitigation measures described in this section are considered suitable to prevent any significant effects arising as a result of the works.

Ground improvement works

11.11.36 The following activities are to occur during ground improvement works:

- Sand drains/stone columns
- Rigid inclusions

11.11.37 Activities related to daytime ground improvement works construction phase are likely to occur within 300 metres of 23 of the 35 representative assessment locations and therefore noise at the worst affected façade arising from activities during ground improvement works have been predicted at these receptors.

11.11.38 The daytime free-field construction noise levels are presented in Table 11-18.

Table11-18: Daytime free-field construction noise levels ($L_{Aeq,T}$ dB) and noise thresholds during the ground improvement works phase

ID	LOAEL	SOAEL	Daytime free-field construction noise levels ($L_{Aeq,T}$ dB)	
			Sand drains / stone columns	Rigid inclusions
92784	64	70	68	73*
92827	57	65	56	60
93218	58	65	55	60
95146	61	65	59	64
95702	57	65	56	61
96732	62	65	56	60
97471	63	70	63	67
99153	56	65	57	61
99217	59	65	56	60
99312	60	65	51	56
125789	74	75	73	78*
125965	71	75	54	59
126002	57	65	51	56
126187	60	65	57	62

ID	LOAEL	SOAEL	Daytime free-field construction noise levels (L _{Aeq,T} dB)	
			Sand drains / stone columns	Rigid inclusions
126201	64	70	70*	74*
126649	65	70	55	60
126809	59	65	51	56
126829	63	70	57	62
126858	61	65	54	58
127039	68	75	54	58
127213	61	65	51	56
127293	65	70	53	57
127825	66	70	61	66

* Representative assessment locations subject to potential Moderate or Major Adverse impacts due to values matching or exceeding SOAEL.

11.11.39 For all activities, impacts which are found to be less than LOAEL or assessed to be Minor or Negligible are not considered significant.

11.11.40 During the sand drains / stone columns activity of the ground improvement works construction phase, representative receptor 126201 is likely to be subject to Moderate Adverse impacts. To avoid significant effects, temporary acoustic barriers would be constructed for mitigation of noise around site works visible from dwellings in the vicinity of Alexander Avenue, that block line-of-sight between the affected receptor and the associated construction activities (to be retained during the follow up rigid inclusions activity).

11.11.41 During the rigid inclusions activity of the ground improvement works construction phase, representative receptors 92784, 125789, and 126201 are likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects, temporary acoustic barriers would be constructed for mitigation of noise at Windmill Viaduct, Nether Lock Viaduct, and site works visible from dwellings in the vicinity of Alexander Avenue (retained from the sand drains / stone columns activity), that block line-of-sight between the affected receptor and the associated construction activities. Temporary acoustic barriers are expected to be less efficient at controlling noise levels at representative receptor 125789 as a result of the local topography. Retained nearby structures (Nether Lock Rail bridge) are nonetheless expected to provide additional screening as the works progress, facing the representative receptor from different angles, with any residual impacts not considered significant.

11.11.42 There are no ground improvement works proposed during the night-time and therefore no associated noise impacts during the night-time for this phase of work.

11.11.43 Relevant mitigation measures, as discussed in this section, are secured via the First Iteration EMP (**TR010065/APP/6.5**) which will be developed into a Second Iteration EMP for implementation during construction of the Scheme. Mitigation measures included are considered suitable to prevent any significant effects arising as a result of the works.

Bridge structures

11.11.44 The following activities are to occur during bridge structures works:

- Piling Operations
- Pile cap excavation and pile trimming
- Pile cap, abutment, and pier construction
- Bridge deck construction

11.11.45 Activities related to daytime bridge structures are likely to occur within 300 metres of 23 of the 35 representative assessment locations and therefore noise at the worst affected façade arising from activities during bridge structures works have been predicted at these receptors.

11.11.46 The daytime free-field construction noise levels are presented in Table 11-19.

Table 11-19: Daytime free-field construction noise levels ($L_{Aeq,T}$ dB) and noise thresholds during the bridge structures construction phase

ID	LOAEL	SOAEL	Daytime free-field construction noise levels ($L_{Aeq,T}$ dB)			
			Piling Operations	Pile cap excavation and pile trimming	Pile cap, abutment, and pier construction	Bridge deck construction
92784	64	70	73*	67	70*	67
92827	57	65	61	55	58	54
93218	58	65	60	54	57	54
95146	61	65	64	58	61	58
95702	57	65	61	55	58	55
96732	62	65	61	55	57	54
97471	63	70	68	62	64	61
99153	56	65	62	56	58	55
99217	59	65	61	55	58	54
99312	60	65	56	50	53	50
125789	74	75	78*	72	75*	72
125965	71	75	59	53	56	53
126002	57	65	56	50	53	50
126187	60	65	62	56	59	56
126201	64	70	75*	69	71*	68

ID	LOAEL	SOAEL	Daytime free-field construction noise levels ($L_{Aeq,T}$ dB)			
			Piling Operations	Pile cap excavation and pile trimming	Pile cap, abutment, and pier construction	Bridge deck construction
126649	65	70	60	54	57	54
126809	59	65	56	50	53	50
126829	63	70	62	56	59	56
126858	61	65	59	53	56	52
127039	68	75	59	53	55	52
127213	61	65	56	50	53	50
127293	65	70	58	52	54	51
127825	66	70	66	60	63	60

* Representative assessment locations subject to potential Moderate or Major Adverse impacts due to values matching or exceeding SOAEL.

11.11.47 For all activities, impacts which are found to be less than LOAEL or assessed to be Minor or Negligible are not considered significant.

11.11.48 During the piling operations activity of the bridge structures construction phase, representative receptors 92784, 125789, and 126201 are likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects, temporary acoustic barriers would be constructed for mitigation of noise at Windmill Viaduct, Nether Lock Viaduct, and at site works visible from dwellings in the vicinity of Alexander Avenue (representative receptor 126201) that block line-of-sight between the affected receptors and the associated construction activities. However, if the piling activities are elevated such that any temporary acoustic barriers would need to be unfeasibly tall to break line of sight, then alternative control measures would be adopted as follows:

- Fitting appropriate measures to control noise generation at the source for example, muffler or sound reduction equipment; or
- Limiting active construction within 300 metres of representative receptors 92784, 125789, 126201 to fewer than 10 days in any 15 consecutive days and a total number of days fewer than 40 in any 6 consecutive months.

11.11.49 During the pile cap excavation and pile trimming activities of the bridge structures construction phase, no representative receptors are likely to be subject to Moderate or Major Adverse impacts.

11.11.50 During the pile cap, abutment, and pier construction activities of the bridge structures construction phase, representative receptors 92784, 125789 and 126201 are likely to be subject to Moderate Adverse impacts. To avoid significant effects, the same approach for mitigating noise for the piling operations phase would be retained.

11.11.51 During the bridge deck construction activities of the bridge structures construction phase, no representative receptors are likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects, the same approach for mitigating noise for the piling operations phase would be retained.

11.11.52 Some bridge construction is proposed to take place during the night-time. Activities related to night-time pre-commencement work are likely to occur within 300 metres of the same 23 of the 30 representative assessment locations and therefore noise at the worst affected façade arising from activities during pre-commencement work have been predicted at these receptors.

11.11.53 The night-time free-field construction noise levels are presented in Table 11-20.

Table 11-20: Night-time free-field construction noise levels ($L_{Aeq,T}$ dB) and noise thresholds during the bridge structures construction phase

ID	LOAEL	SOAEL	Night-time free-field construction noise levels ($L_{Aeq,T}$ dB)	
			Bridge beam lifts	Railway bridge decks
92784	55	55	66*	-
92827	49	55	54	-
93218	50	55	53	55
95146	53	55	57*	-
95702	48	55	54	-
96732	53	55	53	-
97471	54	55	60*	-
99153	48	55	54	-
99217	51	55	54	56*
99312	52	55	49	-
125789	68	68	71*	73*
125965	62	62	52	-
126002	49	55	49	-
126187	52	55	55*	57*
126201	55	55	67*	-
126649	57	57	53	-
126809	51	55	49	-
126829	55	55	55*	-
126858	53	55	52	-
127039	59	59	51	-
127213	53	55	49	-
127293	57	57	50	-
127825	61	61	59	61

* Representative assessment locations subject to potential Moderate or Major Adverse impacts due to values matching or exceeding SOAEL.

11.11.54 For both night-time activities, impacts which are found to be less than LOAEL or assessed to be Minor or Negligible are not considered significant.

11.11.55 During the bridge beam lifts activity of the bridge structures construction phase, representative receptors 92784, 95146, 97471, 125789, 126187, 126829 and 126201 could be subject to Moderate or Major Adverse impacts. Associated construction activity would be limited to fewer than 10 days or nights in any 15 consecutive days or nights and cover a total number of days fewer than 40 in any 6 consecutive months. Bridge beam lift operations are thus not expected to result in a significant effect.

11.11.56 During the railway bridge decks activity of the bridge structures construction phase, representative receptors 93218, 99217, 125789, 126187, and 127825 are likely to be subject to Moderate or Major Adverse impacts. Given the elevated position of the railway bridge deck construction it is unlikely to be feasible to construct site hoardings that break line-of-sight between works and these receptors. To avoid significant effects, railway bridge decks construction would include the following additional control measures:

- Controlling the quantity and / or the on-time of the mobile concrete pump, the concrete wagons, and the poker vibrator (the main contributor of noise during this activity) operating within 300 metres of representative receptors 93218, 99217, 125789, 126187, 127825; or
- Limiting active construction within 300 metres of representative receptors 93218, 99217, 125789, 126187, 127825 to fewer than 10 days or nights in any 15 consecutive days or nights and a total number of days fewer than 40 in any 6 consecutive months (limiting the duration of works impacting representative receptors 125789 and 126187 will consider the total duration of the railway bridge decks activity and the bridge beam lifts activity, as both activities relate to these locations).

11.11.57 Relevant mitigation measures, as discussed in this section, will be secured via the First Iteration EMP (**TR010065/APP/6.5**) which will be developed into a Second Iteration EMP for implementation during construction of the Scheme. Mitigation measures described in this section are considered suitable to prevent any significant effects arising as a result of the works.

Sheet piling

11.11.58 Installing retaining walls will involve sheet piling.

11.11.59 Activities related to daytime sheet piling are likely to occur within 300 metres of 12 of the 35 representative assessment locations and therefore noise at the worst affected façade arising from activities during sheet piling works have been predicted at these receptors.

11.11.60 The daytime free-field construction noise levels are presented in Table 11-21.

Table 11-21: Daytime free-field construction noise levels ($L_{Aeq,T}$ dB) and noise thresholds during the sheet piling phase

ID	LOAEL	SOAEL	Daytime free-field construction noise levels ($L_{Aeq,T}$ dB)
			Install retaining wall
92784	64	70	62
93218	58	65	58
94254	64	70	54
95146	61	65	63
95702	57	65	62
96732	62	65	63
97471	63	70	65
99153	56	65	59
99312	60	65	56
125789	74	75	54
126187	60	65	58

* Representative assessment locations subject to potential Moderate or Major Adverse impacts due to values matching or exceeding SOAEL.

11.11.61 Impacts which are found to be less than LOAEL or assessed to be Minor or Negligible during sheet piling are not considered significant.

11.11.62 No representative receptors are likely to be subject to Moderate or Major adverse impacts during the installation of retaining walls activity.

11.11.63 There is no sheet piling proposed during the night-time and therefore there are no associated noise impacts.

11.11.64 Relevant mitigation measures, as discussed in this section, will be secured via the First Iteration EMP (**TR010065/APP/6.5**) which will be developed into a Second Iteration EMP for implementation during construction of the Scheme. Mitigation measures described in this section are considered suitable to prevent any significant effects arising as a result of the works.

Drainage

11.11.65 The following activities are to occur during drainage construction works:

- Pipe and chamber installation
- Surface Water Channel

11.11.66 Activities related to daytime drainage are likely to occur within 300 metres of 27 of the 35 representative assessment locations and therefore noise at the worst affected façade arising from activities

during drainage construction works have been predicted at these receptors.

11.11.67 The daytime free-field construction noise levels are presented in Table 11-22.

Table 11-22: Daytime free-field construction noise levels ($L_{Aeq,T}$ dB) and noise thresholds during the drainage phase

ID	LOAEL	SOAEL	Daytime free-field construction noise levels ($L_{Aeq,T}$ dB)	
			Pipe and chamber installation	Surface Water Channel
91227	59	65	49	48
92784	64	70	59	57
92827	57	65	63	61
93218	58	65	54	53
94806	55	65	49	47
95146	61	65	68*	67*
95702	57	65	59	58
96732	62	65	60	59
97471	63	70	72*	71*
99153	56	65	59	58
99217	59	65	50	49
99312	60	65	52	51
125789	74	75	53	52
125965	71	75	59	58
126187	60	65	53	52
126201	64	70	63	62
126649	65	70	57	56
126728	73	75	52	51
126809	59	65	52	51
126829	63	70	70*	69
126858	61	65	54	53
127039	68	75	60	59
127111	58	65	50	49
127213	61	65	68*	67*
127293	65	70	70*	69
127460	65	70	60	59
127825	66	70	49	48

* Representative assessment locations subject to potential Moderate or Major Adverse impacts due to values matching or exceeding SOAEL.

11.11.68 For both activities, impacts which are found to be less than LOAEL or assessed to be Minor or Negligible are not considered significant.

11.11.69 During the pipe and chamber installation activity of the drainage construction phase, representative receptors 95146, 97471, 126829, 127213, and 127293 are likely to be subject to Moderate or Major

Adverse impacts. To avoid significant effects, temporary acoustic barriers would be constructed for mitigation of noise at Cattle Market Roundabout and the new grade-separated junction at Brownhills that block line-of-sight between the affected receptors and the pipe and chamber installation activities.

11.11.70 During the surface water channel activity of the drainage construction phase the same receptors (with the exception of receptors 126829 and 127293) are likely to be subject to Moderate or Major Adverse impacts as for the pipe and chamber installation phase. Therefore, the same mitigation is proposed to avoid significant effects.

11.11.71 There are no drainage works proposed during the night-time and therefore no associated noise impacts during the night-time for this phase of work.

11.11.72 Relevant mitigation measures, as discussed in this section, will be secured via the First Iteration EMP (**TR010065/APP/6.5**) which will be developed into a Second Iteration EMP for implementation during construction of the Scheme. Mitigation measures described in this section are considered suitable to prevent any significant effects arising as a result of the works.

Roadworks

11.11.73 The following activities are to occur during roadworks:

- Cement Bound Material CBGM (sub-base)
- CBGM Batching plant
- Vehicle restraint system
- Asphalt pavement

11.11.74 Activities related to daytime roadworks are likely to occur within 300 metres of 28 of the 35 representative assessment locations and therefore noise at the worst affected façade arising from activities during roadworks have been predicted at these receptors.

11.11.75 The daytime free-field construction noise levels are presented in Table 11-23.

Table 11-23: Daytime free-field construction noise levels

ID	LOAEL	SOAEL	Daytime free-field construction noise levels (L _{Aeq,T} dB)			
			Cement Bound Material CBGM (sub-base)	CBGM Batching plant	Vehicle restraint system	Asphalt pavement
91227	59	65	69*	68*	65*	66*
92784	64	70	70*	69	66	67
92827	57	65	57	56	53	54
93218	58	65	58	59	53	55

ID	LOAEL	SOAEL	Daytime free-field construction noise levels (L _{Aeq,T} dB)			
			Cement Bound Material CBGM (sub-base)	CBGM Batching plant	Vehicle restraint system	Asphalt pavement
94254	64	70	63	63	58	60
95146	61	65	64	64	60	61
95702	57	65	61	59	57	58
96732	62	65	64	58	59	61
97471	63	70	68	70*	63	65
99153	56	65	64	74*	60	61
99217	59	65	57	53	53	54
99312	60	65	61	51	56	58
125789	74	75	74	62	69	71
125965	71	75	64	61	59	61
126002	57	65	53	53	48	50
126187	60	65	60	61	56	57
126201	64	70	70*	51	65	67
126649	65	70	58	56	53	55
126728	73	75	75*	-	71	72
126809	59	65	57	55	52	54
126829	63	70	73*	59	69	70*
126858	61	65	58	54	53	55
127039	68	75	61	58	56	58
127111	58	65	56	-	51	52
127213	61	65	71*	-	67*	68*
127293	65	70	73*	54	69	70*
127460	65	70	65	56	60	62
127825	66	70	62	63	58	59

* Representative assessment locations subject to potential Moderate or Major Adverse impacts due to values matching or exceeding SOAEL.

11.11.76 For all activities, impacts which are found to be less than LOAEL or assessed to be Minor or Negligible are not considered significant.

11.11.77 During the Cement Bound Material CBGM (sub-base) activity of the roadworks construction phase, representative receptors 91227, 92784, 126201, 126728, 126829, 127213, and 127293 are likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects, temporary acoustic barriers would be constructed for mitigation of noise at Windmill Viaduct, Cattle Market Roundabout including the tie into to the Great North Road (B6326) and receptors at Kelham Road, the new grade-separated junction at Brownhills, and the northern tie in to the existing A46 that block line-of-sight between the affected receptors and CBGM activities.

- 11.11.78 During the CBGM batching activity of the roadworks, representative receptors 91227, 97471, and 99153 are likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects, temporary acoustic barriers would be provided for the Cement Bound Material CBGM (sub-base) activity would be retained for the CBGM batching activity to continue providing the necessary mitigation.
- 11.11.79 During the vehicle restraint system activity of the roadworks, representative receptors 99227 and 127213 are likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects, temporary acoustic barriers provided for the Cement Bound Material CBGM (sub-base) activity would be retained for the vehicle restraint system activity to continue providing the necessary mitigation.
- 11.11.80 During the asphalt pavement activity of the roadworks, representative receptors 91227, 126829, 127213, and 127293 are likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects, temporary acoustic barriers would be provided for the CBGM (sub-base) activity would be retained for the asphalt pavement activity.
- 11.11.81 Some of the roadworks would take place during the night-time. Activities related to night-time pre-commencement work are likely to occur within 300 metres of the same 28 of the 30 representative assessment locations and therefore noise at the worst affected façade arising from activities during roadworks have been predicted at these receptors.
- 11.11.82 The night-time free-field construction noise levels are presented in Table 11-24.

Table 11-24: Night-time free-field construction noise levels ($L_{Aeq,T}$ dB) and noise thresholds during roadworks the phase

ID	LOAEL	SOAEL	Night-time free-field construction noise levels ($L_{Aeq,T}$ dB)
			Resurfacing
91227	51	55	55*
92784	55	55	60*
92827	49	55	50
93218	50	55	55*
94254	55	55	56*
95146	53	55	58*
95702	48	55	55*
96732	53	55	55*
97471	54	55	50
99153	48	55	55*
99217	51	55	55*
99312	52	55	50
125789	68	68	55
125965	62	62	62*

ID	LOAEL	SOAEL	Night-time free-field construction noise levels (L _{Aeq,T} dB)
			Resurfacing
126002	49	55	59*
126187	52	55	50
126201	55	55	61*
126649	57	57	60*
126728	64	64	55
126809	51	55	55*
126829	55	55	55*
126858	53	55	63*
127039	59	59	62*
127111	49	55	55*
127213	53	55	50
127293	57	57	55
127460	57	57	55
127825	61	61	55

* Representative assessment locations subject to potential Moderate or Major adverse impacts due to values matching or exceeding SOAEL.

11.11.83 During the night-time resurfacing, 18 of the 28 chosen assessed noise sensitive receptors are likely to be subject to Moderate or Major Adverse impacts (minor or negligible impacts are not considered significant). Given the spread of impacts, site hoardings or adjustments to plant usage may be too onerous, therefore resurfacing works within 300 metres of relevant receptors would be reduced to fewer than 10 nights in any 15 consecutive nights and a total number of nights fewer than 40 in any 6 consecutive months to avoid significant effects.

11.11.84 Relevant mitigation measures, as discussed in this section, will be secured via the First Iteration EMP (**TR010065/APP/6.5**) which will be developed into a Second Iteration EMP for implementation during construction of the Scheme. Mitigation measures described in this section are considered suitable to prevent any significant effects arising as a result of the works.

Construction compounds

11.11.85 The operation of construction compounds is likely to occur within 300 metres of 25 of the 35 representative assessment locations and therefore noise at the worst affected façade arising from activities during roadworks have been predicted at these receptors.

11.11.86 The daytime free-field construction noise levels are presented in Table 11-25.

Table 11-25: Daytime free-field construction noise levels ($L_{Aeq,T}$ dB) and noise thresholds associated with construction compounds

ID	LOAEL	SOAEL	Daytime free-field construction noise levels ($L_{Aeq,T}$ dB)
			Operation
91227	59	65	65*
92784	64	70	67
92827	57	65	54
93218	58	65	56
94254	64	70	60
95146	61	65	61
95702	57	65	56
96732	62	65	56
97471	63	70	67
99153	56	65	71*
99217	59	65	51
99312	60	65	49
125789	74	75	60
125965	71	75	59
126002	57	65	51
126187	60	65	58
126201	64	70	48
126649	65	70	53
126809	59	65	52
126829	63	70	56
126858	61	65	51
127039	68	75	55
127293	65	70	52
127460	65	70	53
127825	66	70	60

* Representative assessment locations subject to potential Moderate or Major Adverse impacts due to values matching or exceeding SOAEL.

11.11.87 Impacts which are found to be less than LOAEL or assessed to be Minor or Negligible are not considered significant.

11.11.88 During the operation of the site compounds, representative receptors 91227 and 99153 are likely to be subject to Moderate or Major Adverse impacts. To avoid significant effects, temporary acoustic barriers would be provided around the main construction compound at Cattle Market Roundabout during clearance would be retained.

11.11.89 There are no compound works proposed during the night-time and therefore no associated noise impacts during the night-time for this phase of work.

11.11.90 Relevant mitigation measures, as discussed in this section, will be secured via the First Iteration EMP (**TR010065/APP/6.5**) which will be

developed into a Second Iteration EMP for implementation during construction of the Scheme. Mitigation measures described in this section are considered suitable to prevent any significant effects arising as a result of the works.

Kelham and Averham FCA

11.11.91 Construction activity relating to the Kelham and Averham FCA is likely to occur within 300 metres of 5 of the 35 representative assessment locations and therefore noise at the worst affected façade arising from activities during Kelham and Averham FCA have been predicted at these receptors.

11.11.92 The daytime free-field construction noise levels are presented in Table 11-26.

Table 11-26: Daytime free-field construction noise levels ($L_{Aeq,T}$ dB) and noise thresholds associated with Kelham and Averham FCA

ID	LOAEL	SOAEL	Daytime free-field construction noise levels ($L_{Aeq,T}$ dB)
94502	62	65	-
95185	62	65	48
95253	63	70	54
96519	45	65	49
101467	58	65	-

* Representative assessment locations subject to potential moderate or major adverse impacts due to values matching or exceeding SOAEL.

11.11.93 During construction activity relating to the Kelham and Averham FCA, no receptors are likely to be subject to Moderate or Major Adverse impacts during the daytime (impacts which are found to be less than LOAEL or assessed to be minor or negligible are not considered significant).

Traffic on haul roads not part of the public highway

11.11.94 The following haul routes (shown on Figure 2.4 (Locations of Temporary Working Areas Required During Construction) of the ES Figures (TR010065/APP/6.2)) not part of the public highway are to be used:

- Adjacent to Crees Lane
- Works access from A46 Northbound (Averham Meadows East)
- Main construction compound access
- Works access off the Kelham Road, Great North Road and roundabout - A46 works access
- Works access off the Kelham Road, Great North Road and roundabout - A616 works access
- Works access off the Kelham Road, Great North Road and roundabout - southbound on-slip works access
- Trent Lane / Maltkilns Lane

- Quibells Lane
- Winthorpe Road off the A46 northbound
- A46 east of A1 - A46 Mint Leaf northbound
- A46 east of A1 - A1133 works access
- A46 east of A1 - Drove Lane works access

11.11.95 Daytime use of haul routes is likely to occur within 300 metres of 29 of the 30 representative assessment locations and therefore noise at the worst affected façade arising from haul routes have been predicted at these receptors.

11.11.96 The daytime free-field construction noise levels are presented in Table 11-27, Table 11-28, and Table 11-29.

Table 11-27: Daytime free-field construction noise levels ($L_{Aeq,T}$ dB) and noise thresholds for haul roads not part of the public highway (1 of 3)

ID	LOAEL	SOAEL	Daytime free-field construction noise levels ($L_{Aeq,T}$ dB)			
			Crees Lane	Works access from A46 Northbound (Averham Meadows East)	Main construction compound	Works access off the Kelham Road, Great North Road and roundabout - A46 works access
91227	59	65	-	-	52	-
92784	64	70	55	62	-	-
92827	57	65	-	59	-	-
94254	64	70	55	-	-	-
94806	55	65	-	57	-	-
95146	61	65	-	-	54	60
95702	57	65	57	59	-	-
96732	62	65	-	-	52	60
97471	63	70	-	-	55	60
99153	56	65	-	-	55	59
99217	59	65	-	58	-	58
99312	60	65	-	-	-	61

Table 11-28: Daytime free-field construction noise levels (L_{Aeq,T} dB) and noise thresholds for haul roads not part of the public highway (2 of 3)

ID	LOAEL	SOAEL	Daytime free-field construction noise levels (L _{Aeq,T} dB)			
			Works access off the Kelham Road, Great North Road and roundabout - A616 works access	Works access off the Kelham Road, Great North Road and roundabout - southbound on-slip works access	A46 east of A1 - A1133 works access	A46 east of A1 - Drove Lane works access
91227	59	65	-	53	-	-
93218	58	65	55	55	-	-
95146	61	65	54	63	-	-
96732	62	65	-	62	-	-
97471	63	70	55	66	-	-
99153	56	65	54	57	-	-
99312	60	65	54	52	-	-
126728	73	75	-	-	55	-
127460	65	70	-	-	-	56

Table 11-29: Daytime free-field construction noise levels (L_{Aeq,T} dB) and noise thresholds for haul roads not part of the public highway (3 of 3)

ID	LOAEL	SOAEL	Daytime free-field construction noise levels (L _{Aeq,T} dB)			
			Trent Lane / Maltkilns Lane	Quibells Lane	Winthorpe Road off the A46 northbound	A46 east of A1 - A46 Mint Leaf northbound
93218	58	65	56	47	-	-
125789	74	75	59	51	59	-
125965	71	75	-	-	58	62
126002	57	65	-	50	-	-
126187	60	65	60	48	-	-
126201	64	70	-	-	62	-
126649	65	70	-	-	59	58
126809	59	65	-	-	-	59
126813	57	65	-	-	-	55
126829	63	70	-	-	65	55
126858	61	65	-	-	57	60
127039	68	75	-	-	60	55
127111	58	65	-	-	-	55
127213	61	65	-	-	61	-
127293	65	70	-	-	62	55
127460	65	70	-	-	-	63
127825	66	70	58	48	60	-

11.11.97 For all 12 haul routes, no receptors are likely to be subject to Moderate or Major Adverse impacts during the daytime (impacts which are found to be less than LOAEL or assessed to be minor or negligible are not considered significant).

11.11.98 There is no haulage proposed during the night-time and therefore no associated noise impacts during the night-time for this phase of work.

Construction traffic in public highway

11.11.99 Several existing roads which are part of the public highway will be used to transfer plant and material to site.

11.11.100 The daytime basic noise levels, see paragraph 11.5.4, of each link are presented for normal use and use with haul traffic, including the resultant magnitude of impact, in Table 11-30. The Link ID refers to the section of road that has been modelled in the traffic model.

Table 11-30: Daytime basic noise levels for normal use and use with construction traffic in public highway, together with magnitudes of impact

Link ID	Road name	Baseline BNL	Baseline with haul traffic BNL	Magnitude of Impact
45065_47538	A46	76.3	76.5	Negligible
47537_44181	A46	76.3	76.6	Negligible
100006_100004	A46	74.6	75.0	Negligible
100000_49943	A46	75.0	75.3	Negligible
49943_100001	A46	75.2	75.5	Negligible
42161_42827	A46	74.0	74.2	Negligible
42162_42826	A46	74.4	74.6	Negligible
42161_42827	A46	74.0	74.2	Negligible
42162_42826	A46	74.4	74.6	Negligible
42828_42173	A46	76.0	76.2	Negligible
47613_47531	A46	75.4	75.6	Negligible
47612_47541	A46	76.5	76.7	Negligible
47543_47540	A46	75.4	75.5	Negligible
42392_47543	A46	76.6	76.8	Negligible
100008_47953	Fosse Road	64.0	64.6	Negligible
100007_47991	Farndon Road	68.1	68.1	Negligible
47992_100003	A617 (Kelham Rd)	72.3	72.5	Negligible
47992_49937	A617 (Kelham Rd)	71.5	71.7	Negligible
49932_49937	A617 (Kelham Rd)	71.1	71.4	Negligible
49931_49932	A617 (Kelham Rd)	71.2	71.4	Negligible
49931_49942	A617 (Kelham Rd)	71.5	71.7	Negligible
49941_49942	A617 (Kelham Rd)	70.9	71.2	Negligible
46348_49941	A617 (Kelham Rd)	70.3	70.6	Negligible
41818_46348	A617 (Kelham Rd)	71.1	71.4	Negligible
42169_100002	A616 (Great North Rd)	70.3	70.6	Negligible

Link ID	Road name	Baseline BNL	Baseline with haul traffic BNL	Magnitude of Impact
49730_100005	A616 (Great North Rd)	68.3	68.6	Negligible
49729_49730	A616 (Great North Rd)	68.3	68.5	Negligible
49721_47528	Lincoln Rd 1-way	66.2	66.6	Negligible
42826_49721	Lincoln Rd 1-way	66.7	67.0	Negligible
42172_49721	Lincoln Rd	66.9	67.4	Negligible
42172_49944	Lincoln Rd	66.6	67.1	Negligible
41834_49944	Lincoln Rd	64.0	64.9	Negligible
41834_49737	Lincoln Rd	63.3	64.5	Minor
44289_49737	To Quibell's Lane	62.0	63.4	Minor
44289_49945	To Quibell's Lane	62.5	63.8	Minor
41833_49737	Lincoln Rd Bridge	66.0	66.5	Negligible
41833_49736	Lincoln Rd Bridge	66.7	67.2	Negligible
100010_42391	A17	71.5	71.5	Negligible
42391_47985	A17	72.9	72.9	Negligible
47987_47994	A1133	69.0	69.2	Negligible
47942_47994	A1133	69.0	69.1	Negligible
100013_47919	Drove Lane	61.2	62.3	Minor

11.11.101 No road links are likely to be subject to Moderate or Major Adverse impacts during the haulage usage of the existing road network. Therefore, no significant adverse effects are expected at any receptor adjacent to these haul routes (impacts which are assessed to be Minor or Negligible are not considered significant).

11.11.102 There is no haulage proposed during the night-time and therefore no associated impacts during the night-time for this phase of work.

Diversion Routes

11.11.103 When full carriageway closures are implemented at night on major roads, traffic using those roads is diverted onto local roads that normally experience lower traffic levels at night. Diversion routes are presented in the Outline Traffic Management Plan **(TR010065/APP/7.7)**.

11.11.104 In line with DMRB LA 111, it is not proportionate to calculate changes in noise levels due to diversion routes, and a Major magnitude of impact for construction noise should instead be assumed at any noise sensitive receptor within the associated study area (defined to include a 25 metre width from the kerb line of affected routes) for the following diversion routes:

- A46 Between Farndon Roundabout and Cattle Market Roundabout – the diversion route for this closure would be via the A52 (between the A46 Saxondale Junction and the A1 at Grantham) and along the A1, to re-join the A46 at the Brownhills and Friendly Farmer Roundabouts.

- A46 Between Cattle Market roundabout and Brownhills Roundabout – the diversion route for this closure would be via the A616, B6325 (between the Cattle Market roundabout and the A1 at North Muskham) and along the A1, to re-join the A46 at the Brownhills and Friendly Farmer Roundabouts.
- A46 between Friendly Farmer Roundabout and Brough Junction – the diversion route for this closure would be via the A1 and A57 (between the Markham Moor junction and Saxilby Road Roundabout).
- A1 between North Muskham and Brownhills and Friendly Farmer Roundabouts – the diversion route for this closure would be via the B1164 and A57.
- Fosse Road and Farndon Road – the diversion route for the Farndon to Newark traffic would be via Hawton Lane, Newark Road and Hawton Road.
- A617 Kelham Road – the diversion route for the Kelham to Newark traffic would be via Ollerton Road, A616, B6325, A1 and A46.
- A1133 – the diversion route would be via the A1133, Whitemoor Lane, Brough Lane and the A46.
- Drove Lane – the diversion route would be via Drove Lane, the A17 and the A46.

11.11.105 The extent of usage of any particular diversion route would be managed to fewer than 10 days in any 15 consecutive days and a total number of days fewer than 40 in any 6 consecutive months and therefore no significant adverse effects will arise.

11.11.106 Relevant mitigation measures, as discussed in this section, will be secured via the First Iteration EMP (**TR010065/APP/6.5**) which will be developed into a Second Iteration EMP for implementation during construction of the Scheme. Mitigation measures described in this section are considered suitable to prevent significant effects from arising as a result of the works.

Construction vibration

11.11.107 The following activities will involve the use of plant that has the potential to produce construction vibration:

- Road works (Vibration Compaction)
- Bridges (Vibration Piling)
- Retaining Walls (Percussive Piling)
- Earthworks (Vibration Compaction)

11.11.108 Activities that produce construction vibration are likely to occur within 100 metres of 19 of the 35 representative assessment locations and therefore vibration levels at the worst affected façade arising from construction activities have been predicted at these receptors.

11.11.109 The daytime construction vibration levels are presented in Table 11-31.

Table 11-31: Daytime construction vibration levels (mm/s PPV) and vibration limits (mm/s PPV)

ID	LOAEL	SOAEL	Daytime construction vibration levels (mm/s PPV)			
			Road works (Vibration Compaction)	Bridges (Vibration Piling)	Retaining Walls (Percussive Piling)	Earthworks (Vibration Compaction)
91227	0.3	1.0	0.2	-	-	0.2
92784	0.3	1.0	0.3	0.8	-	0.3
94254	0.3	1.0	0.1	-	-	0.1
95146	0.3	1.0	0.1	0.2	0.8	0.1
95702	0.3	1.0	0.1	-	-	0.1
96732	0.3	1.0	0.1	-	-	0.1
97471	0.3	1.0	0.2	0.3	1.1*	0.2
99153	0.3	1.0	0.1	-	-	0.1
125789	0.3	1.0	0.5	2.0*	-	0.5
125965	0.3	1.0	0.1	-	-	0.1
126201	0.3	1.0	0.3	1.0*	-	0.3
126728	0.3	1.0	1.0*	-	-	1.0*
126809	0.3	1.0	0.1	-	-	0.1
126829	0.3	1.0	0.5	-	-	0.5
126858	0.3	1.0	0.1	-	-	0.1
127213	0.3	1.0	0.4	-	-	0.4
127293	0.3	1.0	0.5	-	-	0.5
127460	0.3	1.0	0.3	-	-	0.3
127825	0.3	1.0	0.1	0.2	-	0.1

* Representative assessment locations subject to potential Moderate or Major Adverse impacts due to values matching or exceeding SOAEL.

11.11.110 During the road works and earthworks, receptor 126728 is likely to be subject to Moderate Adverse impacts. To avoid significant effects, active construction works within 100 metres would be reduced to fewer than 10 days in any 15 consecutive days and a total number of days fewer than 40 in any 6 consecutive months.

11.11.111 During the bridge construction works, representative receptors 125789 and 126201 are likely to be subject to moderate adverse impacts. To avoid significant effects, active construction works within 100 metres would be limited to fewer than 10 days in any 15 consecutive days and a total number of days fewer than 40 in any 6 consecutive months.

11.11.112 During the retaining wall construction, representative receptor 97471 is likely to be subject to Moderate Adverse impacts. To avoid significant effects, active construction works within 100 metres would be reduced to fewer than 10 days in any 15 consecutive days and a total number of days fewer than 40 in any 6 consecutive months.

11.11.113 Relevant mitigation measures, as discussed in this section, will be secured via the First Iteration EMP (TR010065/APP/6.5) which will be

developed into a Second Iteration EMP for implementation during construction of the Scheme. Mitigation measures described in this section are considered suitable to prevent any significant effects arising as a result of the works.

Operational noise

11.11.114 Operational noise effects are determined following the incorporation of mitigation measures outlined in Section 11.10.

11.11.115 Operational noise impact assessment results are provided in the following sections.

11.11.116 The short-term and long-term noise levels without and with the Scheme, as well as the short-term and long-term noise level change with the Scheme are provided in Figures 11.5 to 11.8, and Figures 11.9 to 11.10 respectively of the ES Figures **(TR010065/APP/6.2)**, as per the DMRB LA111 requirements presented in paragraph 11.5.15, to support the initial assessment of significance.

Long-term noise level change without Scheme

11.11.117 Table 11-32 assesses long-term noise level changes by comparing the DM scenario in the opening year (2028) against the DM scenario in the future assessment year (2043).

Table 11-32: Long-term noise level change without the Scheme

Change in noise level			Daytime		Night-time	
			Number of dwellings	Number of other sensitive receptors	Number of dwellings	Number of other sensitive receptors
Increase in noise level, dB LA10,18hr / Lnight	Negligible	0.1-2.9	3385	665	3245	644
	Minor	3.0-4.9	6	1	4	0
	Moderate	5.0-9.9	0	0	0	0
	Major	10.0+	0	0	0	0
No change, dB		0	1099	248	1282	273
Decrease in noise level, dB LA10,18hr / Lnight	Negligible	0.1-2.9	1028	152	1029	151
	Minor	3.0-4.9	51	2	9	0
	Moderate	5.0-9.9	0	0	0	0
	Major	10.0+	0	0	0	0

11.11.118 Table 11-32 shows that the majority of receptors will be subject to no change, or Negligible noise level increases or decreases without the implementation of the Scheme in the long-term. The majority of properties will experience small increases due to increases in traffic flows using the surrounding road network as per traffic model predictions.

11.11.119 Seven properties (six residential) and four properties (all residential) will experience a minor increase in noise levels during the Daytime and Night-time respectively.

11.11.120 Some 53 properties (51 residential) and nine properties (all residential) will experience a minor decrease in noise levels during the Daytime and Night-time respectively.

Short-term noise level change with Scheme

11.11.121 Table 11-33 assesses short-term noise level changes by comparing the DM scenario in the opening year (2028) against the DS scenario in the opening year (2028).

Table 11-33: Short-term noise level change with the Scheme

Change in noise level			Daytime		Night-time	
			Number of dwellings	Number of other sensitive receptors	Number of dwellings	Number of other sensitive receptors
Increase in noise level, dB LA10,18hr / Lnight	Negligible	0.1-0.9	1332	372	1620	414
	Minor	1.0-2.9	1908	234	1611	192
	Moderate	3.0-4.9	15	8	54	12
	Major	5.0+	59	8	18	4
No change, dB		0	106	17	128	18
Decrease in noise level, dB LA10,18hr / Lnight	Negligible	0.1-0.9	672	184	769	198
	Minor	1.0-2.9	1247	227	1213	214
	Moderate	3.0-4.9	226	18	154	16
	Major	5.0+	4	0	2	0

11.11.122 Results in Table 11-33 show:

- 2142 (encompassing 1908 residential) and 1803 (encompassing 1611 residential) Minor Adverse impacts, respectively for Daytime and Night-time, of which 13 (encompassing 3 residential) impacts in the Daytime and 12 (encompassing 3 residential) impacts in the Night-time will exceed SOAEL;
- 23 (encompassing 15 residential) and 66 (encompassing 54 residential) Moderate Adverse impacts, respectively for Daytime and Night-time, of which 1 (non-residential) impacts in the Daytime will exceed SOAEL;
- 67 (encompassing 59 residential) and 22 (encompassing 18 residential) Major Adverse impacts, respectively for Daytime and Night-time, of which 1 (non-residential) impact in the Daytime and 1 (non-residential) impact in the Night-time will exceed SOAEL; and
- 2725 (encompassing 2277 residential) and 2737 (encompassing 2289 residential) assessment locations, respectively for Daytime and Night-time, will either experience no change or a beneficial noise impact with the Scheme.

Long-term noise level change with Scheme

11.11.123 Table 11-34 assesses long-term noise level changes by comparing the DM scenario in the opening year (2028) against the DS scenario in the future assessment year (2043).

Table 11-34: Long-term noise level change with the Scheme

Change in noise level			Daytime		Night-time	
			Number of dwellings	Number of other sensitive receptors	Number of dwellings	Number of other sensitive receptors
Increase in noise level, dB LA10,18hr / Lnight	Negligible	0.1-2.9	3401	626	3422	624
	Minor	3.0-4.9	52	10	32	10
	Moderate	5.0-9.9	61	6	54	6
	Major	10.0+	0	2	0	2
No change, dB		0	65	14	87	17
Decrease in noise level, dB LA10,18hr / Lnight	Negligible	0.1-2.9	1648	374	1647	375
	Minor	3.0-4.9	306	30	324	34
	Moderate	5.0-9.9	36	6	3	0
	Major	10.0+	0	0	0	0

11.11.124 Results within Table 11-32 and Table 11-34 show an increase in both the number of receptors where noise level increases are classified as Minor and above, and the overall number of receptors where noise levels are reduced with the Scheme (DS), compared to without the Scheme (DM).

11.11.125 Negligible Adverse impacts when comparing the long-term change with and without Scheme scenarios are marginally increased. These results are an indication that many of the noise impacts in the future year are not as a result of the Scheme but instead primarily related to changes in traffic flows on the wider road network due to growth and other committed development schemes, as assumed within the traffic flows and detailed in the Transport Assessment (**TR010065/APP/7.4**). Minor Adverse impacts increase from 7 to 60 in the Daytime and from 4 to 43 in the Night-time. 69 Daytime and 62 Night-time Moderate or Major Adverse impacts are introduced.

11.11.126 All receptors with Negligible noise impacts are assessed as not significant.

11.11.127 Noise impacts with the Scheme in the opening year (2028) where noise levels increase by 3 dB or more (Moderate/Major Adverse impact) for receptors above LOAEL or at least 1 dB (Minor impact) for receptors above or at SOAEL are considered to be potentially significant (100 impacts in the Daytime and 93 impacts in the Night-time), see Table 11-34, subject to review of additional factors, see Table 11-35.

11.11.128 Some 232 dwellings are subject to a decrease of 3 dB or more in the daytime in the short-term and 156 dwellings are subject to a decrease of 3 dB or more at night in the short-term.

11.11.129 Some 36 dwellings are subject to a decrease of 5 dB or more in the daytime in the long-term and 3 dwellings are subject to a decrease of 5 dB or more at night in the long-term.

Table 11-35: Potential significant operational noise effects with Scheme

Receptor or receptor group	Receptor type	Number of receptors at location	ST Impact Magnitude dB (Daytime/ Night-time) *	LT Impact Magnitude dB (Daytime/ Night-time) *	Do Something Opening Year noise level, dB L _{A10,18h} (facade) Daytime/ dB L _{night, outside (free-field) Night-time *}
Land-Kelham Road-Newark on Trent- Nottinghamshire- NG24 1WN	Open land	1	1.0 (Minor)/ 0.9 (Negligible)	1.3 (Negligible)/ 1.1 (Negligible)	68.1/ 55.3
Parkevale-Kelham Lane-Newark on Trent- Nottinghamshire- Newark-NG24 1DW	Residential	1	1.0 (Minor)/ 0.9 (Negligible)	1.5 (Negligible)/ 1.3 (Negligible)	68.0/ 55.2
25-Sandhills Park-Newark on Trent- Nottinghamshire- Newark-NG24 1DG	Residential	1	3.1 (Moderate)/ 2.8 (Minor)	3.5 (Minor)/ 3.2 (Minor)	60.9/ 48.8
Briggs Metal Ltd-The Yard-Great North Road-Newark on Trent- Nottinghamshire- NG24 1DP	Commercial	1	1.0 (Minor)/ 0.9 (Negligible)	1.5 (Negligible)/ 1.4 (Negligible)	69.4/ 56.4
Yard Workshop-Great North Road-Newark on Trent- Nottinghamshire- NG24 1DG	Commercial	1	12.2 (Major)/ 11.0 (Major)	12.7 (Major)/ 11.5 (Major)	66.6/ 53.9
Epic Golden Gloves-51-Mill Gate/ Trent Finance-51a-51-A-Mill Gate-Newark on Trent-	Commercial	2	4.0 (Moderate)/ 3.6 (Moderate)	4.3 (Minor)/ 3.9 (Minor)	59.7/ 47.7

Receptor or receptor group	Receptor type	Number of receptors at location	ST Impact Magnitude dB (Daytime/ Night-time) *	LT Impact Magnitude dB (Daytime/ Night-time) *	Do Something Opening Year noise level, dB L _{A10,18h} (facade) Daytime/ dB L _{night,outside} (free-field) Night-time *
Nottinghamshire-Newark-NG24 4TU					
Pelham Street-Newark on Trent- Nottinghamshire-NG24 4XD	Residential	56	3.5-5.6 (Moderate-Major)/ 3.1-5.1 (Moderate-Major)	3.8-5.9 (Minor - Moderate)/ 3.4-5.4 (Minor - Moderate)	56.8-65.5/ 45.3-52.9
Pelham Street t-Newark on Trent- Nottinghamshire-NG24 4XD/ NG24 4UT	Commercial	7	3.7-5.3 (Moderate-Major)/ 3.4-4.8 (Moderate-Moderate)	4.0-5.7 (Minor - Moderate)/ 3.6-5.1 (Minor - Moderate)	56.2-65.4/ 44.6-52.8
Victoria Street NG24 4UT/ Victoria Street NG24 4UU/ Portland Street NG24 4XF/ Clinton Street NG24 4AE/Albert Street NG24 4BQ	Residential	17	5.4-5.8 (Major-Major)/ 4.8-5.2 (Moderate-Major)	5.7-6.2 (Moderate - Moderate)/ 5.1-5.5 (Moderate - Moderate)	55.1-56.3/ 43.6-44.7
Victoria Street NG24 4UT/ Clinton Street NG24 4AE/ Portland Street NG24 4XF	Commercial	5	3.8-5.6 (Moderate-Major)/ 3.4-5.1 (moderate-major)	4.1-5.9 (Minor-Moderate)/ 3.7-5.3 (Minor-Moderate)	60-8-64.3/ 48.7-51.9
Land Adjacent to Newark Nether Weir-Quibells Lane-Newark on Trent- Nottinghamshire-NG24 1HN	Open land	1	2.9 (Minor)/ 2.6 (Minor)	4.0 (Minor)/ 3.6 (Minor)	76.4/ 62.7
Warehouse-Maltkiln Lane-Newark on Trent- Nottinghamshire-NG24 1HN	Commercial	1	1.0 (Minor)/ 0.9 (Negligible)	0.9 (Negligible)/ 0.8 (Negligible)	71.5/ 58.3
Area 15-W A Rainbow and Sons Ltd-	Commercial	1	1.0 (Minor)/ 0.9 (Negligible)	0.3 (Negligible)/ 0.3	73.7/ 60.3

Receptor or receptor group	Receptor type	Number of receptors at location	ST Impact Magnitude dB (Daytime/ Night-time) *	LT Impact Magnitude dB (Daytime/ Night-time) *	Do Something Opening Year noise level, dB L _{A10,18h} (facade) Daytime/ dB L _{night,outside} (free-field) Night-time *
Quibells Lane-Newark on Trent- Nottinghamshire- NG24 2AL				(Negligible)	
Mint Leaf-Mint Leaf Pan Asian Cuisine-Lincoln Road-Winthorpe-Newark on Trent- Nottinghamshire- Newark-NG24 2NY	Commercial	1	17.2 (Major)/ 15.5 (Major)	17.6 (Major)/ 15.9 (Major)	74.8/ 61.3
Newark Indoor Bowls Centre Ltd-County Showground-Fosse Road-Lincoln Road-Winthorpe- Nottinghamshire- Newark-NG24 2NY	Commercial	1	2.7 (Minor)/ 2.4 (Minor)	2.9 (Negligible)/ 2.6 (Negligible)	74.6/ 61.1
Buy & Bid Auctions UK Ltd-A46 A17 A1 South Roundabout-Fosse Road-Lincoln Road-Winthorpe- Nottinghamshire- Newark-NG24 2NY	Commercial	1	1.0 (Minor)/ 0.9 (Negligible)	1.3 (Negligible)/ 1.2 (Negligible)	70.5/ 57.4
Outdoor Bowls Club-Fosse Road-Winthorpe- Nottinghamshire- NG24 2NY	Commercial	1	2.5 (Minor)/ 2.2 (Minor)	2.8 (Negligible)/ 2.5 (Negligible)	72.5/ 59.2
Shell-Winthorpe Service Station-Fosse Road-Lincoln Road-Winthorpe- Nottinghamshire- Newark-NG24 2NY	Commercial	1	1.3 (Minor)/ 1.2 (Minor)	1.6 (Negligible)/ 1.5 (Negligible)	67.8/ 55

Receptor or receptor group	Receptor type	Number of receptors at location	ST Impact Magnitude dB (Daytime/ Night-time) *	LT Impact Magnitude dB (Daytime/ Night-time) *	Do Something Opening Year noise level, dB $L_{A10,18h}$ (facade) Daytime/ dB $L_{night,outside}$ (free-field) Night-time *
The Cottage-Moor Lane-Thurlby-Lincoln-LN5 9FA	Residential	1	2.1 (Minor)/ 1.8 (Minor)	3.5 (Minor)/ 3.1 (Minor)	68.4/ 55.5

* For receptor groups, a range of values is shown.

11.11.130 Additional factors from DMRB LA 111 Table 3.60 as set out in paragraph 11.5.19 and Table 11-8 have been used to determine final significance for the receptors listed in Table 11-35. The outcome of this assessment is shown in Table 11-36.

Table 11-36: Likely significant operational noise effects with Scheme

Receptor or receptor group	Relevant factors	Likely significant effect
Land-Kelham Road-Newark on Trent- Nottinghamshire- NG24 1WN	Receptor is not noise sensitive. The short-term impact classification falls from Minor to Negligible Adverse in the long-term. The DS opening year noise levels are marginally above SOAEL and the short-term noise level change is up to 1 dB. There would be no change in the acoustic character at receptors due to the existing prevailing road traffic noise source.	Not significant
Parkevale-Kelham Lane-Newark on Trent- Nottinghamshire- Newark-NG24 1DW	The short-term impact classification falls from Minor to Negligible Adverse in the long-term. The DS opening year noise levels match but do not exceed SOAEL in the daytime. The DS opening year noise levels are marginally above SOAEL in the night-time but the short-term noise level change is less than 1 dB. There would be no change in the acoustic character at receptors due to the existing prevailing road traffic noise source.	Not significant
25-Sandhills Park-Newark on Trent- Nottinghamshire- Newark-NG24 1DG	The short-term impact classification falls from Moderate to Minor Adverse in the long-term. The short-term impact classification is at the low end of the 'Moderate' range and only in the daytime (night-time is 'Minor'). The DS opening year noise levels are below SOAEL, as is the DM opening year noise level. There would be no change in the acoustic character at receptors due to the existing prevailing road traffic noise source.	Not significant
Briggs Metal Ltd-The Yard-Great North Road-	Receptor is not noise sensitive. The short-term impact classification falls from Minor to Negligible Adverse in the long-term. The DS	Not significant

Receptor or receptor group	Relevant factors	Likely significant effect
Newark on Trent- Nottinghamshire- NG24 1DP	opening year noise levels are above SOAEL, as is the DM opening year noise level. The short-term noise level change is up to 1 dB. There would be no change in the acoustic character at receptors due to the existing prevailing road traffic noise source.	
Yard Workshop- Great North Road- Newark on Trent- Nottinghamshire- NG24 1DG	Building demolished or to be demolished.	Not significant
Epic Golden Gloves-51-Mill Gate/ Trent Finance-51a-51-A-Mill Gate-Newark on Trent- Nottinghamshire- Newark-NG24 4TU	Receptors not noise sensitive. The short-term impact classification falls from Moderate to Minor Adverse in the long-term. The DS opening year noise levels are below SOAEL, as is the DM opening year noise level.	Not significant
Pelham Street- Newark on Trent- Nottinghamshire- NG24 4XD	Impacts are reduced with Major/Moderate Adverse impacts in the opening year becoming Moderate/Minor Adverse in the design year. In particular, all Major impacts in the daytime or at night in the opening year become Moderate impacts in the design year. Some Moderate impacts in the opening year remain Moderate impacts in the design year but then only marginally exceed the Moderate threshold in the design year by no more than 0.1 dB in the daytime and 0.3 dB at night.	Not significant
Pelham Street- Newark on Trent- Nottinghamshire- NG24 4XD/ NG24 4UT	Impacts are reduced with Major/Moderate Adverse impacts in the opening year becoming Moderate/Minor Adverse in the design year. In particular, all Major impacts in the daytime or at night in the opening year become Moderate impacts in the design year. One night time Moderate impact in the opening year remains a Moderate impact in the design year but then only marginally exceeds the Moderate threshold in the design year by no more than 0.1 dB.	Not significant
Victoria Street NG24 4UT/ Victoria Street NG24 4UU/ Portland Street NG24 4XF/ Clinton Street NG24 4AE/Albert Street NG24 4BQ	Impacts are reduced with Major/Moderate Adverse impacts in the opening year becoming Moderate/Minor Adverse in the design year. In particular, all Major impacts in the daytime or at night in the opening year become Moderate impacts in the design year. Some Moderate impacts in the opening year remain Moderate impacts in the design year but then only marginally exceed the Moderate threshold in the design year by no more than 0.4 dB in the daytime and 0.3 dB at night.	Not significant
Victoria Street NG24 4UT/ Clinton	Impacts are reduced with Major/Moderate Adverse impacts in the opening year becoming	Not significant

Receptor or receptor group	Relevant factors	Likely significant effect
Street NG24 4AE/ Portland Street NG24 4XF	Moderate/Minor Adverse in the design year. In particular, all Major impacts in the daytime or at night in the opening year become Moderate impacts in the design year. Two night time Moderate impacts in the opening year remain Moderate impacts in the design year but then only marginally exceed the moderate threshold in the design year by no more than 0.3 dB.	
Land Adjacent to Newark Nether Weir-Quibells Lane-Newark on Trent- Nottinghamshire- NG24 1HN	Receptor is not noise sensitive. The DS opening year noise levels are above SOAEL, as is the DM opening year noise level. The short-term noise level change is up to 2.9 dB. There would be no change in the acoustic character at receptors due to the existing prevailing road traffic noise source.	Not significant
Warehouse- Maltkiln Lane- Newark on Trent- Nottinghamshire- NG24 1HN	Receptor is not noise sensitive. The short-term impact classification falls from Minor to Negligible Adverse in the long-term. The DS opening year noise levels are above SOAEL, as is the DM opening year noise level. The short-term noise level change is up to 1 dB. There would be no change in the acoustic character at receptors due to the existing prevailing road traffic noise source.	Not significant
Area 15-W A Rainbow and Sons Ltd-Quibells Lane- Newark On Trent- Nottinghamshire- NG24 2AL	Receptor is not noise sensitive. The short-term impact classification falls from Minor to Negligible Adverse in the long-term. The DS opening year noise levels are above SOAEL, as is the DM opening year noise level. The short-term noise level change is up to 1 dB. There would be no change in the acoustic character at receptors due to the existing prevailing road traffic noise source.	Not significant
Mint Leaf-Mint Leaf Pan Asian Cuisine- Lincoln Road- Winthorpe-Newark on Trent- Nottinghamshire- Newark-NG24 2NY	Building demolished or to be demolished.	Not significant
Newark Indoor Bowls Centre Ltd- County Showground- Fosse Road- Lincoln Road- Winthorpe- Nottinghamshire- Newark-NG24 2NY	Facility permanently closed. Receptor is not noise sensitive. The short-term impact classification falls from Minor to Negligible Adverse in the long-term. The DS opening year noise levels are above SOAEL, as is the DM opening year noise level. The short-term noise level change is up to 2.7 dB. There would be no change in the acoustic character at receptors due to the existing prevailing road traffic noise source.	Not significant
Buy & Bid Auctions UK Ltd- A46 A17 A1 South Roundabout-Fosse	Receptor is not noise sensitive. The short-term impact classification falls from Minor to Negligible Adverse in the long-term. The DS opening year noise levels are above SOAEL,	Not significant

Receptor or receptor group	Relevant factors	Likely significant effect
Road-Lincoln Road-Winthorpe- Nottinghamshire- Newark-NG24 2NY	as is the DM opening year noise level. The short-term noise level change is up to 1 dB. There would be no change in the acoustic character at receptors due to the existing prevailing road traffic noise source.	
Outdoor Bowls Club-Fosse Road- Winthorpe- Nottinghamshire- NG24 2NY	Facility permanently closed. Receptor is not noise sensitive. The short-term impact classification falls from Minor to Negligible Adverse in the long-term. The DS opening year noise levels are above SOAEL, as is the DM opening year noise level. The short-term noise level change is up to 2.5 dB. There would be no change in the acoustic character at receptors due to the existing prevailing road traffic noise source.	Not significant
Shell-Winthorpe Service Station- Fosse Road- Lincoln Road- Winthorpe- Nottinghamshire- Newark-NG24 2NY	Receptor is not noise sensitive. The short-term impact classification falls from Minor to Negligible Adverse in the long-term. The DS opening year noise levels are at or below SOAEL. The short-term noise level change is up to 1.3 dB. There would be no change in the acoustic character at receptors due to the existing prevailing road traffic noise source.	Not significant
The Cottage-Moor Lane-Thurlby- Lincoln-LN5 9FA	There are no bedroom windows in the orientation facing the road (noise levels drop below SOAEL at relevant façade areas incorporating bedroom windows). The short-term noise level change is up to 2.1 dB. There would be no change in the acoustic character at receptors due to the existing prevailing road traffic noise source.	Not significant

Noise impact summary for Noise Important Areas

11.11.131 A summary of the short-term noise impact at relevant Noise Important Areas is shown in Table 11-37.

Table 11-37: Short-term magnitude of impact at Noise Important Areas with Scheme

ID	Location	Short-term magnitude of impact
7832	Vicarage Lane	Negligible
7834**	The Lodge	Negligible
7838	A1 / Winthorpe Road	Negligible
7839**	A46 / Robert Dukeson Avenue	Minor Beneficial
7840**	A46 / Barley Way	Minor Beneficial
7842	A1*	Negligible
7843	A1*	Minor Beneficial

ID	Location	Short-term magnitude of impact
7846**	Fosse Road	Negligible
8220**	The Lodge	Minor Beneficial
11255	Hockerton*	Minor Beneficial
11256	Kelham	Minor Beneficial

*Only peripherally in the study area

**Noise Important Area located along the Scheme

11.12 Monitoring

Construction

- 11.12.1 In line with DMRB LA 111 (paragraph 4.1), likely significant environmental effects from noise and/or vibration during construction shall be monitored.
- 11.12.2 Monitoring of likely significant effects should include the following (as detailed within the First Iteration EMP **(TR010065/APP/6.5)**):
- verification that specific noise and vibration mitigation measures are in place for activities where there is potential for likely significant effects to occur in their absence, noting potential vibration impacts at the grade II Farndon Mill (MM139), grade II Concrete Footbridge (MM038), and the grade II section of Smeaton's Arches designated as Causeway Arches 500 meters north west of level crossing (MM228), however, BS7385-2: 1993, Evaluation and measurement for vibration in buildings, notes "a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive";
 - checking that noise and vibration management procedures and practices are sufficient to ensure that adverse effects are no worse than set out in the construction noise and vibration assessment.
- 11.12.3 Monitoring during the construction phase would be secured in the First Iteration EMP **(TR010065/APP/6.5)**. During the construction phase of works, and in accordance with Requirement 3 of the draft DCO **(TR010065/APP/3.1)**, a Second Iteration EMP will secure the monitoring requirements and procedures to reduce or eliminate impacts on the environment.
- 11.12.4 Details of whether noise and vibration during construction of the Scheme would constitute a statutory nuisance defined under the EPA 1990 is set out in the Statement Relating to Statutory Nuisance **(TR010065/APP/6.7)**.
- 11.12.5 With the application of mitigation measures included in the First Iteration EMP **(TR010065/APP/6.5)**, it is considered that no statutory nuisance would arise during operation as a result of noise or vibration.

Operation

- 11.12.6 DMRB LA 111 (paragraph 4.2) requires the monitoring of any likely significant environmental effects from noise during operation. This includes:
- ensuring mitigation measures included with the Scheme design are incorporated at the operation stage of the Scheme. Where they are not included, ensuring resultant noise levels, taking account of any additional mitigation installed but not included in the assessed design, are no higher than set out in the Scheme assessment;
 - ensuring noise mitigation measures, including barriers and low noise surfaces, meet design specifications.
- 11.12.7 DMRB LA 111 notes nonetheless post construction noise monitoring cannot provide a reliable gauge for whether the predicted magnitude and extent of operational adverse impacts are greater or less than those predicted in the assessment due to the following reasons:
- the assessment is based on annual average conditions with and without the Scheme to ensure a like-for-like comparison, which is not possible to replicate through monitoring within a reasonable timescale;
 - monitoring in the absence of the Scheme would need to be completed before the start of the construction works, and would therefore be a number of years before the with-Scheme monitoring and the assessment completed for this ES is based on calculated road traffic noise levels, whereas ambient noise monitoring can be affected by other noise sources such as people, agricultural activities, military activities, aircraft etc.
- 11.12.8 No residual significant operational effects in the vicinity of the proposed works have been identified in the current assessment with mitigation (as secured via the First Iteration EMP **(TR010065/APP/6.5)**) in place.
- 11.12.9 No additional noise monitoring during operation of the Scheme is proposed.

11.13 Conclusions

- 11.13.1 This Chapter has considered potential temporary and permanent noise and vibration impacts arising as a result of the Scheme during construction and operation.
- 11.13.2 Construction activities have been considered sequentially to evaluate potential impacts and provide indicative mitigation measures.
- 11.13.3 The assessment of construction noise shows:
- Pre-commencement work/ Earthworks and floodplain compensation/ Ground improvement/ Bridge structures/ Drainage/ Roadworks/ and

Construction compounds construction phases, each have the potential to result in significant adverse effects during the daytime.

- Pre-commencement work/ Bridge structures/ and Roadworks construction phases as well as diversion routes each have the potential to result in significant adverse effects during the night-time.
- Suitable mitigation measures to avoid significant adverse effects are described within the relevant sections under the 'Construction noise' heading in Section 11.11 of this Chapter.
- Potentially significant adverse effects would be avoided if construction works in the vicinity of relevant receptors do not extend to a period of 10 or more days of working in any 15 consecutive days or take place for a total number of days exceeding 40 in any 6 consecutive months.

11.13.4 The assessment of construction vibration shows:

- During the road works and earthworks, representative receptor 126728 is likely to be subject to Moderate Adverse impacts.
- During the bridge construction works, representative receptors 125789 and 126201 are likely to be subject to Moderate Adverse impacts.
- During the retaining wall construction, representative receptor 97471 is likely to be subject to Moderate Adverse impacts.
- Indicative mitigation measures to avoid significant adverse effects are described within the relevant sections under the 'Construction vibration' heading in Section 11.11 of this Chapter.
- Potentially significant adverse effects would be avoided by controlling construction works within 100 metres of relevant receptors to not extend to a period of 10 or more days of working in any 15 consecutive days or take place for a total number of days exceeding 40 in any 6 consecutive months.

11.13.5 The assessment of operational noise shows:

- No residual significant adverse effects have been identified as a result of the Scheme.
- No properties eligible for noise insulation under the Noise Insulation Regulations 1975 (amended 1988) have been identified.
- Avoiding significant adverse effects would comply with the first aim of NPSE, see Section 11.11.
- Provision of mitigation to control adverse noise impacts would facilitate meeting the second and third aim of the NPSE, see Table 11-32 to Table 11-36.
- Some dwellings would be subject to Moderate or Major noise decreases in the short-term and to Moderate noise decreases in the long-term, supporting the third aim of the NPSE.

11.14 References

¹ National Highways, Design Manual for Roads and Bridges (DMRB) LA 111 - Noise and Vibration (Revision 2), 2020.

² Her Majesty's Stationery Office, Land Compensation Act, 1973.

³ Her Majesty's Stationery Office, Noise Insulation Regulations. Building and Buildings, 1975.

⁴ Her Majesty's Stationery Office, The Control of Pollution Act, 1974.

⁵ Her Majesty's Stationery Office, Environmental Noise Regulations, 2006 (Amended 2018).

⁶ Her Majesty's Stationery Office, Environmental Protection Act 1990.

⁷ The Highways Noise Payments and Movable Homes Regulations 2000.

⁸ Department for Levelling Up, Housing & Communities (December 2023). National Planning Policy Framework [online] available at: [National Planning Policy Framework \(publishing.service.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/115271/nppf-2023.pdf) (last accessed March 2024).

⁹ Department for Communities and Local Government, Planning Practice Guidance, 2019.

¹⁰ Department for Environment Food and Rural Affairs. The Noise Policy Statement for England, 2010.

¹¹ Nottinghamshire Local Transport Plan 2011-2026, Nottingham County Council.

¹² National Highways (2015) National Highways Environment Strategy [online]. Available at: [Environment Strategy 21 .pdf \(publishing.service.gov.uk\)](#) (Last accessed December 2023).

¹³ National Highways, Design Manual for Roads and Bridges (DMRB) LA 111 - Noise and Vibration (Revision 2), 2020.

¹⁴ Department of Transport, Calculation of Road Traffic Noise, 1988.

¹⁵ Transport Research Laboratory, P G Abbott and P M Nelson. TRL PR/SE/451/02, 'Converting the UK traffic noise index LA10,18h to EU noise indices for noise mapping', 2014.

¹⁶ British Standards Institution, BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise, 2014.

¹⁷ British Standards Institution, BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration, 2014.

¹⁸ World Health Organization, Night Noise Guidelines for Europe, 2009.

¹⁹ World Health Organization, Environmental Noise Guidelines for the European Region, 2018.

²⁰ Department for Environment Food and Rural Affairs. The Noise Policy Statement for England, 2010.

²¹ National Policy Statement for National Networks.

²² [Clarification note]

²³ European Commission (2002). Environmental Noise Directive [online] available at: Noise - Environment - European Commission (europa.eu) (Last accessed November 2023).

²⁴ Department for Environment, Food and Rural Affairs (DEFRA), Noise Action Planning Important Areas Round 3 England (2022).

²⁵ Department for Environment, Food and Rural Affairs (DEFRA), Strategic noise mapping (2017).