

A12 Chelmsford to A120 widening scheme TR010060

6.1 ENVIRONMENTAL STATEMENT CHAPTER 12 NOISE AND VIBRATION

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ENVIRONMENTAL STATEMENT

CHAPTER 12 NOISE AND VIBRATION

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12 Noise and vibration

12.1 Topic introduction

- 12.1.1 Noise and vibration can have an effect on the environment and on the quality of life enjoyed by individuals and communities. It may, in certain circumstances, lead to effects on human, ecological and infrastructure (e.g. buildings) receptors.
- 12.1.2 This chapter presents the information required by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) to be provided in the Environmental Statement for the proposed A12 Chelmsford to A120 widening scheme (the proposed scheme) in respect of noise and vibration. It describes the findings of the noise and vibration assessment undertaken for the Environmental Statement and the likely environmental effects of the proposed scheme on sensitive receptors within the defined study areas, during both construction and operation, in accordance with the Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration (Highways England, 2020b).
- 12.1.3 This chapter is supported by the following figures [TR010060/APP/6.2]:
- Figure 12.1: Noise Study Areas, Noise Important Areas and Noise Monitoring Locations
 - Figure 12.2: Noise Sensitive Receptors
 - Figure 12.3: Construction Noise Assessment Receptors and Piling Locations
 - Figure 12.4: Additional Noise Mitigation
 - Figure 12.5: Operational Noise Significant Effects (Mitigated Scheme)
 - Figure 12.6: Do-Minimum Noise Contour Map – Opening Year 2027
 - Figure 12.7: Do-Something Noise Contour Map – Opening Year 2027
 - Figure 12.8: Noise Change Contour Map – Opening Year 2027
- 12.1.4 This chapter is supported by the following appendices [TR010060/APP/6.3]:
- Appendix 12.1: Introduction to Noise
 - Appendix 12.2: Noise Assessment Methodology
 - Appendix 12.3: Baseline Noise Surveys
 - Appendix 12.4: Construction Noise Calculations
 - Appendix 12.5: Noise Impact Tables
 - Appendix 12.6: Full Noise Calculation Results

- 12.1.5 This chapter uses some technical acoustic terminology. These terms are described in Appendix 12.1 [TR010060/APP/6.3] and Chapter 18: Glossary and acronyms [TR010060/APP/6.1], of the Environmental Statement.

12.2 Competent expert evidence

- 12.2.1 This assessment has been undertaken and reported by a team of competent noise and vibration specialists. The competent expert responsible for the assessment is an Associate Director for Acoustics with a Diploma in Acoustics and Noise Control, BSc in Mathematics with Statistics, and a member of the Institute of Acoustics. They have over 25 years' experience of undertaking noise and vibration assessments for Environmental Statements as part of the process of Environmental Impact Assessment (EIA) for major infrastructure and linear projects, including highways.

12.3 Stakeholder engagement

- 12.3.1 Stakeholder engagement has been a continuous process undertaken with local residents and businesses and the four local authorities through which the proposed scheme passes. These local authorities are Colchester Borough Council, Chelmsford City Council, Maldon District Council and Braintree District Council. The first engagement was undertaken in August 2020 and focused on agreeing the assessment methodology with those in the local authorities who are responsible for noise and vibration. There were no changes to the proposed assessment methodology as a result of this consultation, compared to the methodology outlined in the Environmental Scoping Report (Highways England, 2020a).
- 12.3.2 A further consultation with the four local authorities was held in April 2021 to provide an overview of the Preliminary Environmental Information Report (PEIR) (Highways England, 2021). There were no changes to the methodology for the Environmental Statement following this consultation.
- 12.3.3 A final consultation exercise with the four local authorities was held in March 2022. This was to provide an overview of the content and conclusions of the Environmental Statement.
- 12.3.4 Consultation events have been held at various stages of the design with local communities.
- 12.3.5 The key requirement from the Planning Inspectorate's Scoping Opinion (Planning Inspectorate, 2021) was for more clarity in some areas to be included within the Environmental Statement and for the rationale behind the selection of noise survey locations to be provided. In addition, there was a request for noise-sensitive ecological receptors and areas where piling may take place to be shown on the figures produced for the noise assessment.

- 12.3.6 It was agreed by the Planning Inspectorate that significant vibration effects during operation are unlikely to arise and that this matter can be scoped out of the Environmental Statement. This is in accordance with DMRB LA 111 (Highways England, 2020b), which states, '*Operational vibration is scoped out of the assessment methodology as a maintained road surface will be free of irregularities as part of project design and under general maintenance, so operational vibration will not have the potential to lead to significant adverse effects*' This matter is therefore scoped out of this assessment.
- 12.3.7 Table 12.1 identifies the key feedback received from the Scoping Opinion for the noise and vibration aspect (Planning Inspectorate, 2021).

Table 12.1 Key Scoping Opinion feedback for noise and vibration

Stakeholder	Comment	Response
Planning Inspectorate	For the construction study area, haul roads and the local road network should be included in the assessment.	For this chapter the potential impact from the use of haul roads and of construction traffic using the local road network has been considered and assessed as appropriate.
Planning Inspectorate	Ecological sensitive receptors should be included within the noise chapter.	Ecological receptors that are sensitive to noise are shown on Figure 12.2 [TR010060/APP/6.2]. The assessment of potential impacts on these receptors are included within Chapter 9: Biodiversity, of the Environmental Statement [TR010060/APP/6.1].
Planning Inspectorate	Piling locations should be described and shown on a figure.	The locations potentially requiring piling during construction are shown on Figure 12.3 [TR010060/APP/6.2].
Planning Inspectorate	Specific receptors likely to be affected by night working should be identified.	All receptors identified as likely to be affected by night working are described in Section 12.9 of this chapter.
Planning Inspectorate	Rationale behind the selection of baseline survey locations, including areas not selected, should be provided.	Appendix 12.3 of the Environmental Statement [TR010060/APP/6.3] describes the rationale for selecting the proposed survey locations. This includes reasons for the omission of baseline surveys in some areas.
Planning Inspectorate	The construction noise assessment should provide the known noise levels of construction activities and equipment, and the calculations used to determine the construction noise should also be provided.	This chapter contains quantitative predictions of construction noise from activities expected to be undertaken. This is described in Sections 12.9 and 12.11 of this chapter, with further details such as known noise levels and equipment provided within Appendix 12.4 of the Environmental Statement [TR010060/APP/6.3].

Stakeholder	Comment	Response
Planning Inspectorate	The operational noise study area and sensitive receptors should be shown on a figure.	Figures 12.1 and 12.2 [TR010060/APP/6.2] have been included within the Environmental Statement to show the operational noise study area and the noise sensitive receptors. Figure 12.2 [TR010060/APP/6.2] also includes the noise-sensitive ecological receptors.
Chelmsford City Council	Likely significant impacts on individual isolated properties should be assessed and reported where necessary rather than aggregated.	The likely significant effects at isolated properties have been reported individually within Section 12.11 of this chapter.
Chelmsford City Council	Night working in close proximity to sensitive receptors should be avoided unless absolutely necessary.	Due to the nature of the proposed scheme, there would be a requirement for night working, for example when demolishing structures over the A12. Where this is required, the working times and appropriate methods to reduce noise levels would be observed where practicable. In addition, the local residents would be kept informed of such works.
Colchester Borough Council	Ensure that baseline monitoring takes place at sensitive properties close to the proposed bypass between junctions 24 and 25 and the new junction at Marks Tey.	The baseline noise survey was undertaken in May 2021 and is reported in Appendix 12.3 of the Environmental Statement [TR010060/APP/6.3]. Measurement locations between junctions 24 and 25 have been included, and these are shown on Figure 12.1 [TR010060/APP/6.2].
Feering Parish Council	There appear to be no noise monitoring locations indicated along the stretch of the A12 that borders Feering. Additional monitoring should be included as part of the EIA.	The noise survey location LT9, shown on Figure 12.1 [TR010060/APP/6.2], is located along the stretch of the A12 that borders Feering.
Maldon District Council	The sensitivity of a receptor should be considered within the assessment, and a justification provided.	The sensitivity of a receptor is considered as one of the factors used to determine whether there is a significant effect. The methodology adopted is summarised in Section 12.5 of this chapter and more detail is provided in Appendix 12.2 of the Environmental Statement [TR010060/APP/6.3].

Stakeholder	Comment	Response
Rivenhall Parish Council	The impacts of construction and the finished, operational road with respect to noise on those isolated properties that are retained close to the route and Rivenhall End should enjoy clear benefits in terms of all these criteria compared to the current situation.	<p>In terms of construction noise, it is not possible to create a benefit from an activity that generates noise. However, the potential noise from construction activities have been calculated and mitigation measures put in place if there are found to be significant effects. The noise reduction measures are described within Section 12.10 of this chapter, with the assessment of effects given in Section 12.11.</p> <p>For operational noise, the proposed scheme provides a clear benefit for almost all of Rivenhall End. There are some increases in noise predicted for isolated properties to the south of the existing A12, and the proposed noise reduction measures are described in Section 12.10 of this chapter, with the assessment of effects given in Section 12.11.</p>
Braintree District Council	Ensure that the dwellings within two developments recently granted planning permission (17/00973/FUL and 19/01803/FUL) are included within the noise assessment.	These two developments have been included within the noise assessment, and any subsequent consideration for mitigation.
Public Health England	Project should meet the aims of the Noise Policy Statement for England (NPSE).	Section 12.13 of this chapter reports against the three aims within the NPSE (Department for Environment, Food and Rural Affairs (Defra), 2010), and describes the actions taken to support delivery of each aim.
Public Health England	Project should explore opportunities to improve the health and quality of life.	Opportunities to improve the health and quality of life of those within the study area have been considered through the design and assessment of the proposed scheme. This is through the alignment of the road and the provision of enhanced surfacing, bunds and barriers.
Public Health England	The project needs to ensure approach is consulted on and agreed.	The proposed scheme has an ongoing process of consultation with various stakeholders. Specific to noise, the four relevant local authorities were consulted in August 2020, April 2021 and in March 2022. The approach agreed with local authorities is to follow the guidance within DMRB LA 111 (Highways England, 2020b).

Stakeholder	Comment	Response
Public Health England	How have the values for significant observed adverse effect level (SOAEL) and lowest observed adverse effect level (LOAEL) been determined.	The setting of values for SOAEL and LOAEL is an area where DMRB LA 111 (Highways England, 2020b) provides example values but allows for modification to fit local circumstances. The example values for LOAEL and SOAEL within DMRB LA 111 (Highways England, 2020b) are based on values that have been used for consented road schemes over the past six years. The proposed scheme is similar to many of these schemes, both in terms of the type of scheme and the surrounding environment. For these reasons, the example values of LOAEL and SOAEL provided in DMRB LA 111 (Highways England, 2020b) have been used in this assessment.
Public Health England	A construction assessment needs to be undertaken, and a detailed Construction Environmental Management Plan needs to be completed by the Applicant and/or the contractor responsible for construction.	The proposed scheme already has a Principal Contractor appointed, and preliminary design information has been used to develop a draft construction methodology. This information has been used to inform the calculations and assessment undertaken for this chapter. This assessment follows the methodology within DMRB LA 111 (Highways England, 2020b). Due to the nature of the proposed scheme, there would be a requirement for night working. The implications of this and actions to control the noise are described in Section 12.11 of this chapter.
Public Health England	Noise insulation should not be used as a mitigation measure.	It is agreed that noise insulation for dwellings for the operational phase is not an appropriate form of mitigation. Noise insulation is mentioned within Section 12.10 of this chapter only to assist describing the hierarchy approach to mitigation that would be used for the proposed scheme, and to indicate that mitigation at the receiver is the last resort in terms of noise mitigation.
Public Health England	Use of the L_{den} index should be considered in the noise assessment chapter.	The values of LOAEL and SOAEL have been provided within this Environmental Statement in terms of L_{den} in order to assist other environmental aspects. However, the noise assessment in this chapter focuses on established indices for noise impact assessment in the UK, such as L_{Aeq} and L_{A10} .

Stakeholder	Comment	Response
Public Health England	A health metric (e.g. disability-adjusted life year) should be considered for use within the noise assessment.	<p>Paragraph 3.28 of DMRB LA 112 (Highways England, 2020c), which is the guidance which has informed the population and human health assessment in Chapter 13 of the Environmental Statement [TR010060/APP/6.1], states that a '<i>qualitative assessment of human health shall be undertaken, with evidence to support conclusions</i>'. The population and human health assessment has been scoped on this basis.</p> <p>The decision on the preferred option has already been made, and so the calculation of noise-related health outcomes in terms of disability-adjusted life years and monetisation is considered to be of limited value to decision-makers.</p>
Public Health England	The assessment should show the steps taken to arrive at significance.	As is described in Appendix 12.2 of the Environmental Statement [TR010060/APP/6.3], the determination of significance has not been simply undertaken by considering the decibel change. Other factors are considered, such as the absolute noise level and the location of the noise source and whether it would change. The steps taken to arrive at significance are reported in Section 12.11 of this chapter as required by DMRB LA 111 (Highways England, 2020b).
Public Health England	The assessment should show the receptor types considered during the assessment.	Different types of sensitive receptors have been examined as shown in Table 12.14 in Section 12.8 of this chapter. These include dwellings, schools, places of worship and community facilities.
Public Health England	The project should consider measures for enhancement.	Measures for enhancement have been investigated and are described within Section 12.10 of this chapter.
Public Health England	A qualitative characterisation of the area should be provided.	Site visits and noise surveys have been undertaken by experienced consultants, and during each visit, notes were made of the characteristics of the noise climate. This included the dominant noise sources and also whether the traffic noise from the A12 was considered to be intrusive and affect the enjoyment of the location. This information is reported in Appendix 12.3 of the Environmental Statement [TR010060/APP/6.3].

Stakeholder	Comment	Response
Public Health England	Consideration should be given to longer noise survey periods.	Noise surveys have been undertaken at each of the 17 locations for a period of one week. For the proposed scheme, the noise climate in the immediate vicinity of the A12 changes very little as the road noise is dominant in most locations. A week-long survey is therefore considered to be long enough to characterise the noise climate. The surveys include a weekend period, as there may be weekend working for the proposed scheme.
Public Health England	Consideration should be given to the use of different metrics (e.g. events) for the assessment.	Given the proposed scheme has a very dominant and near-continuous noise source, it is considered very unlikely that examining further metrics would help to determine likely significant effects.
Public Health England	The mitigation hierarchy should be used when considering mitigation.	Priority would be given to reducing noise at source, as is described in Section 12.10 of this chapter. When the need for mitigation is identified, reducing the noise at source has been considered first.
Public Health England	The project should consider undertaking post-opening monitoring.	As is stated within DMRB LA 111 (paragraph 4.2) (Highways England, 2020b), ' <i>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</i> '. Post construction noise monitoring is therefore not considered to be appropriate.
Public Health England	Production of an Environmental Management Plan (EMP).	A first iteration of the EMP has been produced for the Development Consent Order (DCO) application [TR010060/APP/6.5]. A second iteration of the EMP will be produced for the construction phase.
Public Health England	Public Health England expects consideration to be given to the importance of existing green spaces as well as opportunities to create new tranquil spaces which are easily accessible to those communities exposed to increased noise from the scheme.	The proposed scheme has little opportunity to develop large areas of green space, and this would be considered as enhancement which is not part of the proposed scheme. Existing green spaces, such as the Whetmead Local Nature Reserve, have been considered and the impacts from noise are reported within Chapter 9: Biodiversity, of the Environmental Statement [TR010060/APP/6.1]. Private amenity areas would not be physically changed, although the noise climate in some may change.

Stakeholder	Comment	Response
Public Health England	Consider the step change in noise during the assessment.	The change in noise on opening of the proposed scheme forms the initial indication of likely significance of effect. Within DMRB LA 111 (Highways England, 2020b), there is a move away from examining the long-term effects.
Public Health England	Public Health England encourages the Applicant to use effective ways of communicating any changes in the acoustic environment generated by the scheme to local communities.	<p>The proposed scheme has a dedicated stakeholder team, and communications with key stakeholders have been ongoing throughout the options selection and design development process. The stakeholder team will be taking full advantage of current technology, especially since some of the stakeholder engagement was virtual due to COVID-19 restrictions.</p> <p>With a lot of the proposed scheme being online widening, the local residents will already be aware of the noise generated by a busy road. Therefore, the use of audio recording, while useful for some projects such as a wind farm, is not considered to be a valuable addition to the proposed scheme. With respect to the visual impact, a fly-through was made available at statutory consultation.</p>

12.3.8 The full Scoping Opinion (Planning Inspectorate, 2021), as well as the Applicant's response regarding how and where comments have been addressed in the Environmental Statement and draft Development Consent Order (DCO), is included within Appendix 5.1 [TR010060/APP/6.3] of the Environmental Statement.

12.3.9 Table 12.2 identifies the key feedback received from the statutory consultation. All comments raised during the statutory consultation, as well as the Applicant's responses, are included in the Consultation Report [TR010060/APP/5.1].

Table 12.2 Key statutory consultation feedback for noise and vibration

Stakeholder	Comment	Response
Hatfield Peverel Parish Council	Given that the upgrade work affecting Hatfield Peverel is all online the parish council wishes to see consideration also given to the use of low-noise surfacing on the entire section between the existing junctions 20a and 20b.	The section of the A12 between junctions 20a and 20b is proposed to be resurfaced with a surface with better noise reducing properties than a conventional low-noise surface.

Stakeholder	Comment	Response
Colchester Borough Council	The potential for significant adverse effects during the construction phase and operational phase and especially those at Easthorpe Green, Doggetts Lane, Hall Chase Farmhouse, and Hall Chase (Junction 25) all require that all options are explored to deliver an effective solution to mitigate the adverse impacts identified on these homes.	For construction, noise and vibration mitigation measures are included in the Noise and Vibration Management Plan within the first iteration EMP [TR010060/APP/6.5]. Options to mitigate potential significant noise effects during operation are discussed in Section 12.10 of this chapter.
Braintree District Council	Generally, where the Environmental Statement concludes that there is an increase and particularly a significant adverse effect at the operation stage of the project, then it is recommended that the assessment also considers whether the internal noise levels for habitable rooms as given in table 4 of BS8233 may still be achieved without further mitigation; whether acceptable external noise levels in private garden areas as given in BS8233 may still be achieved; and where noise levels require that windows shall be closed the impact on the thermal comfort of the relevant receptors at the affected dwellings.	<p>The assessment of noise within DMRB LA 111 is not based upon internal noise levels as given within BS 8233 (British Standards Institution, 2014c). BS 8233 is for new buildings in noisy areas, so not appropriate for use on a road scheme. With over 11,000 dwellings within the noise study area, it would be impractical to investigate each dwelling to determine the glazing specification and then investigate the internal noise levels.</p> <p>The assessment has considered the change in external noise levels that would translate to a change in internal levels. Where practicable, increases in noise have been avoided or minimised.</p>
Public Health England	<p>The PEIR sets out the proposed operational noise LOAEL and SOAEL values for the proposed scheme. It also states that <i>'although DMRB allows these example values to be modified, they are considered to be appropriate for the proposed scheme.'</i></p> <p>As explained at scoping stage and in March 2021, Public Health England recommends that the Applicant explains what the chosen LOAELs and SOAELs mean in health terms, in order to facilitate their interpretation by a broader audience.</p>	<p>The setting of values for SOAEL and LOAEL is an area where DMRB LA 111 provides example values but allows for modification to fit local circumstances. The suggested values for LOAEL and SOAEL within DMRB LA 111 are based on values that have been used for road schemes over the past six years, with many of these schemes passing through examination. The proposed scheme is similar to many of these schemes, both in terms of the type of scheme and the surrounding environment. For these reasons, the example values of LOAEL and SOAEL provided in DMRB LA 111 have been used. It is considered that deviating from these values in the absence of good reason would potentially lead to challenge.</p>

Stakeholder	Comment	Response
Public Health England	Public Health England recommend that the population exposure estimates are broken down into categories according to their existing noise exposure (expressed as L_{den} and L_{night}), commencing from the World Health Organisation (WHO) guideline level of 53dB L_{den} and 45dB L_{night} .	This has been undertaken and is shown in Appendix 12.5 of the Environmental Statement [TR010060/APP/6.3] together with the required DMRB LA 111 tables.
Public Health England	The PEIR states that ' <i>the determination of significance will not be simply undertaken by considering the decibel change. Other factors are considered, such as the absolute noise level and the location of the noise source and whether it will change. The steps taken to arrive at significance will be reported in the Environmental Statement.</i> '	The methodology is explained within Section 12.5 of this chapter and also within Appendix 12.2 of the Environmental Statement [TR010060/APP/6.3], although it needs to be understood that there is not a 'one size fits all' approach that can be applied to all situations.
Public Health England	Concerns that the number of people that will experience an increase in noise is approximately eight times higher than those experiencing a decrease in the long term. More than 16,000 people will experience an increase in daytime and night-time noise exposure, most of which are already exposed to average noise levels that exceed WHO guideline levels. This indicates that from a noise perspective the proposed scheme is likely to have a significant adverse effect on the health and quality of life of local communities.	The changes in noise in the long term are shown in Appendix 12.5 of the Environmental Statement [TR010060/APP/6.3]. The increases in noise in the long term are similar to those that would be expected without the proposed scheme in place.

12.4 Legislative and policy framework

Legislation

- 12.4.1 The legislation appropriate for this assessment is briefly described below. Further details can be found in Appendix 12.2 of the Environmental Statement [TR010060/APP/6.3].

Land Compensation Act 1973

- 12.4.2 Part I of the Land Compensation Act 1973 provides a means by which compensation can be paid to owners of land or property due to a decrease in value of these assets caused by public works, such as new or improved railways and roads. Noise and vibration are two of the factors which would qualify for claims for compensation, but the claim should consider all changes and effects, including betterment.
- 12.4.3 In relation to the construction or improvement of a highway, the Act provides for a power to pay reasonable expenses for people to move temporarily during construction works where the works are next to the house and it is affected to such an extent that it is not reasonably practicable to stay in the house. This is subject to meeting certain criteria given in the Noise Insulation Regulations 1975.

Control of Pollution Act 1974

- 12.4.4 The Control of Pollution Act 1974 controls waste disposal, water pollution and noise atmospheric pollution.
- 12.4.5 Under the Act, the local authority may serve notice imposing requirements as to how and when works to roads are carried out, in order to limit construction noise arising from such works and having regard to the need to ensure the best practicable means are employed to minimise noise.
- 12.4.6 The Act sets out the procedure for applying to the local authority for consent prior to carrying out works with the intention of agreeing noise and vibration limits in advance of works and avoiding the need for service of a notice for control of noise under the Act.

Environmental Protection Act 1990

- 12.4.7 The Environmental Protection Act 1990 provides for the control of air pollution, land wastes, nuisance and radioactive substances in order to protect the environment. Part III of the Act defines what may constitute a statutory nuisance (including noise prejudicial to health), what activities are specifically exempt, the procedures the local authority must follow for service of notices to deal with abatement of statutory nuisances and the penalties payable for conviction of causing a statutory nuisance. Local authorities have a duty under the Act to inspect their area from time to time to detect statutory nuisances.

The Noise Insulation Regulations 1975

- 12.4.8 The Noise Insulation Regulations provide for entitlement in specified circumstances to insulation work or a grant for the insulation of residential buildings against noise increases above a certain level caused or expected to be caused by traffic using certain altered highways, new highways and certain highway works. Where there is an 'additional carriageway', the authority has a duty to (i.e. they must) carry out insulation work or make grants. For an 'altered highway', the authority has a power to (i.e. they can) carry out insulation work or make grants.

Environmental Noise (England) Regulations 2006

- 12.4.9 The regulations relate to the assessment and management of environmental noise. They require the Secretary of State to: (a) make strategic noise maps showing peoples' exposure to environmental noise from major roads, railways and airports and in urban areas; and (b) draw up and periodically review action plans for places (including for the most important areas) near to major roads. The action plans aim to prevent and reduce environmental noise and its harmful effects on human health, preserve environmental noise quality where it is good, manage noise issues and effects and protect quiet areas against an increase in noise.
- 12.4.10 Important areas are defined in the strategic noise map as where the 1% of the population that are affected by the highest noise levels from roads or major railways are located according to the results of the strategic noise mapping.

National policy**National Policy Statements**

- 12.4.11 The National Networks National Policy Statement (NNNPS) (Department for Transport, 2014) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects on the national road and rail networks in England. The Secretary of State uses the NNNPS as the primary basis for making decisions on DCO applications.
- 12.4.12 The key requirements from the NNNPS relevant to this aspect are set out in Table 12.3.

Table 12.3 NNNPS requirements for noise and vibration

NNNPS paragraph	NNNPS requirement	How this is addressed in the assessment
5.189	<p>Where a development is subject to EIA and significant noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment, which should form part of the environment statement:</p> <ul style="list-style-type: none"> • a description of the noise sources including likely usage in terms of number of movements, fleet mix and diurnal pattern. For any associated fixed structures, such as ventilation fans for tunnels, information about the noise sources including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise. • identification of noise sensitive premises and noise sensitive areas that may be affected. • the characteristics of the existing noise environment. • a prediction on how the noise environment will change with the proposed development: <ul style="list-style-type: none"> – In the shorter term such as during the construction period; – in the longer term during the operating life of the infrastructure; – at particular times of the day, evening and night as appropriate. • an assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas. • measures to be employed in mitigating the effects of noise. Applicants should consider using best available techniques to reduce noise impacts. • the nature and extent of the noise assessment should be proportionate to the likely noise impact. 	<p>A description of the existing situation is provided within Section 12.8 of this chapter. The noise sources from the proposed scheme are described within Section 12.9.</p> <p>The noise-sensitive premises are identified within Section 12.8 of this chapter and are shown on Figure 12.2 [TR010060/APP/6.2].</p> <p>The characteristics of the existing noise environment are described within Section 12.8 of this chapter and within Appendix 12.3 of the Environmental Statement [TR010060/APP/6.3].</p> <p>The prediction of how the noise environment would change and the assessment of effects from this change is provided within Sections 12.9 and 12.11 of this chapter.</p> <p>Mitigation measures are described in Section 12.10 of this chapter.</p> <p>The noise assessment presented in this chapter is considered to be proportionate to the scale of the proposed scheme.</p>

NNNPS paragraph	NNNPS requirement	How this is addressed in the assessment
5.190	The potential noise impact elsewhere that is directly associated with the development, such as changes in road and rail traffic movements elsewhere on the national networks, should be considered as appropriate.	The assessment of road traffic noise presented in this chapter includes consideration of changes in road traffic noise for all road links where a significant change in noise is predicted, regardless of whether they are close to the proposed scheme or at a greater distance.
5.191	Operational noise, with respect to human receptors, 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 Calculation of Road Traffic Noise. The prediction of noise from new railways should be based on the method described in Calculation of Railway Noise. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies.	The predictions of road traffic noise have been undertaken following the calculation methodology provided by Calculation of Road Traffic Noise (CRTN) (Department of Transport and Welsh Office, 1988). The assessments of construction noise and vibration have been undertaken with reference to BS 5228 Part 1 (British Standards Institution, 2014a) and Part 2 (British Standards Institution, 2014b).
5.193	Developments must be undertaken in accordance with statutory requirements for noise. 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.	The assessment of impacts from noise and vibration has been undertaken in accordance with the instructions within the DMRB LA 111 Noise and Vibration (Highways England, 2020b). By using DMRB LA 111, it is considered that the proposed scheme can be measured against the policy requirements of the NPSE (Defra, 2010) and National Planning Policy Framework (Ministry of Housing, Communities and Local Government, 2021).
5.194	The project should demonstrate good design through optimisation of scheme layout to minimise noise emissions and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission. The project should also consider the need for the mitigation of impacts elsewhere on the road and rail networks that have been identified as arising from the development, according to Government policy.	In the early development of the proposed scheme, the route alignment was selected in order to avoid or minimise impacts on communities or individual receptors. As the design progressed, the reduction in noise emissions has been optimised with the consideration of noise barriers and low-noise surfacing, as described in Section 12.10 of this chapter.

NNNPS paragraph	NNNPS requirement	How this is addressed in the assessment
5.195	<p>The Secretary of State should not grant development consent unless satisfied that the proposals will meet the following aims, within the context of Government policy on sustainable development:</p> <ul style="list-style-type: none"> • avoid significant adverse impacts on health and quality of life from noise as a result of the new development • mitigate and minimise other adverse impacts on health and quality of life from noise from the new development • contribute to improvements to health and quality of life through the effective management and control of noise, where possible 	<p>These aims have been considered within the assessment, and how they are met is described in Section 12.13 of this chapter.</p>
5.199	<p>For most national network projects, the relevant Noise Insulation Regulations will apply. These place a duty on and provide powers to the relevant authority to offer noise mitigation through improved sound insulation to dwellings, with associated ventilation to deal with both construction and operational noise. An indication of the likely eligibility for such compensation should be included in the assessment. In extreme cases, the applicant may consider it appropriate to provide noise mitigation through the compulsory acquisition of affected properties in order to gain consent for what might otherwise be unacceptable development. Where mitigation is proposed to be dealt with through compulsory acquisition, such properties would have to be included within the development consent order land in relation to which compulsory acquisition powers are being sought.</p>	<p>An assessment of eligibility under the Noise Insulation Regulations 1975 (as amended) is provided in Section 12.11 of this chapter.</p>
5.200	<p>Applicants should consider opportunities to address the noise issues associated with the Noise Important Areas as identified through the noise action planning process</p>	<p>Where practicable, opportunities have been considered to address the noise issues in Noise Important Areas (NIAs). As required by DMRB LA 111 (Highways England, 2020b), the impact at each NIA is described within Table 12.33 in Section 12.11 of this chapter.</p>

- 12.4.13 As set out in Chapter 1: Introduction, of the Environmental Statement [TR010060/APP/6.1], the assessment has considered the Overarching National Policy Statement for Energy (EN-1) and National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (Department of Energy and Climate Change, 2011a; 2011b) in relation to the diversion of an existing high pressure gas main (the 'gas main diversion') owned and operated by Cadent Gas Limited (Cadent). Draft versions of the updated EN-1 and EN-4 NPS have also been considered (Department for Business, Energy and Industrial Strategy, 2021a; 2021b).
- 12.4.14 A review of the relevant requirements of EN-1 and EN-4 (including the draft updated versions), relating to the EIA of the gas main diversion works, identified that the requirements are not materially different to those set out in the NNNPS. As such, it is considered that by meeting the NNNPS requirements set out in Table 12.3, the requirements of EN-1 and EN-4 are also met.

National Planning Policy Framework

- 12.4.15 The National Planning Policy Framework (Ministry of Housing, Communities and Local Government, 2021) came into force in March 2012 and has been revised several times, most recently in July 2021. The National Planning Policy Framework states that planning policies and decisions should contribute to and enhance the natural and local environment by, among other things, preventing new and existing development from being put at unacceptable risk or being affected by unacceptable levels of noise pollution. Further details of the National Planning Policy Framework and how it relates to noise and vibration can be found in Appendix 12.2 of the Environmental Statement [TR010060/APP/6.3].

Noise Policy Statement for England

- 12.4.16 The Government's noise policy is set out in the Noise Policy Statement for England (NPSE), which was published in March 2010. It contains the high-level vision of promoting good health and good quality of life (wellbeing) through the effective management of noise. It is supported by three aims, and together they provide the necessary clarity and direction to enable decisions to be made in any particular situation, both nationally and locally, regarding what is an acceptable noise burden to place on society. These three aims are as follows:
- Avoid significant adverse impacts on health and quality of life
 - Mitigate and minimise adverse impacts on health and quality of life
 - Where possible, contribute to the improvement of health and quality of life
- 12.4.17 In defining these aims, the terms 'significant adverse' and 'adverse' are used, for which the NPSE (Defra, 2010) notes the following:
- 'There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation (WHO). They are:*
- *NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*

- **LOAEL – Lowest Observed Adverse Effect Level.** *This is the level above which adverse effects on health and quality of life can be detected.*

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

- **SOAEL – Significant Observed Adverse Effect Level.** *This is the level above which significant adverse effects on health and quality of life occur.'*

Local policy

- 12.4.18 In addition to the national policy set out in the NNNPS, the proposed scheme has also had regard to relevant local plans and policy. A summary of the policy framework is provided in Appendix 1.1 of the Environmental Statement [TR010060/APP/6.3].
- 12.4.19 The policies set out in Table 12.4 all require that noise is assessed, and that suitable measures to protect sensitive receptors are considered. This chapter assesses the likely significant effects of noise and vibration on identified receptors (e.g. dwellings, schools, hospitals) arising from the proposed scheme and recommends mitigation measures to avoid or minimise increases in noise and vibration (see Sections 12.10 and 12.11 of this chapter).

Table 12.4 Regional and local policy relevant to noise and vibration

Plan/Policy Document	Summary of relevant policy
Braintree District Local Plan Review (Braintree District Council, 2005)	<u>Policy RPL 11</u> Development should not harm the character of a predominantly residential area and make it a less pleasant area in which to live, by reason of noise.
Local Development Framework Core Strategy (Braintree District Council, 2011)	<u>Policy CS8</u> All development proposals will take into account the potential impacts of climate change and ensure the protection and enhancement of the natural environment, habitats and biodiversity and geo-diversity of the District. This will include, where appropriate, protection from noise.
Braintree District Publication Draft Local Plan Section 2 (Braintree District Council, 2017)	<u>Policy LPP 73</u> Proposals for all new developments should prevent unacceptable risks from all emissions and other forms of pollution (including light and noise pollution) and ensure no deterioration to either air or water quality.
Chelmsford Local Plan: Our Planning Strategy 2013 to 2036 (Chelmsford City Council, 2020)	<u>Policy DM29</u> The development shall not result in excessive noise, activity or vehicle movements and is compatible with neighbouring or existing uses by ensuring that the development avoids unacceptable levels of noise.

Plan/Policy Document	Summary of relevant policy
Publication Draft Local Plan 2017 – 2033 (Colchester Borough Council, 2017)	<p><u>Policy SP6</u></p> <p>Protect the amenity of existing and future residents and users with regard to noise, vibration, smell, loss of light and overlooking.</p> <p><u>Policy ENV5</u></p> <p>Proposals will be supported that will not result in an unacceptable risk to public health or safety, the environment, general amenity or existing uses due to the potential of air pollution, noise nuisance, surface/ground water sources or land pollution.</p>
North Essex Authorities' Shared Strategic Section 1 Plan (Braintree District Council, 2021)	<p><u>Policy SP7</u></p> <p>All new development should protect the amenity of existing and future residents and users with regards to noise and vibration.</p>
Maldon District Local Development Plan 2014 – 2029 (Maldon District Council, 2017)	<p><u>Policy D1</u></p> <p>Protect the amenity of surrounding areas taking into account privacy, overlooking, outlook, noise, smell, light, visual impact, pollution, daylight and sunlight.</p>

12.5 Assessment methodology

Assessment scope

- 12.5.1 This assessment includes consideration of noise and vibration during construction and of road traffic noise during operation. The likelihood of significant vibration effects from traffic during operation is the only matter that has been scoped out from assessment. This is as proposed in the Environmental Scoping Report (Highways England, 2020a), confirmed in the Scoping Opinion (Planning Inspectorate, 2021), and is in accordance with guidance in DMRB LA 111 Noise and Vibration (Highways England, 2020b).

General approach

- 12.5.2 The assessment of impacts from noise and vibration has been undertaken in accordance with the approach set out in DMRB LA 111. DMRB LA 111 draws upon published guidance and standards to guide the assessor through the assessment. The use of DMRB LA 111 also ensures that the proposed scheme complies with advice set out in the NNNPS (Department for Transport, 2014).
- 12.5.3 DMRB LA 111 incorporates the noise effect levels that have been introduced to English noise policy by the NPSE (Defra, 2010). These effect levels are defined as follows:
- 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.

12.5.4 The NPSE does not assign decibel values to these effect levels as they will vary depending upon the type of assessment being undertaken. However, suggested effect levels for construction and operational noise and vibration are contained within DMRB LA 111, and these have been used for the noise assessment presented in this chapter.

12.5.5 In NNNPS terms, significant adverse noise effects occur only when noise levels are above SOAEL. Other adverse impacts occur when the level is between the LOAEL and SOAEL.

Construction noise

12.5.6 The assessment of noise from construction has been undertaken quantitatively based on the instructions within DMRB LA 111, which in turn references the guidance and calculation methodology within BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise (British Standards Institution, 2014a).

12.5.7 Noise predictions from construction are undertaken using known noise levels from the various items of plant that would be used during the different activities associated with the construction of the proposed scheme. Factors such as the amount of time that each item of plant is operating over a working day are also considered within the calculations. Until construction physically starts, some of the information required to inform these predictions has been based on professional judgement and information provided by the Principal Contractor.

12.5.8 The noise levels from construction have been calculated at selected receptors which are considered to be representative of individual or groups of noise sensitive receptors. The receptors chosen are mostly dwellings but also some other sensitive receptors.

12.5.9 These calculations have been undertaken by using the noise model produced for the assessment of the operational noise. Taking into account the items of plant and corresponding noise levels, a Sound Power Level for each activity has been determined. These Sound Power Levels for each activity have been added to the noise model in order to undertake the calculations at the representative locations. The full plant lists for each activity and determined Sound Power Levels are provided in Appendix 12.4 of the Environmental Statement [TR010060/APP/6.3].

12.5.10 The impact from additional construction traffic on the road network and from general traffic using diversion routes has been assessed in accordance with the instructions from paragraph 3.15 to 3.19 within DMRB LA 111.

Construction vibration

12.5.11 The assessment of vibration from construction has been undertaken quantitatively based on the instructions within DMRB LA 111, which in turn references the guidance and calculation methodology within BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration (British Standards Institution, 2014b).

- 12.5.12 For some activities of construction (e.g. piling, compaction), equations are available within BS 5228-2:2009+A1:2014 to calculate the level of vibration at a distance from the construction activity. Certain input parameters are required for these calculations, and until construction physically starts some of the information required has been based on professional judgement.
- 12.5.13 The level of vibration caused by construction activities has been calculated at selected locations that are considered to be representative of all vibration sensitive receptors in the study area.

Operational noise

- 12.5.14 The assessment of noise from the operation of the proposed scheme has been undertaken quantitatively based on the guidance within DMRB LA 111. The approach within DMRB LA 111 is to compare the predicted noise level with and without the proposed scheme (referred to as the Do-Something and Do-Minimum respectively) at individual or groups of sensitive receptors. Noise levels have been calculated using the methodology contained in CRTN (Department of Transport and Welsh Office, 1988) using proprietary noise modelling software.
- 12.5.15 The prediction method has taken into account factors such as the traffic volume, composition and speed; the alignment and distance of the road relative to the sensitive receptor; the road surface type; the nature of the intervening ground cover between the road; and reflections from building façade to calculate the $L_{A10,18h}$ dB noise level.
- 12.5.16 Annual average weekday traffic volumes, speeds and percentages of heavy goods vehicles have been used to allow for seasonal variations. The annual average weekday traffic is the maximum traffic volume expected between 06:00 and 24:00 on a normal weekday, averaged over a year. The traffic data used within the noise model has been generated from a traffic model produced as part of the proposed scheme development. This model was based on National Highways' South East Regional Transport Model, modified to represent the area around the proposed scheme in more detail. The traffic model has a base year of 2019, and also models the future years of 2027 and 2042.
- 12.5.17 The road traffic noise assessments have been based on a comparison of Do-Minimum and Do-Something scenarios. The Do-Minimum scenario represents the future baseline with minimum interventions and without the proposed scheme or alternatives. The Do-Something scenario represents predicted road traffic levels based on the proposed scheme in operation in the year of opening in 2027 and in the future assessment year 2042.

Assessing the significance of effects

- 12.5.18 The general approach to assessing the significance of effects is set out in Chapter 5: Environmental assessment methodology, of the Environmental Statement [TR010060/APP/6.1], based on DMRB LA 104 Environmental Assessment and Monitoring (Highways England, 2020d).

- 12.5.19 The significance principles for noise and vibration differ from DMRB LA 104 since the sensitivity of a receptor is not defined within DMRB LA 111 (Highways England, 2020b). Some key aspects of the instructions provided within DMRB LA 111 to determine significance of effects are given below, with more detail provided within Appendix 12.2 of the Environmental Statement [TR010060/APP/6.3].

Construction noise

- 12.5.20 Noise impact thresholds over certain time periods for construction activities at residential premises and other noise sensitive receptors are defined based on Table 3.12 of DMRB LA 111, and reproduced in Table 12.5.

Table 12.5 Construction time period impact thresholds

Time period	LOAEL	SOAEL
Day (07:00–19:00 weekday and 07:00–13:00 Saturdays)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per Section E3.2 of BS 5228-1:2009+A1:2014 and Table E.1 of BS 5228-1:2009+A1:2009
Night (23:00–07:00)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per Section E3.2 of BS 5228-1:2009+A1:2014 and Table E.1 of BS 5228-1:2009+A1:2009
Evening and weekends (time periods not covered above)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per Section E3.2 of BS 5228-1:2009+A1:2014 and Table E.1 of BS 5228-1:2009+A1:2009

- 12.5.21 To determine the significance of effect from construction noise, the predicted noise level arising from construction activities is compared to the pre-construction ambient noise level. Table 3.16 of DMRB LA 111 includes a scale of magnitude that has been used to determine the impact, and this is reproduced in Table 12.6.

Table 12.6 Magnitude of impact and construction noise descriptions

Magnitude of change	Criteria
Major	Above or equal to SOAEL +5dB
Moderate	Above or equal to SOAEL and below SOAEL +5dB
Minor	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL

- 12.5.22 The significance of the effect from additional construction traffic on the road network and that from diversion routes has been determined by comparing the existing level of traffic noise against that predicted during construction. Table 3.17 of DMRB LA 111 includes a scale of magnitude that has been used to determine the impact, and this is replicated in Table 12.7.

Table 12.7 Magnitude of construction traffic impact at receptors

Magnitude of impact	Increase in Basic Noise Level 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

- 12.5.23 For diversion routes used at night, a major magnitude of impact for construction noise has been determined at any noise sensitive receptors within the diversion route study area.
- 12.5.24 Construction noise and construction traffic constitute a significant effect where it is determined that a major or moderate magnitude of impact would occur for a duration exceeding (as per DMRB LA 111, paragraph 3.19):
- 10 or more days or nights in any 15 consecutive days or nights
 - a total number of days exceeding 40 in any six consecutive months
- 12.5.25 Where significant effects are identified, specific noise mitigation measures have been considered to reduce the noise impact from activities.

Construction vibration

- 12.5.26 To determine the significance of effect from construction vibration, the magnitude of the predicted level has been compared against impact criteria shown in Table 3.31 of DMRB LA 111 and a magnitude scale shown in Table 3.33 of DMRB LA 111. These tables are reproduced, respectively, in Tables 12.8 and 12.9.

Table 12.8 Construction vibration impact thresholds for all receptors

Time period	LOAEL	SOAEL
All time periods	0.3mm/s Peak Particle Velocity (PPV)	1.0mm/s PPV

Table 12.9 Magnitude of construction vibration impact at receptors

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

12.5.27 Construction vibration constitutes a significant effect where it is determined that a major or moderate magnitude of impact would occur for a duration exceeding (as per DMRB LA 111, paragraph 3.34):

- 10 or more days or nights in any 15 consecutive days or nights
- a total number of days exceeding 40 in any six consecutive months

12.5.28 Where significant effects are identified, specific vibration mitigation measures have been considered to reduce the vibration impact from activities.

Operation noise

12.5.29 The LOAELs and SOAELs for noise sensitive receptors within the study area for operational road traffic noise are reproduced from Table 3.49.1 of DMRB LA 111 in Table 12.10. These suggested values for the day and night LOAEL and SOAEL within DMRB LA 111 are based upon those used for recent large road projects and are considered appropriate for the proposed scheme.

12.5.30 In order to assist other environmental aspects, the equivalent L_{den} is shown in the table for information. This has been converted from the equivalent $L_{Aeq,16hr}$ value using guidance provided in an article within the International Journal of Hygiene and Environmental Health in 2018 (Brink *et al.*, 2018).

Table 12.10 Operational noise LOAELs and SOAELs for all receptors

Time period	LOAEL	SOAEL
Day (06:00–24:00)	55dB $L_{A10,18hr}$ façade 50.5dB $L_{Aeq,16hr}$ free-field	68dB $L_{A10,18hr}$ façade 63.5dB $L_{Aeq,16hr}$ free-field
Night (23:00–07:00)	40dB $L_{night,outside}$ free-field	55dB $L_{night,outside}$ free-field
L_{den} (24-hour period)	52.9dB L_{den} free-field	65.9dB L_{den} free-field

12.5.31 To determine the significance of effect, the predicted change in noise in the short-term (i.e. on opening) has been compared against the scale of magnitude shown in Table 12.11 (as per DMRB LA 111 Tables 3.54a and 3.54b). Where the magnitude of change in the short-term is negligible, this has been deemed as not giving rise to a likely significant effect.

Table 12.11 Classification of magnitude of operational noise impacts

Magnitude of impact	Noise change, dB	
	Short term noise change (dB $L_{A10,18h}$ or L_{night})	Long term noise change (dB $L_{A10,18h}$ 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

- 12.5.32 A change in the short-term of moderate or major magnitude (and in some situations minor) has been used as the starting point to determine whether the effect is likely to be significant. Other factors have been considered in determining whether the impact is significant or not. Table 3.60 of DMRB LA 111 provides a series of factors that can be considered, which can be summarised as follows:
- The actual short-term change, i.e. a change of 2.9dB or less (in the short-term), may still be considered a significant environmental effect
 - The predicted long-term (i.e. 15 years after opening) change in noise, i.e. comparison of the Do-Minimum scenario in baseline year against the Do-Something scenario in the future assessment year
 - Absolute noise level with reference to the LOAEL and SOAEL values
 - Circumstances of the receptor or receptor group, e.g. location of windows, outdoor spaces, use of receptor (i.e. sensitivity)
 - The existing acoustic character of the area
 - Changes to the landscape or setting of the receptor or receptor group
- 12.5.33 An assessment of likely eligibility for sound insulation measures under the Noise Insulation Regulations 1975 (as amended) has also been undertaken to identify residential dwellings that may potentially qualify under the Regulations. This refers to the proposed scheme once operational.
- 12.5.34 The noise level at all noise sensitive receptors within the study area has been calculated using CadnaA noise modelling software, which incorporates the methodology contained in CRTN (Department of Transport and Welsh Office, 1998) and additional advice within DMRB LA 111 (Highways England, 2020b). CRTN is a technical memorandum produced by the Department of Transport and Welsh Office which provides a method of predicting road traffic noise. Night-time noise levels have been calculated using Method 3 contained within the Transport Research Laboratory report PR/SE/451/02 Converting the UK Traffic Noise Index $LA_{10,18h}$ to EU Noise Indices for Noise Mapping (Transport Research Laboratory, 2002). A calculation height of 4m above local ground level has been used for all receptors, unless they are known to only be of one storey high in which case a calculation height of 1.5m has been used.

12.6 Assessment assumptions and limitations

Construction

- 12.6.1 The assessment of potential construction noise and vibration effects has been based on the preliminary construction programme and methodology. Assumptions regarding the provisional plant and equipment that may be used have been developed in consultation with the Principal Contractor. When detailed design is complete and methodology confirmed it may be necessary to use different plant and equipment complements. The risk of changes to plant

and/or methods resulting in differing results is considered to be small owing to pre-application discussions with the Principal Contractor.

- 12.6.2 The sample of receptors used for the assessment of construction noise and vibration were selected as representative of receptors closest to the proposed scheme and are generally the closest and/or most exposed receptors which are therefore assumed to experience the worst-case noise levels. The risk associated with impacts at receptors not covered by the sample is considered to be minimal owing to the proposed scheme design being developed to an extent that the main areas of working are known.
- 12.6.3 There are two residential buildings that would need to be demolished within the footprint of the proposed scheme (Badgers and Hare Lodge). These are close to each other, situated just to the north of the A12 about 750m east of Rivenhall End. These have not been included as receptors for the construction assessment as it is assumed that they would be demolished before any nearby works start.
- 12.6.4 A third building, an office block of Barconn Limited, which is located at Brick Kiln Farm to the south of the A12 at Kelvedon on Inworth Road, is also due to be demolished. This has been excluded as a receptor from the construction impact assessment.

Operation

- 12.6.5 The type of road surface is a factor that is taken into account when predicting noise levels. The existing surfacing along the A12 is known and has been taken into account within the noise model and calculation process, with the appropriate surface correction as described within Appendix A of DMRB LA 111 (Highways England, 2020b) being applied. It is assumed that these surfaces would remain the same for the Do-Minimum future assessment year of 2042.
- 12.6.6 The following assumptions have been made regarding the surfacing in the Do-Something scenarios:
- The new offline sections of the route and those being widened would be surfaced with a low-noise surfacing. The surfacing to be used is described in more detail in Section 12.10 of this chapter.
 - Surfaces on the de-trunked sections of the A12 would remain the same as they are in the Do-Minimum scenario.
 - The section of existing concrete road surfacing around the Kelvedon bypass would be re-surfaced with low-noise surfacing.
 - The sections of concrete road just before junction 19 (Boreham interchange) and just after junction 25 (Marks Tey interchange) would be untouched, as they are outside of the area where the main carriageway works are taking place.

12.6.7 Existing noise mitigation in the form of noise barriers or brick walls have been identified at seven locations along the route and included within the noise model for all scenarios. These have been identified from existing data sources and for reference are labelled Existing Noise Barrier (ENB). These are as follows:

- 150m of timber noise barrier alongside the A12 at Boreham, protecting the houses on Brick House Lane (ENB4). This is assumed to be 2m high and would remain in place with the proposed scheme.
- 100m of timber barrier protecting the houses on Yonge Close in Boreham (ENB4). This is assumed to be 2m high and would remain in place with the proposed scheme.
- 400m of timber noise barrier alongside a new development to the south of Witham, protecting houses on Market Lane (ENB1). This is assumed to be 3m high. It is likely that this barrier would need to be removed during the construction of a retaining wall at this location, and it has therefore not been considered to provide screening during the construction calculations. It is assumed that this barrier would be re-instated prior to the opening of the proposed scheme, so it has been taken into account in the operational noise assessment.
- 90m long and 2m high timber noise barrier protecting houses on Benton Close in Witham (ENB2). It is assumed this barrier would need to be removed for the proposed scheme but would be replaced by a new barrier of the same height. This barrier has therefore not been considered to provide screening during the construction calculations.
- In Rivenhall End, there is 140m of brick wall to the north of the A12, protecting houses on Foxmead. Although this is likely to have been built as a boundary wall for the houses, it will be providing a degree of noise mitigation. It is assumed to be 2m high and would remain in place with the proposed scheme.
- In Hatfield Peverel, a 45m length of 1.7m high brick wall is located on The Street to the south of the A12 and across from the B1137 where it joins The Street. This will be providing a degree of noise mitigation and would remain in place with the proposed scheme.
- On the eastern side of Hatfield Peverel, there is a noise barrier for a new housing development (ENB3). This noise barrier was identified as already being constructed during a site visit in May 2021 and barrier heights confirmed by examining the approved planning application documents. This noise barrier is 3.2m high for a length of approximately 80m along the front of the development closest to the A12. There is also a 100m section along the eastern side of the development, initially at 3.2m before dropping to 2m. These noise barriers would remain in place with the proposed scheme.

12.6.8 Along the route there are wooden fences in some locations, but these have not been included in the noise model as they are unlikely to be providing any noticeable reduction in noise.

- 12.6.9 The two residential and one business building identified for demolition in the construction assumptions have been removed from the Do-Something scenarios within the noise model and are not considered as sensitive receptors.
- 12.6.10 Within Rivenhall End to the north side of the existing A12 is The Fox Inn, which has the windows and doors boarded up. Although this is identified within the Ordnance Survey mapping dataset as being residential, it is assumed that it is unoccupied and is therefore not included as a sensitive receptor. However, the building has remained within the noise model since it provides screening for the receptors behind.
- 12.6.11 There are a number of residential dwellings that have been compulsorily purchased or that have successfully applied for blight as part of the proposed scheme. It is possible that some of these properties may be either demolished or be unoccupied when the proposed scheme opens. However, this is unknown and therefore it has been assumed that these would be occupied during construction and when the proposed scheme opens. This assumption is worst case but has the risk that mitigation may be provided for a receptor that could be demolished or unoccupied on proposed scheme opening.
- 12.6.12 The limits of deviation shown on the Works Plans [TR010060/APP/2.2] have been taken into account in the preparation of the Environmental Statement, and the potential impacts of a deviation within the permitted limits have therefore been assessed.

12.7 Study area

- 12.7.1 Instructions on how to set the study area for an assessment of noise and vibration are provided within DMRB LA 111 (Highways England, 2020b). The distances used for the study areas have been informed by professional judgement and correspond to the distance where it is considered that receptors could potentially be affected by noise or vibration.
- 12.7.2 For construction noise, potential impacts have been considered for receptors up to 300m from construction activity. For construction vibration, any receptors within 100m of an activity likely to generate a noticeable level of vibration have been considered. The construction traffic (i.e. traffic generated due to the construction of the proposed scheme, but excluding non-construction related traffic using a diversion route) study area is an area 50m from the kerb line of public roads with the potential for an increase in noise level of 1dB(A) or more as a result of the addition of construction traffic to existing traffic levels. The diversion route study area is defined to include a 25m width from the kerb line of the diversion route.
- 12.7.3 The study area for operational road traffic noise has been chosen as the area within 600m of new road links or road links physically changed or bypassed by the proposed scheme. In addition, any roads outside of this area where there is a change in the short term of more than 1.0dB(A) as a result of the proposed scheme have been considered, and on these links the receptors within 50m of the road have been included within the assessment.

- 12.7.4 In three areas the study area has been extended to include areas where there is a risk of likely significant effects. These are described in Section 12.9 of this chapter.

12.8 Baseline conditions

Baseline sources

- 12.8.1 The following sources have been used to inform the baseline:

- England Noise Map Viewer (Extrium, 2019)
- Baseline noise surveys undertaken in May 2021
- Site visit undertaken in May 2021

Baseline information

- 12.8.2 The existing noise climate near the proposed scheme is dominated by road traffic noise, predominantly from the A12. The Great Eastern Main Line is close to the alignment of the A12 in places. Rail noise would therefore contribute to the local noise climate in some locations. Other noise sources include road traffic noise from local roads and noise associated with urban and rural activities. Away from the A12, Great Eastern Main Line or urban areas, the noise climate is devoid of any dominant noise source and noise levels are around the LOAEL.
- 12.8.3 There are 18 NIAs along the A12 between junctions 19 and 25. In addition, there are three other NIAs on roads that are within the study area. There is one on the A130 adjacent to junction 19, one on the A120 adjacent to junction 25, and one between junctions 25 and 26 on the A12. These 21 NIAs are listed in Table 12.12 and shown on Figure 12.1 [TR010060/APP/6.2].

Table 12.12 NIAs within study area

NIA number	Road	Number of dwellings within NIA	Noise source asset owner	Noise receiving authority
6141	A12	364	National Highways	Chelmsford
5411	A12	39	National Highways	Chelmsford
5412	A12	13	National Highways	Chelmsford and Braintree
6191	A12	4	National Highways	Braintree
5413	A12	210	National Highways	Braintree
6192 ¹	A12	0	National Highways	Braintree
5414	A12	1	National Highways	Braintree
5415	A12	95	National Highways	Braintree
6144	A12	3	National Highways	Braintree

NIA number	Road	Number of dwellings within NIA	Noise source asset owner	Noise receiving authority
5419	A12	1	National Highways	Braintree
6145	A12	32	National Highways	Braintree
14874	A12	3	National Highways	Braintree
5416	A12	2	National Highways	Colchester
6142	A12	12	National Highways	Colchester
6143	A12	3	National Highways	Colchester
5417	A12	2	National Highways	Colchester
4759	A12	6	National Highways	Colchester
4760	A12	261	National Highways	Colchester
6173	A130	1	Essex	Chelmsford
4758	A120	80	National Highways	Colchester
4761	A12	1	National Highways	Colchester

¹ The group of approximately six dwellings that would have caused this location (NIA 6192) to be classed as an NIA have been demolished. These dwellings are not considered within the noise assessment, but the NIA is listed in this table since it is still included within National Highways datasets as an NIA.

- 12.8.4 A series of baseline noise surveys were undertaken in May 2021. These surveys were undertaken at 17 locations that are representative of individual or groups of sensitive receptors. The full details of the noise measurement surveys, including the rationale for the selection of each location, are provided in Appendix 12.3 of the Environmental Statement [TR010060/APP/6.3]. The noise survey locations are indicated in Figure 12.1 [TR010060/APP/6.2].

Future baseline

- 12.8.5 The Do-Minimum traffic scenario is representative of the predicted growth in traffic, accounting for local and regional development. Cumulative impacts are implicit in the future Do-Minimum and Do-Something scenarios because committed developments are included in the traffic model. The baseline condition for 2027 (i.e. the Do-Minimum opening year scenario) is shown on Figure 12.6 [TR010060/APP/6.2].
- 12.8.6 Traffic growth aside, the future noise baseline around the proposed scheme is likely to be similar to the existing baseline.
- 12.8.7 There are areas of housing development alongside the A12 and within the surrounding area, either currently being constructed or with planning approval to be constructed. Such developments have been included within the noise assessment and considered as sensitive receptors. A masterplan for development 16/02156/OUT was available and so all dwellings within the

development have been added into the noise model. For the rest of the developments listed in Table 12.13, a single calculation point has been manually added into the noise model to represent the assumed line of proposed dwellings closest to the A12. The noise calculations at these proposed development locations have then been included in the assessment for the respective number of proposed dwellings as indicated by the final column of Table 12.13. The developments considered are listed in Table 12.13.

Table 12.13 Proposed housing developments included within the noise assessment

Planning application reference	Location	Proposed number of dwellings
15/00799/OUT, Land at north-east Witham	Witham (east)	222
15/00430/OUT, Land adjacent to Lodge Farm	Witham (east)	750
17/00973/FUL, Land at Bury Lane	Hatfield Peverel (north-west)	50
19/01803/FUL, Bury Farm	Hatfield Peverel (north-west)	50
19/00494/REM, Arla Dairy, Station Road	Hatfield Peverel (north-west)	145
16/01813/OUT, Land south of Stonepath Drive	Hatfield Peverel (north-west)	140
14/01552/OUT, Land east of Plantation Road	Boreham (south-east)	145
09/01314/EIA, Greater Beaulieu Park	Chelmsford (north-east)	3,600*
16/02156/OUT	Land north-east of Gleneagles Way, Hatfield Peverel, Essex	120**
<p>* A large part of this development is a large distance from the A12. Therefore, only 200 dwellings have been assumed on a parcel of land that borders the A12 within the noise study area.</p> <p>** A masterplan for this development has been found within the online planning documents. Therefore, all of the 120 dwellings have been included in the assessment in their planned location.</p>		

- 12.8.8 Future climate change has the potential to alter the noise climate, as rainfall, temperature and wind are factors that can influence the generation or propagation of noise. However, none of these factors are used within the NNNPS (Department for Transport, 2014) stated calculation methodology for the prediction of road traffic noise (i.e. CRTN). In addition, the weather conditions are not considered within the assessment methodology contained within DMRB LA 111.

Value and sensitivity of receptors

- 12.8.9 DMRB LA 111 (Highways England, 2020b) does not provide a scale of value or sensitivity for receptors. A receptor is considered either to be sensitive or not sensitive to noise and/or vibration. With no scale of value, it is therefore not

possible for the noise and vibration assessment to use the matrix-based approach to determine likely significant effects. However, the value of a receptor has been taken into consideration as a factor when determining whether an effect is significant or not.

- 12.8.10 DMRB LA 111 provides examples of receptors that are potentially sensitive to noise and vibration. Those other than dwellings are referred to in this assessment as 'other sensitive receptors'. A summary of these is provided in Table 12.14. Figure 12.2 [TR010060/APP/6.2] shows the sensitive receptors within the noise study area. Also shown on Figure 12.2 are biodiversity areas and features that are sensitive to noise. The extent of these biodiversity areas is not limited to the study area for the noise assessment. The impact from noise and/or vibration on these receptors has been reported in Chapter 9: Biodiversity, of the Environmental Statement [TR010060/APP/6.1].

Table 12.14 Value of receptors in the study area for noise and vibration

Value and sensitivity	Description	Examples within the study area
Sensitive	Dwellings, hospitals, healthcare facilities, education facilities, community facilities, quiet areas or potential quiet areas as defined by the Environmental Noise Directive, international and national or statutorily designated sites, public rights of way, buildings containing vibration-sensitive equipment and cultural heritage assets.	<p>Dwellings within Boreham, Hatfield Peverel, Witham, Rivenhall End, Kelvedon, Feering, Gore Pitt, Pott's Green, Long Green and Marks Tey.</p> <p>Boreham Primary School, Hatfield Peverel Infant School, Gershwin Park Day Nursery Gershwin Park Day Nursery, Chipping Hill Primary School, Holy Family Roman Catholic Primary School, Howbridge Infants School, Rivenhall Church of England Primary School, Feering Church of England Primary School and Tadpoles Pre-School.</p> <p>Prested Hall grounds, Benton Hall Golf and Country Club.</p>

12.9 Potential impacts

- 12.9.1 In this section, the potential impacts from noise and vibration on the sensitive receptors during both construction and operation are described. For construction, this considers only adverse impacts since it is not possible for a construction activity to reduce the ambient noise level at a receptor. However, the presence of a reduced speed limit along the existing A12 during construction can cause a reduction in noise that is often noticeable to nearby residents when works are not taking place in the immediate vicinity.
- 12.9.2 For construction impacts, the main activities taking place that are likely to generate noise and/or vibration are described below for each of the main construction areas.

- 12.9.3 The main construction is expected to start in 2024 and finish in 2027. The peak year of construction activity is expected to be 2025.
- 12.9.4 For the potential impacts from the operation of the new road (i.e. when it is open for traffic), only noise is considered.

Construction

- 12.9.5 The assessment of airborne noise and ground borne vibration during construction has considered the impact of the following factors:
- The different construction activities and techniques
 - Plant and equipment to be used, including percentage on-times
 - Noise emissions from the specific plant
 - Distances from the nearest noise sensitive receptors
- 12.9.6 A detailed list of the construction activities and the plant and equipment assumed for the various construction activities is presented in Appendix 12.4 of the Environmental Statement [TR010060/APP/6.3].
- 12.9.7 Not included within the activities is the work associated with the satellite compounds, drop-off areas, deliveries to the main compounds, activities involving the installation of traffic management (except installation of vehicle restraints) or the smaller areas where traffic management equipment and recovery vehicles are located. These work areas and activities are considered to generate little in the way of noise or vibration.
- 12.9.8 There are no calculations associated with the sections of A12 proposed to be de-trunked, except where tie-ins are required.
- 12.9.9 Acoustic percentage on-times have been derived based on experience, given the definition of the term contained in BS 5228-1:2009+A1:2014 (British Standards Institution, 2014a). The acoustic on-time is the period of time that the equipment is working at full power or within 3dB of its maximum.
- 12.9.10 Standard working hours would be between 07:30 and 19:00 between Monday and Friday, and between 07:30 and 18:00 on Saturday. During the summer months, the working hours will extend to 07:00 to 21:00 to make use of the longer daylight hours.
- 12.9.11 Work undertaken outside standard working hours, as well as on bank holidays, is considered off-peak working. There are certain exceptions where night-time, weekend, or Bank Holiday working would be required. Night working hours would be 19:00 to 07:30 Monday to Friday and 18:00 to 07:00 on Saturdays. Sunday and Bank Holiday working hours would be 07:00 to 21:00 for daytime and 21:00 to 07:00 for night-time.
- 12.9.12 In addition, there would be an hour before and after these times for site set up and close down. This would include activities such as deliveries, movements to place of work, unloading, general preparation works, maintenance and safety checking of plant and machinery, and site clean-up, but would not involve operation of plant or machinery for construction works.

12.9.13 Forty-four receptors have been selected to represent all of the noise sensitive receptors in the study area, as described in paragraph 3.13 of DMRB LA 111 (Highways England, 2020b). These receptors are representative of those closest to the different construction activities that could be expected to be exposed to the highest levels of construction noise. The selected receptors are representative of others near them, which are listed in Appendix 12.4 [TR010060/APP/6.3]. Table 12.15 lists the location of each representative receptor, and these are shown on Figure 12.3 [TR010060/APP/6.2].

Table 12.15 Construction assessment locations

Receptor ID	Location	Receptor ID	Location	Receptor ID	Location
R1	Little Generals Main Road	R16	Natgragle, Hodges Holt	R32	Prested Hall
R2	Boreham – Fitzwalter Road	R17	44 Market Street	R33	Prested Hall Cottages
R3	Boreham – Main Road	R18	Little Braxted Mill	R34	Easthorpe Green
R4	Meadow Bank	R19	Burghey Brook Cottages	R35	Little Birch Holt Farm
R5	10 Swan Close	R20	Fair Rest Caravan Site	R36	Wishingwell Farm
R6	Crofton, Station Road	R21	15 Foxmead	R37	283 A12 London Road
R7	Bennett Way	R22	The Firs	R38	Doggetts
R8	22 Rookery Close	R23	Essex County Fire & Rescue	R39	Elders Garden
R9	Lawrence Court	R24	Hole Farm	R40	York Lodge
R10	Rock Cottages	R25	Davey House	R41	Marks Tey Hall
R11	Kingsford Cottage	R26	Ewell Hall	R42	121 London Road
R12	Latneys Kennels	R27	14 Lapwing Drive	R43	1 London Road
R13	Dengie Farmhouse	R28	Inworth Hall Lodge	R44	Millfields
R14	72 Baker Way	R29	Park Farm	R45	Boleyn Way
R15	132 Maltings Lane	R30	Belmont		

Note: Receptor ID R31 was initially assigned to a building that is now to be demolished and is therefore no longer included as a receptor.

- 12.9.14 The predicted construction noise during each construction activity in the different working areas is presented in full in Appendix 12.4 of the Environmental Statement [TR010060/APP/6.3]. These working areas have been selected to allow the assessment to be broken down into the areas where different construction activities are taking place. A summary of those construction activities predicted to lead to significant levels of construction noise are presented below. Table 12.16 provides a list of the working areas.

Table 12.16 Main construction working areas

Work area ID	Work area description
A	A12 junction 19
B	Boreham
C	Hatfield Peverel
D	New A12 junction 21
E	Witham bypass widening and new A12 junction 22
F	Rivenhall End
G	Kelvedon bypass widening and A12 junction 24
H	Offline between junction 24 and junction 25
I	Marks Tey
J	Compounds
K	Borrow pits

- 12.9.15 A summary of the working areas and construction activities, identifying the potential daytime construction impacts, is given in Table 12.17. The key is provided at the top of the table for clarity.

Table 12.17 Summary of daytime construction impacts

Key											
<ul style="list-style-type: none"> ● Predicted construction noise level above SOAEL ● Predicted construction noise level above LOAEL and below SOAEL ● Predicted construction noise level below LOAEL 											
Construction activity	Working area										
	A	B	C	D	E	F	G	H	I	J	K
De-vegetation	●	n/a	n/a	●	●	●	n/a	●	●	●	●
Culverts	●	n/a	●	●	●	●	●	●	●	n/a	n/a
Archaeological/ecology works	●	n/a	●	●	●	●	●	n/a	●	●	n/a

Key											
<ul style="list-style-type: none"> Predicted construction noise level above SOAEL Predicted construction noise level above LOAEL and below SOAEL Predicted construction noise level below LOAEL 											
Construction activity	Working area										
	A	B	C	D	E	F	G	H	I	J	K
Service diversion				n/a					n/a		n/a
Fencing		n/a									
Building demolition	n/a	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a
Earthworks		n/a	n/a								
Drainage		n/a									n/a
Surface planing	n/a	n/a				n/a				n/a	n/a
Road surfacing	n/a									n/a	n/a
Kerb laying		n/a								n/a	n/a
Bridge widening		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hydro-demolition	n/a	n/a	n/a	n/a		n/a		n/a	n/a	n/a	n/a
Parapet demolition	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Footbridge ¹ foundation		n/a	n/a	n/a			n/a			n/a	n/a
Footbridge piling		n/a	n/a	n/a			n/a			n/a	n/a
Footbridge erection		n/a	n/a	n/a			n/a			n/a	n/a
Structures demolition	n/a	n/a		n/a		n/a		n/a	n/a	n/a	n/a
Structures piling (sheet piling)		n/a								n/a	n/a
Structure Formwork Reinforcement and Concreting (FRC)		n/a								n/a	n/a
Structures backfill		n/a								n/a	n/a
Structure waterproofing		n/a			n/a	n/a	n/a		n/a	n/a	n/a
Barrier removal	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
Installation of noise barriers	n/a	n/a	n/a	n/a			n/a	n/a	n/a	n/a	n/a

Key											
<ul style="list-style-type: none"> Predicted construction noise level above SOAEL Predicted construction noise level above LOAEL and below SOAEL Predicted construction noise level below LOAEL 											
Construction activity	Working area										
	A	B	C	D	E	F	G	H	I	J	K
Lifting pre-fabricated structures		n/a	n/a	n/a	n/a	n/a	n/a		n/a	n/a	n/a
Central reserve	n/a	n/a	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a
Retaining walls piling	n/a	n/a		n/a		n/a		n/a		n/a	n/a
Retaining walls installation	n/a	n/a		n/a		n/a		n/a		n/a	n/a
Beam/parapet installation		n/a	n/a	n/a		n/a	n/a		n/a	n/a	n/a
Bridge joints/bearings		n/a				n/a			n/a	n/a	n/a
Gantry/light column foundations	n/a	n/a	n/a		n/a					n/a	n/a
Duct laying	n/a	n/a	n/a							n/a	n/a
Gantry construction	n/a	n/a	n/a							n/a	n/a
Lighting construction	n/a	n/a	n/a					n/a		n/a	n/a
Installation/removal of Vehicle Restraint System (VRS)		n/a								n/a	n/a
Removal of street furniture	n/a	n/a								n/a	n/a
Slipform of central reserve	n/a	n/a		n/a				n/a		n/a	n/a
Landscaping	n/a	n/a	n/a		n/a		n/a	n/a	n/a	n/a	n/a
Access road	n/a	n/a			n/a	n/a	n/a	n/a	n/a	n/a	n/a
Roundabout works	n/a	n/a	n/a	n/a	n/a	n/a	n/a		n/a	n/a	n/a
Compound construction	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a		n/a
Concrete batching plant	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		n/a
Traffic management compound	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a

Key											
<ul style="list-style-type: none"> ● Predicted construction noise level above SOAEL ● Predicted construction noise level above LOAEL and below SOAEL ● Predicted construction noise level below LOAEL 											
Construction activity	Working area										
	A	B	C	D	E	F	G	H	I	J	K
Asphalt plant (only at the J20b main compound)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		n/a
Surfacing	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		n/a
Borrow pit operation	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Material processing	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
De-watering (assuming the use of a generator)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
¹ The term 'footbridge' is used to describe bridges for walkers, cyclists and horse riders, as described in Chapter 2: The proposed scheme, of the Environmental Statement [TR010060/APP/6.1].											

12.9.16 Locations where the daytime SOAEL is predicted to be exceeded are possible likely significant effects. These are as follows:

- Receptor 1 during structures piling in the area of A12 junction 19 (Boreham)
- Receptor 45 during road surfacing in the area of Boreham
- Receptor 4 during structure waterproofing in the area of Hatfield Peverel
- Receptors 4 and 6 during structures demolition, also receptor 9 during structures piling and structure formwork reinforcement and concreting in the area of Hatfield Peverel
- Receptor 6 during structures backfill and installation of bridge joints in the area of Hatfield Peverel
- Receptor 10 during culverts, drainage, surface planing, road surfacing, structures piling and structure formwork reinforcement and concreting in the area of Hatfield Peverel
- Receptor 44 during structures demolition, structures piling and structures FRC in the area of Hatfield Peverel
- Receptor 13 during de-vegetation, fencing, earthworks, retaining walls piling and retaining walls installation in the area of the Witham bypass widening and new A12 junction 22 (Colemans interchange)

- Receptors 14, 17 and 19 during de-vegetation in the area of the Witham bypass widening and new A12 junction 22 (Colemans interchange)
- Receptor 16 during de-vegetation, culverts, duct laying, fencing, earthworks, drainage, hydro-demolition, surface planing, road surfacing and installation/removal of VRS in the area of the Witham bypass widening and new A12 junction 22
- Receptor 17 during fencing, surface planing, road surfacing and barrier removal in the area of the Witham bypass widening and new A12 junction 22
- Receptor 20 during de-vegetation, culverts, fencing, earthworks, drainage, road surfacing, installation of noise barriers and installation/removal of VRS at Rivenhall End
- Receptor 30 during road surfacing at Kelvedon bypass widening
- Receptors 34, 36 and 38 during earthworks in the area of offline section between junctions 24 and 25
- Receptor 40 during gantry/light column foundations, duct laying, earthworks, surface planing and road surfacing in the area of Marks Tey
- Receptor 42 during de-vegetation, culverts, gantry/light column foundations, duct laying, gantry construction, fencing, earthworks, drainage, surface planing, road surfacing, structures piling, structures FRC, installation/removal of VRS, removal of street furniture and slipform of central reserve in the area of Marks Tey
- Receptor 12 during de-vegetation, earthworks, borrow pit operation and material processing in the area of the borrow pits

12.9.17 A summary of the working areas and construction activities, identifying the potential impacts from night-time works, is given in Table 12.18.

Table 12.18 Summary of night-time construction impacts

Key											
<ul style="list-style-type: none"> • Predicted construction noise level above SOAEL • Predicted construction noise level above LOAEL and below SOAEL • Predicted construction noise level below LOAEL 											
Construction activity	Working area										
	A	B	C	D	E	F	G	H	I	J	K
De-vegetation		n/a		n/a		n/a		n/a		n/a	n/a
Access Track	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Key											
<ul style="list-style-type: none"> Predicted construction noise level above SOAEL Predicted construction noise level above LOAEL and below SOAEL Predicted construction noise level below LOAEL 											
Construction activity	Working area										
	A	B	C	D	E	F	G	H	I	J	K
Road stud removal	n/a	n/a								n/a	n/a
Surface planing		n/a			n/a	n/a	n/a	n/a		n/a	n/a
Road surfacing						n/a		n/a	n/a	n/a	n/a
Bridge widening		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Footbridge ¹ erection		n/a	n/a	n/a		n/a	n/a	n/a		n/a	n/a
Structures demolition	n/a	n/a		n/a		n/a		n/a	n/a	n/a	n/a
Structures piling (including temp sheet piling)		n/a			n/a					n/a	n/a
Structure FRC		n/a			n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lifting pre-fabricated structures		n/a			n/a	n/a	n/a		n/a	n/a	n/a
Central reserve hardening	n/a	n/a		n/a		n/a		n/a	n/a	n/a	n/a
Retaining walls installation/piling	n/a	n/a		n/a		n/a	n/a	n/a	n/a	n/a	n/a
Beam installation		n/a				n/a		n/a	n/a	n/a	n/a
Bridge joints/bearings		n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
Gantry construction/decommissioning	n/a	n/a	n/a			n/a		n/a	n/a	n/a	n/a
Hydro-demolition	n/a	n/a	n/a	n/a		n/a		n/a	n/a	n/a	n/a
Parapet installation		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Installation/removal of VRS		n/a								n/a	n/a
Removal of street furniture	n/a	n/a								n/a	n/a
Slipform of central reserve	n/a	n/a		n/a				n/a		n/a	n/a

Key

- Predicted construction noise level above SOAEL
- Predicted construction noise level above LOAEL and below SOAEL
- Predicted construction noise level below LOAEL

Construction activity	Working area										
	A	B	C	D	E	F	G	H	I	J	K
Concrete batching plant	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		n/a
Asphalt plant (compound J20)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		n/a

¹ The term 'footbridge' is used to describe bridges for walkers, cyclists and horse riders, as described in Chapter 2: The proposed scheme, of the Environmental Statement [TR010060/APP/6.1].

12.9.18 Locations where the night-time SOAEL is predicted to be exceeded are possible likely significant effects. These are as follows:

- Receptor 1 during de-vegetation, bridge widening (hydro-demolition), structures sheet piling, structures formwork reinforcing and concreting and parapet installation in the area of A12 junction 19 (Boreham interchange)
- Receptor 45 during road surfacing in the area of Boreham
- Receptors 4, 6, 8, 9, 10 and 44 during de-vegetation, surface planing, road surfacing and installation/removal of VRS in the area of Hatfield Peverel
- Receptors 4, 6, 9, 10 and 44 during structures piling, structures formworks reinforcement and concreting, lifting pre-fabricating structures, retaining walls installation and beam installation in the area of Hatfield Peverel
- Receptors 4, 6, 9 and 44 during slipform of central reserve in the area of Hatfield Peverel
- Receptor 5 during de-vegetation and installation/removal of VRS in the area of Hatfield Peverel
- Receptors 6 and 44 during central reserve hardening in the area of Hatfield Peverel
- Receptors 4, 6, 9 and 44 during removal of street furniture in the area of Hatfield Peverel
- Receptor 44 during structures demolition in the area of Hatfield Peverel
- Receptor 9 during installation/removal of VRS in the area of the new A12 junction 21 (Witham South interchange)
- Receptor 10 during surface planing and road surfacing in the area of the new A12 junction 21 (Witham South interchange)

- Receptor 13, 14, 16, 17 and 19 during de-vegetation in the area of the Witham bypass widening and new A12 junction 22 (Colemans interchange)
- Receptor 13 and 16 during road surfacing, central reserve hardening and installation/removal of VRS in the area of the Witham bypass widening and new A12 junction 22
- Receptors 13 and 17 during road stud removal and retaining walls piling in the area of the Witham bypass widening and new A12 junction 22
- Receptor 16 during road stud removal, bridge hydro-demolition, removal of street furniture, bridge bearing replacement and slipform of central reserve in the area of the Witham bypass widening and new A12 junction 22
- Receptor 19 during road surfacing, structures piling and central reserve hardening in the area of the Witham bypass widening and new A12 junction 22
- Receptors 19 and 20 during installation/removal of VRS in the area of Rivenhall End
- Receptor 20 during road stud removal, removal of street furniture and slipform central reserve in the area of Rivenhall End
- Receptors 25, 26, 28, 29 and 30 during de-vegetation in the area of Kelvedon bypass widening and A12 junction 24 (Kelvedon North interchange)
- Receptor 30 during road surfacing in the area of Kelvedon bypass widening and A12 junction 24
- Receptor 34 during structures piling at the offline section between junction 24 and 25.
- Receptor 38 during road stud removal at the offline section between junction 24 and 25.
- Receptors 38, 40 and 42 during road stud removal in the area of Marks Tey
- Receptors 38, 40 and 42 during de-vegetation in the area of Marks Tey
- Receptors 40 and 42 during surface planing, installation/removal of VRS, removal of street furniture and slipform of central reserve in the area of Marks Tey
- Receptor 42 during new footbridge erection in the area of Marks Tey
- Receptor 10 during use of the asphalt plant at compound J20b

Cadent gas main diversion

12.9.19 A summary of the potential construction impacts of the installation of the Cadent gas main diversion is given in Table 12.19. It is assumed for this assessment that works associated with this construction activity would occur only during the daytime. The selected receptors relate to the following:

- Cadent 1: The closest receptor along Pantile Close to the works
- Cadent 2: Blue Mills, Blue Mills Hill
- Cadent 3: Glen Acres, Ishams Chase

Table 12.19 Summary of daytime Cadent gas main diversion

Key		
<div><div></div> Predicted construction noise level above SOAEL</div> <div><div></div> Predicted construction noise level above LOAEL and below SOAEL</div> <div><div></div> Predicted construction noise level below LOAEL</div>		
Gas main receptor ID		
Cadent 1	Cadent 2	Cadent 3

12.9.20 None of the selected receptors are predicted to experience a noise level above the SOAEL, and so there are no possible likely significant adverse effects.

Construction vibration

12.9.21 A review of the proposed construction activities identified that there are three activities likely to generate levels of vibration with the potential to create vibration effects for receptors. These are as follows:

- Structures piling
- Retaining walls piling
- Vibratory compaction

12.9.22 Figure 12.3 [TR010060/APP/6.2] shows the indicative location of piling activities. This also includes the type of piles that are most likely to be used (i.e. concrete or sheet).

12.9.23 Equations are contained within BS 5228-2:2009+A1:2014 (British Standards Institution, 2014b) to predict the expected level of vibration from various activities. These have been used to predict the expected impact of vibration from piling and vibratory compaction activities.

12.9.24 It has been assumed that vibratory piling would be the main type of piling that is utilised when sheet piles are required, with hammer piling used to complete the operation. The calculations have been based on this assumption (i.e. a combination of vibratory and hammer piling).

- 12.9.25 Table 12.20 shows the number of sensitive receptors expected to experience the different magnitudes of vibration from piling and vibratory compaction. The calculations only consider those receptors within 100m of the activity and are based on a steady-state operation with a 50% probability of the predicted value being exceeded. The receptors noted within Table 12.20 refer to individual receptors and not the representative receptors referred to for the construction noise assessment.

Table 12.20 Vibration impacts

Magnitude	Number of sensitive receptors	
	Piling	Vibratory compaction
Negligible	0	27
Minor	0	6
Moderate	51	3
Major	2	0

- 12.9.26 A construction vibration magnitude of moderate or major is a likely significant effect.
- 12.9.27 For piling, the areas where there are predicted to be moderate or major impacts are listed below, together with the activity causing the impact:
- Premier Inn at junction 19 (retaining wall piling)
 - Receptors close to Bury Lane Bridge (BE06), Station Road Bridge (BE07) and Wellington Road Bridge (BE08) in Hatfield Peverel (retaining wall piling and structures piling)
 - Receptors closest to Olivers Bridge (BE10) on Hodges Holt, Benton Close and Pantile Close (retaining wall piling and structures piling)
 - Receptors at the north-east end of Market Lane (retaining wall piling)
 - Tugela and Belmont along Inworth Road (retaining wall piling)
 - Receptors on London Road around junction 25 in Marks Tey (retaining wall piling)
- 12.9.28 For vibratory compaction, the three sensitive receptors predicted to experience a moderate impact are as follows:
- 1 and 2 The Lodge (Easthorpe Green)
 - The recording studio at Wishingwell Farm
- 12.9.29 Vibratory compaction for structures backfilling is where vibration may be generated and there are no representative equations within BS 5228-2:2009+A1:2014 (British Standards Institution, 2014b) for this activity. It is

possible that this activity may generate levels of vibration that would cause Moderate or Major impacts. These impacts may occur at:

- Receptors close to Bury Lane Bridge (BE06), Station Road Bridge (BE07) and Wellington Road Bridge (BE08) in Hatfield Peverel (retaining wall piling and structures piling)
- Receptors closest to Olivers Bridge (BE10) on Hodges Holt, Benton Close and Pantile Close (retaining wall piling and structures piling)
- Receptors at the north-east end of Market Lane (retaining wall piling)

12.9.30 Vibration can also be generated on haul roads close to sensitive receptors, although this cannot be predicted from equations within BS 5228-2:2009+A1:2014 (British Standards Institution, 2014b). Mitigation measures to control the generation of vibration are listed in Section 12.10 and contained within the Noise and Vibration Management Plan in the first iteration of the EMP [TR010060/APP/6.5].

Construction traffic and diversion routes

- 12.9.31 The impact from construction traffic on the A12 and the local road network has been examined to determine whether this could affect sensitive receptors. This has been undertaken for the peak construction year of 2025 as this represents the worst-case situation. The amount of construction traffic compared to the existing traffic on the majority of the roads is low, and any increases in noise would be negligible. There are a few roads where the increase in construction traffic would cause a minor impact (1 to 3dB(A)).
- 12.9.32 Within Hatfield Peverel, during the closure of Station Road bridge the local traffic would need to use a route through the new estates of Hatfield Grove and Bury Farm and then onto Bury Lane. The traffic through these estates is expected to more than double and therefore there would be an increase in noise of more than 3dB(A) which would be a moderate or major impact at sensitive receptors along the route through the estates.
- 12.9.33 During the closure of the Bury Lane bridge in Hatfield Peverel, the local traffic would also need to use the route through the new estates of Hatfield Grove and Bury Farm. The diverted traffic is expected to be less than when Station Road is closed but could still generate an increase in noise of more than 3dB(A) which would be a moderate or major impact at sensitive receptors along the route through the estates.
- 12.9.34 The noise from the use of haul roads has not been included within the construction calculations since it is considered to have negligible impact. This is because the haul roads are either located alongside the A12 where the noise level is already high, or they are located away from receptors.
- 12.9.35 During certain construction activities (e.g. bridge demolition), it would be necessary to implement a full closure of the A12. The planned diversion route for the proposed scheme would be along the existing strategic diversion route, which starts at junction 19, then along the A130 and A131 to Braintree, followed by the A120 to junction 25. This diversion route would be the same for both directions of the A12. There are 266 noise sensitive receptors within 25m of this

planned diversion route that may experience a temporary increase in road traffic noise during the period of any diversions.

- 12.9.36 The instruction within DMRB LA 111 (Highways England, 2020b) states that the use of any diversion route would be considered a significant construction noise impact of major magnitude at night (23:00 to 07:00) and would be a significant effect if these occur for 10 or more nights in any consecutive 15 nights, or a total of more than 40 nights in any consecutive six-month period.

Operation

- 12.9.37 The level of road traffic noise affecting any receptor is dependent on several variables, all of which are accounted for within the road traffic noise prediction methodology. In summary, these are as follows:
- Traffic related factors: volume, speed and composition of vehicles
 - Road related factors: surface (e.g. concrete, bituminous) and gradient
 - Propagation factors: distance, the presence of screening and type of ground cover intervening between the road and any receptor
 - Receptor specific factors: view of the road and reflections (for example from large buildings)
- 12.9.38 The proposed scheme would result in changes if some or all of these factors alter, either through changes on or to an existing road, or with the introduction of a new section of road. As a result, noise levels are also likely to change. Individually these variables might cause noise levels to increase or decrease for any receptor. Given the proximity of sensitive receptors to the proposed scheme, it is likely that some sensitive receptors would experience adverse impacts. This section describes the potential impacts along the route. The noise predictions include embedded and standard mitigation, but not additional mitigation.
- 12.9.39 In three areas, the study area of 600m around new road links or road links physically changed or bypassed by the proposed scheme has been changed to ensure that likely significant effects are included. These are along Braxted Road to the south of the A12, the route from Inworth Road to the B1022 (via Kelvedon Road, through Messing and then Harborough Road), and along Inworth Road on the approach to Tiptree.
- 12.9.40 Noise contour plots for the Do-Minimum and Do-Something scenarios in the opening year of 2027 are shown, respectively, on Figures 12.6 and 12.7 [TR010060/APP/6.2]. The change between Do-Minimum and Do-Something scenarios in the opening year of 2027 is shown on Figure 12.8 [TR010060/APP/6.2].

Junction 19 (Boreham interchange) to junction 20a (Hatfield Peverel South interchange), including Boreham

- 12.9.41 Increases in traffic volume and speed on the A12 may result in increases in road traffic noise at the closest sensitive receptors to the A12. These increases are predicted to be minor with some noise levels being above the SOAEL.

12.9.42 Along Main Road within Boreham, there would be a minor increase in noise due to an increase in traffic volume along Main Road. Some of the sensitive receptors that front onto Main Road are predicted to have noise levels above the SOAEL with the proposed scheme in place.

12.9.43 For the remainder of Boreham, there would be a negligible change in noise.

Junction 20a (Hatfield Peverel South interchange) to junction 21 (Witham South interchange), including Hatfield Peverel

12.9.44 Due to a combination of the road widening, which would bring the noise source closer to some receptors, and small increases in traffic volume and speed, there would be a minor increase in noise for those sensitive receptors alongside the A12 through Hatfield Peverel. The sensitive receptors closest to the A12 would be above the SOAEL.

12.9.45 Along The Street through Hatfield Peverel, there would be negligible and minor decreases in noise. This is due to a reduction in traffic volume along The Street. At the far eastern end of The Street, there would be moderate decreases in noise due to the closure of the slip road off the A12 at junction 20b (Hatfield Peverel North interchange).

12.9.46 For the remainder of Hatfield Peverel, there would be a negligible change in noise.

Junction 21 (Witham South interchange) to junction 22 (Colemans interchange), including Witham

12.9.47 Changes in alignment of the A12 through this section, together with changes in traffic volume and speed on the A12, are predicted to result in minor increases in noise. Some of these sensitive receptors, especially around Olivers Drive, Halfacres, Ashby Drive, Hodges Holt, Benton Close and Maldon Road, are predicted to be above the SOAEL.

12.9.48 At three sensitive receptors around the existing junction 21, there would be a minor increase at night where the predicted absolute noise level is above the SOAEL. These receptors are the dwellings at Latneys Kennels, Cattery and Grooming Parlour; Mayfield Cottage; and 22 Collar Way.

Junction 22 (Colemans interchange) to junction 23 (Kelvedon South interchange), including Rivenhall End

12.9.49 Due to realignment of the A12 and changes in traffic volume and speed, both increases and decreases in road traffic noise are predicted through this section. In some locations, there would be increases on one side and decreases on the other side of receptors.

12.9.50 Around the existing junction 22, there would be major decreases in noise at four dwellings due to the realignment of the A12.

12.9.51 Within Rivenhall End, sensitive receptors on the northern side of the existing A12 are expected to experience a major decrease in noise. Those on the southern side of the existing A12 (e.g. The Drive) would experience a major decrease on the front façade of the building and a major increase in noise on the rear.

12.9.52 Within the Fair Rest Caravan Site, there would be moderate or major increases and decreases in noise at the four identified sensitive receptors, with two of these being above the SOAEL. The increases in noise would be due to the route of the A12 moving closer, while the decreases in noise would be caused by the closure of the section of Braxted Road that passes alongside the Fair Rest Caravan Site.

12.9.53 The nearby dwellings of Rose Cottage and Garden Cottage are also predicted to experience moderate increases in noise.

Junction 23 (Kelvedon South interchange) to junction 24 (Kelvedon North interchange), including Kelvedon

12.9.54 With the resurfacing of the existing section of concrete road on the A12, there would generally be moderate and major decreases in noise for receptors along this section of the proposed scheme, including the south-eastern edges of Kelvedon.

12.9.55 Along Braxted Road to the south of the A12, there are four sensitive receptors (Ashman's Farm, Greenleaves, Brickhouse Barn and Kelvedon Lodge) that are predicted to experience a moderate increase in noise. This increase is due to a predicted doubling of traffic volume along this road.

12.9.56 Around the proposed new junction 24, minor and moderate decreases in noise are predicted. Along Inworth Road, minor increases in noise are predicted due to an increase in traffic. At four of the sensitive receptors (The Laurels, Thatch Cottage, and 1 and 2 Happy Gardens), the absolute noise level would be above the SOAEL.

12.9.57 Along the Kelvedon Road on the approach to Tiptree there are four dwellings where there is a minor increase in noise due to an increase in traffic volume and where the absolute noise level is above the SOAEL.

12.9.58 Along the route from Inworth Road to the B1022 (via Kelvedon Road, through Messing and then Harborough Road) there are receptors that are predicted to experience moderate or major increases in noise. This increase in noise is due to the predicted increase in traffic volume along this route.

12.9.59 To the west of Tiptree along Grange Road there are 12 dwellings where a moderate decrease in noise is predicted due to reduction in traffic volume.

Junction 24 (Kelvedon North interchange) to junction 25 (Marks Tey interchange), including Marks Tey

12.9.60 Around the existing junction 24, there would be between minor and major decreases in noise. This would be due to a combination of the resurfacing of the existing section of concrete road and the realignment of the A12. These decreases in noise would be experienced by sensitive receptors on the eastern side of Kelvedon and within Feering.

12.9.61 The proposed realignment of the A12 and changes in traffic volume and speed would result in both increases and decreases in road traffic noise through this section of the proposed scheme. There would be major decreases in noise for sensitive receptors currently alongside the A12.

- 12.9.62 For the sensitive receptors at Easthorpe Green (1 and 2 The Lodge, Easthorpe Green Farm, Church View), there would be a moderate increase in noise. This increase in noise would be caused by the alignment of the A12 moving closer to the sensitive receptors. At 1 and 2 The Lodge, the absolute noise level would be above the SOAEL.
- 12.9.63 At Wishingwell Farm, there would be a major increase in noise at both the dwelling and the recording studio, and this would be caused by the alignment of the A12 moving closer to these sensitive receptors.
- 12.9.64 For the two sensitive receptors on Doggetts Lane (Hammer Farm and Doggetts), there would be a major increase in noise caused by the realignment of the A12. At Doggetts, the predicted noise level is above the SOAEL.
- 12.9.65 Along the existing A12 on the northbound approach to Marks Tey, there would be a major decrease in noise. Along London Road within Marks Tey, there would be a minor increase in noise caused by an increase in traffic on this road. At 10 of these sensitive receptors, the absolute noise level would be above the SOAEL. At Hall Chase Farm House there would also be a minor increase in noise with the absolute noise level above the SOAEL.

Short-term traffic noise impacts

- 12.9.66 The predicted changes in road traffic noise upon proposed scheme opening in 2027 are presented in Table 12.21. The results include embedded and standard mitigation, but not any additional mitigation measures considered. The long-term changes are shown in Table 12.22. In both tables, the number of night-time other sensitive receptors is lower than the daytime total as for some of these (e.g. schools, places of worship) it is assumed there would be no human receptors within them at night.

Table 12.21 Operational unmitigated road traffic noise summary short-term change

		Daytime		Night-time	
		Number of dwellings	Number of other sensitive receptors	Number of dwellings	Number of other sensitive receptors
Increase in noise level dB $L_{A10,18h} / L_{night}$	<1.0	3,209	26	3,480	2
	1.0-2.9	6,146	40	5,627	4
	3-4.9	67	1	35	1
	>5	66	7	47	1
No change	0	328	1	792	0
Decrease in noise level dB $L_{A10,18h} / L_{night}$	<1.0	1,866	17	1,788	1
	1.0-2.9	400	11	386	2
	3-4.9	553	12	497	3
	>5	129	3	112	1

12.9.67 Table 12.21 indicates there are more dwellings and other sensitive receptors predicted to experience an increase than a decrease in noise in the absence of additional mitigation. However, there is a greater number of receptors in the group predicted to experience a moderate or major decrease in noise than a moderate or major increase.

Table 12.22 Operational unmitigated road traffic noise summary long-term change

		Daytime		Night-time	
		Number of dwellings	Number of other sensitive receptors	Number of dwellings	Number of other sensitive receptors
Increase in noise level dB $L_{A10,18h} / L_{night}$	<3.0	9,861	69	9,479	7
	3.0-4.9	144	1	52	0
	5-9.9	69	6	48	2
	>10	2	1	2	0
No change	0	419	5	254	0
Decrease in noise level dB $L_{A10,18h} / L_{night}$	<3.0	1,733	28	2,400	2
	3.0-4.9	428	5	421	3
	5-9.9	91	2	83	1
	>10	17	1	25	0

12.9.68 Table 12.22 indicates there are more dwellings and other sensitive receptors predicted to experience an increase than a decrease in noise in the absence of additional mitigation. There are 71 dwellings and seven other sensitive receptors predicted to experience an increase in noise of over 5dB(A). For those predicted to experience a decrease in noise of more than 5dB(A), the figures are 108 for dwellings and three for other sensitive receptors.

12.10 Design, mitigation and enhancement measures

12.10.1 When considering noise mitigation, the principle of source–path–receptor has been applied. This is a principle where noise mitigation is first considered at source as this is more than often the most practical and cost-effective solution, and it would also provide a reduction in noise to all the surrounding receptors. Examples of mitigation at source are:

- changes to the vertical or horizontal alignment of the road
- low noise road surfacing
- speed limits
- restrictions on noisy vehicle types

- 12.10.2 DMRB LA 111 (Highways England, 2020b) notes that, for operational mitigation, speed limits or restrictions on noisy vehicle types are not normally practical for use on motorways and all-purpose trunk roads, as they can encourage drivers to take alternative routes which can be less safe and result in higher noise levels for populations along the alternative routes.
- 12.10.3 The reduction of noise between the source and receptor is considered next as, after controlling noise at source, a reduction in the path would benefit the greatest number of receptors. A reduction in noise in the path is most likely to be achieved by placing a solid structure between the source and receptor, such as a purpose-built noise barrier. However, the use of a solid barrier would only protect receptors within around 200m of the barrier. Examples of mitigation in the path are:
- purpose-built noise barriers
 - bunds or earth embankments
- 12.10.4 The mitigation of noise at the receptor in the form of noise insulation of buildings is the last resort in terms of noise mitigation and is included here only to demonstrate the hierarchy of noise mitigation. Noise insulation is the last form of mitigation because it would only be of benefit to the individual receptor. In addition, providing insulation in terms of improved glazing would be ineffective if the windows of a property are open or if the individuals are outside.

Embedded (design) mitigation

- 12.10.5 The environment team has worked in close collaboration with the infrastructure design team to avoid or reduce environmental impacts through the proposed scheme design. This is referred to as embedded (or design) mitigation. Chapter 3: Assessment of alternatives, of the Environmental Statement [TR010060/APP/6.1], details the design alternatives that have been considered, including the environmental factors which have influenced the decision making.
- 12.10.6 Embedded noise mitigation relevant to this aspect includes the following:
- The alignment of the proposed scheme in some locations has reduced the impact from noise, as follows:
 - Taking the new alignment of the A12 to the south of Rivenhall End has reduced the impact from noise for sensitive receptors to the north of the existing A12 alignment.
 - The new A12 alignment moving to the south of the existing A12 between junctions 24 and 25 has reduced the noise for a large part of the eastern side of Kelvedon and also for all of Feering. In addition, many of the individual receptors along the existing A12 alignment and on the approach to Marks Tey would experience a reduction in noise.
 - Earth bunding to reduce noise levels. Earth bunds have been included within the design near to the alignment of the new offline sections of the A12 at the following locations:
 - For the four dwellings on The Drive, Rivenhall End

- Dwellings (e.g. Heathfield, Prested Hall Cottages) to the east of junction 24, to the south of the A12
- Dwellings on Easthorpe Green, south of the A12 between junctions 24 and 25
- Little Domsey Cottages, south of the A12 between junctions 24 and 25
- Dwellings on Doggetts Lane, to the south of the A12 between junctions 24 and 25
- Hall Chase Farm House, Hall Chase, to the south of the A12 at Marks Tey

12.10.7 All of the earth bunds listed are proposed to be 4m in height.

12.10.8 The decision on whether to include bunding within the design or to include space for a potential noise barrier was based on the likely effectiveness of the measure, engineering constraints and the visual impact. Earth bunds have been considered as the preference since these make use of excess spoil and provide space for planting, which when mature can provide additional visual screening.

12.10.9 There are some earth bunds along the proposed scheme that are required for visual mitigation but would also provide some reduction in noise.

12.10.10 Low noise surfacing would be provided as standard on the new offline sections of the route and any part of the existing route that is to be resurfaced. This excludes the sections where a road surface with better noise reducing properties than a conventional low noise surface is to be used. These areas are described within the additional mitigation sub-section below.

Standard mitigation

12.10.11 Standard mitigation would occur as a matter of course due to legislative requirements or standard sector practices, and these measures are included within the first iteration of the EMP [TR010060/APP/6.5]. Some examples of standard mitigation for this aspect include the following:

- Where practicable, the use of Best Practicable Means (BPM) during construction. This is standard sector practice in accordance with BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (British Standards Institution, 2014a) and BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (British Standards Institution, 2014b), as outlined within the noise management plan in the first iteration of the EMP.
- Standard working hours would be between 07:30 and 19:00 between Monday and Friday, and between 07:30 and 18:00 on Saturday. During the summer months, the working hours would extend to 07:00 to 21:00 to make use of the longer daylight hours.

- Work undertaken outside of standard working hours, as well as on bank holidays, is considered off-peak working. There are certain exceptions where night-time, weekend, or Bank Holiday working would be required. Night working hours would be 19:00 to 07:30 Monday to Friday, and 18:00 to 07:00 on Saturday. Sunday and Bank Holiday working hours would be 07:00 to 21:00 for daytime and 21:00 to 07:00 for night-time.
- Where concrete and asphalt batching plants are used within the junction 20b main compound, these would be placed as far from sensitive receptors as practicable.
- Where practicable, concrete batching plant, offices and welfare facilities would be strategically placed towards the north of the junction 22 main compound.
- Environmental constraints and the sensitivity of the receiving environment have been considered when siting and designing the proposed borrow pits. Borrow pits have been located to avoid densely populated areas. Where isolated properties are in close proximity to the borrow pits, a seeded bund would be installed around the pit perimeter to provide noise and visual mitigation.
- Alternative methods of piling to vibratory and hammer piling would be investigated during detailed design.
- To limit potential building damage or disturbance to residents, the use of compaction techniques other than vibratory compaction will be investigated for use when within 10m of buildings.
- Where haul roads pass within 100m of a sensitive receptor they would be kept as smooth as practicable, and a reduced speed limit would be considered if complaints are received about vibration.
- Stakeholder liaison is an activity that has been ongoing and will continue leading up to and during construction.
- Implement a framework to determine eligibility for noise insulation and temporary re-housing, where not practicable to mitigate airborne noise or reduce exposure to levels that are tolerable during certain intensive construction phases. This would include the noise limits used for determining eligibility and the frequency of such assessments.

12.10.12 Standard mitigation is included in the Register of Environmental Actions and Commitments (REAC), within the first iteration of the EMP [TR010060/APP/6.5] which forms part of the DCO submission (refer to Chapter 5: Environmental assessment methodology, of the Environmental Statement [TR010060/APP/6.1]).

Additional mitigation

- 12.10.13 For operation, there are two forms of additional mitigation for noise used throughout the proposed scheme. These are noise barriers and the provision of a road surface with better noise reducing properties than a conventional low noise surface.
- 12.10.14 Noise barriers are proposed at the following locations. All of these are proposed to either remove or reduce the identified likely significant adverse effects. These are identified by a unique reference starting with Proposed Noise Barrier (PNB) and are shown on Figure 12.4 [TR010060/APP/6.2]:
- A portion of the proposed 4m high bund at Doggetts Lane would require a section of noise barrier to maintain the height at 4m (PNB1).
 - A 4m high reflective noise barrier of 245m in length would be installed alongside Wishingwell Farm (PNB2).
 - At Easthorpe Green, a length of reflective noise barrier would be installed to provide a 4m high screen (PNB3). This would be approximately 185m long and would vary in height depending upon the height of the earthworks of the Wishingwell Overbridge (BN14).
 - A 3m high absorptive noise barrier of around 175m in length would be installed alongside the Fair Rest Caravan Site (PNB4).
 - At Witham, a 2m high absorptive noise barrier of approximately 115m in length would be installed for the sensitive receptors on Pantile Close (PNB5).
 - At Witham, a 2m high absorptive noise barrier of approximately 105m in length would be installed for the sensitive receptors on the western side of Maldon Road (PNB6).
 - At Witham, a 2m high absorptive noise barrier of approximately 110m in length would be installed for the sensitive receptors on Hodges Holt (PNB7).
- 12.10.15 The requirement for noise barriers in specified locations is secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5].
- 12.10.16 Some sections of the proposed scheme would be surfaced with better noise reducing properties than a conventional low noise surface. This surface would have a Road Surface Influence (RSI) of -6.5dB(A) or less. The RSI of a conventional low noise surface is -3.5dB(A). A Highway Authorities Product Approval Scheme (HAPAS) certificate will be required from the supplier to demonstrate that performance of each type of low noise surfacing meets the design specification as described in the REAC, included within the first iteration EMP [TR010060/APP/6.5]. Subsequent resurfacing of these sections of the A12 would be undertaken with a surface meeting the same or better RSI as described in the REAC, included within the first iteration EMP.

- 12.10.17 All of these sections of surfacing are proposed to either remove or reduce likely significant adverse effects. These sections are identified by a unique reference starting with Additional Mitigation Surfacing (AMS) and are shown on Figure 12.4 [TR010060/APP/6.2]:
- Between junction 19 and the existing junction 20a on the southbound carriageway (AMS1).
 - On the A12 through Hatfield Peverel from junction 20a to junction 20b on both carriageways (AMS2).
 - From just north of the proposed new junction 21 to the existing junction 23, to the south of Kelvedon, on both carriageways (AMS3). Where the new alignment of the A12 is offline, the surfacing would be applied to that section and not the existing A12 that would be de-trunked.
 - On the offline section of the new alignment from just west of Easthorpe Green to where the offline section re-joins the existing A12 at Marks Tey at junction 25 (AMS4).
- 12.10.18 The sections of surfacing with better noise reducing properties than a conventional low noise surface are secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5].
- 12.10.19 At some locations where mitigation is required, further reductions in noise through the use of noise barriers has been considered and subsequently ruled out in favour of using the surface with better noise reducing properties than a conventional low noise surface. These are described below, together with a reference to the section of surfacing that is being proposed:
- Alongside the A12 in Boreham, noise barriers have been ruled out because installing them would likely create adverse environmental effects for other aspects (landscape and visual and biodiversity) by removing large amounts of vegetation. The removal of vegetation and installation of noise barriers would also likely be perceived as a worsening of the current situation. AMS1 has been proposed in this location.
 - Alongside the A12 in Hatfield Peverel, a noise barrier on the southern side was considered at PEIR. During further design, this barrier, and the possibility of a noise barrier on the northern side of the A12, were ruled out due to engineering constraints. AMS2 has been proposed in this location.
 - Around the Witham bypass, a further reduction in noise has been ruled out as installing noise barriers would likely create adverse environmental effects for other aspects (landscape and visual and biodiversity) by removing large amounts of vegetation. In addition, the majority of receptors are at least 100m away from the A12, and at this distance there is little reduction in noise achieved by a noise barrier. AMS3 has been proposed in this location.

Enhancement

- 12.10.20 No enhancements over and above the proposed mitigation measures have been proposed. However, the widespread provision of a surface with better noise reducing properties than a conventional low noise surface as an additional mitigation measure would reduce the noise at source, lowering the noise for all affected receptors and not just those for whom the mitigation has been provided.

12.11 Assessment of likely significant effects

- 12.11.1 This section provides a receptor-based assessment of the significance of effect, following the application of additional mitigation. This focuses on effects which have the potential to be significant.

Construction

Construction noise

- 12.11.2 In Section 12.9 of this chapter, activities were identified where the SOAEL is reached (i.e. moderate or major impacts) and therefore could be likely significant effects. These activities have now been considered against the temporal thresholds given in DMRB LA 111 (Highways England, 2020b) to determine if there are likely significant effects. Instances of where this may occur are shown in Tables 12.23 to 12.30. As is defined earlier within the chapter, the temporal durations are:
- 10 or more days or nights in any 15 consecutive days or nights
 - a total number of days exceeding 40 in any six consecutive months
- 12.11.3 The predicted noise level at the representative receptor is also reported in each table.
- 12.11.4 While the duration of some activities is longer than the temporal scope thresholds, because the activity is transient the temporal threshold may not be met at an individual receptor. For example, the activity of surfacing would last for many weeks over the whole proposed scheme, but since it is a moving activity, it would not be close to any individual receptor for long enough to meet the temporal thresholds.

Table 12.23 Summary of construction significant effects at receptors near A12 junction 19 (Boreham interchange)

Activity	Time of works	Predicted $L_{Aeq,T}$ dB at receptor IDs
		(R1) Little Generals Main Road
Structures FRC	Night-time	57

- 12.11.5 The night-time SOAEL is predicted to be exceeded at receptor 1 (Little Generals Main Road), which is representative of the Boreham Premier Inn and Grange public house.

Table 12.24 Summary of construction significant effects at receptors near Hatfield Peverel

Activity	Time of works	Predicted $L_{Aeq,T}$ dB at receptor IDs				
		(R4) Meadow Bank	(R6) Crofton, Station Road	(R9) Lawrence Court	(R10) The Vineyards	(R44) Millfields
Structures demolition (BE05)	Daytime	70	72	n/a	n/a	69
Structures demolition	Night-time	n/a	n/a	n/a	n/a	60
Structures piling (sheet piling)	Day and night-time	82	72	70	66	n/a
Structure FRC	Daytime	82	73	71	67	62

- 12.11.6 During structures demolition, the daytime SOAEL is exceeded at receptor 4 (Meadow Bank) which is representative of receptors near Bury Lane Bridge, and receptor 6 (Crofton, Station Road) which is representative of receptors near Station Road Bridge. At receptor 44 (Millfields), which is representative of those near the River Ter to the west of Hatfield Peverel, the daytime and night-time SOAEL is exceeded.
- 12.11.7 Structures piling is planned to operate during day and night-time hours, when the SOAELs are predicted to be exceeded at receptors 4 (Meadow Bank), 6 (Crofton, Station Road), 9 (Lawrence Court), 10 (The Vineyards) and 44 (Millfields). These are representative of receptors near Bury Lane Bridge, Station Road and Wellington Road Bridge in Hatfield Peverel, The Vineyards and those near the River Ter to the west of Hatfield Peverel.
- 12.11.8 Structures formwork reinforcement and concreting would only occur during daytime hours when the SOAEL is predicted to be exceeded at receptors 4 (Meadow Bank), 6 (Crofton, Station Road), 9 (Lawrence Court), 10 (The Vineyards) and 44 (Millfields). These are representative of receptors near Bury Lane Bridge, Station Road and Wellington Road Bridge in Hatfield Peverel, The Vineyards and those near the River Ter to the west of Hatfield Peverel.

Table 12.25 Summary of construction significant effects at receptors near the Witham bypass widening, including the new A12 junction 22

Activity	Time of works	Predicted $L_{Aeq,T}$ dB at receptor IDs		
		(R16) Natgragle Hodges	(R17) 44 Market Street	(R19) Burghey Brook Cottages
Hydro-demolition of Olivers Bridge (BE10)	Night-time	69	n/a	n/a
Structure demolition Colemans Bridge (BE14)	Night-time	n/a	n/a	62
Retaining walls piling	Night-time	n/a	69	n/a

12.11.9 During the hydro-demolition of Olivers Bridge, the night-time SOAEL is predicted to be exceeded at receptor 16 (Natgragle Hodges) which is representative of receptors closest to Olivers Bridge (Maldon Road underbridge), including Pantile Close, Hodges Holt and Benton Close.

12.11.10 During the structure demolition of Colemans Bridge, the night-time SOAEL is predicted to be exceeded at receptor 19 (Burghey Brook Cottages).

12.11.11 During retaining walls piling the night-time SOAEL is predicted to be exceeded at receptor 17 (44 Market Street), which is also representative of receptors along Market Lane facing the A12.

Table 12.26 Summary of construction significant effects at receptors near Rivenhall End

Activity	Time of works	Predicted $L_{Aeq,T}$ dB at receptor IDs
		(R20) Fair Rest Caravan Site
Earthworks	Daytime	75

12.11.12 The daytime SOAEL is predicted to be exceeded at receptor 20 (Fair Rest Caravan Site) during earthworks, which is also representative of The Cottage and Rose Cottage.

Table 12.27 Summary of construction significant effects at receptors near offline section between junction 24 and junction 25

Activity	Time of works	Predicted $L_{Aeq,T}$ dB at receptor IDs		
		(R34) Easthorpe Green	(R36) Wishingwell Farm	(R38) Doggetts
Earthworks	Daytime	65	71	76

12.11.13 The daytime SOAEL is predicted to be met at receptor 34 (Easthorpe Green) during earthworks, which is also representative of 1 and 2 The Lodge.

12.11.14 The daytime SOAEL is predicted to be exceeded at receptor 36 (Wishingwell Farm) and receptor 38 (Doggetts) during earthworks.

Table 12.28 Summary of construction significant effects at receptors near Marks Tey

Activity	Time of works	Predicted $L_{Aeq,T}$ dB at receptor IDs
		(R42) 121 London Road
Structures piling (sheet piling)	Night-time	61

12.11.15 The night-time SOAEL is predicted to be exceeded during structures piling at receptor 42 (121 London Road) which is also representative of receptors along London Road near the existing junction 25.

Table 12.29 Summary of construction significant effects at receptors near the main construction compound

Activity	Time of works	Predicted $L_{Aeq,T}$ dB at receptor IDs
		(R10) The Vineyards
Compound construction (buildings)	Daytime	65

12.11.16 The daytime SOAEL is predicted to be met at receptor 10 (The Vineyards) during the construction of the buildings at the main compound.

Table 12.30 Summary of construction significant effects at receptors near the borrow pits

Activity	Time of works	Predicted $L_{Aeq,T}$ dB at receptor IDs
		(R12) Latneys Kennels
Earthworks	Daytime	66
Borrow pit operation	Daytime	73
Material processing	Daytime	66

12.11.17 The daytime SOAEL is predicted to be exceeded during the activities of earthworks, operation and material processing in the area of borrow pit F at receptor 12 (Latneys Kennels).

12.11.18 Within the remaining works areas (i.e. Boreham, new A12 junction 21, Kelvedon bypass widening and A12 junction 24), there is predicted to be no significant adverse effects.

12.11.19 The Noise and Vibration Management Plan, included within the first iteration of the EMP [TR010060/APP/6.5], contains control measures to reduce the levels of noise and vibration from the works. If the likely significant adverse effects cannot be removed through control measures within the EMP, then an assessment will be undertaken to determine if any dwellings are eligible for noise insulation or the residents eligible for temporary re-housing. An

assessment to determine eligibility cannot be undertaken at this stage of the proposed scheme development as it requires detailed information on programme that is not available until closer to the start of construction of these works.

Construction vibration

- 12.11.20 Potential significant effects where calculations can be undertaken have been identified at 54 dwellings and two other sensitive receptors. These have been identified from the use of vibratory piling for retaining walls, structures piling and vibratory compaction. However, the effects would not be significant as these exceedances of the SOAEL are likely to only be for approximately one week while the equipment passes by the closest point to each receptor, and hence the temporal threshold would not be met. However, the predicted levels of vibration are still high and should be reduced where practicable. A commitment to examine measures to limit the magnitude of vibration is in the REAC, which is within the first iteration of the EMP [TR010060/APP/6.5].
- 12.11.21 The use of vibratory compaction for structures backfilling is an activity that may remain in one location for above the temporal thresholds and therefore could cause a significant adverse effect at dwellings nearby to these works. A commitment to examine measures to minimise vibration is in the REAC, which is within the first iteration of the EMP [TR010060/APP/6.5].

Diversion routes

- 12.11.22 The increase in traffic through the estates of Hatfield Grove and Bury Farm in Hatfield Peverel would be present for the expected six months when Station Road and Bury Lane bridges are closed. This duration is above the temporal scope and would therefore be a significant adverse effect for sensitive receptors through the estates. Mitigation measures through the estates are unlikely to be possible as a low noise surface is only considered to be effective by DMRB LA 111 (Highways England, 2020b) when average speeds are above 75km/h. The predicted traffic speeds through the estates would be less than this. In an urban situation such as this, a noise barrier would not be effective as access is required to the dwellings within the estate and so it is not possible to have a barrier that is unbroken.
- 12.11.23 An initial conservative estimate of the number of night closures, and hence use of the planned diversion route at night, indicates a requirement to use the diversion for 500 nights over the near four-year construction programme. This amount would be above the threshold of 40 nights in any six month period, and would cause a **significant adverse effect** at 266 dwellings within 25m of the planned diversion route.
- 12.11.24 Given the location of the proposed scheme, the identified diversion route is the only strategic diversion route available. As the construction programme develops, opportunities to reduce the number of required night-time closures would be reviewed and this is a commitment in the REAC, which is within the first iteration of the EMP [TR010060/APP/6.5].

Operation

- 12.11.25 The change in road traffic noise that would arise at individual receptors within the study area for the opening year of 2027, including the application of additional mitigation, is presented in Table 12.31 for the short-term, with the absolute noise levels shown on Figure 12.7 [TR010060/APP/6.2]. The long term changes are presented in Table 12.32. The noise level changes (i.e. the difference between the Do-Minimum and Do-Something) are shown on Figure 12.8 [TR010060/APP/6.2]. Appendix 12.6 [TR010060/APP/6.3] contains a full list of the calculated noise levels at every sensitive receptor within the noise study area.
- 12.11.26 Compared with Table 12.21, shown in Section 12.9 of this chapter, there is a considerable change following the additional mitigation. There are now more sensitive receptors with a decrease in noise than with an increase.
- 12.11.27 The number of dwellings with an increase in noise of moderate or major has fallen from 133 to 71 during the day and from 82 to 57 at night. Those with a moderate or major decrease in noise has increased from 682 to 791 during the day following the additional mitigation. At night those with a moderate or major decrease in noise has increased from 609 to 721.
- 12.11.28 The number of other sensitive receptors with an increase in noise of moderate or major has fallen from eight to four during the day. Those with a moderate or major decrease in noise has increased from 15 to 18 during the day following the additional mitigation.

Table 12.31 Operational mitigated road traffic noise summary short-term change

Change in noise level dB(A)		Daytime		Night-time	
		Number of dwellings	Number of other sensitive receptors	Number of dwellings	Number of other sensitive receptors
Increase in noise level dB $L_{A10,18h}$ / L_{night}	<1.0	3,038	30	2,000	1
	1.0-2.9	391	6	151	1
	3-4.9	17	0	20	0
	>5	54	4	37	0
No change	0	351	1	1,146	0
Decrease in noise level dB $L_{A10,18h}$ / L_{night}	<1.0	4,556	31	5,340	4
	1.0-2.9	3,566	28	3,349	3
	3-4.9	630	12	573	4
	>5	161	6	148	2

12.11.29 The change in the long term is shown in Table 12.32. Compared with Table 12.22, shown in Section 12.9 of this chapter, there is less of a noticeable change in the proposed scheme with and without additional mitigation. This is due to the assumed surfacing in the future year being a surface with a -3.5dB(A) RSI correction, as opposed to the assumed -6.5dB(A) RSI correction in the short term (i.e. the opening year).

Table 12.32 Operational mitigated road traffic noise summary long-term change

Change in noise level dB(A)		Daytime		Night-time	
		Number of dwellings	Number of other sensitive receptors	Number of dwellings	Number of other sensitive receptors
Increase in noise level dB $L_{A10,18h}$ / L_{night}	<3.0	9,710	67	9,361	7
	3.0-4.9	151	1	45	0
	5-9.9	60	4	40	0
	>10	1	0	1	0
No change	0	430	5	286	0
Decrease in noise level dB $L_{A10,18h}$ / L_{night}	<3.0	1,845	31	2,473	3
	3.0-4.9	455	5	449	3
	5-9.9	90	4	78	1
	>10	22	1	31	1

12.11.30 Locations where either significant adverse or beneficial effects are predicted are described below. These are also shown on Figure 12.5 [TR010060/APP/6.2]. Where a significant adverse effect remains, a justification is provided for why no further measures are possible to reduce the noise level. Where an absolute noise level is quoted, this is a façade level in the $L_{A10,18h}$ noise index.

Junction 19 (Boreham interchange) to junction 20a (Hatfield Peverel South interchange), including Boreham

12.11.31 There are 28 dwellings along Main Road (through Boreham and to junction 20a) where there would be minor increases in noise (between 1dB(A) and 2.9dB(A)) with the absolute noise level above the SOAEL. It is not possible to mitigate these **significant adverse effects** for the following reasons:

- A low noise surface is only considered to be effective by DMRB LA 111 (Highways England, 2020b) when average speeds are above 75km/h. The predicted speeds along Main Road are between 48 and 62km/h and so low noise surfacing would not be effective.
- To be effective, a noise barrier needs to be unbroken. In an urban situation such as Main Road, where access is required to the residential receptors via Main Road, it is not possible to have a barrier that is unbroken.

- The proposed scheme is already reducing the speed limit from 40mph to 30mph through Boreham.

Junction 20a (Hatfield Peverel South interchange) to junction 21 (Witham South interchange), including Hatfield Peverel

- 12.11.32 Due to the provision of surfacing with better noise reducing properties than a conventional low noise surface along the A12, there would be a **significant beneficial effect** for 35 dwellings and one other sensitive receptor which have a moderate decrease in noise.
- 12.11.33 Despite the widespread decrease in noise through Hatfield Peverel, there are still 28 dwellings alongside the A12 that would remain above the SOAEL but would not be significant adverse effects as they are predicted to experience a decrease in noise. A further reduction in noise from the provision of noise barriers is not possible due to engineering constraints.

Junction 21 (Witham South interchange) to junction 22 (Colemans interchange), including Witham

- 12.11.34 The minor increase in noise at night for three dwellings around the existing junction 21 (Latneys Kennels, Cattery and Grooming Parlour; Mayfield Cottage; and 22 Collar Way) is removed due to the provision of surfacing with better noise reducing properties than a conventional low noise surface. These would therefore not be significant effects.
- 12.11.35 There are 23 dwellings along Baker Way in Witham that would experience a moderate decrease in noise which would be a **significant beneficial effect** due to a reduction in noise caused by the provision of surfacing with better noise reducing properties than a conventional low noise surface.
- 12.11.36 Due to the provision of surfacing with better noise reducing properties than a conventional low noise surface and the proposed noise barriers around Maldon Road, there would be a **significant beneficial effect** for 26 dwellings and one other sensitive receptor. These are all predicted to experience either a moderate or major decrease in noise. Of the 72 dwellings that were above the SOAEL before the additional mitigation, there are now only 19 above the SOAEL, but none of these are predicted to experience an increase in noise.

Junction 22 (Colemans interchange) to junction 23 (Kelvedon South interchange), including Rivenhall End

- 12.11.37 Around the existing junction 22, there is predicted to be a **significant beneficial effect** for four dwellings which would have a major reduction in noise. These dwellings are Burghey Brook Farm, two dwellings at Burghey Brook Cottages and Whitelands. This decrease in noise is due to the realignment of the A12 and the provision of a surface with better noise reducing properties than a conventional low noise surface.
- 12.11.38 Due to the realignment of the A12 and the provision of a surface with better noise reducing properties than a conventional low noise surface, there would be moderate and major decreases in noise within Rivenhall End. This would cause a **significant beneficial effect** at 69 dwellings and three other sensitive receptors within Rivenhall End. This total includes three to the south side of the

re-aligned A12, of this two are within the Fair Rest Caravan Site which also benefits from the provision of a noise barrier and the realigned Braxted Road. The increase in noise on the rear of the dwellings along The Drive is predicted to be minor, with none of these above the SOAEL.

- 12.11.39 To the east of Rivenhall End towards Kelvedon, there would be a moderate decrease in noise that would provide a **significant beneficial effect** at three dwellings in the area of Hole Farm. This is due to the realignment of the A12 and the provision of a surface with better noise reducing properties than a conventional low noise surface.

Junction 23 (Kelvedon South interchange) to junction 24 (Kelvedon North interchange), including Kelvedon

- 12.11.40 Due to the resurfacing of the concrete road, there would be moderate decreases in noise that would be a **significant beneficial effect** at 306 dwellings and one other sensitive receptor to the north of the Kelvedon bypass.
- 12.11.41 To the south of the Kelvedon bypass along Braxted Road, there are four dwellings (Ashman's Farm, Greenleaves, Brickhouse Barn and Kelvedon Lodge) where there would be a predicted increase in noise of over 3dB(A), which would be a **significant adverse effect**. The daytime absolute noise level at these dwellings would be between 60 and 64dB(A), which is below the SOAEL. It is not possible to mitigate these significant effects for the following reasons:
- A low noise surface is only considered to be effective by DMRB LA 111 when average speeds are above 75km/h. The predicted speed along this part of Braxted Road is predicted to be 48km/h and so a low noise surface would not be effective.
 - To be effective, a noise barrier needs to be unbroken. In a situation such as Braxted Road, where access is required from the road to sensitive receptors, it is not possible to have a barrier that is unbroken.
- 12.11.42 Along Highfields Lane, also to the south of the Kelvedon bypass, there are eight dwellings and one other sensitive receptor that would experience a decrease in noise of over 3dB(A) which would be a **significant beneficial effect**. This decrease in noise is caused by the resurfacing of the concrete road surface on the A12 and also a predicted reduction in traffic volume along Highfields Lane.
- 12.11.43 Around the proposed new junction 24, there is predicted to be a major or moderate decrease in noise at nine dwellings which would be a **significant beneficial effect**. This is due to the resurfacing of the concrete road surface on the A12 and also some screening provided by the earthworks associated with the new junction 24.
- 12.11.44 Along Inworth Road there are four dwellings (The Laurels, Thatch Cottage, and 1 and 2 Happy Gardens) where the absolute noise level would be just above the SOAEL and there would be up to a 1.3dB(A) (minor) increase in noise. In accordance with DMRB LA 111, this would be a **significant adverse effect**. It is not possible to mitigate these significant effects for the following reasons:

- A low noise surface is only considered to be effective by DMRB LA 111 when average speeds are above 75km/h. The average traffic speed along this part of Inworth Road is predicted to be 34km/h and so a low noise surface would not be effective.
- To be effective, a noise barrier needs to be unbroken. In an urban situation such as Inworth Road, where access is required to sensitive receptors via Inworth Road, it is not possible to have a barrier that is unbroken. Noise barriers within the middle of a village and surrounding dwellings would also likely have adverse visual effects.

12.11.45 Within Inworth, there are seven dwellings and one other sensitive receptor that would experience a **significant beneficial effect**. This is due to the resurfacing of the concrete road surface on the existing A12 providing more than a 3dB(A) reduction in noise on the rear façade of the dwellings. These dwellings do not experience the same increase in noise as those identified in the above paragraph because they are further from Inworth Road and the change in noise is more influenced by the A12 than Inworth Road.

12.11.46 Along Kelvedon Road on the approach to Tiptree there are four dwellings that experience an increase in noise of up to 1.6dB(A) (minor) and are above the SOAEL. In accordance with DMRB LA 111, this would be a **significant adverse effect**. It is not possible to mitigate these significant effects for the following reasons:

- A low noise surface is only considered to be effective by DMRB LA 111 when average speeds are above 75km/h. The average traffic speed along this part of Kelvedon Road is predicted to be 47km/h and so a low noise surface would not be effective.
- To be effective, a noise barrier needs to be unbroken. In an urban situation such as this, where access is required to sensitive receptors via Kelvedon Road, it is not possible to have a barrier that is unbroken. Noise barriers in this setting are also likely have adverse visual effects.

12.11.47 At 71 dwellings and three other sensitive receptors (All Saints Church, Messing Village Hall and Brook Farm on Kelvedon Road) along the route from Inworth Road to the B1022 (via Kelvedon Road, through Messing and then Harborough Road), there is predicted to be a **significant adverse effect**. This would be caused by a moderate (3–5dB(A)) increase in noise at 16 dwellings and a major (+5dB(A)) increase at 55 dwellings. This increase in noise would be caused by an increase in traffic volume along this route, although it should be noted that the 18-hour daily traffic volumes are predicted to change from around 380 without the proposed scheme to 1,210 with the proposed scheme. Over the 18-hour period considered for a daytime noise assessment, this level of traffic would equate to around two vehicles every five minutes without the proposed scheme and six vehicles every five minutes with the proposed scheme. The daytime absolute noise level at those dwellings closest to (e.g. within 10m of) Kelvedon Road/The Street would be between 58 and 62dB(A), which is below the SOAEL. Further from these roads the noise levels would be lower. The acoustic character and context of the noise is not expected to change with the

proposed scheme, as the noise would still be from road traffic on the same façade of a sensitive receptor as before. Mitigation is not possible along this road for the following reasons:

- A low noise surface is only considered to be effective by DMRB LA 111 when average speeds are above 75km/h. The predicted speed along this part of Kelvedon Road is predicted to be 34km/h and so a low noise surface would not be effective.
- To be effective, a noise barrier needs to be unbroken. In a situation such as Kelvedon Road, where access is required from the road to sensitive receptors, it is not possible to have a barrier that is unbroken. Noise barriers within the middle of a village and surrounding dwellings would also likely have adverse visual effects.

- 12.11.48 To the west of Tiptree along Grange Road there are 12 dwellings that would experience a decrease in noise of over 3dB(A) which would be a **significant beneficial effect**. This decrease in noise is caused by a predicted reduction in traffic volume along Grange Road.

Junction 24 (Kelvedon North interchange) to junction 25 (Marks Tey interchange), including Marks Tey

- 12.11.49 There are 242 dwellings and 10 other sensitive receptors to the east of Kelvedon and within Feering that would experience a **significant beneficial effect** due to a combination of the resurfacing of the existing concrete road surface and the realignment of the A12. These decreases in noise would be major for the dwellings closest to the existing A12, and moderate for others.
- 12.11.50 Within Easthorpe Green, measures to remove the likely significant adverse effects have been applied in the form of a noise barrier and the use of a surface with better noise reducing properties than a conventional low noise surface. Despite the identified mitigation measures, there is still predicted to be a moderate increase in noise at 1 and 2 The Lodge. The daytime absolute noise level at these dwellings would be around 62dB(A), which is below the SOAEL. The residual effect would be a **significant adverse effect** at these two dwellings. No further mitigation measures are considered feasible in this location.
- 12.11.51 At Wishingwell Farm, measures to remove the likely significant adverse effect have been applied in the form of a noise barrier and the use of a surface with better noise reducing properties than a conventional low noise surface. Despite the identified mitigation measures, there would be a major increase in noise which would cause a **significant adverse effect** at one dwelling and one other sensitive receptor (the Recording Studio). The daytime absolute noise level at Wishingwell Farm would be around 61dB(A), which is below the SOAEL. No further mitigation measures are considered feasible in this location.
- 12.11.52 At Doggetts, measures to remove the likely significant adverse effect have been applied in the form of a noise barrier and the use of a surface with better noise reducing properties than a conventional low noise surface. Despite the identified mitigation measures, there would be a major increase in noise and the residual effect would be **significant adverse** at this one dwelling. The daytime absolute

noise level at Doggetts would be around 63dB(A), which is below the SOAEL. No further mitigation measures are considered feasible in this location.

- 12.11.53 Along the existing A12 on the northbound approach to Marks Tey, there would be a **significant beneficial effect** at 62 dwellings. This is due to the realignment of the A12, which would cause moderate and major decreases in noise.
- 12.11.54 At Hall Chase Farm House, there is predicted to be a minor increase in noise of 1.5dB(A) at night and the absolute noise level being above the SOAEL. Mitigation measures in the form of an earth bund and a surface with better noise reducing properties than a conventional low noise surface have been applied to the A12, but this would still be a **significant adverse effect** at this one dwelling, which is within NIA 4760. The increase in noise is due to the realignment of the A12 and the noise source (i.e. the A12) increasing on a façade of the dwelling that was previously less exposed. The daytime absolute noise level at Hall Chase Farm House would be around 67dB(A), which is just below the SOAEL. No further mitigation measures are considered feasible in this location.
- 12.11.55 Along London Road, there are seven dwellings within Copford where the absolute noise level would be just above the SOAEL and there would be a 1.0dB(A) (minor) increase in noise. In accordance with DMRB LA 111, these would experience **significant adverse effects**. It is not possible to mitigate these significant effects for the following reasons:
- A low noise surface is only considered to be effective by DMRB LA 111 when average speeds are above 75km/h. The average traffic speed along this part of London Road is predicted to be 40km/h.
 - To be effective, a noise barrier needs to be unbroken. In an urban situation such as London Road, where access is required to sensitive receptors via London Road, it is not possible to have a barrier that is unbroken.

Noise Insulation Regulations

- 12.11.56 An assessment of indicative forecast eligibility for Part 2 of the Noise Insulation Regulations has identified three possible dwellings. The eligibility criteria are described within Appendix 12.2 of the Environmental Statement [TR010060/APP/6.3]. In summary, to be eligible, a dwelling must be within 300m of the proposed scheme, have a noise level above 68dB LA10,18h, and experience a 1dB(A) increase in the long term. These three dwellings are as follows:
- Hall Chase Farm House, Marks Tey
 - Two dwellings at Sorrells Cottages, Bury Lane, Hatfield Peverel
- 12.11.57 The eligibility of these three dwellings and any others that may be eligible would be confirmed during detailed design and prior to the start of construction. The REAC, within the first iteration of the EMP [TR010060/APP/6.5], contains a commitment to undertake an assessment of eligibility.

Noise Important Areas (NIAs)

- 12.11.58 The location of each of the 21 NIAs is shown on Figure 12.1 [TR010060/APP/6.2] and the expected change in noise at each is presented in Table 12.33. As required by DMRB LA 111, Table 12.33 also lists what noise mitigation the proposed scheme would deliver for each NIA. The change in noise provided in the third column of Table 12.33 is in relation to the change in noise on the façade of the dwelling(s) that would have been used to define the location as an NIA. This is from the mitigated proposed scheme in the short term.
- 12.11.59 Of the 21 NIAs identified, there is one (NIA 6192) where the dwellings have been demolished and so the change in noise cannot be determined. Of the remaining 20 NIAs, there are predicted to be increases in noise at two, decreases at 13, a mixture of increases/decreases/no change at one, and no change at four.
- 12.11.60 The environmental effects at some NIAs are different from what the change in noise presented in Table 12.33 may suggest. This is due to a different façade of the dwelling being used to determine the environmental effect from that used to classify the location as an NIA.
- 12.11.61 One of the 261 dwellings within NIA 4760 is predicted to experience a significant adverse effect at night due to an increase of 1.5dB(A), with the absolute noise level being above the SOAEL. This increase in noise is due to the realignment of the A12 and the noise source (i.e. the A12) increasing on a façade of the dwelling that was previously less exposed.

Table 12.33 Noise mitigation at each NIA within the study area

NIA number and area	Road	Change in noise ¹	Noise mitigation and justification
6141 (Boreham)	A12	Decrease	Resurfacing along the A12 using a surface with better noise reducing properties than a conventional low noise surface. Extended noise barriers not considered due to extensive vegetation that would be lost to accommodate a noise barrier. Removing the vegetation and installing a barrier may be perceived as no benefit and would likely introduce adverse visual and biodiversity impacts.
5411 (Boreham east)	A12	Increase	Resurfacing along the A12 using a surface with better noise reducing properties than a conventional low noise surface. Noise barriers not considered due to extensive vegetation that would be lost to accommodate a noise barrier. Removing the vegetation and installing a barrier may be perceived as no benefit and would likely introduce adverse visual and biodiversity impacts.

NIA number and area	Road	Change in noise ¹	Noise mitigation and justification
5412 (between Boreham and Hatfield Peverel)	A12	No change	Resurfacing along the A12 using a surface with better noise reducing properties than a conventional low noise surface. Noise barriers not considered due to extensive vegetation that would be lost to accommodate a noise barrier. Removing the vegetation and installing a barrier may be perceived as no benefit and would likely introduce adverse visual and biodiversity impacts.
6191 (between Boreham and Hatfield Peverel)	A12	Increase	Resurfacing along the A12 using a surface with better noise reducing properties than a conventional low noise surface. Increase in noise due to increase in traffic on Main Road where mitigation is not possible. Noise barriers not considered due to extensive vegetation that would be lost to accommodate a noise barrier. Removing the vegetation and installing a barrier may be perceived as no benefit and would likely introduce adverse visual and biodiversity impacts.
5413 (Hatfield Peverel)	A12	Decrease	Resurfacing along the A12 using a surface with better noise reducing properties than a conventional low noise surface.
6192 ²	A12	N/A	N/A
5414 (Dengie Farmhouse, Witham bypass)	A12	Decrease	Resurfacing along the A12 using a surface with better noise reducing properties than a conventional low noise surface.
5415 (Maldon Road area, Witham bypass)	A12	Decrease	Resurfacing along the A12 using a surface with better noise reducing properties than a conventional low noise surface. Three new noise barriers proposed, and an existing old noise barrier would be replaced.
6144 (Burghey Brook Cottages)	A12	Decrease	Road alignment change to remove high noise level on front façade of dwellings.
5419 (Whitelands)	A12	Decrease	Road alignment change to remove high noise level on front façade of dwelling.
6145 (Rivenhall End)	A12	Decrease	Road alignment change to remove high noise level on front façade of dwellings.

NIA number and area	Road	Change in noise¹	Noise mitigation and justification
14874 (Hole Farm)	A12	Decrease	Road alignment change to remove high noise level on front façade of dwellings. Resurfacing along the A12 using a surface with better noise reducing properties than a conventional low noise surface.
5416 (Inworth Road area, Kelvedon bypass)	A12	Decrease	Slight alignment change and resurfacing of the concrete road would cause a decrease in noise.
6142 (Feering, along A12)	A12	Decrease	Road alignment change to remove high noise level on front façade of dwellings.
6143 (Along A12 between J24 and J25)	A12	Decrease	Road alignment change to remove high noise level on front façade of dwellings.
5417 (Along A12 between J24 and J25)	A12	Decrease	Road alignment change to remove high noise level on front façade of dwellings.
4759 (Along A12 between J24 and J25)	A12	Decrease	Road alignment change to remove high noise level on front façade of dwellings.
4760 (Marks Tey)	A12	Decrease, Increase and no change	Mitigation considered where practicable. Road alignment change to remove high noise level on front façade of some dwellings. Noise bunds in one location. Resurfacing along parts of the A12 using a surface with better noise reducing properties than a conventional low noise surface. Noise barriers not possible due to engineering constraints or not being practical in this location.
6173 (Chelmsford)	A130	No change	Mitigation not considered as engineering constraints would prevent noise mitigation from being effective.
4758 (Marks Tey)	A120	No change	Mitigation not considered as engineering constraints would prevent noise mitigation from being effective.
4761 (The Willows, Marks Tey)	A12	No change	Mitigation not considered as this location is outside of the Order Limits.

NIA number and area	Road	Change in noise ¹	Noise mitigation and justification
¹ This change is presented in terms of 'no change', increase' or 'decrease' to avoid confusion with environmental effects. ² The group of approximately six dwellings that would have caused this location to be classed as an NIA have been demolished. These dwellings are not considered within the noise assessment, but the NIA is listed in this table since it is still included within National Highways datasets as an NIA.			

- 12.11.62 NIA 6145 is within Rivenhall End and contains 28 dwellings to the north and four to the south of the existing A12. All of these dwellings would experience a reduction in noise on the façade of the dwelling that would have caused them to be classed as an NIA (i.e. the façade facing the existing A12). However, the four dwellings to the south would now experience an increase in noise on the rear façade from the new A12 alignment. This has been minimised through the use of a 4m high bund alongside the new alignment of the A12 and the use of a surface with better noise reducing properties than a conventional low noise surface.
- 12.11.63 NIA 5147 is approximately 1.5km to the east of the existing junction 24 and contains two dwellings, both of which are to the south of the A12. Both these dwellings would experience a reduction in noise on the façade of the dwelling that would have caused them to be classed as an NIA (i.e. the façade facing the existing A12). However, they would now experience an increase in noise on the rear façade from the new A12 alignment, but this has been minimised through the use a 4m high earth bund.

12.12 Monitoring

- 12.12.1 The identified likely significant environmental effects from noise and/or vibration during construction would be monitored. The monitoring of likely significant effects would include one or more of the following:
- Verification that the identified noise and vibration mitigation measures are in place for activities where there is potential for likely significant effects to occur
 - Measurement of noise and/or vibration
 - Monitoring noise and vibration procedures and practices to check adverse effects are no worse than those predicted
- 12.12.2 A commitment to produce a Noise and Vibration Management Plan is contained within the first iteration of the EMP [TR010060/APP/6.5]. The Noise and Vibration Management Plan will also include the approach to noise and vibration monitoring.
- 12.12.3 Post-construction noise monitoring (i.e. measurements) cannot provide a reliable indication of whether the predicted magnitude and extent of operational effects are greater or less than those predicted in the assessment. Therefore, no actual noise measurements are proposed following the opening of the

proposed scheme. The prediction and assessment methodologies set out in Section 12.5 of this chapter would be used to determine the effectiveness of mitigation measures. This would be carried out as part of National Highways' Post Opening Project Evaluation procedures, which review how highway schemes are delivering on environmental predictions.

12.13 Summary

- 12.13.1 During construction, there could be significant adverse effects during some activities, mainly those concerning work on structures. The duration of some of these works is expected to produce noise levels that exceed the SOAEL at nearby receptors and exceed the temporal thresholds, which would result in significant adverse effects.
- 12.13.2 The night closures of the A12 required for construction works would cause significant adverse effects at 266 dwellings within 25m of the planned diversion route.
- 12.13.3 Across the proposed scheme, noise modelling has predicted that there would be 806 dwellings and 18 other sensitive receptors experiencing a **significant beneficial effect**. These significant beneficial effects have been achieved through the route alignment (i.e. moving the A12 away from noise sensitive receptors), earth bunds, noise barriers, removal of the existing concrete surfacing and in some locations the use of a surfacing with better noise reducing properties than a conventional low noise surface. Some of the predicted reductions in noise are over 10dB(A).
- 12.13.4 Of the 123 **significant adverse effects** at dwellings, 28 of these are along Main Road, Boreham. A further 71 of these are along Kelvedon Road, through Messing and then Harborough Road. The significant adverse effects at these 123 dwellings are due to an increase in traffic volume on these roads. Of the 123 dwellings, 78 of these are predicted to experience moderate or major increases in noise, with the remainder predicted to experience a minor increase in noise where the absolute noise level is above SOAEL.
- 12.13.5 There are four other sensitive receptors predicted to experience a **significant adverse effect**. One of these is the recording studio at Wishingwell Farm, which is predicted to experience a major increase in noise. The other three are within Messing.
- 12.13.6 With additional proportionate and reasonable mitigation, the highest increases in noise across the proposed scheme are at Wishingwell Farm and Doggetts, where the noise level is predicted to increase by over 5dB(A). This is due to the change in the alignment of the A12 bringing the road closer to these receptors. Both receptors are predicted to experience absolute noise levels below the SOAEL.
- 12.13.7 Table 12.34 provides a summary of the identified significant effects.

Table 12.34 Summary of significant noise and vibration effects

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Construction			
Noise level above the daytime SOAEL and the temporal thresholds for some activities within the area of Hatfield Peverel, Rivenhall End and the offline section between junctions 24 and 25.	Consideration of further measures to reduce the noise from construction activities.	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant adverse
Noise level above the night-time SOAEL and the temporal thresholds for some activities within the area of junction 19, Hatfield Peverel, Witham bypass and Marks Tey.	Consideration of further measures to reduce the noise from construction activities.	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant adverse
Noise level above the daytime SOAEL and the temporal thresholds for the operation of borrow pit F.	Consideration of further measures to reduce the noise from construction activities.	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant adverse
Levels of vibration above the SOAEL for vibratory compaction during structures backfilling through Hatfield Peverel and the Witham bypass.	Consideration of measures to reduce the level of vibration during construction.	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant adverse
Increase in local traffic through the Hatfield Grove and Bury Farm estates during the closures of Station Road and Bury Lane Bridges.	Ongoing review of programme and traffic management phasing.	REAC, within the first iteration of the EMP [TR010060/APP/6.5] Outline Construction Traffic Management Plan [TR010060/APP/7.7]	Significant adverse

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Increase in noise due to use of strategic diversion route. 266 dwellings within 25m of the planned diversion route.	Ongoing review of programme and traffic management phasing to reduce usage of strategic diversion route.	REAC, within the first iteration of the EMP [TR010060/APP/6.5] Outline Construction Traffic Management Plan [TR010060/APP/7.7]	Significant adverse
Operation			
Above SOAEL and minor increase. 28 dwellings along Main Road, Boreham.	No mitigation practicable	n/a	Significant adverse
Moderate decreases. 35 dwellings in Hatfield Peverel.	Surfacing with better noise reducing properties than a conventional low noise surface	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Moderate decrease. One other sensitive receptor in Hatfield Peverel.	Surfacing with better noise reducing properties than a conventional low noise surface	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Moderate decreases. 23 dwellings along Baker Way, Witham.	Surfacing with better noise reducing properties than a conventional low noise surface	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Moderate decreases. 26 dwellings around the Maldon Road underbridge	Surfacing with better noise reducing properties than a conventional low noise surface and noise barriers	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Moderate decrease. One other sensitive receptor around the Maldon Road underbridge	Surfacing with better noise reducing properties than a conventional low noise surface and noise barriers	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Major decreases. Four dwellings around junction 22.	Alignment and surfacing with better noise reducing properties than a conventional low noise surface	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Major and moderate decreases. 69 dwellings within Rivenhall End.	Alignment and surfacing with better noise reducing properties than a conventional low noise surface	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Major decreases. Three other sensitive receptors within Rivenhall End.	Alignment and surfacing with better noise reducing properties than a conventional low noise surface	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Moderate decrease. Three dwellings at Hole Farm.	Alignment and surfacing with better noise reducing properties than a conventional low noise surface	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Moderate decreases. 306 dwellings within Kelvedon.	Resurfacing of the concrete on the Kelvedon bypass	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Moderate decrease. One other sensitive receptor in Kelvedon.	Resurfacing of the concrete on the Kelvedon bypass	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Moderate increase. Four dwellings along Braxted Road	No mitigation practicable	n/a	Significant adverse
Moderate decreases. Eight dwellings along Highfields Lane.	Resurfacing of the concrete on the Kelvedon bypass	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Moderate decrease. One other sensitive receptor along Highfields Lane.	Resurfacing of the concrete on the Kelvedon bypass	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Moderate decreases. Nine dwellings around the proposed new junction 24	Surfacing with better noise reducing properties than a conventional low noise surface	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Above SOAEL and minor increase. Four dwellings along Inworth Road.	No mitigation practicable	n/a	Significant adverse
Moderate decreases. Seven dwellings within Inworth.	Resurfacing of the concrete on the Kelvedon bypass	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Moderate decrease. One other sensitive receptor in Inworth.	Resurfacing of the concrete on the Kelvedon bypass	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Above SOAEL and minor increase. Four dwellings along Kelvedon Road on the approach to Tiptree.	No mitigation practicable	n/a	Significant adverse
Major and moderate increases. 71 dwellings along Kelvedon Road, through Messing and then Harborough Road	No mitigation practicable	n/a	Significant adverse
Major increases. Three other sensitive receptors along Kelvedon Road, through Messing and then Harborough Road	No mitigation practicable	n/a	Significant adverse
Moderate decreases 12 dwellings along Grange Road to the west of Tiptree	n/a	n/a	Significant beneficial

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Moderate and major decreases. 242 dwellings on the east of Kelvedon and Feering.	Alignment and resurfacing of the concrete on the Kelvedon bypass	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
Moderate and major decreases. 10 other sensitive receptors on the east of Kelvedon and Feering.	Alignment and resurfacing of the concrete on the Kelvedon bypass	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial
One moderate increase and one above SOAEL and minor increase. Two dwellings at Easthorpe Green	Surfacing with better noise reducing properties than a conventional low noise surface and noise barrier	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant adverse
Major increase. One dwelling of Wishingwell Farm.	Surfacing with better noise reducing properties than a conventional low noise surface and noise barrier	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant adverse
Major increase. One other sensitive receptor (recording studio) at Wishingwell Farm.	Surfacing with better noise reducing properties than a conventional low noise surface and noise barrier	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant adverse
Major increase. One dwelling of Doggetts.	Surfacing with better noise reducing properties than a conventional low noise surface and noise barrier	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant adverse
Moderate and major decreases. 62 dwellings within Marks Tey.	Alignment and surfacing with better noise reducing properties than a conventional low noise surface	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant beneficial

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Above SOAEL and minor increase. One dwelling of Hall Chase Farm House.	Surfacing with better noise reducing properties than a conventional low noise surface and noise bund	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Significant adverse
Above SOAEL and minor increase. Seven dwellings along London Road, Copford.	No mitigation practicable	n/a	Significant adverse

12.13.8 This Environmental Statement has demonstrated that compliance with the aims of the NNNPS (Department for Transport, 2014) and the NPSE (Department for Environment, Food and Rural Affairs (Defra), 2010) are achieved:

- Aim 1: Likely significant adverse impacts from the proposed scheme have been avoided where possible. This has been achieved using the following measures:
 - The provision of a surface with better noise reducing properties than a conventional low noise surface.
 - The provision of noise barriers in certain locations.

Where it is not possible to avoid the identified significant effects then reasoning has been provided.
- Aim 2: Adverse impacts from the proposed scheme have been minimised through the choice of alignment and the inclusion of earth bunding within the design.
- Aim 3: The use of measures to reduce the noise at source (i.e. a surface with better noise reducing properties than a conventional low noise surface) has provided widespread reductions in noise for communities living alongside the proposed scheme.

12.14 References

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