Lower Thames Crossing

6.1 Environmental Statement Chapter 12 – Noise and Vibration

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Lower Thames Crossing

6.1 Environmental Statement
Chapter 12 – Noise and Vibration

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12 Noise and Vibration

12.1 Introduction

12.1.1 This chapter presents the assessment of the likely significant effects of the proposed A122 Lower Thames Crossing ('the Project') on noise and vibration during construction and operation. The assessment considers potential changes to noise and vibration levels at identified noise sensitive receptors (NSRs) due to construction activities, vehicle traffic and the tunnel ventilation system required during operation.

12.1.2 Paragraph 5.189 of the National Policy Statement for National Networks (NPSNN) (Department for Transport, 2014) indicates that the applicant should produce a noise assessment which should form part of the Environmental Statement (ES). Detailed criteria are set out in the NPSNN and where appropriate to the proposals. Compliance with the requirement is achieved through following the methodology set out in Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration (National Highways, 2020a), which references relevant guidance including the Calculation of Road Traffic Noise (CRTN) (Department of Transport and Welsh Office, 1988), and other British Standards.

12.1.3 Where appropriate to the proposals, within Chapter 12 and the supporting Appendix 12.8, the requirements of the relevant National Policy Statements for Energy are referenced, namely:

a. EN 1 – Overarching National Policy Statement for Energy,

b. EN 4 – National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines, and

c. EN 5 – National Policy Statement for Electricity Networks Infrastructure.

12.1.4 This chapter is supported by Figures 12.1 to 12.8 (Application Document 6.2), and additional information contained in the following appendices (Application Document 6.3):

a. Appendix 12.1: Noise and Vibration Legislation and Policy

b. Appendix 12.2: Operational Ventilation Noise Assessment: South Portal

c. Appendix 12.3: Operational Ventilation Noise Assessment: North Portal

d. Appendix 12.4: Construction Noise and Vibration Assessment

e. Appendix 12.5: Baseline Noise Survey Information

f. Appendix 12.6: Assessment of Ground-borne Noise and Vibration at land-based receptors

g. Appendix 12.7: Noise Insulation Regulations Assessment

h. Appendix 12.8: National Grid Electricity Transmission Network, Assessment for Audible Noise

i. Appendix 12.9: Effects of Vibration from Road Traffic (National Highways Ref. 1-457 Noise Support 2017-2021)

j. Appendix 12.10: Road Traffic Noise Mitigation and Cost Benefit Analysis

12.2 Legislative and policy framework

12.2.1 This assessment has been undertaken in accordance with relevant legislation and having regard to national and local plans and policies.

12.2.2 Appendix 12.1 (Application Document 6.3) sets out how the Applicant has considered and addressed those policies in the NPSs which relate to the assessment of effects considered in this chapter of the Environmental Statement. Policies in the NPSs which relate to decision making in relation to matters of relevance to this topic of the ES are addressed in the Planning Statement (Application Document 7.2).

Legislative requirements

12.2.3 Relevant environmental noise and vibration legislation that has been considered during the assessment is presented in Appendix 12.1 Noise and Vibration Legislation and Policy (Application Document 6.3).

National policy

12.2.4 Nationally Significant Infrastructure Projects (NSIPs) are determined in accordance with the decision-making framework in the Planning Act 2008 (as amended) and relevant National Policy Statements (NPSs), as well as any other matters that are both important and relevant (which may include the National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2021).

12.2.5 The NPSNN (Department for Transport, 2014) sets out the Government's policies to deliver NSIPs on the national road and rail networks in England. Modifications to the nationally significant energy infrastructure are required as part of the Project. Four utilities diversions constitute NSIPs in their own right, and therefore the Project will also be assessed against the following energy policy statements:

a. Overarching National Policy Statement for Energy (EN-1) (Department of Energy and Climate Change, 2011a)

b. National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (Department of Energy and Climate Change, 2011b)

c. National Policy Statement for Electricity Networks Infrastructure (EN-5) (Department of Energy and Climate Change, 2011c).

12.2.6 However, the NPSNN forms the "case-making" basis for the Project, and the need for nationally significant utilities diversions arises solely from the need for the road element of the Project.

12.2.7 National Highways has taken these policy requirements into account during the development and design of the Project and the preparation of this ES.

12.2.8 The NPPF sets out the Government's planning policies. It provides a framework within which locally prepared plans for housing and other development can be produced.

12.2.9 The NPPF does not contain specific policies for NSIPs. However, the NPPF advises that local authorities' planning policies should take into account NSIPs which are located within their local areas. Paragraph 1.17 of the NPSNN states that the NPS and NPPF are consistent, and paragraph 1.18 explains that the NPPF is an important and relevant consideration, 'but only to the extent relevant to [the] project'.

12.2.10 Appendix 12.1: Noise and Vibration Legislation and Policy (Application Document 6.3) lists the planning policies at a national level and the Project response.

12.2.11 Further information on the how the application has responded to national planning policies is available in the Planning Statement (Application Document 7.2).

Local policy framework

12.2.12 Consideration has been given to county policies within Kent, Essex, the Updated Local Plan and local policies relating to noise and vibration within the following local authorities within the study area: Maidstone, Medway, Tonbridge and Malling, Dartford, Gravesham, Thurrock, Havering and Brentwood. These are outlined in Appendix 12.1: Noise and Vibration Legislation and Policy (Application Document 6.3) and are considered further within the Planning Statement (Application Document 7.2).

12.3 Assessment methodology

Standards and guidance

12.3.1 DMRB LA 111 has been followed for the assessment and draws on the following guidance and standards with the exception of e, f and g which have been used for the assessment of the tunnel ventilation systems and overhead lines.

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

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

c. CRTN (Department of Transport and Welsh Office, 1988)

d. Converting the UK traffic noise index LA10, 18h to EU noise indices for noise mapping, PR/SE/451/02 (Transport Research Laboratory (TRL) Limited, 2002)

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

f. PS(T)134 'Operational Audible Noise Policy of Overhead Lines (New Build, Reconductoring, Diversion and Uprating)', Issue 2, June 2021

g. TGN(E) 322 'Operational Audible Noise Assessment Process for Overhead Lines (New Build, Reconductoring, Diversion and Uprating)', Issue 2, June 2021.

12.3.2 These standards and guidance documents are described in more detail within Appendix 12.1 (Application Document 6.3).

Scope of the assessment

12.3.3 This chapter presents the potential impacts and effects from the following identified sources of noise and vibration:

a. Temporary construction effects:

   i. Noise from surface construction activities

   ii. Vibration from surface construction activities

   iii. Noise from construction road traffic

   iv. Ground-borne noise from the operation of tunnel boring machinery (TBM) and where necessary Micro TBM equipment

   v. Ground-borne vibration from the operation of tunnel boring machinery and where necessary Micro TBM equipment

b. Permanent operational effects:

   i. Road traffic noise and operational vibration as a result of the new road and changes on the existing road network

   ii. Noise resulting from permanent electricity transmission overhead line (OHL) diversions

   iii. Noise from the tunnel ventilation system

12.3.4 The scope of the assessment also includes an extensive quantification of the existing baseline noise levels within the study area, as detailed within Section 12.4 and Appendix 12.5 (Application Document 6.3).

12.3.5 The following aspects have been scoped out for the assessment of impacts on noise and vibration as a result of the Project:

Construction vibration other than piling and TBM activities

12.3.6 Research into levels of vibration from various construction activities, reported by the Transport and Road Research Laboratory (now the Transport Research Laboratory (TRL)) in Supplementary Report 328 'Ground vibrations caused by road construction activities' (TRL Limited, 1997), concluded that, '*at distances greater than 20m, the vibration levels measured were below the level of human perception because of attenuation in the ground and that it is unlikely that people would be disturbed by vibration from general construction activities at distances of 20m or more*.'

12.3.7 Given the research carried out by TRL, and through the implementation of best available techniques in the construction of the Project (Section 12.5), it is not anticipated that there would be any vibration impacts on sensitive receptors from general construction activities. However, vibration impacts from piling and TBM activities, which could have the potential for significant effects, are considered within the scope of the construction noise and vibration assessment.

12.3.8 This chapter also informs other ES chapters: Chapter 6: Cultural Heritage, Chapter 7: Landscape and Visual, Chapter 8: Terrestrial Biodiversity and Chapter 13: Population and Human Health.

Temporal scope

12.3.9 The environmental assessment uses defined temporal scales to characterise the duration of potential operational effects:

a. 'Short term' is defined as a noise change based on parallel assessment year (for example the Do-Minimum opening year against the Do-Something opening year scenario).

b. 'Long term' is defined as a noise change based on a comparison of assessment years that are 15 years apart.

12.3.10 For construction, the terms short and long term are not generally used in the assessment of noise and vibration. However, a temporal scope is included within the assessment to determine if an identified significant impact could become a significant effect.

Limits of deviation and Rochdale Envelope

12.3.11 The Project's application of the Rochdale Envelope is summarised in Chapter 2: Project Description. The limits of deviation (LOD) for the Project (defined in the Draft DCO (Application Document 3.1)) represent an 'envelope' within which the Project would be constructed and have informed the reasonable worst case approach to assessment for the purposes of this chapter. The proposed acoustic barrier heights are relative to the pavement height as presented in Table 12.29 and secured in REAC NV011 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) to ensure that the relationship between the road and the acoustic mitigation is maintained.

Use of the River

12.3.12 Based on the predicted vessel movements associated with the construction of the Project, as outlined in Chapter 2: Project Description, this Chapter considers the requirement for assessment of the use of the river and a qualitative assessment has been undertaken as described in paragraphs 12.6.89 and 12.6.217.

12.3.13 Material supply vessels have been excluded from the preliminary Navigation Risk Assessment (pNRA) (Application Document 7.15), although Project vessels were included. Project vessels are those that would be used for temporary works site investigations and during temporary construction works. The reason for the exclusion of material supply vessels from the pNRA is that the imports would be to existing established facilities. The use of established facilities would not give rise to the use of any vessels or any additional vessel movements that would not otherwise be likely to occur in the absence of the Project. Therefore, these movements would be in the scope under existing navigational risk assessments of the Port of London Authority (PLA) and any other Statutory Harbour Authority (SHA) (eg PoTLL if movements enter their limits). This position was agreed with the PLA and PoTLL in a meeting on 10 May 2021.

Scoping Opinion

12.3.14 A Scoping Report (National Highways, 2017) was submitted to the Planning Inspectorate on 2 November 2017, setting out the proposed approach to this EIA. A Scoping Opinion was received from the Secretary of State on 13 December 2017, which included comments on the scope of assessment from the Planning Inspectorate and Statutory Environmental Bodies. These comments have been taken into account in the preparation of this chapter, and the Project response is set out in Appendix 4.1: The Inspectorate's Scoping Opinion and National Highways' Responses (Application Document 6.3).

12.3.15 It should be noted that the noise and vibration assessment methodology within DMRB has been updated from that outlined in the Scoping Report. The current version of the methodology is DMRB LA 111 Noise and Vibration (National Highways, 2020a), which supersedes DMRB HD 213/11 Volume 11, Section 3, Part 7 (Highways Agency, 2011) and the associated Interim Advice Notes. The assessment follows the requirements of DMRB LA 111, NPSNN and the relevant energy NPSs; for the determining of significant effects, the methodology within DMRB LA 111 has been followed.

12.3.16 The main issues raised by the Planning Inspectorate were the following:

a. Ground-borne traffic vibration (construction and operational ground-borne vibration) (Planning Inspectorate Scoping Opinion Noise and Vibration ID 1)

b. Identification of sensitive receptors (Planning Inspectorate Scoping Opinion Noise and vibration ID 2 and 4)

c. Locations for short-term and longer-term monitoring (Planning Inspectorate Scoping Opinion Noise and Vibration ID 3)

d. Impacts from barge loading (Planning Inspectorate Scoping Opinion Noise and Vibration ID 5)

e. Impacts from TBM and TBM operations (Planning Inspectorate Scoping Opinion Noise and Vibration ID 6 and 7)

f. Mitigation measures (Planning Inspectorate Scoping Opinion Noise and Vibration ID 8)

12.3.17 These issues are considered within the assessment in Section 12.6.

Consultation

Project consultation

12.3.18 Statutory Consultation under Section 42 of the Planning Act 2008 was undertaken on the Project from 10 October 2018 to 20 December 2018. This provided an opportunity for consultees to comment on the Preliminary Environmental Information Report (PEIR) (National Highways, 2018). A summary of the responses to the Statutory Consultation can be found in the Consultation Report (Application Document 5.1). Consultees comprised prescribed bodies, local authorities, people with an interest in land affected by the Project and local communities.

12.3.19 The Project design continued to be developed, which resulted in changes in the Project. These formed the basis for the Supplementary Consultation, which was undertaken from 29 January 2020 to 2 April 2020. A Design Refinement Consultation was undertaken from 14 July 2020 to 12 August 2020.

12.3.20 A Community Impacts Consultation was undertaken from 14 July 2021 to 8 September 2021. This sought feedback on the impacts of the Project at a local ward level, as well as the mitigation proposed for those impacts. Changes to the Project since the Design Refinement Consultation were also presented, along with a summary of how feedback to earlier consultation had shaped the development of the Project.

12.3.21 Prior to the submission of this DCO application, the Local Refinement Consultation was held between 12 May 2022 and 20 June 2022. This provided local communities with the opportunity to comment on proposed refinements to the Project.

12.3.22 These Consultations all included information about the environmental impacts associated with the Project proposals and refinements presented for consultation. A summary of the responses to these consultation stages can also be found in the Consultation Report (Application Document 5.1).

Stakeholder engagement

12.3.23 A summary of the stakeholder engagement specific to noise and vibration is provided in Table 12.1.

Table 12.1 Local Authority Consultation

Stakeholder	Meeting/ communication	Summary of discussions
Brentwood Borough Council	26/02/2018 E-mail	Specifics of baseline noise surveys within Brentwood Borough Council area. At the time of writing, no formal or informal response has been received from Brentwood Borough Council.
Gravesham Borough Council	26/02/2018 E-mail	Specifics of baseline noise surveys within Gravesham Borough Council area. Gravesham Borough Council responded on 06/08/2018 with broad acceptance of the information presented, stating that Gravesham Borough Council were '*Content with noise monitoring locations though may wish to return to the subject when we have a set of the plans of your revised A2 junction should that produce any concerns. Primarily thinking about M2 J1 and any potential implications on the edge of Strood*'.
London Borough of Havering	26/02/2018 E-mail	Specifics of baseline noise surveys within London Borough of Havering area. London Borough of Havering responded on 10/04/2018 with broad acceptance of the information presented, stating that '*The proposed locations and methodology for the baseline surveys seem reasonable and we're happy for you to proceed*'. An update on the specifics of the baseline noise surveys was supplied to London Borough of Havering on 10/04/2018 accounting for comments made.
Medway Council	26/02/2018 E-mail	Specifics of baseline noise surveys within Medway Council area. At the time of writing, no formal or informal response has been received from Medway Council.
Thurrock Council	26/02/2018 E-mail	Specifics of baseline noise surveys within Thurrock Council area. Thurrock Council responded on 8/03/2018 with the information presented, requesting the following variations to the proposed monitoring scheme: '*…it would appear that ST50 in Baker Street is very close to the proposed alignment. This is at one of the properties to be demolished, and will probably become an earth embankment supporting the road. A comparative post-opening measurement could not then be easily made at the same location.*' '*Please can you acknowledge this and engage with us on an alternative…*' An update was suppled to Thurrock Council on 20/03/2018 considering variations to the monitoring scheme and information presented as requested.

Stakeholder	Meeting/ communication	Summary of discussions
Local authorities and Statutory Environmental Bodies	21/04/20 Workshop 22/04/20 Workshop	Preliminary Environmental Impacts and Mitigation Workshop North. Preliminary Environmental Impacts and Mitigation Workshop South. To provide an update on the methodology for assessment of potential effects, significance of effects and approach to mitigation.
Local authorities and Statutory Environmental Bodies	Part 1 23/06/20 Part 2 25/06/20	Environmental Impact & Mitigation and REAC Review Workshop to provide recap on approach to environmental assessment and mitigation.
Thurrock Council	May 2021 11/06/21 Online Meeting	Discussion with Thurrock Council on the Statement of Common Ground Issues Log for Noise. Matters discussed include baseline noise surveys, scope of assessment, assessment methodology and mitigation measures.
Community Impacts Public Health Advisory Group (CIPHAG) Briefing 1	03/10/22 Online Briefing	A briefing on how the likely significant environmental effects and mitigation have changed in the assessments and why since October 2020 submission.
Medway Council	07/10/22 Online Meeting	Discussion on environmental impacts in Medway.

Study area

12.3.24 The study areas for noise and vibration are illustrated on Figures 12.1 to 12.4 (Application Document 6.2) and described in the following paragraphs.

12.3.25 Operational and construction noise impacts would not occur at the same time, therefore a combined assessment of these two elements is not necessary.

12.3.26 Within the operational phase of the Project, operational road traffic noise and static plant noise impacts are considered under different assessment criteria, and hence a combined assessment is not possible. As such operational impacts associated with road traffic noise, OHL generated noise and static plant have been considered separately in this Chapter.

12.3.27 General construction activities and construction traffic are also considered in different parameters. As such construction impacts associated with off site road traffic noise and general construction activity have been considered separately in this Chapter.

Construction

Construction noise

12.3.28 With regard to the setting of construction noise study areas relating to road schemes, DMRB LA 111 (National Highways, 2020a) states, '*A construction noise study area shall be defined, where the need for further assessment has been established to include all noise sensitive receptors:*

a. *that are potentially affected by construction noise;*

b. *in areas where there is a reasonable stakeholder expectation that a construction noise assessment will be undertaken'.*

12.3.29 DMRB LA 111 (National Highways, 2020a) further qualifies that '*a study area of 300m from the closest construction activity is normally sufficient to encompass noise sensitive receptors*.'

12.3.30 As such, the study area for the construction noise assessment has been defined in accordance with DMRB LA 111 to consider the closest NSRs to the works. In most instances this comprises an area up to 300m from any proposed construction activities associated with the Project. However, due to the rural nature of the Project, where the closest sensitive receptor to the Project route is outside of this 300m area, then the closest receptor has been selected.

12.3.31 The study area was also determined in accordance with guidance provided in BS 5228-1 (British Standards Institution, 2014a). BS 5228-1 states that, generally, at distances over 300m, noise predictions should be treated with caution because of the increasing importance of meteorological effects. As such, the prediction of construction noise levels has generally been limited to within 300m, aside from in areas where the closest sensitive receptor is outside of this distance and still demonstrates a potential for adverse impacts.

12.3.32 Noise impacts from the construction of the Project have been assessed at 140 selected closest sensitive receptors which are considered to be representative of all NSRs within the immediate vicinity of the Project. Receptors are presented on Figure 12.1: Construction Noise and Vibration Study Area (Application Document 6.2).

Construction vibration

12.3.33 The construction vibration study areas are restricted to piling and TBM/Micro-TBM activity for the reasons specified in paragraphs 12.3.6 and 12.3.7. The study areas are defined in accordance with DMRB LA 111 (National Highways, 2020a), which states, '*Where the need for further assessment has been established, a vibration study area shall be defined to include all:*

a. *vibration sensitive receptors that are potentially affected by construction vibration;*

b. *vibration sensitive receptors in areas where there is a reasonable stakeholder expectation that a construction vibration assessment will be undertaken.'*

12.3.34 Therefore, vibration impacts from the construction of the Project have been assessed at 54 sensitive receptors within 100m (as defined by DMRB LA 111) of any structure requiring percussive or vibratory piling activities. Receptors are presented in Figure 12.1: Construction Noise and Vibration Study Area (Application Document 6.2).

TBM and Micro-TBM operations

12.3.35 A desk-based review was carried out relating to receptors sensitive to ground-borne noise and vibration from tunnel boring machinery and Micro-TBM activities based upon professional judgement and separation distances.

12.3.36 Based upon professional judgement and the generation and propagation of ground borne noise and vibration from TBM activities the study area was restricted to 500m from any TBM Activities, outside of which impacts would not occur.

South of the River Thames

12.3.37 Between the South Portal and the River Thames, there are potentially sensitive receptors for TBM generated ground-borne noise and vibration from the main tunnel works, including the advanced grouting tunnel.

12.3.38 A review of this area has identified the following sensitive receptors near the main tunnel alignment:

a. 84 & 86 Castle Lane: 118m from the northbound tunnel and 150m from southbound tunnel; 134m from the advanced grouting tunnel

b. Viewpoint Place: 129m from the northbound tunnel and 161m from southbound tunnel. At 582m the receptor falls outside of the defined study area for ground borne noise and vibration associated with the AGT and as such outside of the zone within which impacts would be expected.

c. St Mary's Church: 441m from the northbound tunnel and 409m from southbound tunnel. At 803m the receptor falls outside of the defined study area for ground borne noise and vibration associated with the AGT and as such outside of the zone within which impacts would be expected

12.3.39 In addition, whilst not a human receptor, consideration of vibration on the structure elements of the canal has been undertaken for the Thames and Medway Canal.

12.3.40 In the area of Thong Lane there are potentially sensitive receptors for Micro-TBM generated ground-borne noise and vibration. A review of this area has identified the following sensitive receptors near the Micro-TBM works.

a. 37 Thong Lane: 42m from Works No. G3 and 63m from Works No. G4

b. Hartshill Bungalow, Thong Lane: 38m from Works No. G3 and 70m from Works No. G4

c. 38 Thong Lane: 52m from Works No. G3 and 73m from Works No. G4

12.3.41 These potentially sensitive receptors are all shown on figures within Appendix 12.6: Assessment of Ground-borne Noise and Vibration at land-based receptors (Application Document 6.3).

North of the River Thames

12.3.42 Between the River Thames and the North Portal, no potentially sensitive receptors for TBM or Micro-TBM generated ground-borne noise and vibration have been identified.

Off-site construction vehicles

12.3.43 With regard to off-site construction traffic, DMRB LA 111 (National Highways, 2020a) states, '*A construction traffic study area shall be defined to include a 50m width from the kerb line of public roads with the potential for an increase in baseline noise level (BNL) of 1 dB(A) or more as a result of the addition of construction traffic to existing traffic levels*'.

12.3.44 As such, the study area for the construction vehicle assessment has considered noise changes in the form of Basic Noise Levels (BNLs) along any road/route identified as experiencing temporary increases in road traffic noise level of 1dB(A) or greater as a result of the construction of the Project, in line with DMRB LA 111 requirements. These roads are presented on Figure 12.2: Construction Traffic Noise and Vibration Study Area (Application Document 6.2).

12.3.45 With regard to diversion routes associated with the construction of the Project, where these have been identified as necessary the study area has been defined in accordance with DMRB LA 111 (National Highways, 2020a) to include '*a 25m width from the kerb line of the diversion route*'. Where these diversions occur during the night-time period, DMRB LA 111 considers it proportionate to assume that any dwelling within 25m of the kerb edge would be subject to disturbance and as such concluded to be adversely impacted.

Operation

Operational traffic noise

12.3.46 The operational noise study area has been derived in accordance with the requirements of DMRB LA 111 (National Highways, 2020a), which says, *'Where the need for further assessment has been established, an operational study area shall be defined within the scoping assessment to include:*

a. *noise sensitive receptors that are potentially affected by operational noise changes generated by the project, either on the route of the project or other roads not physically changed by the project;*

b. *noise sensitive receptors in areas where there is a reasonable stakeholder expectation that noise assessment will be undertaken*'.

12.3.47 Note 1 to paragraph 3.44 of DMRB LA 111 (National Highways, 2020a) further qualifies that, *'An operational study area defined as the following can be sufficient for most projects, but it can be reduced or extended to ensure it is proportionate to the risk of likely significant effects:*

a. *The area within 600m of new road links or road links physically changed or bypassed by the project;*

b. *The area within 50m of other road links with potential to experience a short term BNL change of more than 1.0dB(A) as a result of the project'.*

12.3.48 However, Note 2 to the same paragraph within DMRB LA 111 advises that it may be appropriate to vary this for individual projects. Since the Project often passes through rural areas, the study area has been extended to ensure that all likely effects are identified. The operational study area is presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2), specified as follows:

a. 600m from any road physically changed or bypassed by the Project

b. 1,200m from the Project route to account for the separation distances to receptors and the rural nature of the Project in some places

c. 600m from other road links where there is a change in predicted BNL as a result of the Project in excess of 1.0dB(A) in the short term

Operational vibration

12.3.49 Operational vibration has been considered in accordance with the requirements of DMRB LA 111 (National Highways, 2020a), 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*'.

12.3.50 In support of the guidance of DMRB LA 111, research presented in RR246 Traffic Induced Vibrations in Buildings (Transport Research Laboratory, 1990), found no evidence that traffic-induced ground-borne vibration is a source of significant damage to buildings. The report concluded that *'peak particle velocities in the structure of buildings close to heavily trafficked roads rarely exceed 2 mm/s and typically are below 1mm/s. Normal use of a building such as closing doors, walking on suspended wooden floors and operating domestic appliances can generate similar levels of vibration to those from road traffic'.*

12.3.51 However, in accordance with the Scoping Opinion, road traffic induced ground-borne vibration has been considered according to the methodology presented within RR246 (Transport Research Laboratory, 1990) based upon the specific design parameters of the Project.

Operational ventilation noise

12.3.52 Noise impacts from the operation of the tunnel ventilation system have been considered at selected closest identified sensitive receptors.

12.3.53 The receptors considered in the ventilation assessment are presented on Figure 12.4: Operational Ventilation Noise Sensitive Receptors (Application Document 6.2).

Operational noise – National Grid electricity transmission network

12.3.54 Noise impacts from changes in operational noise associated with the electricity transmission network in the area, which needs to be permanently diverted by the Project, have been considered at selected closest identified sensitive receptors.

12.3.55 The receptors considered in the electricity transmission network assessment are presented in Appendix 12.8: National Grid Electricity Transmission Network, Assessment for Audible Noise (Application Document 6.3).

Impact assessment methodology

12.3.56 The assessment follows the general approach described in Chapter 4: EIA Methodology (I). This section provides topic-specific information regarding the methodology used for establishing the baseline conditions, and the methods used for the construction and operational phase assessments.

Method of establishing baseline conditions

Existing baseline

12.3.57 The existing baseline in relation to noise and vibration was established based on data collection, consultation, modelling studies and site surveys.

Desk-based studies

12.3.58 A desk-based review of the following data sources has been carried out to determine the baseline conditions across the study areas:

a. Noise Action Plan: Roads (Defra, 2019)

b. England Noise and Air Quality Viewer (Extrium, 2022)

c. Commercial mapping and aerial photography sources to derive baseline noise survey locations

Fieldwork

12.3.59 As part of the noise assessment for the Project, the following baseline noise surveys were undertaken at sensitive receptors and strategic locations within the noise study area:

a. Short-term attended noise surveys, undertaken over a period of three hours at 44 locations

b. Unattended 24-hour noise surveys, undertaken at eight locations

c. Unattended long-term noise surveys, undertaken over a period of seven days at 16 locations

12.3.60 The purpose of these surveys was to understand the nature of the existing ambient/baseline noise climate of the area surrounding the Project, and to identify areas of existing high or low noise levels and their sources (for example road, aircraft, rail).

12.3.61 These noise monitoring locations are presented on Figure 12.5: Baseline Noise Monitoring Locations (Application Document 6.2). Further information regarding the baseline noise surveys is detailed in Appendix 12.5: Baseline Noise Survey Information (Application Document 6.3).

Future baseline ('Without Scheme' scenario)

12.3.62 Modelling techniques have been used to calculate future road traffic noise levels across the operational road traffic noise study area. This has been done for all receptors identified for the future assessment year of 2044 in accordance with the requirements of DMRB LA 111.

12.3.63 This future baseline road traffic noise climate has been determined using the 'Do-Minimum' traffic scenario from 2045 from the Project's transport model. This assumes that the Project is not operational, but with wider growth in line with DfT TEMPro 7.2 traffic growth forecasts, adjusted for local development as set out within Appendix C: the Transport Forecasting Package of the ComMA (Application Document 7.7)) which includes the Project's Uncertainty Log.

12.3.64 This scenario has been modelled within the commercially available, proprietary noise mapping software IMMI, which is validated to implement the CRTN calculation methodology (Department for Transport and Welsh Office, 1988) and is therefore appropriate to use to predict noise associated with NSIPs.

Method of assessment – construction

12.3.65 Outputs of construction transport modelling data from the Lower Thames Area Model (LTAM) (described in the Transport Assessment (Application Document 7.9) and the Combined Modelling and Appraisal Report (Application Document 7.7)) have been used for this assessment to predict construction road traffic noise impacts as a result of the Project. Traffic data used for the noise assessment includes total vehicle flows, number of light vehicles, number and percentage of Heavy Goods Vehicles (HGVs), and pivoted speeds (speed pivoting ensures that modelled speeds from the traffic model are consistent with observed speeds). The traffic data is based on 18-hour Annual Average Weekday Traffic (AAWT). Do-Minimum (without the Project) and Do-Something (with the Project) traffic datasets are obtained for each year of construction.

Onsite construction noise

12.3.66 The method of assessing construction noise impacts follows that defined in DMRB LA 111 (National Highways, 2020a).

12.3.67 Noise levels during the construction phase of the Project have been predicted using the formulae contained within BS 5228-1 (British Standards Institution, 2014a).

Off-site construction vehicle noise

12.3.68 Off-site construction vehicle noise impacts have been assessed in accordance with the methodology outlined in DMRB LA 111, implementing the prediction methodology of the CRTN (Department for Transport and Welsh Office, 1988).

12.3.69 For each identified link (i.e. those that would experience a change of 1dB or more in road traffic noise), the predicted road traffic noise levels including construction vehicles for the years 2025 to 2030 have been compared against a baseline scenario without construction vehicles for the same year.

Construction vibration from piling

12.3.70 Impacts associated with construction vibration have been assessed in accordance with DMRB LA 111.

12.3.71 Vibration levels, in terms of peak particle velocity (PPV), generated from the operation of piling equipment during the construction phase of the Project have been predicted using the formulae contained within Annex E of BS 5228-2 (British Standards Institution, 2014b).

Construction noise and vibration from TBM/Micro-TBM

12.3.72 Ground-borne noise and vibration result from the excitation of the ground medium surrounding a source of vibration, in this instance the motion and action of tunnel boring machinery /Micro-TBM. Essentially, the phenomena of ground-borne noise and ground-borne vibration describe the same issue, which is the excitation of the ground. The difference between the two parameters relates more to the way the phenomena affect the receptor, in the case of human receptors as either audible sound (ground-borne noise) or tactile/motion effects (ground-borne vibration).

12.3.73 Ground-borne noise and vibration levels generated from the operation of tunnel boring machinery / Micro-TBM have been calculated using proprietary software FINDWAVE®. This software uses finite difference analysis techniques and calculates likely levels of ground-borne noise and vibration at receptors from the operational TBM/Micro-TBM, taking into account separation distance and geological conditions.

12.3.74 Details of the prediction methodology and parameters used in the TBM/ Micro-TBM noise and vibration assessment are presented within Appendix 12.6: Assessment of Ground-borne Noise and Vibration at land-based receptors (Application Document 6.3).

Method of assessment – Operation

12.3.75 Outputs of Core Do Minimum (without the Project) and Core Do Something (with the Project) transport modelling data for the opening year (2030) and future assessment year (2045) have been used for the operational daytime and night-time road traffic noise assessment. Further information on the traffic data can be found in the following paragraphs and in the road traffic noise assessment in Section 12.6.

Operational daytime road traffic noise prediction

12.3.76 Operational road traffic noise impacts have been assessed in accordance with the methodology outlined in DMRB LA 111, using the calculation methodology of the CRTN (Department for Transport and Welsh Office, 1988).

12.3.77 The prediction method takes into account factors such as the traffic flow, composition and speed, the alignment and distance of the road relative to the receiving property, the road surface type, the nature of the intervening ground cover between the road and receptors, and reflections from building facades in order to calculate the dB $L_{A10, 18hr}$ noise level.

12.3.78 Road traffic noise has been predicted using the commercially available, proprietary noise mapping software IMMI, which is validated to implement the CRTN calculation methodology and is therefore appropriate to use to predict noise associated with NSIPs.

Operational night-time road traffic noise prediction

12.3.79 Night-time operational road traffic noise impacts have also been assessed in accordance with the methodology outlined in DMRB LA 111, which recommends using the methods proposed in the TRL report PR/SE/451/02 ‘Converting the UK traffic noise index dB $L_{A10\ 18\text{-}hour}$ to EU noise indices for noise mapping’ (TRL, 2002) when considering night-time road traffic noise.

12.3.80 DMRB LA 111 states that this TRL document provides methods to convert $L_{A10, 18hr}$ to other indices, including the $L_{Aeq, 8hr}$ parameter for the assessment and consideration of night-time road traffic noise impacts. TRL 'Method 1' requires hourly traffic flows and gives reliable results. However, the methodology is only as reliable as the input data, and currently transportation models cannot accurately predict flows every hour in the overnight period. As such, while the TRL ‘Method 1’ process itself is more accurate, the lack of availability of robust hourly overnight traffic data on this Project currently limits its accuracy. TRL 'Method 2' has been shown in some circumstances to give large step changes and thus also unreliable results. TRL 'Method 3' provides reliable results for most UK roads.

12.3.81 The LTAM Fully Modelled Area includes the representation of special traffic generating locations such as ports. This includes the Port of Dover, the Port of Tilbury and the DP World London Gateway port which are included as point zones. More information about the approach taken is detailed within Appendix B: The Transport Model Package, and Appendix C: The Transport Forecasting Package of the Combined Modelling and Appraisal Report (Application Document 7.7).

12.3.82 Therefore, it is concluded that the relationships relied upon in Method 3 are representative across the majority of the Project noise study area, so the method provides a robust consideration of night-time road traffic noise based upon the available and reliable outputs generated by the LTAM. On the basis of the traffic information available in support of the Project, Method 3 has therefore been used to support the night-time road traffic noise assessment.

12.3.83 Furthermore, when the measured $L_{A10, 18hr}$ daytime noise levels in 2019/2020 across the study area are converted to $L_{Aeq\ 8hr}$ night-time levels using Method 3, the values correlate reliably to the measured $L_{Aeq\ 8hr}$ night-time levels, with a mean error of 0.5dB. This further corroborates the view that the relationships between night-time traffic flows and Method 3 are reliable within the Project noise study area.

Operational daytime road traffic noise assessment

12.3.84 In accordance with DMRB LA 111, the following comparisons have been made of the predicted 18-hour daytime road traffic noise levels (06:00 to 24:00). In the comparisons described below, the term 'Do-Minimum' describes a situation without the Project, and 'Do-Something' describes a situation inclusive of the Project and all defined mitigation (Section 12.5):

a. Short-term: Do-Minimum scenario in the opening year (DMOY 2030) against Do-Something scenario in the opening year (DSOY 2030)

b. Long-term: Do-Minimum scenario in the opening year (DMOY 2030) against Do-Something scenario in the future assessment year (DSFY 2045)

c. Long-term non-Project change: Do-Minimum scenario in the opening year (DMOY 2030) against Do-Minimum scenario in the future assessment year (DMFY 2045)

Operational night-time road traffic noise assessment

12.3.85 In accordance with DMRB LA 111, short-term and long-term comparisons have been undertaken to consider night-time road traffic noise changes as a result of the Project for the same short-term, long-term, and long-term non-Project change comparisons as used in the daytime assessment (set out in the previous paragraph).

Operational road traffic vibration impact assessment method

12.3.86 DMRB LA 111 specifies that operational road traffic ground-borne vibration impacts should not be assessed, and specifies the reasoning as to why the subject can be scoped out of assessment. However, as a result of a specific request from PINS via the Scoping Opinion (Planning Inspectorate, 2017), operational road traffic ground-borne vibration impacts were specifically requested to be considered. Therefore, the methodology of TRL (1990) report RR246 has been used to predict these levels of ground-borne vibration from road traffic noise sources.

Operational tunnel ventilation noise impact assessment method

12.3.87 The Project includes a twin bore tunnel which would require a ventilation system to maintain airflow through the tunnels. Tunnel ventilation noise has been assessed following the methodology of BS 4142, which provides a methodology with which to assess the significance of impacts from static plant sources.

Operational National Grid electricity transmission network

12.3.88 The Project includes the permanent diversion of a number of OHLs within the National Grid electricity transmission network. Overhead electricity transmission network noise is predicted and assessed using a different methodology to road traffic noise. The full assessment methodology is set out within Appendix 12.8: National Grid Electricity Network, Assessment for Audible Noise (Application Document 6.3)

12.3.89 This assessment has been undertaken in accordance with the standard National Grid methodology for considering noise associated with OHL diversions considered as NSIPs: National Grid Policy Statement PS(T)134 and its supporting technical guidance, TGN(E)322 and TR(E)564.

12.3.90 PS(T)134 describes a methodology for predicting and assessing the environmental impact due to audible noise caused by new, reconductored, diverted or uprated overhead transmission lines, considering noise generation associated with operating voltage, conductor design and pylon geometry. To present a robust assessment the study has considered both “wet noise” and “dry noise”, with people generally having a higher tolerance to dry noise.

12.3.91 The health based noise criteria set out within PS(T)134 has been used within the scope of the assessment as it takes account of UK policy and evidence from multiple sources, including the World Health Organisation and BS 4142:2014 + A1:2019. The guidance presents a three-tier ‘screening’ approach based on source to receptor distance.

12.3.92 If predicted noise levels fail the Tier 1 test, a Tier 2 assessment is undertaken.

12.3.93 If predicted noise levels fail the Tier 2 test, a Tier 3 assessment is undertaken.

12.3.94 This three-tier approach effectively screens receptors out of further assessment where there would be no adverse impact, and leads to a greater detail of assessment where the screening concludes a risk of adverse impacts.

12.3.95 Tier 1: A primary screening step based on ‘worst-case’ absolute wet noise effects and the pre-determined assessment criteria set out in PS(T)134;

12.3.96 Tier 2: A further screening step based on combined absolute wet noise and dry noise effects and recalculated assessment criteria which take account of the annual average rainfall rate in the assessment area. This step takes account of the fact that wet noise occurs during periods of wet weather and therefore does not occur all the time; and

12.3.97 Tier 3: If required, full assessment following the principles of BS 4142:2014 + A1:2019 for both wet noise and dry noise.

12.3.98 The health based noise criteria set out within PS(T)134 for each “Tier” of assessment are detailed within Appendix 12.8 by receptor type.

Identifying mitigation and enhancement measures

12.3.99 In line LA 111, referencing the requirements of the Noise Policy Statement for England (NPSE) (Defra, 2010) and the NPSNN (Department for Transport, 2014), conclusions on noise mitigation would first involve identifying whether the level of the noise or vibration exposure would be above or below a Significant Observed Adverse Effect Level (SOAEL) or a Lowest Observed Adverse Effect Level (LOAEL) for the given situation. The application of these requirements to the policy tests in the NPS is set out in Table 12.2 further below.

12.3.100 The terms LOAEL and SOAEL are concepts of effect which are derived from toxicology and are defined within NPSE along with a further term of No Observed Effect Level (NOEL). These are described below:

a. 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.

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

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

12.3.101 With regard to levels of SOAEL, the NPSE (Defra, 2010) states:

'*It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available*.'

12.3.102 LA 111 further identifies that the suitability of any potential mitigation measure for use within a project shall consider the following:

a. For residential noise receptors only, a comparison of the monetised noise benefit of a mitigation measure against the cost of the measure over the anticipated design life of the project;

b. The likely perceived benefit of the measure at any noise sensitive receptors;

c. The benefit of a measure in terms of elimination of likely significant effects;

d. Practicality of the measure, for example, in terms of safety considerations and engineering constraints;

e. The impact of the measure across other environmental factors, for example the visual impact of a noise barrier.

12.3.103 The hierarchy of noise exposure taken from LA 111 and the resultant mitigating action/Project response required is presented in Table 12.2.

Table 12.2 NN-NPS Aims and associated actions from Table E/1.3 of LA 111

NN-NPS Aim	Action	Action applicable to all three aims
Aim 1: Avoid significant adverse impacts on health and quality of life from noise as a result of the new development. NOTE: Significant adverse noise effects occur when noise levels are above SOAEL.	1) For each receptor or group of receptors, set out the mitigation measures used to reduce noise exposure to below SOAEL; 2) Where project noise levels are not predicted to be below the SOAEL, report the reasons why noise levels could not be reduced below the SOAEL, in terms of Government policy on sustainable development.	Mitigation measures include the following: 1) measures incorporated into a project to reduce overall environmental impact, which can include, but are not limited to: project alignment, project design; and, 2) measures used solely to mitigate noise, which can include, but are not limited to, noise barriers, restrictions on the use of plant during the construction phase, or quieter road surfaces.
Aim 2: Mitigate and minimise other adverse impacts on health and quality of life from noise from the new development. NOTE: Other adverse impacts occur when noise levels are between LOAEL and SOAEL.	1) Set out measures used to mitigate and minimise other adverse impacts for all receptors or groups of receptors where project noise levels are above LOAEL; 2) Where project noise levels are not predicted to be below the LOAEL, report the reasons why noise levels could not be reduced below the LOAEL, in terms of Government policy on sustainable development.	
Aim 3: Contribute to improvements to health and quality of life through the effective management and control of noise, where possible. NOTE: Applies to all noise levels.	1) Set out mitigation measures used to improve the noise environment. 2) Where it has not been possible to contribute to improvements to health and quality of life through management of project noise levels, report the reasons why it is not possible in terms of Government policy on sustainable development.	

12.3.104 The following sections describe how the different noise and vibration impacts associated with the Project have been quantified using relevant guidance to determine LOAEL and SOAEL for each different identified element of the noise and vibration assessment.

Determining significance of effects

12.3.105 As described in Chapter 4: EIA Methodology, the significance of environmental effects was determined by taking into account the value (sensitivity) of the receptor and the magnitude of the impact. However, for noise and vibration the generic significance matrix as provided in Chapter 4: EIA Methodology does not apply. Instead, the method for determining significance for noise and vibration is set out in this chapter.

12.3.106 The assessment of significance undertaken in this chapter is used as the basis for identifying effects which are considered significant in the context of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations).

Defining the importance/sensitivity of resources and/or receptors

12.3.107 In terms of noise and vibration, there is no published methodology available to assign a value to a receptor. In accordance with DMRB LA 111:

a. **Noise sensitive receptors** (NSRs) are defined as dwellings, hospitals, healthcare facilities, education facilities, community facilities, Environmental Noise Directive quiet areas or potential Environment Noise Directive quiet areas, international and national or statutorily designated sites, Public Rights of Way and cultural heritage assets.

b. **Vibration sensitive receptors** (VSRs) are classified as dwellings, hospitals, healthcare facilities, education facilities, community facilities, buildings containing vibration-sensitive equipment and cultural heritage assets.

12.3.108 DMRB LA 111 further states that, with regard to receptors containing biodiversity resources (DMRB LA 108), landscape resources (DMRB LA 107), cultural heritage resources (relating to the impacts on the building itself not residents of such) (DMRB LA 106) and community recreation resources (DMRB LA 112), these should be considered in accordance with the appropriate sections of the DMRB within the appropriate sections of the ES.

12.3.109 In addition to the sensitive receptor categories specified in DMRB LA 111, receptors within Noise Important Area(s) (NIAs), which are defined based upon the Strategic Noise Maps and defined in line with the requirements of the noise action plans, have also been considered within the noise and vibration assessment.

Defining impact magnitude and effect significance

Construction

Construction noise impact criteria

12.3.110 For construction noise, the values for LOAEL and SOAEL for dwellings are defined in accordance with DMRB LA 111, as outlined within Table 12.3.

Table 12.3 LA 111 Construction noise LOAEL and SOAEL values

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 BS 5228-1, Section E3.2 and Table E.1.
Night (23:00–07:00)	Baseline noise levels $L_{Aeq, T}$	Threshold level determined as per BS 5228-1, Section E3.2 and Table E.1.
Evenings and weekends (time periods not covered in rows above)	Baseline noise levels $L_{Aeq, T}$	Threshold level determined as per BS 5228-1, Section E3.2 and Table E.1.

12.3.111 Table E.1 from BS 5228-1 has been used to determine the SOAEL in the construction noise assessment for each NSR and is presented in Table 12.4.

Table 12.4 BS 5228-1 (Table E.1)

Assessment category and threshold value period	Threshold level		
	Category A	Category B	Category C
Night-time (23:00–07:00)	45dB L_{Aeq}	50dB L_{Aeq}	55dB L_{Aeq}
Evenings and weekends[1]	55dB L_{Aeq}	60dB L_{Aeq}	65dB L_{Aeq}
Daytime (07:00–19:00) and Saturday mornings[2]	65dB L_{Aeq}	70dB L_{Aeq}	75dB L_{Aeq}
1 19:00–23:00 weekdays, 13:00–23:00 Saturdays and 07:00–23:00 Sundays **2** 07:00–13:00 Saturdays			
A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values. B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values. C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.			

12.3.112 Based on the information defined within DMRB LA 111, magnitude of impact has been defined relative to both environment, and health and quality of life impacts. As such, the following impact magnitudes are applicable:

a. **Negligible:** Below LOAEL (as defined in Table 12.3)

b. **Minor:** Above or equal to LOAEL and below an SOAEL (Table 12.3)

c. **Moderate:** Above or equal to an SOAEL and below an SOAEL +5dB (Table 12.3)

d. **Major:** Above or equal to an SOAEL +5dB (Table 12.3)

12.3.113 Additionally, off-site construction traffic impacts on the surrounding road network have been considered. While similar values for LOAEL and SOAEL have been used as for other construction activities, the magnitude of impact at receptors from this activity is defined based on the requirements of DMRB LA 111 as below:

a. **Negligible:** Less than 1.0dB change in road traffic noise

b. **Minor:** Greater than or equal to a 1.0dB, but less than a 3.0dB, change in road traffic noise

c. **Moderate:** Greater than or equal to a 3.0dB, but less than a 5.0dB, change in road traffic noise

d. **Major:** Greater than or equal to a 5.0dB change in road traffic noise

12.3.114 Significant effects are then defined in accordance with DMRB LA 111 on the following grounds:

12.3.115 '*Construction noise and construction traffic noise shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:*

a. *10 or more days or nights in any 15 consecutive days or nights;*

b. *a total number of days exceeding 40 in any 6 consecutive months.'*

Ground-borne noise impact criteria for TBM/ Micro-TBM

12.3.116 The phenomena of ground-borne noise is defined within paragraph 12.3.72

12.3.117 As the tunnel boring machinery /Micro-TBM would be operational underground, the impacts of airborne noise would be limited. However, the same energy that would generate airborne noise is transmitted as ground-borne noise, and as such this is considered within the assessment.

12.3.118 There are no UK legislative standards or criteria that define when ground-borne noise becomes significant. The impact used for ground-borne noise from the tunnel boring machinery/Micro-TBM has been based on the criteria considered as acceptable through the Development Consent Order (DCO) process on other UK tunnelling projects, including the Silvertown Tunnel, Crossrail and Thames Tideway Tunnel.

12.3.119 The assessment of TBM/Micro-TBM ground-borne noise impacts at identified sensitive receptors has been undertaken using the dB $L_{Amax, Slow}$ parameter. The magnitude criteria for different levels of predicted ground-borne noise from tunnel boring machinery/Micro-TBM is presented in Table 12.5.

Table 12.5 Ground-borne noise significance thresholds TBM/Micro-TBM

Ground-borne noise level (dB $L_{AMax, slow}$)	Magnitude of impact	Observed Adverse Effect Level
<35	Negligible	n/a
≥35 to <45	Minor	LOAEL
≥45 to <50	Moderate	SOAEL
≥50	Major	

12.3.120 At levels below 25dB $L_{AMax, Slow}$ it is considered that there would be no observed effects associated with ground borne noise.

12.3.121 Levels of ground-borne noise generated by TBM/Micro-TBM activities have been deemed to constitute a significant adverse effect where it is determined that moderate or greater magnitude of impact will occur at any identified sensitive receptor.

Piling ground-borne vibration impact criteria

12.3.122 Based on the guidance of DMRB LA 111, magnitude of impact has been defined relative to environment, and health and quality of life impacts. As such, the following impact magnitudes are applicable with regard to piling ground-borne vibration:

a. **Negligible:** Below LOAEL (as defined in Table 12.6)

b. **Minor:** Above or equal to LOAEL and below an SOAEL (Table 12.6)

c. **Moderate:** Above or equal to an SOAEL and below 10mm/s PPV (Table 12.6)

d. **Major:** Above or equal to 10mm/s PPV

12.3.123 A significance of effect in terms of PPV for piling operations has been determined, along with values for LOAEL and SOAEL, and is presented in Table 12.6.

Table 12.6 Construction vibration significance thresholds

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

12.3.124 Significant effects are then defined in accordance with DMRB LA 111 on the following grounds:

12.3.125 '*Construction vibration shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:*

a. *10 or more days or nights in any 15 consecutive days or nights;*

b. *a total number of days exceeding 40 in any 6 consecutive months.'*

Ground-borne vibration impact criteria for TBM/Micro-TBM

12.3.126 The phenomena of ground-borne vibration is defined within paragraph 12.3.72.

12.3.127 The significance of ground-borne vibration levels from TBM/Micro-TBM and tunnelling activities with regard to human perception are best described in terms of the vibration dose value (VDV); with this parameter defined under BS 6472-1:2008 'Guide to evaluation of human exposure to vibration in buildings - Vibration sources other than blasting' (British Standards Institution, 2008). Values for VDV relative to tunnelling activities have been drawn from High Speed 2 (HS2) Information Paper E23 (Phase 1) Control of Construction Noise and Vibration (HS2, 2017), which presents the significance of vibration levels in terms of VDV with reference to LOAEL and SOAEL values.

12.3.128 The criteria thresholds for predicted VDV vibration from the tunnel boring machinery /Micro-TBM are different for daytime and night-time periods, as presented in Table 12.7.

Table 12.7 Tunnelling vibration significance thresholds TBM/Micro-TBM

Time period	VDV ($m/s^{1.75}$)	Magnitude of impact	Observed adverse effect level
Day	<0.2	Negligible	n/a
	≥0.2 to <0.8	Minor	LOAEL
	≥0.8 to <1	Moderate	SOAEL
	≥1	Major	
Night	<0.1	Negligible	n/a
	≥0.1 to <0.4	Minor	LOAEL
	≥0.4 to <0.7	Moderate	SOAEL
	≥0.7	Major	

12.3.129 At levels below 0.1 $m/s^{1.75}$ daytime and 0.05 $m/s^{1.75}$ it is considered that there would be no observed effects associated with ground borne vibration.

12.3.130 Ground-borne vibration generated by TBM/Micro-TBM activities has been deemed to constitute a significant adverse effect where it is determined that a moderate or greater magnitude of impact would occur at any of the identified sensitive receptors.

Operation

Operational road traffic noise impact criteria

12.3.131 DMRB LA 111 provides a classification for the magnitude of change in road traffic noise. A change in road traffic noise of 1dB(A) in the short term (DMOY to DSOY) is the smallest that is considered perceptible. In the long term (DMOY to DSFY), a 3dB(A) change is the smallest that is considered to be perceptible.

12.3.132 The magnitude of impact in the short and long term is therefore considered to be different. For road traffic noise, the classification of magnitude of change is reproduced from DMRB LA 111 in Table 12.8.

Table 12.8 Classification of magnitude of noise impact

Short-term magnitude	Long-term magnitude	Change in road traffic noise level
No change	No change	0dB
Negligible	Negligible	>0dB and <1dB
Minor		≥1dB and <3dB
Moderate	Minor	≥3dB and <5dB
Major	Moderate	≥5dB and <10dB
	Major	≥10dB

12.3.133 In addition to the above classifications of magnitude associated with operational road traffic noise, definitions of LOAEL and SOAEL used in the operational traffic noise assessment are presented in Table 12.9, reproduced from the advice of DMRB LA 111.

Table 12.9 Levels of LOAEL and SOAEL – operational road traffic noise

Time period	Adverse effect level	$L_{night, outside}$ noise level (dB)	L_{A10} noise level (dB)
Day	LOAEL	n/a	55dB $L_{A10, 18hr}$ facade
	SOAEL	n/a	68dB $L_{A10, 18hr}$ facade
Night	LOAEL	40dB $L_{night, outside}$ (free field)	n/a
	SOAEL	55dB $L_{night, outside}$ (free field)	n/a

12.3.134 An initial assessment would indicate a significant effect from road traffic noise on noise sensitive buildings is deemed to have occurred if the predicted change in road traffic noise level is:

a. Moderate or greater below a SOAEL in the short term (Table 12.9)

b. Minor or greater above a SOAEL in the short term (Do-Something) (Table 12.9)

12.3.135 A significant environmental effect would be determined based upon the instructions within DMRB LA 111, taking into account factors such as:

a. Magnitude of change in short term and long term

b. Absolute noise level with reference to LOAEL and SOAEL

c. Acoustic context and characteristics of the resultant noise climate

d. Circumstance of receptor, i.e. location of noise sensitive rooms (bedrooms/living rooms) and whether the receptor would also experience benefits from the Project

Operational road traffic ground-borne vibration impact criteria

12.3.136 DMRB LA 111 does not provide impact criteria for ground-borne vibration generated by road traffic movements.

12.3.137 Therefore, the guidance of BS 5228-2 with regard to effects of vibration levels on humans in terms of PPV has been used for the consideration of road traffic induced ground-borne vibration:

a. **Negligible:** Below LOAEL (as defined in Table 12.10)

b. **Minor:** Above or equal to LOAEL and below an SOAEL (Table 12.10)

c. **Moderate:** Above or equal to an SOAEL and below 10mm/s PPV (Table 12.10)

d. **Major:** Above or equal to 10mm/s PPV

12.3.138 Using the requirements provided in BS 5228-2, a significance of effect in terms of PPV for operational road traffic induced ground-borne vibration has been determined, along with values for LOAEL and SOAEL, and is presented in Table 12.10.

Table 12.10 Road traffic induced ground-borne vibration significance thresholds

Vibration level (PPV)	Effect	Observed Adverse Effect Level
>0.14 to <0.3mm/s	Vibration might be just perceptible in the most sensitive situations.	n/a
≥0.3 to <1.0mm/s	Vibration might be just perceptible in residential environments.	LOAEL
≥1.0 to <10mm/s	It is likely that vibration of this level in residential environments will cause complaint.	SOAEL
≥10mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	

12.3.139 Significant effects are then defined in accordance with DMRB LA 111 on the grounds that a major or moderate magnitude of impact occurs.

Operational tunnel ventilation noise impact criteria

12.3.140 An assessment of the likely impacts from the tunnel ventilation system was carried out in accordance with BS 4142 at residential receptors. The assessment compared the measured background noise level to the predicted noise level from the plant items under consideration, and considered the following:

a. Typically, the greater this difference, the greater the magnitude of the impact.

b. A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context. This is defined as an SOAEL.

c. A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

d. The lower the rating level is, relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Therefore, LOAEL is defined as existing background.

e. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

12.3.141 Assessment of impacts associated with static/fixed plant is based on the considerations presented above.

Operational National Grid electricity transmission network

12.3.142 An assessment of the likely impacts from the electricity transmission network was carried out in accordance with noise prediction and assessment method described in National Grid Policy Statement PS(T)134 and its supporting technical guidance TGN(E)322 and TR(E)564. The full assessment methodology and the derivation of the criteria are fully set out within Appendix 12.8: National Grid Electricity Network, Assessment for Audible Noise (Application Document 6.3).

12.3.143 Under this guidance, a three tier assessment criteria is set out as detailed in paragraphs 12.3.88 to 12.3.98. Under this tiered approach the following criteria is set:

a. Tier 1, wet noise criteria for screening out of impacts:

Table 12.11 Tier 1 assessment criteria

Receptor Class	**No Adverse Impact**	**Further Assessment Necessary**
	Screened Out	**TIER 2 Assessment Required**
Vulnerable Subgroups	< 29 dB(A)	≥ 29 dB(A)
Residential	< 34 dB(A)	≥ 34 dB(A)
Schools and Hotels	< 39 dB(A)	≥ 39 dB(A)

b. Tier 2, combined dry and wet noise criteria for screening out of impacts:

Table 12.12 Tier 2 defined assessment criteria (rainfall <450hrs per year)

Receptor Class	**No Adverse Impact**	**Further Assessment Necessary**	**Significant Adverse Impact**
	Acceptable	**Mitigate and Minimise**	**Unacceptable**
	Screened Out	**TIER 2 Assessment Required**	**TIER 3 Assessment Required**
Vulnerable Subgroups	< 31.9 dB(A)	31.9 to 41.9 dB(A)	> 41.9 dB(A)
Residential	< 36.9 dB(A)	36.9 to 46.9 dB(A)	> 46.9 dB(A)
Schools and Hotels	< 41.9 dB(A)	41.9 to 51.9 dB(A)	> 51.9 dB(A)

c. Under Tier 3 a full BS 4142 assessment would be undertaken and the criteria set out within paragraph 12.3.140 would apply.

Assumptions and limitations

12.3.144 General assumptions used throughout the ES, and limitations affecting the assessments are set out in Chapter 4: EIA Methodology. Relevant assumptions and any other limitations encountered during the noise and vibration assessment are as described below. Acknowledging the assumptions and limitations identified below and in Chapter 4: EIA Methodology, the ES is considered robust and in line with relevant legislation, policy, and guidance.

12.3.145 The construction modelling undertaken using the Project's transport model provides an extensive quantitative assessment of the forecast impact of construction works on the road network, using the same traffic baseline and forecasting work that informed the operational modelling.

12.3.146 The construction noise assessment has been carried out on a reasonable worst case scenario, based on the envisaged construction programme and plant itinerary, taking into account assumptions as to the types of activities, percentage on times and plant that are likely to be used, as discussed in Appendix 12.4: Construction Noise and Vibration Assessment (Application Document 6.3). It should be noted at this stage that the lists within Appendix 12.4 do not form the full complement of plant and equipment for each phase of construction. Where plant is likely to be in close proximity to a receptor the noise calculations consider a single homogenous source for the type of works described. Changes to the construction information through refinement and development process would result in changes to the noise assessment, however these changes are unlikely to result in material differences to the conclusions drawn within this chapter, unless significant variations in methodology are proposed. Any such variations, including significant variations, in methodology would be controlled through the commitments set out in the CoCP/REAC.

12.3.147 In line with the Code of Construction Practice (CoCP) (Application Document 6.3), it is assumed for the purposes of the noise and vibration assessment that under the reasonable worst case scenario assessed, and accounting for the working hours assumptions for the Project as defined in Table 6.1 of the CoCP, outside of emergency situations and abnormal loads there will generally be no overnight construction haulage traffic associated with any activities on the Project.

12.3.148 Assessment and consideration of TBM/Micro-TBM ground-borne noise and vibration is based on the current knowledge with regard to the geology of the tunnel alignment. Micro-scale variations in the geology not picked up by the ground investigations may result in slight changes in the characteristic of the ground excitation during the passage of the tunnel boring machinery /Micro-TBM; however, these are not considered to be a significant issue based on the distances involved between the tunnel boring machinery /Micro-TBM and potential receptors and are unlikely to materially change the conclusions drawn with regard to ground borne noise and vibration.

12.3.149 In accordance with DMRB LA 111, the definition of the operational road traffic noise study area was varied from those parameters typically implemented. To account for local factors, the study area along the route corridor was expanded from 600m to 1,200m either side of the Project route. This was done to account for situations where there would be a reasonable stakeholder expectation that noise should be considered. However, while the defined Project study area is greater than the recommended study area from DMRB LA 111, it is not considered to be beyond the validity limit of the methodology or to adversely affect the uncertainty inherent therein. As such, the predictions and assessments carried out between 600m and 1,200m are considered to be both representative and robust for the purposes of assessment and consideration of road traffic noise.

12.3.150 The DCO application has been developed on the basis of a 2030 opening year. This assumes consent is granted in 2024. Following the DCO grant there would be preparatory works, referred to in the draft DCO as preliminary works taking place in 2024. The main construction period for the Lower Thames Crossing would start in early 2025, with the road being open for traffic in late 2030. Construction may take approximately six years, but as with all large projects whist there was a design freeze implemented to provide information upon which to base the assessments, there remains a level of uncertainty over the construction programme, which will be refined once Contractors are appointed and as the detailed design is developed. The 2030 opening year has been selected as the basis for the assessments and is representative of the reasonable worst-case scenario. This has been used consistently across the environmental assessments, transport assessments and the economic appraisal of the Project.

12.3.151 Operational audible noise from electricity OHLs occurs at an conductor surface voltage gradient or electrical stress level of approximately 17 to 20 kilovolts per centimetre (kV/cm). The electrical stresses on a 132kV circuit are typically in the range 5 to 6kV/cm, which is such a low level that they would virtually never produce noise. Therefore, operational noise from any of the proposed 132kV OHL diversions has not been accounted for in the electricity OHL noise assessment.

12.3.152 An assessment of the impact from combined operational noise sources associated with the Project, namely that from the operational road traffic noise, OHLs noise and tunnel ventilation systems, has not been considered necessary within the scope of this study. With the implementation of the Project the noise climate along the route will change, with ambient noise levels increasing as a result of the new road in the environment. The levels of road traffic noise generated by the Project is such that low level OHL generated noise (predicted to be between 22dB(A) and 36dB(A)) and tunnel ventilation noise (predicted to be between 23dB(A) and 30dB(A)), would not result in any cumulative increase in noise at any receptor; with road traffic noise from the Project being the dominant noise source of concern.

12.3.153 Within the scope of the operational road traffic noise assessment, the study area has been defined based upon the guidance presented within DMRB LA 111. This study area covers the main alignment, bypassed routes and affected links and uses the outputs from the LTAM. The study area defined for noise is much smaller in size than the LTAM fully modelled area.

12.3.154 Initial road traffic noise calculations, based upon the LTAM dataset, undertaken in accordance with the BNL methodology of the DMRB LA 111 identified the B186 Warley Hill in Brentwood, as demonstrating the potential to be classified as an affected link resulting from increases in heavy vehicle movements in the do something scenario. This link is approximately 3km northeast of the main Project alignment and no other affected links were identified in the definition of the study area connecting it to the main Project alignment.

12.3.155 The identification of this link, and the iterative process followed within the noise assessment, lead into a process of detailed consideration and discussion with the traffic team about the B186 Warley Hill link. Detailed analysis of the network coding in the LTAM was undertaken and some restrictions on vehicles over 7.5 tonnes, apart from access, were identified. The LTAM does not include these vehicle restrictions, meaning that the dataset presented was a worst case with no restriction on the distribution of heavy vehicles within this area. To remedy this, and to consider if the B186 Warley Hill would be identified within the study area as an affected link, additional detail on these restrictions were added into the LTAM, together with a division of HGV vehicles into those above and below the 7.5 tonne limit to present a reasonable worst case of the actual situation that exists in and around Brentwood.

12.3.156 The subsequent definition of the operational road traffic noise study area, based upon this detailed consideration of heavy vehicle distributions in the Brentwood area, identified that Warley Hill would not be classified as an affected link. Any cumulative effects are considered and presented within the scope of Chapter 16: Cumulative Effects Assessment (Application Document 6.1).

Nitrogen deposition compensation sites

12.3.157 The DCO application documents identify the locations of habitat creation sites proposed as compensation for the effects of nitrogen deposition. Consideration of these sites is not relevant to this chapter because only limited groundworks and construction plant are required. Assessment of these sites has therefore been excluded from the scope of this Chapter.

12.4 Baseline conditions

Existing baseline

12.4.1 To help interpret the noise climate over such a large area, the study area has been divided into eight discrete geographical sections and the baseline is described separately for each:

a. Between the M2/A2/Lower Thames Crossing junction and the south shore of the River Thames

b. Between the north shore of the River Thames and the A13/A1089 junction

c. Between the A13/A1089 junction and the A122 Lower Thames Crossing/M25 junction

d. Along the existing A13 between A13/A1089/A122 Lower Thames Crossing junction and M25 junction 30

e. Along the existing M25 between the Dartford Crossing and M25 junction 28

f. Along the existing A282 between the Dartford Crossing and the M25 junction 2 (with the A2)

g. Along the existing A2 between M25 junction 2 and the M2

h. Affected unaltered traffic links outside of bypassed area

Between the M2/A2/Lower Thames Crossing junction and the south shore of the River Thames

Receptors

12.4.2 There are a number of dwellings between the M2/A2/Lower Thames Crossing junction and the south shore of the River Thames that fall within the noise and vibration study area. These are primarily within residential areas to the east of the Project in Gravesend, Chalk, Singlewell, Riverview Park and Thong. In addition to these main residential areas, there are also numerous outlying, more isolated dwellings.

12.4.3 The following other sensitive receptors (OSRs) were also identified within the study area and are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2):

a. Chalk Parish Hall (Community Facility)

b. Church of St Margaret (Place Of Worship)

c. Church of St Mary (Place Of Worship)

d. City Praise Centre (Place Of Worship)

e. Gravesend Shahjalal Masjid (Place Of Worship)

f. Hever Court Residential Home (Care Home)

g. Holy Family (Place Of Worship)

h. Inn On The Lake (Hotel)

i. Jesus Victory Centre (Place Of Worship)

j. Little Explorers Kindergarten & Nursey (Nursery)

k. Manor Hotel (Hotel)

l. National Maritime Training Centre (Further Education)

m. National Sea Training Centre (College)

n. North Kent College (College)

o. Orchard Cottage Care Home (Care Home)

p. Parish Church of St Mary Magdalene (Place Of Worship)

q. Riverside Community Resource Trust (School)

r. Riverview Infant School (Infant School)

s. Rochester Health Clinic (Community Facility)

t. Sheringham House Care Home (Care Home)

u. Singlewell Primary School (School)

v. St Aidan's Church (Place Of Worship)

w. St Joseph's Convent of Mercy (Communal Residence)

x. St Mary's Church (Place Of Worship)

y. Thamesview School (Nursery)

z. Tymberwood Academy (School)

aa. There are no designated NIAs identified within this section of the Project.

Existing noise levels

12.4.4 Within this subsection of the Project, a total of five three-hour attended, two 24-hour unattended and five seven-day unattended noise surveys were undertaken, as listed in Table 12.13.

12.4.5 Data tables presenting the measured baseline noise levels relevant to each survey location are presented within Appendix 12.5: Baseline Noise Survey Information (Application Document 6.3), along with photographs of the monitoring equipment *in situ*, time history graphs of the measured noise levels and meteorological information.

Table 12.13 Noise survey locations between the M2/A2/Lower Thames Crossing junction and the south shore of the River Thames

Survey location	Noise survey duration
A-NML 01 - Bligh Way Park	3-hour survey
A-NML 02 - Squires Close	3-hour survey
A-NML 03 - Inn on the Lake	3-hour survey
A-NML 04 - Gravesend Road	3-hour survey
A-NML 05 - Polperro	3-hour survey
LT-NML 01 - Puckle Hill House	7-day survey
LT-NML 02 - White Horse Cottages	7-day survey
LT-NML 03 - Genesta Glade	7-day survey
LT-NML 04 - Church Lane	7-day survey
LT-NML 05 - Castle Lane	7-day survey
ST-NML 01 - Marling Manor	24-hour survey
ST-NML 02 - Church Lane	24-hour survey

12.4.6 The monitoring locations within this area were noted to be predominantly influenced by road traffic noise, primarily from the A2/M2. This was either a complete dominance or a slight contribution, depending on how close the survey location was to this existing road.

12.4.7 Certain survey locations at the southern end of the Project are further affected by periodic railway noise from HS1. Contribution from conventional railway activity associated with the North Kent railway line was noted at locations around Thong Lane.

12.4.8 From Thong Lane to the southern shoreline of the River Thames, the area is mainly rural in nature. The noise climate is dominated by road traffic noise from the existing A2, M2, A226 and local roads around Chalk.

12.4.9 The noise climate in this area is mainly characterised by road traffic noise, with a contribution from railway noise. In addition, the noise climate is affected by general human activity noise and natural/agricultural noise sources depending on the season.

Between the north shore of the River Thames and the A13/A1089 junction

Receptors

12.4.10 Between the north shore of the River Thames and the A13/A1089 junction, the study area covers sensitive receptors located in East Tilbury, Orsett Heath, Tilbury, Linford, Chadwell St Mary and Grays. In addition to these main residential areas, there are also numerous outlying, more isolated dwellings.

12.4.11 The following OSRs were also identified within the study area and are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2):

a. Allens Mead Care Home (Care Home)

b. Avalon Care Home (Care Home)

c. Beacon Hill Academy (Special Needs Establishment)

d. Bennett Lodge (Care Home)

e. Caroline House (Care Home)

f. Chadwell Road Cemetery (Place of Worship)

g. Chadwell St Mary Cemetery (Place of Worship)

h. Chadwell St Mary Church (Place of Worship)

i. Chadwell Twinkles (Community Facility)

j. Church of St Mary the Virgin (Place of Worship)

k. Community Church Chadwell St Mary (Place of Worship)

l. Convent of Mercy (Communal Residence)

m. Delgary Close (Communal Residence)

n. Deneholm Primary School (Other Educational Establishment)

o. East Tilbury Library Village Hall (Community Facility)

p. East Tilbury Primary School & Nursery (Nursery)

q. Emmanuel House (Care Home)

r. Emmanuel Church Emmanuel Church (Place of Worship)

s. Grapecroft Care Home (Care Home)

t. Grays Health Hub Clinic (Community Facility)

u. Grays Spiritualist Centre (Place of Worship)

v. Great Child Day Nursery (Nursery)

w. Hammond Hall (Community Facility)

x. Holiday Let Sycamore Close (Guest House)

y. Hotel/Motel Dock Road (Hotel)

z. Lansdowne Primary Academy (School)

aa. Linford Methodist Church (Place of Worship)

bb. Little Angels Day Nursery (Nursery)

cc. Little Pirates Nursery (Nursery)

dd. Little Roos Pre School (Nursery)

ee. Marisco Hall (Community Facility)

ff. Merrie Loots Farm Rest Residential Home (Care Home)

gg. Mosaic Housing (Care Home)

hh. Orsett Heath Academy (School)

ii. Our Lady Star of the Sea RC (Place of Worship)

jj. Sockett's Heath Baptists Church (Place of Worship)

kk. St Clere's School (School)

ll. St Francis Church (Place of Worship)

mm. St John the Baptist, Tilbury (Place of Worship)

nn. St Mary's Catholic Primary School (School)

oo. The Church of Jesus Christs of Latter-day Saints (Place of Worship)

pp. The Sunshine Centre Civic Square (Nursery)

qq. The Whitecroft Nursing Home (Care Home)

rr. Tilbury Pioneer Academy (School)

ss. Treetops School (Special Needs Establishment.)

tt. USP College. Palmer's Campus (Other Educational Establishment)

uu. Waltons Hall Road Guest House (Hotel)

vv. West Tilbury Village Hall (Community Facility)

ww. Whitmore Hall (Community Facility)

xx. William Edwards School (School)

yy. Willow Garden Day Nursery (Nursery)

zz. Woodside Academy (School)

12.4.12 There are eight NIAs designated within this subsection of the noise assessment study area. The locations of these NIAs are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2) and within Table 12.14.

Table 12.14 NIAs Between the north shore of the River Thames and the A13/A1089 junction

NIA ref. no	Noise Making Authority	Location
5695	National Highways	B188
5696	Thurrock	A1013
5698	Thurrock	A1013
5697	Thurrock	A1013
5694	Thurrock	A1013
13480	Thurrock	A1013
5692	Thurrock	A1013
5693	National Highways	A1089

Existing noise levels

12.4.13 Within this section of the study area, a total of 11 three-hour attended, two 24-hour unattended and three seven-day unattended noise surveys were undertaken, as listed in Table 12.15.

12.4.14 Data tables presenting the measured baseline noise levels relevant to each survey location are presented within Appendix 12.5: Baseline Noise Survey Information (Application Document 6.3), along with photographs of the monitoring equipment *in situ*, time history graphs of the measured noise levels and meteorological information.

Table 12.15 Noise survey locations between the north shore of the River Thames and the A13/A1089 junction

Survey location	Noise survey duration
A-NML 06 - The Worlds End Pub	3-hour survey
A-NML 07 - Brunel Close	3-hour survey
A-NML 08 - London Road	3-hour survey
A-NML 09 - Princess Margaret Road	3-hour survey
A-NML 10 – Norrsken	3-hour survey
A-NML 11 - Muckingford Road	3-hour survey
A-NML 12 - High House Lane	3-hour survey
A-NML 13 - Heath Road	3-hour survey
A-NML 14 - Heath Place	3-hour survey
A-NML 15 - The Whitecroft	3-hour survey
A-NML 19 - Welling Road	3-hour survey
LT-NML 06 - Beechcroft Avenue	7-day survey
LT-NML 07 - Willow Garden Day Nursery	7-day survey
LT-NML 10 - Five Chimney Cottages	7-day survey
ST-NML 03 - Station Road (Gravel Pit Cottages)	24-hour survey
ST-NML 04 - Station Road (Near Tilbury Loop)	24-hour survey

12.4.15 The monitoring locations within this area were dominated by an underlying climate of road traffic noise, primarily from local roads such as Muckingford Road and localised noise sources specific to individual survey locations.

12.4.16 At certain survey locations near Tilbury Town and Station Road, West Tilbury, the dominant noise source in the locality was periodic railway noise associated with the Tilbury Loop railway line.

12.4.17 At the northern extent of this section, most notably at survey locations near the A13 junction, the noise climate was dominated by road traffic noise emanating from the A13, but also from other roads close by, including the A1089 and the A1013.

12.4.18 The noise climate in this area is predominantly characterised by road traffic noise, with a contribution from railway noise. In addition, the climate is affected by general human activity noise and natural/agricultural noise sources depending on the season.

Between the A13/A1089 junction and the A122 Lower Thames Crossing/M25 junction

Receptors

12.4.19 Between the A13/A1089 junction and the A122 Lower Thames Crossing/M25 junction, there are existing noise sensitive dwellings within the study area, predominantly located in Orsett, South Ockendon and North Ockendon. In addition to these main residential areas, there are also numerous outlying, more isolated dwellings.

12.4.20 The following OSRs were also identified within the study area and are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2):

a. Baker Street Guest House (Hotel)

b. Brad Close Nursing Home (Care Home)

c. Church of St Giles and All Saints (Place of Worship)

d. Church of St Nicholas (Place of Worship)

e. Corner Farm Bungalow (Guest House)

f. Orsett Church Hall (Place of Worship)

g. Orsett Hall Hotel Spa (Hotel)

h. Orsett Hospital (Hospital)

i. Orsett Village Hall (Community Facility)

j. South Ockendon Methodist Church (Place of Worship)

k. St Nicholas Church (Place of Worship)

12.4.21 There are no designated NIAs identified within this section of the Project.

Existing noise levels

12.4.22 Within this section of the study area, a total of seven three-hour attended, three 24-hour unattended and four seven-day unattended noise surveys were undertaken, as listed in Table 12.16.

12.4.23 Data tables presenting the measured baseline noise levels relevant to each survey location are presented within Appendix 12.5: Baseline Noise Survey Information (Application Document 6.3), along with photographs of the monitoring equipment *in situ*, time history graphs of the measured noise levels and meteorological information.

Table 12.16 Survey locations between the A13/A1089 junction and the A122 Lower Thames Crossing/M25 junction

Survey location	Noise survey duration
A-NML 18 - Baker Street	3-hour survey
A-NML 20 - Stifford Clays Road (Near Baker Street)	3-hour survey
A-NML 21 - Hall Lane Farm	3-hour survey
A-NML 22 - Cheelson Road	3-hour survey
A-NML 23 - Red Croft Forge	3-hour survey
A-NML 24 - Fen Farm Cottages	3-hour survey
A-NML 25 - Cranham Place	3-hour survey
LT-NML 09 - Springfield Cattery	7-day survey
LT-NML 11 - Baker Street Mill	7-day survey
LT-NML 12 - Lake Alexandria (Flint Cottage)	7-day survey
LT-NML 13 - The Downs (Elms Lane)	7-day survey
ST-NML 05 - Fen Lane (Old Rectory)	24-hour survey
ST-NML 06 - Mollands Lane	24-hour survey
ST-NML 07 - Field House (Dennises Lane)	24-hour survey

12.4.24 The monitoring locations within this area were dominated by a climate of road traffic noise, primarily from the major sources of the A13 and M25, coupled with local roads including North Road and Fen Lane which link the settlements of North Ockendon, South Ockendon and Bulphan.

12.4.25 However, within this area certain measurement locations around the Mardyke were notable for the perceived lack of dominant background noise sources, or barely perceptible levels of road traffic noise, most notably LT-NML 13 – The Downs (Elms Lane).

Along the A13 between the A13/A1089/A122 Lower Thames Crossing junction and M25 junction 30

Receptors

12.4.26 Along the existing A13, between the A13/A1089/A122 /Lower Thames Crossing junction and the M25 junction 30 there are existing noise sensitive dwellings within the study area, predominantly located in Chafford Hundred, North Stifford and Stifford Clays.

12.4.27 The following OSRs were also identified within the study area and are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2):

a. A M Care Home (Care Home)

b. All Saints - Chafford Hundred (Place of Worship)

c. Anchor Hanover Elizabeth Gardens (Community Facility)

d. Chafford Gorges Visitor Centre (Other Educational Establishment)
e. Creche at Ikea (Nursery)
f. Dexter Close Care Home (Care Home)
g. Gallimore Lodge (Care Home)
h. Grays Methodist Church (Place of Worship)
i. Grays Seventh Day Adventist Church (Place of Worship)
j. Grays United Reformed Church (Place of Worship)
k. Harris Primary Academy (Primary School)
l. Harris Primary Academy Mayflower (School)
m. Hathaway Academy (School)
n. Hollyrose House (Care Home)
o. Honeywood Care Choices (Care Home)
p. Just Learning Ltd (Nursery)
q. Long Lane Care Home (Care Home)
r. Meesons Lodge Care Home (Care Home)
s. Oak Tree Resource Centre (Nursery)
t. Premier Inn Howard Road (Hotel)
u. Sartoria Court (Community Facility)
v. St Cedd's Church (Place of Worship)
w. St John the Evangelist (Place of Worship)
x. St John's Church (Place of Worship)
y. St Thomas's Catholic Junior School (Primary School)
z. Stifford Clays Primary School (School)
aa. Stifford Hall Hotel (Hotel)
bb. The Barn & Coach House (Care Home)
cc. The Roman Catholic Church of St Peter (Place of Worship)
dd. West Thurrock Cemetery Chapel (Place of Worship)

12.4.28 There are four NIAs designated within this section of the noise assessment study area. The locations of these NIAs are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2) and defined within Table 12.17.

Table 12.17 NIAs located along the A13 between the A13/A1089/A122 Lower Thames Crossing junction and M25 junction 30

NIA ref no.	Noise Making Authority	Location
5565	National Highways	Along the A13
5566		
5700		
5699		

Existing noise levels

12.4.29 Within this section of the Project, a total of five three-hour attended and one seven-day unattended noise surveys were undertaken, as listed in Table 12.18.

12.4.30 Data tables presenting the measured baseline noise levels relevant to each survey location are presented within Appendix 12.5: Baseline Noise Survey Information (Application Document 6.3), along with photographs of the monitoring equipment *in situ*, time history graphs of the measured noise levels and meteorological information.

Table 12.18 Survey locations along the A13 between the A13/A1089/A122 Lower Thames Crossing junction and M25 junction 30

Survey location	Noise survey duration
A-NML 16 - Fairfield Avenue	3-hour survey
A-NML 17 - Stifford Clays Road (Near William Edwards School)	3-hour survey
A-NML 39 - Davy Down Car park	3-hour survey
A-NML 40 - Clockhouse Lane	3-hour survey
A-NML 41 - Stifford Clays Road	3-hour survey
LT-NML 08 - Springfield Road	7-day survey

12.4.31 The monitoring locations within this area were dominated by a climate of road traffic noise, primarily from the A13 and M25, coupled with the A1012, A1306 and A126.

Along the M25 between the Dartford Crossing and M25 junction 28

Receptors

12.4.32 Along the M25 between the Dartford Crossing and M25 junction 28 there are existing noise sensitive dwellings located within the study area, namely within the towns of Upminster, Great Warley, Hornchurch, Little Warley, Aveley, South Ockendon, West Thurrock, Purfleet, Thurrock and Grays. In addition to these main residential areas, there are also numerous outlying, more isolated dwellings.

12.4.33 The following OSRs were also identified within the study area and are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2):

a. All Saints Parish Church (Place of Worship)

b. All Saints Parish Church Hall (Place of Worship)

c. Aveley Christian Centre (Place of Worship)

d. Aveley House Care Home (Care Home)

e. Aveley Primary School (Nursery)

f. Dilkes Academy (School)

g. Harris Academy Ockendon and Sixth Form (School)

h. Hotel/Motel Weston Avenue (Hotel)

i. Ibis Hotel Weston Avenue (Hotel)

j. Larwood Care Home (Care Home)

k. Premier Inn Stonehouse Lane (Hotel)

l. St Peter's Catholic Centre (Place of Worship)

m. Thames Chase Forest Centre (Community Facility)

n. Thurrock Hotel (Hotel)

12.4.34 There are three NIAs designated within this section of the noise assessment study area. The locations of these NIAs are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2) and within Table 12.19.

Table 12.19 NIAs along the M25 between the Dartford Crossing and M25 junction 28

NIA ref no.	Noise Making Authority	Location
5567	National Highways	Located along the M25
5570		Located along the M25
5571		Located along the B1421

Existing noise levels

12.4.35 Within this subsection of the Project, a total of seven three-hour attended, one 24-hour unattended and three seven-day unattended noise surveys were undertaken, as listed in Table 12.20.

12.4.36 Data tables presenting the measured baseline noise levels relevant to each survey location are presented within Appendix 12.5: Baseline Noise Survey Information (Application Document 6.3), along with photographs of the monitoring equipment *in situ*, time history graphs of the measured noise levels and meteorological information.

Table 12.20 Survey locations along the M25 between the Dartford Crossing and M25 junction 28

Survey location	Noise survey duration
A-NML 26 - St Mary's Lane	3-hour survey
A-NML 27 - InFitness In Health	3-hour survey
A-NML 28 - Folkes Lane	3-hour survey
A-NML 38 - Back Lane	3-hour survey
A-NML 42 - Impulse Leisure Belhus Park	3-hour survey
A-NML 43 - Gatehope Drive	3-hour survey
A-NML 44 - Dennises Lane	3-hour survey
LT-NML 14 - Bridge Cottages	7-day survey
LT-NML 15 - Latchford Farm Aquatics	7-day survey
LT-NML 16 - Beresden Lane	7-day survey
ST-NML 08 - The Kilns Hotel	24-hour survey

12.4.37 The survey locations within this area were noted to be dominated by a climate of road traffic noise, primarily from the M25 but coupled with noise from the busy A127.

Along the A282 between the Dartford Crossing and M25 junction 2 (with the A2)

Receptors

12.4.38 Along the A282 between the Dartford Crossing and the M25 junction 2 (with the A2) there are existing noise sensitive dwellings located primarily within Dartford, Stone, Southfleet, Darenth and Greenhithe.

12.4.39 The following OSRs were also identified within the study area and are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2):

a. Archery House (Care Home)

b. Bunstone Hall (Hospital / Hospice)

c. Campanile Hotel, Clipper Boulevard (Hotel)

d. Double Tree Hotel (Hotel)

e. Fleet Day Nursery (Nursery)

f. Greenacres, Little Brook Hospital (Care Home)

g. Hesketh Park Day Care Centre (Nursery)

h. Holiday Inn Express University Way (Hotel)

i. Little Brook Hospital (Care Home)

j. Littlestone Continuing Care Unit (Communal Residence)

k. New Life Christian Community (Care Home)

l. Premier Inn Halcrow Avenue (Hotel)

m. Priory Mews (Care Home)

n. Rainbow Lodge (Care Home)

o. RCCG Rehoboth House (Place of Worship)

p. St Albans Church (Place of Worship)

q. St Andrews URC Dartford (Place of Worship)

r. Temple Hill Community Primary School and Nursery (School)

s. The Brent Methodist Church (Place of Worship)

t. The Brent Primary School (School)

u. The Gateway Community Primary School (School)

v. The Redeemed Christian Church of God (Place of Worship)

w. Vietnamese Buddhist Meditation Centre (Place of Worship)

x. Winners Chapel International (Place of Worship)

y. Yew Tree Centre (Care Home)

12.4.40 There is one NIA designated within this section of the noise assessment study area. The location of this NIA is presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2) and within Table 12.21.

Table 12.21 NIAs along the A282 between the Dartford Crossing and M25 junction 2 (with the A2)

NIA ref no.	Noise Making Authority	Location
927	Kent	Along the A206

Existing noise levels

12.4.41 Within this subsection of the study area, a total of three three-hour attended noise surveys were undertaken, as listed in Table 12.22.

12.4.42 Data tables presenting the measured baseline noise levels relevant to each survey location are presented within Appendix 12.5: Baseline Noise Survey Information (Application Document 6.3), along with photographs of the monitoring equipment *in situ*, time history graphs of the measured noise levels and meteorological information.

Table 12.22 Survey locations along the A282 between the Dartford Crossing and M25 junction 2 (with the A2)

Survey location	Noise survey duration
A-NML 35 - Queens Gardens	3-hour survey
A-NML 36 - Wayville Road	3-hour survey
A-NML 37 - Holiday Inn Express Dartford	3-hour survey

12.4.43 The survey locations within this area were noted to be dominated by a climate of road traffic noise, primarily from the major sources of the A282 and M25, coupled with local roads including the A206.

Along the A2 between A282/M25 junction 2 and the M2

Receptors

12.4.44 Along the A2, between A282/M25 junction 2 and the M2, within the study area there are existing noise sensitive dwellings primarily within Gravesend, Higham, Cobham, Rochester, Gravesham, Shorne, Northfleet, Ebbsfleet Valley, Swanscombe, Bean, Dartford, Greenhithe, Southfleet and Longfield. In addition to these main residential areas, there are also numerous outlying, more isolated dwellings.

12.4.45 The following OSRs were also identified within the study area and are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2):

a. 2J's Pre-School (Nursery)

b. Abbey Court School (School)

c. Beehove! And Buzz (Nursery)

d. Birling House (Care Home)

e. Blight Junior School (School)

f. Bridge Reach (Care Home)

g. Cedar Children's Academy (School)

h. Choice Support Care Home Snodland (Care Home)

i. Christ Church (Place of Worship)

j. Christ Church Hall (Community Facility)

k. Church Farm Hall Building 1 (Community Facility)

l. Church Farm Hall Building 2 (Community Facility)

m. Church of All Saints All Saints (Place of Worship)

n. Church of St John the Baptist (Place of Worship)

o. Church of St Michael (Place of Worship)

p. Church of the Holy Trinity (Place of Worship)

q. Clifton Church (Place of Worship)

r. Curlew Crescent Care Home (Care Home)

s. Cuxton Community Church URC (Place of Worship)

t. Cuxton Community Infant School (School)

u. Cuxton Medical Centre (Health Centre)

v. Cuxton Village Hall (Community Facility)

w. George Holding Centre (Health Care Services)

x. Greatfield Lodge Hostel (Community Facility)

y. Halling Baptist Church (Place of Worship)

z. Hedera House (Care Home)

aa. Holmesdale Adult Education (Further Education)

bb. Holmesdale Technology College (Further Education)

cc. Kiddy Joy Nursery (Place of Worship)

dd. Kingdom Hall of Jehovah's Witnesses (Place of Worship)

ee. Marlowe Park Medical Centre (Health Centre)

ff. Premier Inn Castle Way (Hotel)

gg. Rede Court Road Guest House (Hotel)

hh. Smallville Nursery (Place of Worship)

ii. St Francis' Church (Place of Worship)

jj. St Francis' Pre-School (Nursery)

kk. St John the Baptist (Place of Worship)

ll. St Michael's Church (Place of Worship)

mm. Strood Cemetery (Chapel)

nn. The Holmsdale School (College)

oo. The Melanie Ann Trust Residential Home Building 1 (Care Home)

pp. The Melanie Ann Trust Residential Home Building 2 (Care Home)

qq. The Melanie Ann Trust Residential Home Building 3 (Care Home)

rr. The Sundial (Hotel)

ss. Waterford House Evangelical Free Church (Place of Worship)

tt. Zoe Evans Childcare (Nursery)

12.4.46 There are 12 NIAs designated within this section of the noise assessment study area. The locations of these NIAs are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2) and in Table 12.23.

Table 12.23 NIAs along the A2 between A282/M25 junction 2 and the M2

NIA ref no.	Noise Making Authority	Location
1219	National Highways	Located along the A2
1220		Located along the A2
6265		Located along the A2
5955		Located along the A225
5957		Located along the A282
5958		Located along the A2
5959		Located along the A2
5960		Located along the A2
846		Located along the A2
921		Located along the A2
924	Kent	Located along the B262
1121	National Highways and Kent	Along the A2

Existing noise levels

12.4.47 Within this section of the study area, a total of six three-hour attended surveys were undertaken, as listed in Table 12.24.

12.4.48 Data tables presenting the measured baseline noise levels relevant to each survey location are presented within Appendix 12.5: Baseline Noise Survey Information (Application Document 6.3), along with photographs of the monitoring equipment *in situ*, time history graphs of the measured noise levels and meteorological information.

Table 12.24 Survey locations along the A2 between A282/M25 junction 2 and the M2

Survey location	Noise survey duration
A-NML 29 - Watling Street	3-hour survey
A-NML 30 - Hog Lane	3-hour survey
A-NML 31 - Littledale	3-hour survey
A-NML 32 - Darenth Country Park	3-hour survey
A-NML 33 - Sandy Lane	3-hour survey
A-NML 34 - Ackers Drive	3-hour survey

12.4.49 The survey locations within this area were dominated by a climate of road traffic noise, primarily from the A2 and the A282/M25. At certain locations, noise was also present from the HS1 railway line.

12.4.50 Road traffic noise from the B260 and A2260 also contributed to the ambient noise environment at certain survey locations.

Affected unaltered traffic links outside of bypassed area

Receptors

12.4.51 To the south of the Project along the M2, M20, A228, there are existing noise sensitive dwellings primarily within Swanley Village, Fawkham Green, Wrotham Heath, Wrotham, Farningham, West Kingsdown and Ash.

12.4.52 To the north of the Project along the A128, there are existing noise sensitive dwellings primarily within Little Warley, Bulphan, East Horndon, Childerditch.

12.4.53 The following OSRs were also identified within this aspect of the study area and are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2):

a. 1 Bell Lane (Communal Residence)

b. Abbey Court Nursing Home (Care Home)

c. Addington Village Hall (Community Facility)

d. Appleton Lodge Care Home (Care Home)

e. Aquarius Residential Care Home (Care Home)

f. Avenues South East (Care Home)

g. Blue Bell Hill Village Hall (Community Facility)

h. Borstal Baptist Church (Place of Worship)

i. Brands Hatch Place Hotel & Spa (Hotel)

j. Bridgewood Manor Hotel (Hotel)

k. Brookfield Infant School (Infant School)

l. Catholic Church of St Bernadette (Place of Worship)

m. Charton Manor Care Home (Care Home)

n. Chatham Road Guest House (Hotel)

o. Church of All Saints (Place of Worship)

p. Church of Saint Edmund (Place of Worship)

q. Church of St John the Baptist (Place of Worship)

r. Church of St Martin (Place of Worship)

s. Church of St Martin Village Hall (Place of Worship)

t. Church of St Mary (Place of Worship)

u. Church of St Peter (Place of Worship)

v. Church of St Peter and St Paul (Place of Worship)

w. Copper Beeches Care Home (Care Home)

x. Culpeper Road (Hospital / Hospice)

y. Dawn to Dusk Day Nursery (Nursery)

z. Dell Cottage (Guest House)

aa. Dingley Cottage (Guest House)

bb. Essex Wildlife Trust (Other Educational Establishment)

cc. Friern Manor (Hotel)

dd. Gavin Astor House (Care Home)

ee. Helen Allison School (Special Needs Establishment)

ff. Holcombe Health Clinic (Clinic)

gg. Holiday Inn Maidstone Road (Hotel)

hh. Hospital Lane Dental and Implant Clinic (Place of Worship)

ii. Kent Community Health NHS Foundation (Community Facility)

jj. Kent Health Needs Education Service (Special Needs Establishment.)

kk. King's Church (Place of Worship)

ll. Kingsway International Christian Centre (Place of Worship)

mm. Lawson House (Care Home)

nn. Little Stars (Nursery)

oo. Manordene (Care Home)

pp. Medway Towns Gurdwara (Place of Worship)

qq. Medway Village Hall (Community Facility)

rr. Nurstead Gardens (Community Facility)

ss. Parish Church of St John the Baptist (Place of Worship)

tt. Parkwood Hall School (Special Needs Establishment)

uu. Pippins Preschool (Nursery)

vv. Premier Inn Sandling (Hotel)

ww. St George's (Place of Worship)

xx. St John's Centre (Place of Worship)

yy. St Matthew's Church, Borstal (Place of Worship)

zz. St Peter & St Paul Brassey Centre (Community Facility)

aaa. St. Lukes Hospice (Care Home)

bbb. The Churchill Centre (Hospital / Hospice)

ccc. The Friars Aylesford (Place of Worship)

ddd. The Hilltop Labour in Vain Road (Hotel)

eee. The Seekers Trust (Place of Worship)

fff. Travelodge Hotel (Southend Arterial Road)

ggg. Valley Invicta Primary School (School)

hhh. Village Leisure Hotel (Hotel)

iii. Voyage Care (Care Home)

jjj. Wesleyan Methodist Chapel (Church Hall)

kkk. West Kingsdown Baptist Church (Place of Worship)

lll. West Kingsdown CE Primary School (School)

mmm. West Kingsdown Pre School (Nursery)

nnn. Wrotham Cemetery (Place of Worship)

ooo. Wrotham Village Hall (Community Facility)

ppp. Ye Olde Plough House (Hotel)

qqq. Zion Hall Missions Interdenominational (Place of Worship)

12.4.54 There are 24 NIAs designated within this section of the noise assessment study area (northern and southern sections as defined above). The locations of these NIAs are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2) and within Table 12.25.

Table 12.25 NIAs along affected unaltered traffic links outside of bypassed area

NIA ref no.	Noise Making Authority	Location
5680	Essex	A127
5962	National Highways	M20
5963	National Highways	M20
5964	Kent	A20
5965	National Highways & Kent	A20
5966	National Highways	M26
5974	Kent	A228
5975	Kent	A228
5992	Kent	A228
5993	Kent	A228
5994	Kent	A228
6007	Medway	A228
6011	Medway	A228
6012	Medway	A228
6019	National Highways	A2
6020	National Highways	M2
6261	National Highways	M20
6272	National Highways	M20
12245	Medway	A228
12247	Kent	A226
13463	Essex	A128
13479	Thurrock	A128
13489	Kent	A20
14636	Medway	A228

Existing noise levels

12.4.55 Within this section of the study area, no surveys were undertaken.

12.4.56 Due to the limited lateral extent of the study area that needs to be considered around affected links (50m from any affected road link), it has been assumed that the noise climate would be dominated by road traffic noise along these major road links.

Use of the River

12.4.57 The baseline data used in this topic assessment include information relating to existing vessel movements on the River Thames. The relevant baseline data is outlined in Chapter 2: Project Description (Application Document 6.1).

Future baseline ('Without Scheme' scenario)

12.4.58 The future baseline identifies anticipated changes to the existing baseline over time in the absence of the Project and is used as a basis against which to predict the potential impacts of the Project. A description of how the future baseline has been considered within the assessment is provided in Chapter 4: EIA methodology.

12.4.59 DMRB LA 111 (National Highways, 2020a) requires that changes to road traffic noise in the study area be considered without the Project. As such, the expected road traffic noise levels within the study area were estimated for the future assessment year of 2045 based on the forecasts from the Project's transport model.

12.4.60 This future baseline scenario considers the change in road traffic noise between the predicted DMOY 2030 scenario and the DMFY 2045 scenario. The change in baseline road traffic noise was assessed using the DMRB LA 111 assessment table as presented within Table 12.26.

12.4.61 Table 12.26 shows how road traffic noise levels are predicted to change at receptors within the study area over time, as a result of year-on-year traffic changes and committed development, but in the absence of the Project.

12.4.62 All identified OSRs have been considered during both the daytime and night-time periods as a worst case.

Table 12.26 Long-term traffic noise changes inside detailed study area without Project (DMOY 2030) versus (DMFY 2045)

Change in noise level		Daytime		Night-time	
		Number of dwellings	Number of Other Sensitive Receptors	Number of dwellings	Number of Other Sensitive Receptors
Increase in noise level, $L_{A10, 18hr}/L_{night}$	<3.0	47,775	181	46,997	179
	3.0–4.9	385	1	327	0
	5.0–9.9	0	0	0	0
	>10+	0	0	0	0
No change	0	36,500	64	37,895	70

Change in noise level		Daytime		Night-time	
		Number of dwellings	Number of Other Sensitive Receptors	Number of dwellings	Number of Other Sensitive Receptors
Decrease in noise level, $L_{A10, 18hr}/L_{night}$	<3.0	10,047	42	9,488	39
	3.0–4.9	0	0	0	0
	5.0–9.9	0	0	0	0
	>10+	0	0	0	0

12.4.63 From the data presented in Table 12.26, of the 94,707 dwellings and 288 OSRs assessed, during the daytime period 94,322 dwellings and 287 OSRs are predicted to experience **no change/negligible** changes in long-term road traffic noise during the daytime period in the future assessment year of 2045 compared to the opening year of 2030 without the implementation of the Project.

12.4.64 However, **minor** increases of between 3dB(A) and 4.9dB(A) in long-term road traffic noise are predicted to occur at 385 dwellings (and 1 OSR) located near Mayflower Road and Lancaster Road in Grays.

12.4.65 During the night-time period, without the implementation of the Project, 94,380 dwellings and all 288 identified OSRs within the study area are predicted to experience **no change/negligible** changes in long-term road traffic noise.

12.5 Project design and mitigation

12.5.1 Environmental considerations have influenced the Project throughout the design development process, from early route options assessment through to refinement of the Project design. An iterative process has facilitated design updates and improvements, informed by environmental assessment and input from the Project engineering teams, stakeholders and public consultation.

12.5.2 The Project as applied for includes a range of environmental commitments. Commitments of relevance to noise and vibration are set out in this section under the following categories:

a. Embedded mitigation: measures that form part of the engineering design, developed through the iterative design process summarised above.

b. Good practice: standard approaches and actions commonly used on infrastructure development projects to avoid or reduce environmental impacts, typically applicable across the whole Project.

c. Essential mitigation: any additional Project-specific measures needed to avoid, reduce or offset potential impacts that could otherwise result in effects considered to be significant in the context of the EIA Regulations. Essential mitigation has been identified by environmental topic specialists, taking into account the embedded and good practice mitigation.

12.5.3 Embedded mitigation is included within the Design Principles (Application Document 7.5) or as features presented on Figure 2.4: Environmental Masterplan (Application Document 6.2). Design Principles relevant to mitigation of effects on noise and vibration are described below, each with an alpha-numerical reference code (e.g. LSP.XX). Good practice and essential mitigation are included in the Register of Environmental Actions and Commitments (REAC). The REAC forms part of Appendix 2.2: Code of Construction Practice (CoCP) (Application Document 6.3). Each entry in the REAC has an alpha-numerical reference code (e.g. NV0XX) to provide cross-reference to the secured commitment. Relevant good practice and essential mitigation to reduce noise and vibration effects are identified below.

12.5.4 The Design Principles, Environmental Masterplan, LEMP, CoCP and REAC, all form part of the Project control plan. The control plan is the framework for mitigating, monitoring and controlling the effects of the Project. It is made up of a series of 'control documents' which present the mitigation measures identified in the application that must be implemented during design, construction and operation to reduce the adverse effects of the Project. Further explanation of the control plan and the documents which it comprises is provided in the Introduction to the Application (Application Document 1.3).

12.5.5 Enhancement measures have been directly incorporated into the Project as part of the application of 'good design' principles. Enhancements are measures that are considered to be over and above any measures to avoid, reduce or remediate adverse impacts of the Project. Relevant beneficial effects arising as a consequence of this good design process are provided below.

Embedded mitigation

Construction phase

12.5.6 The construction programme has been developed to allow the following to be implemented:

a. During construction, where possible earthworks and bunding that comprise the embedded mitigation for the operational road would be established at an early stage of the construction programme for that part of the works. This includes the earthworks and engineering design, which keeps the road low in the landscape and screens it from view where possible through earthworks features. Early establishment of these measures would allow subsequent activities to be undertaken behind the bunding, thus providing acoustic screening. The embedded earthworks mitigation for construction is set out in Table 12.27 and secured through REAC commitments (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)).

b. During the construction phase of the Project a commitment is made through Table 6.1 of the Code of Construction Practice (CoCP) (Application Document 6.3) to ensure a 300m restricted zone for any bulk earthworks works being undertaken during the evening period, up to 22:00, over the summer months. This measure is inherent within the noise assessment base scenario.

c. The reception cuttings of the tunnel portals will be established prior to TBM activity, therefore many of the tunnelling associated surface activities would be undertaken at up to 25m below ground level at the South Portal, and up to 11m below the crest of the engineered bund at the North Portal. This will reduce noise from construction activities through screening associated with these design elements.

12.5.7 The Project has considered noise, landscape and visual, soils, construction and engineering limitations to identify appropriate environmental mitigation during the construction phase. Table 12.27 identifies a series of measures using soils that would be excavated on site and stored as stockpiles fashioned into bunds to reduce visual effects on nearby residents. These measures would also provide acoustic screening.

Table 12.27 Earthworks measures – construction

Location	Mitigation measures	REAC reference
Southern tunnel entrance compound	Earth bunds of approximately 2-3m in height formed from material excavated on site would be sited along the boundary of the compound, as material becomes available to facilitate visual screening for residential properties on Thong Lane and Rochester Road (A226) during construction.	LV008
A226 Gravesend Road compound	Earth bunds of 3m in height would be formed from material excavated and retained on site, as material becomes available to facilitate visual screening for residential properties on Castle Lane, Chalk.	LV011
Northern Tunnel Entrance Compound	The earthworks area (Tilbury Fields landform) in the southern part of the northern tunnel entrance compound will include a 3m high bund (including any temporary barrier or equivalent required) constructed 75m north of the existing field boundary (indicative location shown on HRA Figure 24 (Application Document 6.5)) to delimit the extent of works from the functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar and avoid disturbance of birds in the passage and winter period. Construction of the 3m high bund will be carried out during April, May, June and July, and the 3m bund (including any temporary barrier or equivalent required) will be functional to mitigate noise and visual disturbance by the end of July, so that completion of the bund does not disturb (as monitored through HR009) the wintering bird qualifying interests. Any earthwork movements required to complete the Tilbury Fields landform south of the bund will only be carried out during April, May, June and July.	HR005
Station Road compound	Where soil is excavated and retained on site temporarily, it would be stockpiled in the form of earth bunds to facilitate visual screening for residential properties along Church Road and Station Road.	LV015
Brentwood Road compound	Where soil is excavated and retained on site temporarily, it would be stockpiled in the form of an earth bund on the southern boundary of the compound to facilitate visual	LV017

Location	Mitigation measures	REAC reference
	screening for residential properties within Chadwell St Mary where reasonably practicable.	
Mardyke compound	Where soil is excavated and retained on site temporarily, it would be stockpiled in the form of earth bunds to facilitate screening for Hobletts to the north-east.	LV021
M25 compound	It is anticipated that a concrete batching plant would be located within this compound. This facility would be located as south-westerly as reasonably practicable, to maximise distance from the North Ockendon Conservation Area.	LV023
M25 compound	Where soil is excavated and retained on site temporarily, it would be stockpiled as earth bunds on the north-eastern boundary of the compound to facilitate visual screening for the North Ockendon Conservation Area.	LV024
Ockendon Road compound	Where soil is excavated and retained on site temporarily, it would be stockpiled in the form of earth bunds on the south and west boundaries of the compound, where required to facilitate screening for Ockendon Road and the nearest residential properties at the static caravan park.	LV026

Operational phase

12.5.8 Operational phase embedded mitigation of relevance to noise and vibration is as follows:

a. Through the design process, the alignment of the Project has been located to be as far away as is feasible from identified NSRs (see Section 3.3 of Chapter 3: Assessment of Reasonable Alternatives).

b. Through the design process, the alignment of the Project has been located within cuttings and/or false cuttings/bunds where practicable to reduce significant environmental effects including for noise, and landscape and visual. The embedded earthworks mitigation for operation is set out below in Table 12.28 and presented in Figure 2.4: Environmental Masterplan (Application Document 6.2). Relevant Design Principles (Application Document 7.5) for embedded earthworks are STR.10, S11.05, S11.09 and S14.06.

12.5.9 The Project design has sought to incorporate noise mitigation by means of earthwork features where practicable. The multidisciplinary iterative design process considered the potential for adverse impacts of each specific design measure having regard for noise, landscape and visual, soils, construction and engineering limitations, to identify a combined and deliverable design.

12.5.10 Where earthworks measures were not practicable and additional mitigation was deemed necessary, acoustic fencing has been identified, supporting the earthwork features and low noise surfacing provision within the Project; acoustic fencing is therefore discussed under essential mitigation below.

12.5.11 Earthwork bunds and false cutting would be provided at the locations detailed in Figure 2.4: Environmental Masterplan (Application Document 6.2) and as listed in Table 12.28, reproduced from Table 2.3 of Chapter 2: Project Description.

Table 12.28 Embedded earthwork elements – operational

Section	Element	False cutting, embankment or cutting height from the Project/scope
A2 to the South Portal	False cutting along M2/A2/A122 Lower Thames Crossing junction slip road	4m above slip roads/visual mitigation
	Tunnel approach cutting	Up to 28m deep
North Portal to the A13	Flood bunding and protection bund to the portal maintenance access road either side of the Project road	7.83m above ordnance datum (AOD) flood bunding with 9m AOD bund for future fill by Ingrebourne Valley Limited (IVL)
	A122 in tunnel approach structure	Up to 12.8m deep
	A122 at Hoford Road in cutting	Up to 8.5m deep
	False cuttings along Chadwell St Mary link both sides of the Project	4m above the A122/noise mitigation
	Muckingford Road slackened slopes to blend landscaping in with green bridge	Up to 7m high
A13 junction	False cutting along junction slip roads	Either 2m or 4m above slip roads/visual or noise mitigation
	A122 in cutting	Between 2m and 5m deep
	Engineered earth slope between A13 slip road and A1013 to soften slope	10m high
A13 to the M25	False cuttings along Ockendon link both sides of the A122 south of the flood zone and along the southbound carriageway between FP136 and The Wilderness	2m above the A122/visual mitigation
	A122 on embankment in flood zone between viaducts	6.2m high
	Retaining walls either side of the Project between the landfill and The Wilderness	5.5m deep
	False cuttings between North Road and the M25	5m above the A122/noise and visual mitigation
	Green Lane slackened slopes to blend landscaping in with green bridge	Up to 12m high
	North Road slackened slopes to blend landscaping in with green bridge	Up to 3m high
M25	False cuttings between North Road and the M25	5m above the A122/noise and visual mitigation
	False cutting to slip roads bordering Thames Chase Community Forest with slackened slope for planting	2m above the A122/visual mitigation
	Slip road slackened slope between Ockendon Road and the M25 for agriculture	13.5m in height above the A122 and 10m above the M25 at its highest point
Project-wide Local roads	Embankments and cutting where not landscaped	Varies throughout Project route

Good practice

Construction phase

12.5.12 A CoCP (Application Document 6.3, Appendix 2.2) is being submitted as part of the DCO application which contains general construction good practice measures.

12.5.13 The noise and vibration study has assumed that the following good practice mitigation measures would be implemented:

a. Noise and vibration level controls (REAC Ref. NV001):

   i. Noise and vibration levels would be controlled in accordance with BS 5228: Code of practice for noise and vibration control on construction and open sites, to reduce disturbance to the environment and communities in the vicinity of the construction works, including Thames Estuary and Marshes Special Protection Area (SPA)/Ramsar and associated functionally linked land.

b. Noise and Vibration Plan (REAC Ref. NV002):

   i. A Noise and Vibration Management Plan (NVMP) or equivalent would be prepared for each part of the construction works subject to Section 61 control for consideration by the relevant planning authorities (see below).

c. Conveyor systems (REAC Ref. NV003) and (REAC Ref. NV012):

   i. A maintenance programme which includes inspection of the conveyor equipment would be implemented to reduce noise and vibration.

   ii. An acoustic insulation cover would be installed to reduce noise from conveyor systems that are operating within 300m of noise sensitive receptors, as defined in ES Section 12.3, including the Thames Estuary and Marshes SPA/Ramsar and associated functionally linked land.

d. Section 61 consents (REAC Ref. NV004):

   i. Where appropriate, consents would be obtained from the relevant local authorities under Section 61 of the Control of Pollution Act 1974 (which may include noise and vibration limits where relevant) for the proposed construction works.

e. Baseline noise levels (REAC Ref. NV005):

   i. Pre-construction baseline noise levels would be submitted to the relevant planning authority to establish a pre-construction baseline for monitoring compliance with construction noise limits.

f. Noise assessment (REAC Ref. NV006).

   i. Construction works would be assessed in accordance with BS 5228 using specific manufacturer's data and proposed position of equipment. Results of the assessment would be presented to the Environmental Health Officers of the planning authorities prior to the commencement of that part of the construction works, as appropriate, to inform consideration of Section 61 agreements.

g. Best Practicable Means (REAC Ref. NV007) as defined under Section 72 of the Control of Pollution Act 1974 would be employed during the construction phase to reduce noise and vibration nuisance. These would include measures such as:

   i. installing and maintaining hoarding around the construction areas likely to generate noise

   ii. keeping site access routes in good condition with condition assessments onsite to inspect for defects such as potholes

   iii. turning off plant and machinery when not in use

   iv. maintaining all vehicles and mobile plant such that loose body fittings or exhausts do not rattle or vibrate

   v. using silenced equipment where available, in particular silenced power generators and pumps

   vi. no music or radios would be played for entertainment purposes outdoors onsite

   vii. planning site layout to ensure that reversing is kept to a practicable minimum.

   viii. reversing manoeuvres would be supervised by a trained banksman/vehicle marshal to ensure they are conducted safely and concluded quickly

   ix. non-percussive demolition techniques would be adopted where reasonably practicable to reduce noise and vibration impact

h. Community engagement (REAC Ref. NV008):

   i. Residents would be notified of particularly noisy and vibration generating work such as percussive piling and concrete breaking prior to their commencement. The mechanisms for notification will be detailed in the Engagement and Community Plan. Effective communication would be established, keeping local residents informed of the type and timing of works involved, paying particular attention to potential evening and night-time works and activities which may occur in close proximity to receptors.

i. Noise and vibration monitoring (REAC Ref. NV009):

    i. During the construction phase, day and night-time noise and vibration monitoring would be undertaken at locations identified in consultation with the relevant local planning authorities to ensure that the mitigation measures suggested are working effectively

j. Haulage routes (REAC Ref. NV010):

    i. A maintenance programme which includes inspection of all haul routes and infill of potholes and other surface irregularities would be implemented to reduce noise and vibration.

k. Conveyor System (REAC Ref. NV012):

    i. An acoustic insulation cover would be installed to reduce noise from conveyor systems that are operating within 300m of noise sensitive receptors, as defined in ES Section 12.3, including the Thames Estuary and Marshes SPA/Ramsar and associated functionally linked land.

l. Action in case of construction Noise or Vibration exceedance (REAC Ref. NV015):

    i. In the event that noise and vibration monitoring (as provided for in NV009) identifies that noise and vibration limits (as provided for in NV004) have been exceeded, the Contractors shall, at the earliest reasonably practicable opportunity, investigate to confirm that works being undertaken as part of the Project are the source of the noise. If this is confirmed, then the Contactor shall immediately undertake a further review of the best practicable means (as defined under the Control of Pollution Act, 1974) employed for the activity to minimise noise and agree additional or modified mitigation with the relevant local authorities unless otherwise agreed with the SoS.

m. Vibration from piling activities (REAC Ref. NV017):

    i. Works to any structures requiring piling and located within 100m of any Vibration Sensitive Receptor as defined under DMRB LA 111 may require further specific mitigation and control measures to reduce the level of vibration from piling activities within the specified distance beyond Best Practicable Means (BPM) defined under BS 5228-2. Where significant effects on Vibration Sensitive Receptors are identified in ES Figure 12.1, the contractor shall as part of the Noise and Vibration Management Plan (NVMP) (REAC item NV002) set out the measures beyond BPM to minimise those effects as a result of the Project's construction works. The NVMP must set out details of a risk assessment of each building which is a Vibration Sensitive Receptor to

determine susceptibility to damage from vibration and define acceptable vibration limits that the works must comply with to avoid physical or structural damage. The NVMP should also contain details of reasonable practicable measures and methods adopted to reasonably minimise noise and vibration impacts on buildings which remain occupied during the works.

This NVMP would be provided to the relevant local planning authorities as part of an application submitted under the Control of Pollution Act (CoPA) 1974 Section 61 (REAC item NV004) which is relevant to the works caught by the NVMP. Following the implementation of these control measures, compliance with vibration limits will be monitored, reported and managed in accordance with REAC commitments NV009 and NV015.

Operational phase

Road surfacing (REAC Ref. NV013)

12.5.14 For operational road traffic noise, all new and altered roads associated with the Project will be surfaced with a Thin Surface Course or Low Noise Surface (LNS). This type of road surface provides a reduction in road traffic noise as below:

12.5.15 NV013 of the REAC states that:

'*For the locations identified on ES Figure 12.6, a surfacing system that has a reported noise Road Surface Influence (RSI_H) of -7.5dB(A) or better in accordance with the Highway Authorities Product Approval Scheme [HAPAS] certification system shall be installed. For the locations identified on ES Figure 12.6, a 'Level 3' (i.e. RSI_H -3.5 dB(A) or better), very quiet surfacing material, as defined by Manual Specification for Highways Works Volume 1, Series 0900, Table 9-17, shall be installed on all other new and altered trunk roads and associated slip roads forming part of the Project.*

For the locations identified on ES Figure 12.6, a 'Level 2' (i.e. RSI_H -2.5dB(A) or better), quieter than Hot Rolled Asphalt (HRA) surfacing material, as defined by Manual Specification for Highways Works Volume 1, Series 0900, Table 9- 17, shall be installed on all new and altered local roads forming part of the Project.'

Operational fixed plant at Tunnel Services Buildings (REAC Ref. NV014)

12.5.16 The $L_{Ar,Tr}$ (rating level) noise emitted from operational fixed plant and associated with any noise generating element of the tunnel service buildings shall not result in exceedance of the existing $L_{Ar,Tr}$ (rating level) background level by more than 0dB(A) at the nearest residential or sensitive receptors during either night-time or day-time periods when assessed in accordance with BS 4142: 2014+A1:2019, Methods for rating and assessing industrial and commercial sound.

Noise from pylon fittings (REAC Ref. NV016)

12.5.17 REAC commitment NV016 states that:

Noise from pylon fittings, such as dampers, spacers, clamps and insulators, will be controlled through technical specifications: TS2.04 'Generic Design Principles for Overhead Lines', (Issue 6 July 2021); TS 3.04.35 'Components for Overhead Lines', (Issue 5 April 2021); TS 3.04.36 'Insulators and Insulator Sets for Overhead Lines', (Issue 7 February 2022) and TS 3.04.37 'Conductors and Conductor Systems for Overhead Lines', (Issue 8 January 2022), which include requirements for wind tunnel testing and/or corona extinction tests to minimise the occurrence of both corona and wind induced noise, and PS(T)134 'Operational Audible Noise Policy of Overhead Lines (New Build, Reconductoring, Diversion and Uprating)' (Issue 2, June 2021) and TGN(E)322 'Operational Audible Noise Assessment Process for Overhead Lines (New Build, Reconductoring, Diversion and Uprating)', (Issue 2, June 2021).

In accordance with the technical specifications, policy and guidance document listed above, good practice environmental and quality control processes to control audible noise generated by the operation of the new and refurbished sections of OHL shall include:

a. Pylon fittings designed and procured in accordance with National Grid's functional and performance requirements.

b. Compliance with performance requirements for corona inception and audible noise on all fittings

c. Wind tunnel testing of insulators for audible tones generated by Aeolian mechanisms

d. Sample testing to ensure each fitting type conforms to the specification

e. Care taken during installation to ensure conductors are kept clean and free of surface contaminants during stringing

Essential mitigation

Potentially significant effects

12.5.18 An iterative appraisal of the Project design, taking into account the Design Principles and good practice, was undertaken to identify any potentially significant effects that would require essential mitigation. Effects on noise and vibration that could be significant and therefore required further consideration for essential mitigation were identified as follows:

a. Significant construction noise effects due to construction plant, transportation of excavated material and deliveries, main tunnel drive sites, and other key working areas along the Project route.

b. Operational road traffic noise impacts at NSRs within the Project corridor requiring further acoustic mitigation measures under the national policy principles of mitigating adverse impacts to a minimum in the context of sustainable development.

Construction phase

12.5.19 For the construction phase, embedded and good practice measures set out in the previous sections form the basis of the majority of the mitigation options.

12.5.20 However, specifically with regard to earthworks activities it is noted that within the CoCP these could occur during the evening periods between March and October. Where this is necessary a 300m “restriction Zone” around any residential or sensitive receptor will be enforced. This will be secured through Appendix 2.2: CoCP (Table 6.1 (Application Document 6.3)).

Operational phase

12.5.21 As discussed, earthworks features and pavement surfaces have been included in the Project design, where practicable, as the primary means of noise mitigation. Where earthworks measures were not practicable and additional mitigation was deemed necessary, acoustic fencing has been identified as an essential mitigation measure.

12.5.22 DMRB LA 111 states that, for all essential mitigation, the following factors should be considered:

a. With regard to residential noise receptors only, a comparison of the monetarised noise benefit of a mitigation measure against the cost of the measure over the anticipated design life of the Project

b. The likely perceived benefit of the measure at any noise sensitive receptors

c. The benefit of a measure in terms of elimination of likely significant effects

d. The practicality of the measure, for example in terms of safety considerations and engineering

e. The impact of the measure across other environmental factors, for example the visual impact of a noise barrier

12.5.23 After considering the above factors alongside environmental and engineering factors, the following essential mitigation was concluded to be necessary. It is reiterated that the essential mitigation provision is applied in addition to both the embedded and good practice measures.

Acoustic barriers (REAC Ref. NV011)

12.5.24 Reflective acoustic barriers of the dimensions presented in Table 12.29, would be installed at the locations shown on Figure 12.6: Operational Road Traffic Noise Mitigation (Application Document 6.2). These acoustic barriers are secured through REAC commitment NV011 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) and relevant Design Principles (Application Document 7.5) are STR.04, STR.06, STR.07, STR.09, STR.10, S10.05, S11.05, and LSP.09.

12.5.25 These barriers would be specified in accordance with DMRB LD 119 (National Highways, 2020e) Section 5 and would have to accord with the appropriate airborne sound insulation values derived from ‘*the addition of +15 dB(A) to the maximum insertion loss specified for the barrier in the environmental statement or environmental assessment report*’.

12.5.26 It is also noted that the 'height' of the barrier quoted in Table 12.29 relates to the height relative to the pavement surface of the Project.

12.5.27 The iterative design process involving the Project Team considered other environmental topics, the context of sustainable development and engineering constraints. Through this process, a number of measures were identified, with those taken forward by the Project presented within Table 12.29.

Table 12.29 Acoustic barrier dimensions and location reference

Acoustic barrier location reference	Height (relative to Pavement)	Length	Insertion loss and barrier type	Justification
AB1	2.0m (from Pavement height)	137m	BS EN 1793-2 Class B2 Reflective barrier with insertion loss of no less than 30dB(A)	Acoustic barrier positioned to protect residential amenity at isolated properties on Station Road/Love Lane to the West of East Tilbury. Design philosophy to reduce noise to a minimum in accordance with national policy. Height of barrier controlled to prevent the introduction of new landscape and visual impacts.
AB2	1.0m (from Pavement height)	667m	Robust concrete bridge parapet for safety reasons, with acoustic attributes. Insertion loss of no less than 25dB(A)	Tilbury Viaduct Acoustic barrier position provides noise mitigation to outlying residential properties to the western extent of East Tilbury. Height of barrier controlled by engineering constraints and to prevent the introduction of new landscape and visual impacts.
AB3	1.0m (from Pavement height)	667m	Robust concrete bridge parapet for safety reasons, with acoustic attributes. Insertion loss of no less than 25dB(A)	Tilbury Viaduct Feature is a robust bridge parapet for safety reasons, with acoustic attributes. Acoustic barrier position provides noise mitigation to residential amenity of properties on Low Street Lane. Height of barrier controlled by engineering constraints and to prevent the introduction of new landscape and visual impacts.
AB4	3.0m (from Pavement height)	95m	BS EN 1793-2 Class B3 Reflective barrier with	Acoustic barrier positioned to protect residential amenity at Brook Farm Cottages as a result of two receptors reporting unmitigated levels above a SOAEL during the night-time period.

Acoustic barrier location reference	Height (relative to Pavement)	Length	Insertion loss and barrier type	Justification
			insertion loss of no less than 33dB(A)	Design philosophy to reduce noise as far as reasonably possible in accordance with national policy on noise. Height of barrier controlled by engineering constraints and to prevent the introduction of new landscape and visual impacts.
AB5	1.0m (from Pavement height)	1,399m	Robust concrete bridge parapet for safety reasons, with acoustic attributes. Insertion loss of no less than 25dB(A)	Acoustic barrier positioned on either side of the Mardyke Viaduct. Feature is a robust bridge parapet for safety reasons, with acoustic attributes. Acoustic barrier position provides noise mitigation to isolated sensitive receptors and areas of tranquillity within this area. Height of barrier controlled by engineering constraints and to prevent the introduction of new landscape and visual impacts.
AB6	1.0m (from Pavement height)	1,434m		

12.5.28 The mitigation options that have been considered but not taken forward are presented within Appendix 12.10 (Application Document 6.3) along with the reason they were not taken forward in the design.

12.6 Assessment of likely significant effects

12.6.1 This section presents the assessment of likely significant effects on noise and vibration receptors resulting from the construction and operational phases of the Project. This is based on the design of the Project and takes into account the mitigation as presented in Section 12.5.

12.6.2 The significance has been determined based on the standards contained within DMRB LA 111 and presented in Section 12.3 of this chapter.

Construction noise

12.6.3 This section discusses the construction impacts of the Project initially based on a reasonable worst case without the inclusion of good practice measures to control construction noise and vibration. At present, a construction contractor has not been identified for the Project, but a reasonably foreseeable construction programme has been developed within the scope of the Project. Following the initial consideration of this reasonable worst case to identify potential areas where significant impacts may occur, the performance of Best Practicable Means (BPM) as defined under Part III of the EPA 1990 has been included in the determination of significance based upon reasonable assumptions and measures (Section 12.3).

12.6.4 The DMRB LA 111 classifies construction noise as representing a significant environmental effect where '*major or moderate magnitude of impact will occur for a duration exceeding: 1) 10 or more days or nights in any 15 consecutive days or nights; 2) a total number of days exceeding 40 in any 6 consecutive months*'. Activities have been assumed to occur for a full calendar month, which allows a robust consideration of effects.

12.6.5 Within the assessment of construction noise impacts, a total of 140 NSRs have been selected as representative of the entire Project route. These are presented graphically on Figure 12.1: Construction Noise and Vibration Study Area (Application Document 6.2) and presented in full detail within Figure 12.2: Construction Traffic Noise Affected Links (Application Document 6.2).

12.6.6 The construction noise assessment is presented and discussed relative to three areas along the Project route:

a. The Project south of the River Thames and the A2/M2 (southern Project termination)

b. The Project north of the River Thames to the A13

c. The Project north of the A13 to the M25 (northern Project termination)

Application of BPM within the Assessment

12.6.7 In order to mitigate the potential for significant effects, BPM and specific mitigation will be implemented during the construction phase through the controls inherent within the REAC (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)).

12.6.8 Under the controls within the CoCP, when further details of the construction method and design are known, the Contractors will develop a Noise and Vibration Management Plan (REAC NV002) to control noise as far as reasonably possible through the implementation of BPM.

12.6.9 Generally, it is accepted that BPM measures will reasonably reduce construction noise by up to 10dB or more, with BPM applied to certain specific activities achieving 20dB of reduction, as detailed within BS 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites - Part 1: Noise; Annex B, *Noise sources, remedies and their effectiveness*, depending upon the measures used and the issues faced. This Annex within BS 5228-1:2009+A1:2014 has been reviewed and where it is considered that BPM would reduce the noise from certain items of plant then these reductions have been assumed within the calculations of construction noise. BPM will be implemented under REAC commitment NV007.

12.6.10 In addition, further specific mitigation, considered to be above general BPM measures and secured through REAC commitments NV001 to NV010 and NV012 would also be implemented.

South of the River Thames

12.6.11 Construction noise levels have been predicted during the daytime, evening and night-time periods at 37 identified NSRs based upon the envisaged Project construction programme.

12.6.12 The predicted reasonable worst case construction noise levels at each representative calculation point are presented in Appendix 12.4: Construction Noise and Vibration Assessment (Application Document 6.3) referenced to the individual receptor IDs.

12.6.13 Table 12.30 identifies where the reasonable worst-case predicted construction noise levels have the potential to breach these based upon the construction information underpinning this assessment.

Table 12.30 Potential construction noise impacts south of the River Thames

Receptor ID	Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of BPM		
	Day	Eve	Night
CN 1	No	No	No
CN 2	No	No	Yes
CN 3	No	No	No
CN 4	No	No	No
CN 5	No	No	No
CN 6	Yes	No	No
CN 7	No	No	Yes
CN 8	No	No	No
CN 9	No	No	No
CN 10	No	No	No
CN 11	Yes	No	No
CN 12	No	No	Yes
CN 13	No	No	No
CN 14	No	Yes	Yes
CN 15	No	No	Yes
CN 16	No	No	No
CN 17	No	Yes	Yes
CN 18	No	No	No
CN 19	Yes	Yes	Yes
CN 20	No	No	No
CN 21	No	No	Yes
CN 22	No	No	No
CN 23	No	No	No

Receptor ID	Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of BPM		
	Day	Eve	Night
CN 24	No	No	No
CN 25	No	No	No
CN 26	No	No	No
CN 27	No	No	No
CN 28	Yes	No	Yes
CN 29	No	No	No
CN 30	No	No	Yes
CN 31	Yes	No	No
CN 32	No	No	No
CN 33	No	No	Yes
CN 34	No	No	No
CN 35	No	No	No
CN 36	No	No	No
CN 37	No	No	No

12.6.14 The assessment results presented in Table 12.30 indicate the following for the 37 NSRs considered within this section of the Project:

a. 32 of the NSRs would experience daytime construction noise levels of no greater than a minor magnitude of impact.

b. 34 NSRs would experience evening construction noise levels of no greater than a minor magnitude of impact.

c. 26 NSRs would experience night-time construction noise levels of no greater than a minor magnitude of impact.

12.6.15 It is concluded that receptors experiencing a magnitude of impact of less than Moderate would **not experience a significant effect** based upon the reasonable worst case and the guidance of DMRB LA 111.

12.6.16 The assessment results presented in Table 12.30 also indicate the following, based upon the reasonable worst case assumptions, for the 37 NSRs considered:

a. Five NSRs would demonstrate the potential for significant effects during the daytime period.

b. Three NSRs would demonstrate the potential for significant effects during the evening period.

c. 11 NSRs would demonstrate the potential for significant effects during the night-time period.

12.6.17 For the NSRs identified in Table 12.30 as potentially experiencing a significant effect, further information relating to these effects is presented within Table 12.31. Within the following table the impacts are directly related to specific work activities from the construction information which are concluded to be the cause of the impact. The specifics of these activities can be found in the Construction Methodology (Application Document Appendix 2.1 Construction Supporting Information (Application Document 6.3).

Table 12.31 Potential for impacts from construction noise south of the River Thames

NSR location	Description of potential impacts
CN 2 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 4.9dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods. During the night-time these exceedances would occur during the A2 tie in construction works. As a result of the exceedance of a SOAEL, mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would require the following: • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and **would therefore not constitute a significant effect**.
CN 6 (Daytime only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the daytime, with a maximum exceedance of 2.4dB(A) above the daytime period SOAEL. No significant impacts are reported at this location during the night-time or evening periods. During the daytime these exceedances would occur during the construction of offline elements (Henhurst Road to Brewers Lane and east of Thong Lane), construction operations within Marling Cross Compound and construction of utilities work No(s) MU9. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following:

NSR location	Description of potential impacts
	• Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 7 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the night-time, with a maximum exceedance of 5.3dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods. During the night-time these exceedances would occur during the construction of utilities Work No. G1b. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Trenchless installation at Work No. G1b to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and **would therefore not constitute a significant effect**.
CN 11 (Daytime only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the daytime, with a maximum exceedance of 5dB(A) above the daytime period SOAEL. No significant impacts are reported at this location during the night-time or evening periods. During the daytime these exceedances would occur during the A2 and offline project earthworks, construction of the retaining wall adjacent to Gravesend east of M2 viaduct, construction operations within Southern Tunnel Entrance Compound, movements along construction haul routes and construction of utilities work No(s) G1b and MU17.

NSR location	Description of potential impacts
	As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Trenchless installation at Work No. G1b to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 12 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time period, with a maximum exceedance of 2.5dB(A). No significant impacts are reported at this location during the daytime period. During the night-time these exceedances would occur during the construction of utilities Work No. G1b. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Trenchless installation at Work No. G1b to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period.

NSR location	Description of potential impacts
	With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 14 (Evening and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the evening and night-time periods, with a maximum exceedance of 11.7dB(A) above the evening period SOAEL and a maximum exceedance of 16.7dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime period. During the evening and night-time these exceedances would occur during the Thong Lane tie in construction works. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) As such, notwithstanding the inclusion of mitigation effects associated with the implementation of BPM reducing construction noise to below a SOAEL, based upon the construction programme, night-time impacts associated with these works would not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period as detailed within Table 1.1 of Appendix 2.1 (Application Document 6.3). As such the impacts would therefore **not constitute a significant effect**.
CN 15 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 2.9dB(A) reported. No significant impacts are reported at this location during the daytime period. During the evening and night-time these exceedances would occur during the construction of utilities Work No. OH1 and OHT1. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Enclose static plant (overhead line hydraulic tensioner) in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise)

NSR location	Description of potential impacts
	As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect**.
CN 17 (Evening and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the evening and night-time periods, with a maximum exceedance of 4.8dB(A) above the evening period SOAEL and a 9.8dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime period. During the evening and night-time these exceedances would occur during the construction of utilities Work No. G4. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Trenchless installation at Work No. G4 to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and therefore **would not constitute a significant effect**.
CN 19 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, evening and night-time periods, with a maximum exceedance of 8.3dB(A) above the daytime period SOAEL, 10.4dB(A) above the evening period SOAEL and 15.3dB(A) above the night-time period SOAEL. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. ***Daytime Impacts*** During the daytime these exceedances would occur associated with: • pavement works, • Thong Lane bridge construction, • construction operations within the Southern Tunnel Entrance Compound, • movements along construction haul routes, and • construction of utilities work No(s) MU19, MU17, MU18.

NSR location	Description of potential impacts
	With regard to BPM associated with the daytime activities in proximity to this NSR, measures would be required to include the following: • Acoustic screening between construction works (including compounds and haul routes) and noise sensitive receptors (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**. ***Evening and Night-time Impacts*** During the evening and night-time these exceedances would occur associated with: • Thong Lane tie in construction works. With regard to BPM relating to the evening and night-time activities, measures would be required to include the following: • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) With regard to the evening and night-time impacts at this receptor, whilst BPM will be applied along with other control measures through commitments secured within the REAC to reduce construction noise levels as far as reasonably possible, there remains the potential for construction noise to exceed a SOAEL and report a Moderate impact. However, based upon the construction programme, night-time impacts associated with these works would not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period as detailed within Table 1.1 of Appendix 2.1 (Application Document 6.3). As such the impacts would therefore **not constitute a significant effect on the basis of duration**.
CN 21 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 1.4dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods. During the night-time these exceedances would occur during the Thong Lane tie in construction works.

NSR location	Description of potential impacts
	As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time periodand therefore **would not constitute a significant effect**.
CN 28 (Daytime and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the daytime and night-time, with a maximum exceedance of 3.1dB(A) above the daytime period SOAEL and 4.3dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the evening period. During the daytime these exceedances would occur during the construction operations within Southern Tunnel Entrance Compound and A226 Gravesend Road Compound, movements along construction haul routes and construction of utilities work No(s) MU24, MUT3. During the night-time these exceedances would occur during the operation of the Southern Tunnel Entrance Compound. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period.

NSR location	Description of potential impacts
	With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it **would not constitute a significant effect**.
CN 30 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the night-time, with a maximum exceedance of 4.2dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods. During the night-time these exceedances would occur during the operation of the Southern Tunnel Entrance Compound As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works (including compounds and haul routes) and noise sensitive receptors (BS 5228-1 indicates up to 10 dB reduction in noise) Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it **would not constitute a significant effect**.
CN 31 (Daytime only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, with a maximum exceedance of 2.0dB(A) above the daytime period SOAEL. No significant impacts are reported at this location during the evening or night-time periods. During the daytime these exceedances would occur during the construction operations within Southern Tunnel Entrance Compound and movements along construction haul routes. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all

NSR location	Description of potential impacts
	construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works (including compounds and haul routes) and noise sensitive receptors (BS 5228-1 indicates up to 10 dB reduction in noise) Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) Screening of haul routes with temporary barriers (5 to 10 dB) Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it **would not constitute a significant effect**.
CN 33 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the night-time, with a maximum exceedance of 3.4dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods. During the night-time these exceedances would occur during the operation of the Southern Tunnel Entrance Compound. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works (including compounds and haul routes) and noise sensitive receptors (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period.

NSR location	Description of potential impacts
	With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it **would not constitute a significant effect**.

12.6.18 In order to mitigate the potential for significant effects, BPM and other construction phase mitigation will be implemented through the controls inherent within the REAC (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)). Additionally, under the controls within the CoCP, when further details of the construction method and design are known, the Contractors will develop a Noise and Vibration Management Plan (REAC NV002) to control noise as far as reasonably possible under BPM.

12.6.19 With regard to evening and night-time impacts, consideration of the construction programme conclude these to be primarily associated with short duration utilities and “tie in” activities and do not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period. These durations are specifically set out in Appendix 2.1 (Application Document 6.3).

12.6.20 As such it can be concluded that construction noise would be suitably controlled to a level where it **would not constitute a significant effect within this section of the Project**.

North of the River Thames to the A13

12.6.21 Construction noise levels have been predicted during the daytime, evening and night-time periods at 61 identified NSRs based upon the envisaged Project construction programme.

12.6.22 The predicted reasonable worst case construction noise levels at each representative calculation point are presented in Appendix 12.4: Construction Noise and Vibration Assessment (Application Document 6.3) referenced to the individual receptor IDs.

12.6.23 Table 12.32 identifies where the reasonable worst-case predicted construction noise levels have the potential to breach of these based upon the construction information underpinning this study.

Table 12.32 Construction noise impacts north of the River Thames to the A13

Name	Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of BPM		
	Day	Eve	Night
CN 38	No	No	No
CN 39	No	No	No
CN 40	No	No	No
CN 41	No	No	No
CN 42	No	No	Yes

Name	Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of BPM		
	Day	Eve	Night
CN 43	Yes	No	Yes
CN 44	No	No	No
CN 45	No	Yes	Yes
CN 46	No	No	No
CN 47	Yes	Yes	Yes
CN 48	Yes	No	Yes
CN 49	Yes	No	Yes
CN 50	No	Yes	Yes
CN 51	No	No	No
CN 52	No	No	No
CN 53	No	No	No
CN 54	No	No	Yes
CN 55	No	No	No
CN 56	No	No	Yes
CN 57	Yes	No	No
CN 58	No	No	Yes
CN 59	No	No	No
CN 60	Yes	No	No
CN 61	No	No	No
CN 62	Yes	Yes	Yes
CN 63	No	No	No
CN 64	No	No	No
CN 65	No	No	Yes
CN 66	No	No	No
CN 67	No	No	No
CN 68	No	No	No
CN 69	No	No	No
CN 70	No	No	No
CN 71	No	Yes	Yes
CN 72	No	Yes	Yes
CN 73	Yes	Yes	Yes
CN 74	No	No	Yes
CN 75	No	No	No

Name	Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of BPM		
	Day	Eve	Night
CN 76	No	No	Yes
CN 77	Yes	Yes	Yes
CN 78	Yes	Yes	Yes
CN 79	Yes	No	No
CN 80	Yes	Yes	Yes
CN 81	Yes	No	Yes
CN 82	No	No	Yes
CN 83	Yes	Yes	Yes
CN 84	No	No	Yes
CN 85	Yes	No	Yes
CN 86	No	No	Yes
CN 87	Yes	Yes	Yes
CN 88	Yes	Yes	Yes
CN 89	Yes	Yes	Yes
CN 90	No	No	Yes
CN 91	Yes	No	No
CN 92	Yes	No	No
CN 93	No	No	No
CN 94	No	Yes	Yes
CN 95	No	Yes	Yes
CN 96	No	No	Yes
CN 100	No	No	No
CN 106	No	No	No

12.6.24 The assessment results presented in Table 12.32 indicate the following for the 61 NSRs considered within this section of the Project:

a. 41 NSRs would experience daytime construction noise levels of no greater than a minor magnitude of impact.

b. 45 NSRs would experience evening construction noise levels of no greater than a minor magnitude of impact.

c. 28 NSRs would experience night-time construction noise levels of no greater than a minor magnitude of impact.

12.6.25 It is concluded that receptors experiencing a magnitude of impact of minor or less (including negligible) would **not present a significant effect** based upon the reasonable worst-case scenario and the guidance of DMRB LA 111.

12.6.26 The assessment results presented in Table 12.32 also indicate the following, based upon the reasonable worst-case assumptions, for the 61 NSRs considered:

a. 20 NSRs would demonstrate the potential for significant effects during the daytime period.

b. 16 NSRs would demonstrate the potential for significant effects during the evening period.

c. 33 NSRs would demonstrate the potential for significant effects during the night-time period.

12.6.27 For the NSRs identified in Table 12.32 as potentially experiencing a significant effect, further information relating to these effects is presented within Table 12.33. Within the following table the impacts are directly related to specific work activities from the construction information which are concluded to be the cause of the impact. The specifics of these activities can be found in the Construction Methodology (Application Document Appendix 2.1 Construction Supporting Information (Application Document 6.3).

Table 12.33 Potential for impacts from construction noise north of the River Thames to the A13

NSR location	Justification of significance conclusion
CN 42 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the night-time, with a maximum exceedance of 10.7dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods. During the night-time these exceedances would occur during the Tilbury Viaduct works over the existing Tilbury Loop rail line. This structure consists of a 10-span viaduct, and the construction methodology is a combination of incremental launching and lifting of the spans. The works above and in close proximity to the railway require night possessions, however, the works information describes these as limited night time rail possession. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) With regard to the evening and night-time impacts at this receptor, whilst BPM will be applied along with other control measures through commitments secured within the REAC to reduce construction noise levels as far as reasonably possible, there remains the potential for construction noise to exceed a SOAEL and report a Moderate impact. However, based upon the construction programme, night-time

NSR location	Justification of significance conclusion
	impacts associated with these works would not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period as detailed within Table 1.1 of Appendix 2.1 (Application Document 6.3). As such the impacts would therefore **not constitute a significant effect on the basis of duration**.
CN 43 (Daytime and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime and night-time with a maximum exceedance of 1.5dB(A) above the daytime period SOAEL and 12.8dB(A) above the night-time period SOAEL. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. ***Daytime Impacts*** During the daytime these exceedances would occur associated with: • construction operations within Northern Tunnel Entrance Compound • movements along construction haul routes and • construction of utilities work No(s) MUT6, With regard to BPM associated with the daytime activities in proximity to this NSR, measures would be required to include the following: • Acoustic screening between construction works (including compounds and haul routes) and noise sensitive receptors (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**. ***Night-time Impacts*** During the night-time these exceedances would occur associated with: • Tilbury Viaduct works over the existing Tilbury Loop rail line. During the night-time these exceedances would occur during the Tilbury Viaduct works over the existing Tilbury Loop rail line. This structure consists of a 10-span viaduct, and the construction methodology is a combination of incremental

NSR location	Justification of significance conclusion
	launching and lifting of the spans. The works above and in close proximity to the railway require night possessions, however, the works information describes these as limited night time rail possession. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) With regard to the evening and night-time impacts at this receptor, whilst BPM will be applied along with other control measures through commitments secured within the REAC to reduce construction noise levels as far as reasonably possible, there remains the potential for construction noise to exceed a SOAEL and report a Moderate impact. However, based upon the construction programme, night-time impacts associated with these works would not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period as detailed within Table 1.1 of Appendix 2.1 (Application Document 6.3). As such the impacts would therefore **not constitute a significant effect on the basis of duration**.
CN 45 (Evening and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the evening and night-time, with a maximum exceedance of 1.2dB(A) above the evening period SOAEL and 6.4dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime period. During the evening and night-time these exceedances would occur during the Tilbury Viaduct works over the existing Tilbury Loop rail line. This structure consists of a 10-span viaduct, and the construction methodology is a combination of incremental launching and lifting of the spans. The works above and in close proximity to the railway require night possessions, however, the works information describes these as limited night time rail possession. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and **would therefore not constitute a significant effect**.

NSR location	Justification of significance conclusion
CN 47 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, evening and night-time period with a maximum exceedance of 4.4dB(A) above the daytime period SOAEL, 6.2dB(A) above the evening period SOAEL and 11.2dB(A) above the night-time period SOAEL. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. ***Daytime and Evening Impacts*** During the daytime and evening these exceedances would occur associated with: • construction operations within Northern Tunnel Entrance Compound • movements along construction haul routes and • construction of utilities work No(s) MUT6 and TFGP1 With regard to BPM associated with the daytime activities in proximity to this NSR, measures would be required to include the following: • Acoustic screening between construction works (including compounds and haul routes) and noise sensitive receptors (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**. ***Night-time Impacts*** During the night-time these exceedances would occur associated with: • Tilbury Viaduct works over the existing Tilbury Loop rail line. During the night-time these exceedances would occur during the Tilbury Viaduct works over the existing Tilbury Loop rail line. This structure consists of a 10-span viaduct, and the construction methodology is a combination of incremental launching and lifting of the spans. The works above and in close proximity to the railway require night possessions, however, the works information describes these as limited night time rail possession. With regard to BPM for this NSR, measures would include the following:

NSR location	Justification of significance conclusion
	• Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) With regard to the evening and night-time impacts at this receptor, whilst BPM will be applied along with other control measures through commitments secured within the REAC to reduce construction noise levels as far as reasonably possible, there remains the potential for construction noise to exceed a SOAEL and report a Moderate impact. However, based upon the construction programme, night-time impacts associated with these works would not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period as detailed within Table 1.1 of Appendix 2.1 (Application Document 6.3). As such the impacts would therefore **not constitute a significant effect on the basis of duration**.
CN 48 (Daytime and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime and night-time periods, with a maximum exceedance of 6.4dB(A) above the daytime period SOAEL and 5.0dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the evening period. During the daytime these exceedances would occur during the construction operations within Station Road Compound and construction of utilities work No(s) MUT11 During the night-time these exceedances would occur during the construction of utilities Work No. MUT6. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works (including compounds and haul routes) and noise sensitive receptors (BS 5228-1 indicates up to 10 dB reduction in noise) Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Trenchless installation at Work No. MUT6 to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.

NSR location	Justification of significance conclusion
CN 49 (Daytime and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the daytime and night-time periods, with a maximum exceedance of 2.6dB(A) above the daytime period SOAEL and 2.6dB(A) above the night-time period SOAEL. During the daytime these exceedances would occur during the construction of utilities work No(s) MUT14. During the night-time these exceedances would occur during the construction of utilities Work No. OHT2 and OH4 As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in (overhead line hydraulic tensioner) (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 50 (Evening and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the evening and night-time periods, with a maximum exceedance of 2.1dB(A) above the evening period SOAEL and 7.1dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime period. During the evening and night-time these exceedances would occur during the construction of utilities Work No. MU29 As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Trenchless installation at Work No. MU29 to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise)

NSR location	Justification of significance conclusion
	As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 54 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 3.5dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods. During the night-time these exceedances would occur during the construction of utilities Work No. MUT6. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Trenchless installation at Work No. MUT6 to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect.**
CN 56 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 2.9dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods. During the night-time these exceedances would occur during the tie in works with Muckingford Road. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all

NSR location	Justification of significance conclusion
	construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 57 (Daytime only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the daytime, with a maximum exceedance of 2.9dB(A) above the daytime period SOAEL. No significant impacts are reported at this location during the night-time or evening periods. During the daytime these exceedances would occur during the construction of utilities work No(s) MU35, As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 58 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 1.4dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods.

NSR location	Justification of significance conclusion
	During the night-time these exceedances would occur during the tie in works with Muckingford Road. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect**.
CN 60 (Daytime only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the daytime, with a maximum exceedance of 2.1dB(A) above the daytime period SOAEL. No significant impacts are reported at this location during the night-time or evening periods. During the daytime these exceedances would occur during the topsoil strip and earthworks and construction of utilities work No(s) OHT2. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for

NSR location	Justification of significance conclusion
	BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 62 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, evening and night-time periods with a maximum exceedance of 3.7dB(A) above the daytime period, 14.2dB(A) above the evening period SOAEL and 19.2dB(A) above the night-time period SOAEL. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. ***Daytime Impacts*** During the daytime these exceedances would occur associated with: • construction of utilities work No(s) MU34, MU35, MUT6 With regard to BPM associated with the daytime activities in proximity to this NSR, measures would be required to include the following: • Acoustic screening between construction works (including compounds and haul routes) and noise sensitive receptors (BS 5228-1 indicates up to 10 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**. ***Night-time and evening Impacts*** During the evening and night-time these exceedances would occur associated with: • tie in works with Muckingford Road. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise)

NSR location	Justification of significance conclusion
	• Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) With regard to the evening and night-time impacts at this receptor, whilst BPM will be applied along with other control measures through commitments secured within the REAC to reduce construction noise levels as far as reasonably possible, there remains the potential for construction noise to exceed a SOAEL and report a Moderate impact. However, based upon the construction programme, night-time impacts associated with these works would not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period as detailed within Table 1.1 of Appendix 2.1 (Application Document 6.3). As such the impacts would therefore **not constitute a significant effect on the basis of duration**.
CN 65 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the night-time, with a maximum exceedance of 1.4dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods. During the night-time these exceedances would occur during the construction of utilities Work No. OHT3 As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in (overhead line hydraulic tensioner) (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect.**
CN 71 (Evening and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the evening and night-time periods, with a maximum exceedance of 6.1dB(A) above the evening period SOAEL and 13.8dB(A) above the night-time period SOAEL. During the evening and night-time these exceedances would occur during the tie in works at Brentwood Road As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007

NSR location	Justification of significance conclusion
	(Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) With regard to the evening and night-time impacts at this receptor, whilst BPM will be applied along with other control measures through commitments secured within the REAC to reduce construction noise levels as far as reasonably possible, there remains the potential for construction noise to exceed a SOAEL and report a Moderate impact. However, based upon the construction programme, night-time impacts associated with these works would not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period as detailed within Table 1.1 of Appendix 2.1 (Application Document 6.3). As such the impacts would therefore **not constitute a significant effect on the basis of duration**.
CN 72 (Evening and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the evening and night-time periods, with a maximum exceedance of 4.1dB(A) above the evening period SOAEL and 6.6dB(A) above the night-time period SOAEL. During the night-time these exceedances would occur during the A1013 tie in works and surfacing. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.

NSR location	Justification of significance conclusion
CN 73 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the daytime, evening and night-time periods with a maximum exceedance of 2.8dB(A) above the daytime period SOAEL, 1.7dB(A) above the evening period SOAEL and 1.7dB(A) above the night-time period SOAEL. During the daytime these exceedances would occur as a result construction haul route movements and construction of utilities work No(s) MU40, MUT13, MU39. During the night-time these exceedances would occur during the local road tie in works at Brentwood Road. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 74 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 3.1dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods. During the night-time these exceedances would occur during the construction of utilities Work No. MUT16. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Trenchless installation at Work No. MUT16 to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to

NSR location	Justification of significance conclusion
	NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 76 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the night-time, with a maximum exceedance of 5.7dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods. During the night-time these exceedances would occur during the construction of utilities Work No. OHT 4 to 7 and OH6. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in (overhead line hydraulic tensioner) (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect.**
CN 77 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, evening and night-time periods with a maximum exceedance of 12.4dB(A) above the daytime period SOAEL, 9.5dB(A) above the evening period SOAEL and 14.5dB(A) above the night-time period SOAEL. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. ***Daytime and evening Impacts*** During the daytime and evening these exceedances would occur associated with: • construction of utilities works No(s) MUT18 and MU49 These impacts above a SOAEL relate to short duration utilities activities during May 2025, October 2025 and February 2029, where the utilities works are located very close to the receptor location. • With regard to MUT 18 this relates to a temporary foul water pipe installed to serve Stanford Road Compound. The impacts occur during the installation period May 2025 and the subsequent removal in April 2029. As these works are transient in nature and are fast progressing cut and cover pipe installation

NSR location	Justification of significance conclusion
	activities, the impacts above a SOAEL would only be short duration as the works pass at closest approach to the receptor, reducing as works are further away: with the model representing the period at closest approach. As such the works on MUT 18 would not be expected to occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period at this closest approach location. • With regard to MU 49 this relates to the installation of a multi use utility corridor, with the impacts occur during the installation period during October 2025. As these works are transient in nature and are fast progressing cut and cover activities, the impacts above a SOAEL would only be short duration as the works pass at closest approach to the receptor, reducing as works are further away: with the model representing the period at closest approach. As such the works on MU 49 would not be expected to occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period at this closest approach location. With regard to BPM associated with the daytime activities in proximity to this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works (including compounds and haul routes) and noise sensitive receptors (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant (including overhead line hydraulic tensioner) (BS 5228-1 indicates up to 20 dB reduction in noise) With regard to the impacts at this receptor, whilst BPM will be applied along with other control measures through commitments secured within the REAC relating to MUT18 and MU49 to reduce construction noise levels as far as reasonably possible, there remains the potential for construction noise to exceed a SOAEL and report a Moderate or greater impact. However, based upon the transient nature of these activities, the exceedance above a SOAEL associated would not be expected to occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period and would therefore be **unlikely to constitute a significant effect on the basis of duration**. ***Night-time Impacts*** During the night-time these exceedances would occur associated with: • construction of utilities work No(s) MU47 These impacts above a SOAEL are reported relating to short duration utilities activities programmed to occur sometime during the period June 2025 to June 2026, where the utilities works are located very close to the receptor location. • With regard to MU 47 this relates to the installation of a multi use utility corridor, with the impacts occur during the installation under the A1089 by trenchless crossing techniques. Whilst MU47 is identified within the construction programme for a full 12 months, the night time works associated with the installation of the crossing under the A1089 is unlikely to be for the full duration. As the issue relates to the trenchless crossing the following specific control would be necessary relating to this activity:

NSR location	Justification of significance conclusion
	• Trenchless installation at Work No. MU47 to use machine inside temporary acoustic enclosure/building with adequate ventilation - BS 5228-1 indicates up to 15 dB reduction in noise. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 78 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, evening and night-time periods with a maximum exceedance of 7.1dB(A) above the daytime period SOAEL, 4.6dB(A) above the evening period SOAEL and 4.6dB(A) above the night-time period SOAEL. During the daytime these exceedances would occur during the creation of haul routes alongside the main alignment, movements along construction haul routes and construction of utilities work No(s) MU48, MUT18, MUT16, OHT5, MU47, OH6. During the night-time these exceedances would occur during the construction of utilities Work No. OHT 4 to 7 and OH6. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Rotary drilling and boring activities, use machine inside acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect.**
CN 79 (Daytime only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the daytime, with a maximum exceedance of 12.3dB(A) above the daytime period SOAEL. No significant impacts are reported at this location during the night-time or evening periods.

NSR location	Justification of significance conclusion
	During the daytime these exceedances would occur during the topsoil strip and earthworks, retaining wall construction, movements along construction haul routes and construction of utilities work No(s) MU41, MUT12, MU40, MU38. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Rotary drilling and boring activities, use machine inside acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 80 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, evening and night-time periods with a maximum exceedance of 7.5dB(A) above the daytime period SOAEL, 1.7dB(A) above the evening period SOAEL and 6.7dB(A) above the night-time period SOAEL. During the daytime these exceedances would occur during the earthworks, construction of the retaining wall adjacent to A1013 over the A1089 and construction of utilities work No(s) MU49, OH6, OH7, MU54. During the night-time these exceedances would occur during the A1089 tie in and surfacing works. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following:

NSR location	Justification of significance conclusion
	• Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect.**
CN 81 (Daytime and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime and night-time periods with a maximum exceedance of 9.0dB(A) above the daytime period SOAEL and 5.4dB(A) above the night-time period SOAEL. During the daytime these exceedances would occur during the construction of utilities work No(s) OH6, OH7 and OHT4. During the night-time these exceedances would occur during the A1089 tie in and surfacing works. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect.**

NSR location	Justification of significance conclusion
CN 82 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 3.8dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the night-time or evening periods. During the night-time these exceedances would occur during the construction of utilities Work No. OHT 4 and 7 and OH6. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect**.
CN 83 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, evening and night-time periods with a maximum exceedance of 9.7dB(A) above the daytime period SOAEL, 7.5dB(A) above the evening period SOAEL and 17.5dB(A) above the night-time period SOAEL. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. ***Daytime and evening Impacts*** During the daytime and evening these exceedances would occur associated with: • creation of haul routes and topsoil strip, • construction of the retaining wall adjacent to A1013 over the A1089, • movements along construction haul routes • construction of utilities work No(s) MU50, OH7. With regard to BPM associated with the daytime activities in proximity to this NSR, measures would be required to include the following: • Acoustic screening between construction works (including compounds and haul routes) and noise sensitive receptors (BS 5228-1 indicates up to 10 dB reduction in noise)

NSR location	Justification of significance conclusion
	• Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**. ***Night-time Impacts*** During the night-time these exceedances would occur associated with: • construction of the retaining wall adjacent to A1013 over the A1089. Based upon the information contained within the construction programme it is apparent that the night-time activities relate only to 3No. 48hr possessions throughout the entire duration of the activity, with all other works being limited to daytime. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) With regard to the evening and night-time impacts at this receptor, whilst BPM will be applied along with other control measures through commitments secured within the REAC to reduce construction noise levels as far as reasonably possible, there remains the potential for construction noise to exceed a SOAEL and report a Moderate impact. However, based upon the construction programme, night-time impacts associated with these works would not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period as detailed within Table 1.1 of Appendix 2.1 (Application Document 6.3). As such the impacts would therefore **not constitute a significant effect on the basis of duration.**
CN 84 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the night-time, with a maximum exceedance of 5.3dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods During the night-time these exceedances would occur during the construction of utilities Work No. OHT 4 to 7 and OH6.

NSR location	Justification of significance conclusion
	As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Enclose static plant in (overhead line hydraulic tensioner) (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect**.
CN 85 (Daytime and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime and night-time periods, with a maximum exceedance of 7.3dB(A) above the daytime period SOAEL and 10.5dB(A) above the night-time period SOAEL. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. ***Daytime Impacts*** During the daytime these exceedances would occur associated with: • construction of the A1013 bridge over the A13, • movements along construction haul routes, • construction of a large earth bund and • construction of utilities work No(s) MU44. With regard to BPM associated with the daytime activities in proximity to this NSR, measures would be required to include the following: • Acoustic screening between construction works (including compounds and haul routes) and noise sensitive receptors (BS 5228-1 indicates up to 10 dB reduction in noise) • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period.

NSR location	Justification of significance conclusion
	With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**. ***Night-time Impacts*** During the night-time these exceedances would occur associated with: • during the A1013 tie in and surfacing works. Based upon the information contained within the construction programme it is apparent that the night time activities relate only to 2No. 48hr possessions throughout the entire duration of the activity, with all other works being limited to daytime. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) With regard to the impacts at this receptor, whilst BPM will be applied along with other control measures through commitments secured within the REAC to reduce construction noise levels as far as reasonably possible, there remains the potential for construction noise to exceed a SOAEL and report a Moderate or greater impact. However, based upon the construction programme informing the construction noise assessment, the exceedance above a SOAEL associated with the 2No 48hr possessions would not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period and **would therefore not constitute a significant effect on the basis of duration.**
CN 86 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the night-time, with a maximum exceedance of 8.8dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods During the night-time these exceedances would occur during the construction of utilities Work No. MU56 and MU57. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise)

NSR location	Justification of significance conclusion
	• Trenchless installation to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect**.
CN 87 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the daytime, evening and night-time periods with a maximum exceedance of 3.5dB(A) above the daytime period SOAEL, 1.8dB(A) above the evening period SOAEL and 4.3dB(A) above the night-time period SOAEL. During the daytime these exceedances would occur during the construction of the realigned A1013, topsoil strip and construction of utilities work No(s) MU44. During the night-time these exceedances would occur during the construction of utilities Work No. MU46 As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Rotary drilling and boring activities, use machine inside acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect**.
CN 88 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, evening and night-time periods with a maximum exceedance of 3.4dB(A) above the daytime period SOAEL, 2.1dB(A) above the evening period SOAEL, 4.5dB(A) above the night-time period SOAEL. During the daytime these exceedances would occur during the construction of the realigned A1013, topsoil strip and construction of utilities work No(s) MU44.

NSR location	Justification of significance conclusion
	During the night-time these exceedances would occur during the construction of utilities Work No. MU46 As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Rotary drilling and boring activities, use machine inside acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect.**
CN 89 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, evening and night-time periods with a maximum exceedance of 3.3dB(A) above the daytime period SOAEL, 2.4dB(A) above the evening period SOAEL and 4.9dB(A) above the night-time period SOAEL. During the daytime these exceedances would occur during the construction of the realigned A1013, topsoil strip and construction of utilities work No(s) MU44. During the night-time these exceedances would occur during the construction of utilities Work No. MU46 As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise)

NSR location	Justification of significance conclusion
	• Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Rotary drilling and boring activities, use machine inside acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect.**
CN 90 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the night-time, with a maximum exceedance of 4.4dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods. During the night-time these exceedances would occur during the construction of utilities Work No. MU56/MU57. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect**.
CN 91 (Daytime only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, with a maximum exceedance of 7.7dB(A) above the daytime period SOAEL. No significant impacts are reported at this location during the night-time or evening periods During the daytime these exceedances would occur during the topsoil strip, earthworks and construction of utilities work No(s) MU43, MU44. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007

NSR location	Justification of significance conclusion
	(Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Rotary drilling and boring activities, use machine inside acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 92 (Daytime only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the daytime, with a maximum exceedance of 3.7dB(A) above the daytime period SOAEL. No significant impacts are reported at this location during the night-time or evening periods During the daytime these exceedances would occur during the topsoil strip and earthworks, construction of bridge over Orsett Cock to A13, construction operations within Stifford Clays Road Compound West and construction of utilities work No(s) MU43, MU44. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise)

NSR location	Justification of significance conclusion
	• Rotary drilling and boring activities, use machine inside acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 94 (Evening and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the evening and night-time periods with a maximum exceedance of 1.8dB(A) above the evening period SOAEL and 11.8dB(A) above the night-time period SOAEL. During the night-time these exceedances would occur during the construction of utilities Work No. MU60. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Rotary drilling and boring activities, use machine inside acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures, and a specific inclusion of 15dB for the enclosure around the drilling equipment can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect.**
CN 95 (Evening and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the evening and night-time periods with a maximum exceedance of 2.1dB(A) above the evening period SOAEL and 12.1dB(A) above the night-time period SOAEL. During the evening and night-time these exceedances would occur during the construction of utilities Work No. MU60.

NSR location	Justification of significance conclusion
	As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Trenchless installation at Work No. MU60 to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures, and a specific inclusion of 15dB for the enclosure around the drilling equipment can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect.**
CN 96 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 2.1dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods During the night-time these exceedances would occur during the construction of utilities Work No. MUT23. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Trenchless installation at Work No. MUT23 to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect**.

12.6.28 In order to mitigate the potential for significant effects, BPM and other construction phase mitigation will be implemented through the controls inherent within the REAC (Section 7 of the CoCP (Application Document 6.3, Appendix

2.2)). Additionally, under the controls within the CoCP, when further details of the construction method and design are known, the Contractors will develop a Noise and Vibration Management Plan (REAC NV002) to control noise as far as reasonably possible under BPM.

12.6.29 With regard to evening and night-time impacts, consideration of the construction programme concludes these to be primarily associated with short duration utilities and “tie in” activities would not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period. These durations are specifically set out in Appendix 2.1 (Application Document 6.3).

12.6.30 As such it can be concluded that construction noise would be suitably controlled to a level where it **would not constitute a significant effect within this section of the Project**.

North of the A13 to the M25

12.6.31 Construction noise levels have been predicted during the daytime, evening and night-time periods at 42 identified NSRs based upon the envisaged Project construction programme.

12.6.32 The predicted reasonable worst case construction noise levels at each representative calculation point are presented in Appendix 12.4: Construction Noise and Vibration Assessment (Application Document 6.3) referenced to the individual receptor IDs.

12.6.33 Table 12.34 identifies where the reasonable worst-case predicted construction noise levels have the potential to breach of these based upon the construction information underpinning this study.

Table 12.34 Potential construction noise impacts north of the A13 to the M25

Name	Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of BPM		
	Day	Eve	Night
CN 97	No	No	Yes
CN 98	No	No	Yes
CN 99	No	No	No
CN 101	No	No	No
CN 102	Yes	No	Yes
CN 103	No	No	No
CN 104	Yes	Yes	Yes
CN 105	No	No	No
CN 107	No	No	Yes
CN 108	No	No	No
CN 109	No	No	No
CN 110	No	No	Yes
CN 111	No	No	No
CN 112	No	No	No

Name	Potential for a likely significant effect based upon reasonable worst-case assumptions and in the absence of BPM		
	Day	Eve	Night
CN 113	No	No	No
CN 114	No	No	No
CN 115	Yes	No	No
CN 116	Yes	No	Yes
CN 117	No	No	No
CN 118	No	No	No
CN 119	No	No	No
CN 120	No	No	No
CN 121	No	No	No
CN 122	No	No	Yes
CN 123	No	No	No
CN 124	No	No	Yes
CN 125	Yes	Yes	Yes
CN 126	Yes	Yes	Yes
CN 127	No	No	No
CN 128	No	No	No
CN 129	No	No	No
CN 130	No	No	No
CN 131	No	Yes	Yes
CN 132	No	No	Yes
CN 133	Yes	No	Yes
CN 134	No	Yes	Yes
CN 135	No	No	No
CN 136	No	Yes	Yes
CN 137	No	No	No
CN 138	No	No	No
CN 139	No	No	No
CN 140	No	No	No

12.6.34 The assessment results presented in Table 12.34 indicate the following for the 42 NSRs considered within this section of the Project:

a. 35 NSRs would experience daytime construction noise levels of no greater than a minor magnitude of impact.

b. 36 NSRs would experience evening construction noise levels of no greater than a minor magnitude of impact.

c. 26 NSRs would experience night-time construction noise levels of no greater than a minor magnitude of impact.

12.6.35 It is concluded that receptors experiencing a magnitude of impact of minor or less (including negligible) would **not present a significant effect** based upon the reasonable worst-case scenario and the guidance of DMRB LA 111.

12.6.36 The assessment results presented in Table 12.34 also indicate the following, based upon the reasonable worst-case assumptions, for the 42 NSRs considered:

a. Seven NSRs would demonstrate the potential for significant effects during the daytime period.

b. Six NSRs would demonstrate the potential for significant effects during the evening period.

c. 16 NSRs would demonstrate the potential for significant effects during the night-time period.

12.6.37 For the NSRs identified in Table 12.34 as potentially experiencing a significant effect, further information relating to these effects is presented within Table 12.35. Within the following table the impacts are directly related to specific work activities from the construction information which are concluded to be the cause of the impact. The specifics of these activities can be found in the Construction Methodology (Application Document Appendix 2.1 Construction Supporting Information (Application Document 6.3).

Table 12.35 Potential for impacts from construction noise north of the A13 to the M25

NSR location	Justification of significance conclusion
CN 97 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the night-time, with a maximum exceedance of 8.4dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods During the night-time these exceedances would occur during construction of the new A13 underpass, specifically with regard to the necessity for constant pushing pressure on the box jack aspect of the works, meaning it cannot be stopped once started for reasons of safety. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise)

NSR location	Justification of significance conclusion
	• Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Trenchless installation to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 98 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the night-time, with a maximum exceedance of 6.3dB(A) above the night-time period SOAEL. During the night-time these exceedances would occur during construction of the new A13 underpass, specifically with regard to the necessity for constant pushing pressure on the box jack aspect of the works, meaning it cannot be stopped once started for reasons of safety. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Trenchless installation to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period.

NSR location	Justification of significance conclusion
	With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 102 (Daytime and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the daytime and night-time periods with a maximum exceedance of 1.0dB(A) above the daytime period SOAEL and 2.2dB(A) above the night-time period SOAEL. During the daytime these exceedances would occur during the creation temporary access to compounds, construction operations within Stifford Clays Road Compound East, movements along construction haul routes and construction of utilities work No(s) MUT23, MU58, MUT24. During the night-time these exceedances would occur during the tie in works with Stifford Clays Road. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) • Rotary drilling and boring activities, use machine inside acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 104 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, evening and night-time periods with a maximum exceedance of 2.6dB(A)

NSR location	Justification of significance conclusion
	above the daytime period SOAEL, 3.4dB(A) above the evening period SOAEL and 13.4dB(A) above the night-time period SOAEL. During the daytime these exceedances would occur as a result of movements along construction haul routes and construction of utilities work No(s) MUT21, MU59, MU56, MU60. During the night-time these exceedances would occur during the tie in works with Stifford Clays Road. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime and evening construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**. With regard to the impacts at this receptor during the overnight, whilst BPM will be applied along with other control measures through commitments secured within the REAC to reduce construction noise levels as far as reasonably possible, there remains the potential for construction noise to exceed a SOAEL and report a Moderate impact. However, based upon the construction programme informing the construction noise assessment, the exceedance above a SOAEL associated with 2 x 48hr possessions, and would therefore not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period and **would therefore not constitute a significant effect on the basis of duration.**
CN 107 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 1.3dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods

NSR location	Justification of significance conclusion
	During the night-time these exceedances would occur during the construction of utilities Work No. G6. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect**.
CN 110 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 4.6dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods During the night-time these exceedances would occur during the tie in works at Green Lane. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the

NSR location	Justification of significance conclusion
	robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect**.
CN 115 (Daytime only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, with a maximum exceedance of 9.1dB(A) above the daytime period SOAEL. No significant impacts are reported at this location during the night-time or evening periods During the daytime these exceedances would occur during the construction of utilities work No(s) MU66, MU68, MU69. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time periodand therefore **would not constitute a significant effect**.
CN 116 (Daytime and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime and night-time periods with a maximum exceedance of 5.5dB(A) above the daytime period SOAEL and 3.6dB(A) above the night-time period SOAEL. During the daytime these exceedances would occur during construction operations within Ockendon Road Compound, movements along construction haul routes and construction of utilities work No(s) MUT28, MU69, G9, MU68, MU70, MUT27. During the night-time these exceedances would occur during the B186 North Road tie in works. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM.

NSR location	Justification of significance conclusion
	A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime and evening construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**.
CN 122 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 4.8dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods. During the night-time these exceedances would occur during the construction of utilities Work No. MU75. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated

NSR location	Justification of significance conclusion
	reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect**.
CN 124 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 1.1dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods During the night-time these exceedances would occur during the construction of utilities Work No. MU73. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect**.
CN 125 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the daytime, evening and night-time periods with a maximum exceedance of 6.9dB(A) above the daytime period SOAEL, 16.3dB(A) above the evening period SOAEL and 16.2dB(A) above the night-time period SOAEL A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. ***Daytime Impacts*** During the daytime these exceedances would occur associated with: • topsoil strip, earthworks, overbridge northbound onto Ockendon Road, • movements along construction haul routes and • construction of utilities work No(s) MU72, MU76, MU75, MUT31, MU77, MUT30

NSR location	Justification of significance conclusion
	With regard to BPM associated with the daytime activities in proximity to this NSR, measures would be required to include the following: • Acoustic screening between construction works (including compounds and haul routes) and noise sensitive receptors (BS 5228-1 indicates up to 10 dB reduction in noise) • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**. ***Night-time and evening Impacts*** During the evening and night-time these exceedances would occur associated with: • construction of utilities Work No. MU75. These impacts above a SOAEL are reported relating to short duration utilities activities programmed to occur sometime during the period August 2025 to August 2026, where the utilities works are located very close to the receptor location. • With regard to MU75 this relates to the installation of a multi use utility corridor, with the overnight works relating specifically to overnight possession works for trenchless crossing activities linking to MU76 and MU79 underneath Network Rail assets which will be done under possession work. As the issue relates to the trenchless crossing the following specific control would be necessary relating to this activity: • Trenchless installation at Work No. MU75 to use machine inside temporary acoustic enclosure/building with adequate ventilation - BS 5228-1 indicates up to 15 dB reduction in noise. With regard to the evening and night-time impacts at this receptor, whilst BPM will be applied along with other control measures through commitments secured within the REAC to reduce construction noise levels as far as reasonably possible, there remains the potential for construction noise to exceed a SOAEL and report a Moderate impact. However, based upon the construction programme, night-time impacts associated with these works would relate to rail possessions and as such would not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period as detailed within Table 1.2 of

NSR location	Justification of significance conclusion
	Appendix 2.1 (Application Document 6.3). As such the impacts would therefore **not constitute a significant effect on the basis of duration**.
CN 126 (Daytime, Evening and Night-time)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the daytime, evening and night-time periods with a maximum exceedance of 2.6dB(A) above the daytime period SOAEL, 1.1dB(A) above the evening period SOAEL and 10.8dB(A) above the night-time period SOAEL. During the daytime these exceedances would occur during the earthworks, construction of the retaining wall east of M25, lane widening, movements along construction haul routes and construction of utilities work No(s) MU74. During the evening and night-time these exceedances would occur during the M25 widening /tie in construction works As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted daytime and evening reasonable worst case construction noise levels to below a SOAEL for the identified time period. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that daytime construction noise at this NSR would be suitably controlled to a level where it would **not constitute a significant effect**. With regard to the evening and night-time impacts at this receptor, whilst BPM will be applied along with other control measures through commitments secured within the REAC to reduce construction noise levels as far as reasonably possible, there remains the potential for construction noise to exceed a SOAEL and report a Moderate impact. However, based upon the construction programme, night-time impacts associated with these works would not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period as detailed within Table 1.1 of Appendix 2.1 (Application Document 6.3). As

NSR location	Justification of significance conclusion
	such the impacts would therefore **not constitute a significant effect on the basis of duration**.
CN 131 (Evening and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the evening and night-time periods with a maximum exceedance of 2.5dB(A) above the evening period SOAEL and 12.3dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime period. During the night-time these exceedances would occur during the construction of utilities Work No. MU83 which is a multiutility corridor installed by trenchless techniques in proximity to this receptor As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. As the issue relates to the trenchless crossing the following specific control would be necessary relating to this activity: • Trenchless installation at Work No. MU83 to use machine inside temporary acoustic enclosure/building with adequate ventilation - BS 5228-1 indicates up to 15 dB reduction in noise. As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures, and a specific inclusion of 15dB for the enclosure around the drilling equipment can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect.**
CN 132 (Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the night-time, with a maximum exceedance of 1.1dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime or evening periods During the night-time these exceedances would occur during the construction of utilities Work No. MU82 which is a multiutility corridor installed by trenchless techniques in proximity to this receptor As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. As the issue relates to the trenchless crossing the following specific control would be necessary relating to this activity: • Trenchless installation at Work No. MU82 to use machine inside temporary acoustic enclosure/building with adequate ventilation - BS 5228-1 indicates up to 15 dB reduction in noise. With the inclusion of the above BPM mitigation measures (REAC NV007), and all other construction phase control measures secured through REAC Ref. NV001 to NV010 and NV012, it is concluded that construction noise at

NSR location	Justification of significance conclusion
	this NSR would be suitably controlled to a level where it would **not constitute a significant effect.**
CN 133 (Daytime and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate impact during the daytime and night-time periods with a maximum exceedance of 3.0dB(A) above the daytime period SOAEL and 2.6dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the evening period • During the daytime these exceedances would occur during the earthworks activities, construction of the retaining wall adjacent east of M25, lane widening, movements along construction haul routes and construction of utilities work No(s) MU81. • During the night-time these exceedances would occur during the construction of utilities Work No. MU83 As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in (overhead line hydraulic tensioner) (BS 5228-1 indicates up to 20 dB reduction in noise) • Trenchless installation at Work No. MU83 to use machine inside temporary acoustic enclosure with adequate ventilation (BS 5228-1 indicates up to 15 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect.**
CN 134 (Evening and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the evening and night-time periods with a maximum exceedance of 3.3dB(A) above the evening period SOAEL and 13.2dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime period During the evening and night-time these exceedances would occur during the construction of utilities Work No. MU83 As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. As the issue relates to the trenchless crossing the following specific control would be necessary relating to this activity:

NSR location	Justification of significance conclusion
	• Trenchless installation at Work No. MU83 to use machine inside temporary acoustic enclosure/building with adequate ventilation - BS 5228-1 indicates up to 15 dB reduction in noise. As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures, and a specific inclusion of 15dB for the enclosure around the drilling equipment can be reasonably applied. This correction for BPM would therefore reduce the predicted unmitigated reasonable worst case construction noise levels to below a SOAEL for the identified time period and would therefore **not constitute a significant effect.**
CN 136 (Evening and Night-time only)	Unmitigated reasonable worst case construction noise levels at this receptor are predicted to have a moderate or greater impact during the evening and night-time periods with a maximum exceedance of 2.0dB(A) above the evening period SOAEL and 7.0dB(A) above the night-time period SOAEL. No significant impacts are reported at this location during the daytime period During the evening and night-time these exceedances would occur during the construction of the Footbridge over A127, east of M25 at Junction 29. As a result of the exceedance of a SOAEL mitigation will be required to be implemented through the controls inherent within REAC commitment NV007 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) relating to BPM. A comprehensive list of BPM measures is presented within Section 12.5 (Good Practice Mitigation) which will be implemented where appropriate across all construction activities associated with the Project. With regard to BPM for this NSR, measures would be required to include the following: • Fit construction plant with efficient exhaust sound reduction and equipment enclosure panels to be kept closed (BS 5228-1 indicates a 5 to 10dB reduction in noise) • Acoustic screening between construction works and noise sensitive receptor (BS 5228-1 indicates up to 10 dB reduction in noise) • Enclose static plant in ventilated acoustic enclosure (BS 5228-1 indicates up to 20 dB reduction in noise) As a conservative assumption, based upon the activities being undertaken in close proximity to at this NSR, a 10dB(A) attenuation attributable to the robust implementation of BPM measures can be reasonably applied. This correction for BPM would therefore reduce the predicted night-time and evening reasonable worst case construction noise levels to below a SOAEL for the identified time period and would **not constitute a significant effect**.

12.6.38 In order to mitigate the potential for significant effects, BPM and other construction phase mitigation will be implemented through the controls inherent within the REAC (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)). Additionally, under the controls within the CoCP, when further details of the construction method and design are known, the Contractors will develop a Noise and Vibration Management Plan (REAC NV002) to control noise as far as reasonably possible under BPM.

12.6.39 With regard to evening and night-time impacts, consideration of the construction programme conclude these to be primarily associated with short duration utilities and “tie in” activities would not occur for a duration of 10 or more days in any 15 consecutive day period or for more than 15 days in any six-month period.

12.6.40 As such it can be concluded that construction noise would be suitably controlled to a level where it **would not constitute a significant effect within this section of the Project**.

Construction traffic noise impacts – existing road network

12.6.41 To assess construction traffic noise impacts, forecast construction traffic figures for the Project were used, predicted for each year of the construction programme (2025-2030).

12.6.42 Table 12.36 presents the number of dwellings and OSRs predicted to experience an increase in road traffic noise levels during each construction year as a result of the addition of construction traffic to existing traffic levels.

Table 12.36 Construction traffic noise impacts – existing road network

Increase in noise level (dB $L_{A10, 18hr}$)	Construction year					
	2025	2026	2027	2028	2029	2030
Dwellings						
<1.0	1,784	3,611	2,955	3,325	4,196	4,271
1.0–2.9	2,334	734	1,352	811	157	84
3.0–4.9	235	2	40	217	0	0
>5	2	8	8	2	2	0
Other Sensitive Receptors						
<1.0	4	12	13	14	18	19
1.0–2.9	10	6	5	3	0	0
3.0–4.9	4	0	0	1	0	0
>5	1	1	1	1	1	0

Construction Year 2025

12.6.43 During 2025, the first year of the construction of the Project:

a. 1,784 dwellings and four OSR are predicted to experience no change or a negligible change in road traffic noise level.

b. 2,334 dwellings and 10 OSRs are predicted to experience a minor adverse increase in road traffic noise:

i. These impacts are predicted to occur at NSRs located near Brennan Road, Green Farm Lane, Lower Higham Road, Lower Road, Thong Lane and Vigilant Way, Beechcroft Avenue, Brennan Road, Calcutta Road, Chadwell Road, Dennises Lane, Dock Road, East Tilbury Road, Essex Gardens, Fort Road, Gowers Lane, Gun Hill, Heath Road, High House Lane, Muckingford Road, Pike Lane, Rectory Road, Sunnings Lane, West Road and Whitehall Lane

c. 235 dwellings and four OSRs are predicted to experience a moderate adverse increase in road traffic noise:

   i. These impacts are predicted to occur at NSRs located near Calcutta Road, Dennis Road Dock Road and Pea Lane

d. Two dwellings and one OSRs are predicted to experience a major adverse increase in road traffic noise:

   i. These impacts are predicted to occur at NSRs located near Medebridge Road

Construction Year 2026

12.6.44 During 2026, the second year of the construction of the Project :

a. 3,611 dwellings and 12 OSRs are predicted to experience no change or a negligible change in road traffic noise level.

b. 734 dwellings and six OSRs are predicted to experience a minor adverse increase in road traffic noise:

   i. These impacts are predicted to occur at NSRs located near Green Farm Lane, Lower Higham Road and Lower Road, Calcutta Road, Dennis Road, Dennises Lane, Dock Road, Sunnings Lane and West Road

c. Two dwellings and zero OSRs are predicted to experience a moderate adverse increase in road traffic noise:

   i. These impacts are predicted to occur at NSRs located near Pea Lane

d. Eight dwellings and one OSR are predicted to experience a major adverse increase in road traffic noise:

   i. These impacts are predicted to occur at NSRs located near Medebridge Road and Pike Lane

Construction Year 2027

12.6.45 During 2027, the third year of the construction of the Project:

a. 2,955 dwellings and 13 OSRs are predicted to experience no change or a negligible change in road traffic noise level.

b. 1,352 dwellings and five OSRs are predicted to experience a minor adverse increase in road traffic noise:

   i. These impacts are predicted to occur at NSRs located near Brown Road, Bush Road, Chalk Road, Dock Road, Green Farm Lane, Hampton Crescent, Lower Higham Road, Lower Road, Rectory Road, St Mary's Lane, Sunnings Lane, Dennises Lane, Harwood Hall Lane, Jeskyns Road, and West Road

c. 40 dwellings and zero OSRs are predicted to experience a moderate adverse increase in road traffic noise:

   i. These impacts are predicted to occur at NSRs located near Warren Road, Cobhambury Road, Dennis Road and Pea Lane

d. Eight dwellings and one OSR are predicted to experience a major adverse increase in road traffic noise:

   i. These impacts are predicted to occur at NSRs located near Medebridge Road and Pike Lane

Construction Year 2028

12.6.46 During 2028, the fourth year of the construction of the Project :

a. 3,325 dwellings and 14 OSRs are predicted to experience no change or a negligible change in road traffic noise level.

b. 811 dwellings and three OSRs are predicted to experience a minor adverse increase in road traffic noise:

   i. These impacts are predicted to occur at NSRs located near Brown Road, Bush Road, Chalk Road, Green Farm Lane, Hampton Crescent, Henhurst Road, Jeskyns Road, Lower Higham Road, Lower Road and Lower Rochester Road, Dennis Road, Pea Lane and Prince Charles Avenue

c. 217 dwellings and one OSR are predicted to experience a moderate adverse increase in road traffic noise:

   i. These impacts are predicted to occur at NSRs located near Bush Road, Cobhambury Road, Warren Road and Pike Lane

d. 2 dwellings and one OSR are predicted to experience a major adverse increase in road traffic noise:

   i. These impacts are predicted to occur at NSRs located near Medebridge Road

Construction Year 2029

12.6.47 During 2029, the fifth year of the construction of the Project :

a. 4,196 dwellings and 18 OSRs are predicted to experience no change or a negligible change in road traffic noise level.

b. 157 dwellings and zero OSRs are predicted to experience a minor adverse increase in road traffic noise:

   i. These impacts are predicted to occur at NSRs located near Chalk Road, Jeskyns Road, Peartree Lane and Prince Charles Avenue

c. Zero dwellings and OSRs are predicted to experience a moderate adverse increase in road traffic noise

d. Two dwellings and one OSR are predicted to experience a major adverse increase in road traffic noise located near Medebridge Road

Construction Year 2030

12.6.48 During 2030, the sixth year of the construction of the Project :

a. 4,271 dwellings and 19 OSRs are predicted to experience no change or a negligible change in road traffic noise level.

b. 84 dwellings and zero OSRs are predicted to experience a minor adverse increase in road traffic noise:

i. These impacts are predicted to occur at NSRs located near Chalk Road and Jeskyns Road

c. Zero dwellings and OSRs are predicted to experience a moderate or greater adverse increase in road traffic noise

Construction traffic noise summary

12.6.49 The likely significant effects from road traffic noise during the construction phase of the Project are presented in Table 12.37. The significance has been determined based on the standards contained within DMRB LA 111 and presented in Section 12.3 of this chapter.

Table 12.37 Likely significant effects from road traffic noise during Project construction phase

NSR location	Justification of significance conclusion	Conclusion of significance of effect
2025		
237 NSRs located on Calcutta Road, Dennis Road Dock Road and Pea Lane and the following OSRs • Convent of Mercy (Communal Residence) • Grapecroft Care Home (Care Home) • Lansdowne Primary Academy (School) • Little Angels Day Nursery (Nursery) • Stifford Hall Hotel (Hotel)	Temporary moderate or major adverse change in road traffic noise below a SOAEL	**Significant (adverse)**
2026		
10 NSRs located on Pea Lane, Medebridge Road, Pike Lane and at Stifford Hall Hotel (Hotel)	Temporary moderate or major adverse change in road traffic noise below a SOAEL	**Significant (adverse)**

NSR location	Justification of significance conclusion	Conclusion of significance of effect
2027		
48 NSRs located on Warren Road, Medebridge Road, Cobhambury Road, Dennis Road, Pea Lane, Pike Lane and at Stifford Hall Hotel (Hotel)	Temporary moderate or major adverse change in road traffic noise below a SOAEL	**Significant (adverse)**
2028		
219 NSRs located on Bush Road, Cobhambury Road, Warren Road, Pike Lane and Medebridge Road Cuxton Community Church URC (Place of Worship) • Stifford Hall Hotel (Hotel)	Temporary moderate or major adverse change in road traffic noise below a SOAEL	**Significant (adverse)**
2029		
Two NSRs located on Medebridge Road and at Stifford Hall Hotel (Hotel)	Temporary moderate or major adverse change in road traffic noise below a SOAEL	**Significant (adverse)**
2030		
No adverse significant effects as a result of changes in road traffic noise during this construction year are predicted to occur.	Temporary minor or less adverse change in road traffic noise below a SOAEL	**Not Significant**

Off-site construction vehicles – diversion routes

12.6.50 Within the Outline Traffic Management Plan for Construction (Application Document 7.14), there are 55 road closures listed which would require diversion routes.

12.6.51 For 49 of these road closures, these would only last for a short duration and over a single night or weekend. In accordance with DMRB LA 111, these road closures would not be considered to be of environmental significance due to not occurring for 10 or more nights in any 15 consecutive nights or a total number of days exceeding 40 in any six consecutive months.

12.6.52 The remaining six diversions would be required over a longer period as set out within the Outline Traffic Management Plan for Construction (Application Document 7.14); these are presented in Table 12.38.

Table 12.38 Long-term road closures during Project construction phase

Traffic management ID	Name	Duration
RSTM25	Brewers Road	19 months
RNTM58	Ockendon Road	19 months
RNTM52	Fen Lane/Green Lane	9 months
RNTM38	Baker Street	9 months
RNTM20	Rectory Road	7 months
RNTM104	A128 Layby Access	2 months

12.6.53 The likely significant effects of road traffic noise during the night-time period as a result of road closures and consequent diversion during the construction phase of the Project are presented in Table 12.39. The significance has been determined based on the criteria contained within DMRB LA 111 and presented in Section 12.3 of this chapter.

Table 12.39 Night-time Impacts and Effects from Road Closures and consequent diversions during Project construction phase

Traffic management ID	Name	Justification of significance conclusion	Conclusion of significance of effect
RNTM38	Baker Street	Diversion of traffic via Rectory Road/ Baker Street. 185 NSRs adversely impacted	**Significant (adverse)**
RNTM20	Rectory Road		
RNTM58	Ockendon Road	Diversion of traffic from Ockendon Road via the B186, West Road, Dennis Road, Dennises Lane and Stubbers Lane. 206 NSRs adversely impacted.	**Significant (adverse)**
RSTM25	Brewers Road	Diversion of traffic onto the existing A2/M2. As a result of high traffic flows on the A2/M2 routes, the additional vehicles would not generate a significant increase in road traffic noise.	**Not significant**
RNTM52	Fen Lane/ Green Lane	Diversion of farm tracks. As a result of high traffic flows on the diversion routes, the low number of additional vehicles would not generate a significant road traffic noise increase.	**Not significant**
RNTM104	A128 Layby Access	Closure of Layby. As a result of high traffic flows on the diversion routes, the low number of additional vehicles would not generate a significant road traffic noise increase.	**Not significant**

Construction vibration impacts – piling activities

12.6.54 The assessment of percussive/vibratory piling activities considers the generated vibration levels and the durations to identify significant effects by reference to the significance criteria in DMRB LA 111.

12.6.55 All piling activities associated with the Project would be limited to daytime operations only.

12.6.56 Within the assessment of construction vibration impacts, a total of 44 vibration sensitive receptors (VSRs) within 100m of any structure requiring percussive or vibratory piling have been selected. These are presented graphically on Figure 12.1 (Application Document 6.2) and discussed in full detail within Appendix 12.4 (Application Document 6.3).

12.6.57 Based on detailed calculations and assumptions regarding ground type and energy per blow, significant effects have been assessed as having the potential to occur if moderate or greater vibration impacts occur for 10 or more days in line with DMRB LA 111; based upon these assumptions this equates to the following separation distances for percussive and vibratory piling techniques, inside of which significant effects have the potential to occur depending upon duration:

a. Percussive piling techniques: <65m

b. Vibratory piling techniques: <45m

12.6.58 Within this section, the results of the construction vibration assessment are presented and discussed relative to three areas:

a. The Project south of the River Thames and the A2/M2 (southern Project termination)

b. The Project north of the River Thames to the A13

c. The Project north of the A13 to the M25 (northern Project termination)

South of the River Thames

12.6.59 Construction vibration levels from structures requiring percussive/vibratory piling have been predicted at eight identified VSRs.

12.6.60 The predicted construction vibration levels at each representative calculation point are presented in Appendix 12.4: Construction Noise and Vibration Assessment (Application Document 6.3) referenced to the individual receptor IDs.

12.6.61 Table 12.40 presents the construction vibration limits for human receptors and identifies where the predicted construction vibration levels (Application Document 6.3, Appendix 12.4) exceed those limits within this section of the Project.

Table 12.40 Construction vibration impacts south of the River Thames

Receptor ID	Structure reference (c.f. Appendix 12.4)	Moderate or greater construction vibration impact level (PPV)	Exceedance of vibration level	
			Percussive	Vibratory
CV 1	RWN0000006	≥1mm/s	No	No
CV 2	RWN0000102	≥1mm/s	Yes	No
CV 3	RWN0000102	≥1mm/s	No	No
CV 4	RWN0000028	≥1mm/s	No	No
CV 5	RWN0000028	≥1mm/s	No	No
CV 6	RWN0000028	≥1mm/s	No	No
CV 7	RWN0000028	≥1mm/s	No	No
CV 8	RWN0000028	≥1mm/s	No	No

12.6.62 The assessment results presented in Table 12.40 show that the type of piling method used can affect whether or not there would be an exceedance of vibration levels at VSRs within this section of the Project. The significance of effect would be as follows for these receptors:

a. Percussive piling techniques:

i. There would not be exceedances of vibration limits at seven of the eight identified receptors, and therefore these receptors would not experience a significant effect.

ii. There would be a potential exceedance of the vibration limits at receptor CV 2 when works are on Structure RWN0000102 and within approximately 65m of the identified receptor. As detailed within Appendix 12.4 (Application Document 6.3) the level of vibration predicted at this receptor would not exceed a moderate or greater adverse impact for a duration of more than 10 days, and therefore would not result in a likely adverse significant effect.

b. Vibratory piling techniques:

i. There would be no exceedances of vibration levels at any of the identified receptors with this piling technique. Therefore, these receptors would **not present significant effects** where vibratory piling is proposed on any structure.

12.6.63 Since no significant effects are predicted for construction vibration in this part of the Project, no further specific mitigation and control measures would be needed for the piling activities outside of BPM measures.

North of the River Thames to the A13

12.6.64 Within this reporting section, construction vibration levels from structures requiring percussive/vibratory piling have been predicted at 15 identified VSRs.

12.6.65 The predicted construction vibration levels at each representative calculation point during the construction phase are presented in Appendix 12.4: Construction Noise and Vibration Assessment (Application Document 6.3) referenced to the individual receptor IDs.

12.6.66 Table 12.41 presents the construction vibration limits and identifies where the predicted construction vibration levels (Application Document 6.3, Appendix 12.4) exceed those limits within this section of the Project.

Table 12.41 Construction vibration impacts north of the River Thames to the A13

Receptor ID	Structure reference (c.f. Appendix 12.4)	Moderate or greater construction vibration impact level (PPV)	Exceedance of vibration level	
			Percussive	Vibratory
CV 9	RWN0000032	≥1mm/s	Yes	Yes
CV 10	RWN0000032	≥1mm/s	Yes	Yes
CV 11	RWN0000060	≥1mm/s	No	No
CV 12	RWN0000060	≥1mm/s	No	No
CV 13	RWN0000060	≥1mm/s	No	No
CV 14	RWN0000060	≥1mm/s	No	No
CV 15	RWN0000060	≥1mm/s	No	No
CV 16	RWN0000060	≥1mm/s	No	No
CV 17	RWN0000060	≥1mm/s	Yes	No
CV 18	RWN0000060	≥1mm/s	Yes	No
CV 19	RWN0000060	≥1mm/s	Yes	No
CV 20	RWN0000060	≥1mm/s	Yes	No
CV 21	RWN0000060	≥1mm/s	Yes	No
CV 22	RWN0000060	≥1mm/s	No	No
CV 23	RWN0000060	≥1mm/s	Yes	Yes

12.6.67 The assessment results presented in Table 12.41 show that the type of piling method used can affect whether or not there would be an exceedance of vibration levels at VSRs within this section of the Project. The significance of effect would be as follows for these receptors:

a. Percussive piling techniques:

i. There would not be exceedances of vibration limits at seven of the 15 identified receptors, and therefore these receptors would not experience a significant effect.

ii. There would be potential exceedances of the vibration limits at eight of the 15 receptors when works are within approximately 65m of the identified receptors:

iii. There would be a potential exceedance of the vibration limits at receptor CV 17 and CV18 when works are on Structure RWN000060 and within approximately 65m of the identified receptor. As detailed within Appendix 12.4 (Application Document 6.3) the level of vibration predicted at this receptor would not exceed a moderate or greater adverse impact for a duration of more than 10 days, and therefore would not result in a likely adverse significant effect.

iv. At Structure RWN0000060 should a percussive piling technique be used; sensitive receptors CV 19, CV 20, CV 21 and CV 23 would experience a moderate or greater adverse impact for a duration of more than 10 days, and therefore would result in a likely adverse significant effect.

v. At Structure RWN0000032 should a percussive piling technique be used; sensitive receptors CV 9 and CV 10 would experience a moderate or greater adverse impact for a duration of more than 10 days, and therefore would result in a likely adverse significant effect.

b. Vibratory piling techniques:

i. There would not be exceedances of vibration limits at 12 of the 15 receptors should this technique be implemented, and therefore these receptors would not experience significant effects.

ii. There would be exceedances of vibration limits at three of the 15 receptors when works on the identified structures are within approximately 45m of an identified receptor:

iii. At Structure RWN0000060 should a vibratory piling technique be used; sensitive receptor CV 23 would experience a moderate or greater adverse impact for a duration of more than 10 days, and therefore would result in a likely adverse significant effect.

iv. At Structure RWN0000032 should a vibratory piling technique be used; sensitive receptors CV 9 and CV 10 would experience a moderate or greater adverse impact for a duration of more than 10 days, and therefore would result in a likely adverse significant effect.

12.6.68 At any receptors where a piling technique is concluded not to constitute a significant effect, predicted vibration levels would not be above an appropriately defined SOAEL either. Therefore, no further mitigation would be required beyond the good practice mitigation outlined in Section 12.5. Any receptors where a piling technique constitutes a significant effect would also present predicted vibration levels above an appropriately defined SOAEL.

12.6.69 The likely significant effects, and the VSRs predicted to experience them, are presented in Table 12.42. The significance has been determined based upon the standards contained within DMRB LA 111 and presented in Section 12.3 of this chapter.

Table 12.42 Likely significant environmental effects from construction vibration north of the River Thames to the A13

Receptor ID	Justification of significance conclusion	Conclusion of significance of effect
CV 9 CV 10	**Moderate adverse** construction vibration impacts are predicted to occur should either **percussive or vibratory** piling methods be used on structure RWN0000032 for a duration of 10 or more days.	**Significant (adverse)**
CV 19 CV 20 CV 21	**Moderate adverse** construction vibration impacts are predicted to occur should **percussive piling** methods be used on structure RWN0000060 for a duration of 10 or more days.	**Significant (adverse)**
CV 23	Moderate adverse construction vibration impacts are predicted to occur should either **percussive or vibratory** piling methods be used on structure RWN0000060 for a duration of 10 or more days.	**Significant (adverse)**

12.6.70 Relative to works on these structures, further specific mitigation and control measures would be necessary, associated with the piling activities, within the specified distance and time frames identified, beyond BPM defined under BS 5228-2. These would be implemented through the REAC commitment NV017 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) and secured under the DCO.

North of the A13 to the M25

12.6.71 Within this reporting section, construction vibration levels from structures requiring percussive/vibratory piling have been predicted at 21 identified VSRs.

12.6.72 The predicted construction vibration levels at each representative calculation point during the construction phase are presented in Appendix 12.4: Construction Noise and Vibration Assessment (Application Document 6.3) referenced to the individual receptor IDs. Table 12.43 presents the construction vibration limits for human receptors and identifies where the predicted construction vibration levels (Application Document 6.3, Appendix 12.4) exceed those limits within this section of the Project.

Table 12.43 Construction vibration impacts north of the A13 to the M25

Receptor ID	Structure reference (c.f. Appendix 12.4)	Moderate or greater construction vibration impact level (PPV)	Exceedance of vibration level	
			Percussive	Vibratory
CV 24	RWN0000049	≥1mm/s	Yes	Yes
CV 25	RWN0000049	≥1mm/s	Yes	Yes
CV 26	RWN0000049	≥1mm/s	Yes	No
CV 27	RWN0000049	≥1mm/s	Yes	Yes
CV 28	RWN0000049	≥1mm/s	Yes	No
CV 29	RWN0000049	≥1mm/s	Yes	No
CV 30	RWN0000049	≥1mm/s	Yes	No

Receptor ID	Structure reference (c.f. Appendix 12.4)	Moderate or greater construction vibration impact level (PPV)	Exceedance of vibration level	
			Percussive	Vibratory
CV 31	RWN0000049	≥1mm/s	Yes	No
CV 32	RWN0000049	≥1mm/s	Yes	No
CV 33	RWN0000049	≥1mm/s	Yes	No
CV 34	RWN0000049	≥1mm/s	Yes	No
CV 35	RWN0000049	≥1mm/s	No	No
CV 36	RWN0000049	≥1mm/s	Yes	No
CV 37	RWN0000049	≥1mm/s	No	No
CV 38	RWN0000049	≥1mm/s	No	No
CV 39	RWN0000049	≥1mm/s	No	No
CV 40	RWN0000049	≥1mm/s	No	No
CV 41	RWN0000049	≥1mm/s	No	No
CV 42	RWN0000082	≥1mm/s	Yes	No
CV 43	RWN0000082	≥1mm/s	No	No
CV 44	RWN0000085	≥1mm/s	Yes	Yes

12.6.73 The assessment results presented in Table 12.43 show that the type of piling method used can affect whether or not there would be an exceedance of vibration limits at VSRs within this section of the Project. The significance of effect would be as follows for these receptors:

a. Percussive piling techniques:

i. There would not be exceedances of vibration levels at seven of the 21 receptors, and therefore these receptors would not experience significant effects.

ii. There would be potential exceedances of the vibration limits at 14 of the 21 receptors when works on the identified structure are within approximately 65m of the identified receptor:

iii. There would be a potential exceedance of the vibration limits at receptor CV 36 when works are on Structure RWN000049 and within approximately 65m of the identified receptor. As detailed within Appendix 12.4 (Application Document 6.3, Appendix 12.4) the level of vibration predicted at this receptor would not exceed a moderate or greater adverse impact for a duration of more than 10 days, and therefore would not result in a likely adverse significant effect.

iv. At Structure RWN0000049 should a percussive piling technique be used; sensitive receptors CV 24, CV 25, CV 26, CV 27, CV 28, CV 29, CV 30, CV 31, CV 32, CV 33 and CV 34 would experience a moderate or greater adverse impact for a duration of more than 10 days, and therefore would result in a likely adverse significant effect.

v. There would be a potential exceedance of the vibration limits at receptor CV 42 when works are on Structure RWN000082 and within approximately 65m of the identified receptor. As detailed within Appendix 12.4 (Application Document 6.3) the level of vibration predicted at this receptor would not exceed a moderate or greater adverse impact for a duration of more than 10 days, and therefore would not result in a likely adverse significant effect.

vi. There would be a potential exceedance of the vibration limits at receptor CV 44 when works are on Structure RWN000085 and within approximately 65m of the identified receptor. As detailed within Appendix 12.4 (Application Document 6.3) the level of vibration predicted at this receptor would not exceed a moderate or greater adverse impact for a duration of more than 10 days, and therefore would not result in a likely adverse significant effect.

b. Vibratory piling techniques:

i. There would not be exceedances of vibration limits at 17 of the 21 receptors, and therefore these receptors would not experience significant effects.

ii. There would be exceedances of vibration levels at four of the 21 receptors when works on the identified structure are within approximately 45m of the identified receptor:

iii. There would be a potential exceedance of the vibration limits at receptor CV 27 when works are on Structure RWN000049 and within approximately 45m of the identified receptor. As detailed within Appendix 12.4 (Application Document 6.3) the level of vibration predicted at this receptor would not exceed a moderate or greater adverse impact for a duration of more than 10 days, and therefore would not result in a likely adverse significant effect.

iv. At Structure RWN0000049 should a vibratory piling technique be used; sensitive receptors CV 24 and CV 25 would experience a moderate or greater adverse impact for a duration of more than 10 days, and therefore would result in a likely adverse significant effect.

v. There would be a potential exceedance of the vibration limits at receptor CV 44 when works are on Structure RWN000085 and within approximately 45m of the identified receptor. As detailed within Appendix 12.4 (Application Document 6.3) the level of vibration predicted at this receptor would not exceed a moderate or greater adverse impact for a duration of more than 10 days, and therefore would not result in a likely adverse significant effect.

12.6.74 At any receptors where a piling technique is concluded not to constitute a significant effect, predicted vibration levels would not be above an appropriately defined SOAEL either. Therefore, no further mitigation would be required beyond good practice measures outlined in Section 12.5. Any piling technique constituting a significant effect at any receptor would also present predicted vibration levels above an appropriately defined SOAEL.

12.6.75 The likely significant effects, and the VSRs predicted to experience them, are presented in Table 12.44. The significance has been determined based upon the standards contained within DMRB LA 111 and presented in 12.3 of this chapter.

Table 12.44 Likely significant environmental effects from construction vibration north of the A13 to the M25

Receptor ID	Justification of significance conclusion	Conclusion of significance of effect
CV 24 CV 25	Moderate adverse construction vibration impacts are predicted to occur should either percussive or vibratory piling methods be used on structure RWN0000049 for a duration of 10 or more days.	**Significant (adverse)**
CV 26 CV 27 CV 28 CV 29 CV 30 CV 31 CV 32 CV 33 CV 34	Moderate adverse construction vibration impacts are predicted to occur should percussive piling methods be used on structure RWN0000049 for a duration of 10 or more days.	**Significant (adverse)**

12.6.76 Relative to works on these structures, further specific mitigation and control measures would be necessary, associated with the piling activities, within the specified distance and time frames identified, beyond BPM defined under BS 5228-2. These would be implemented in accordance with the REAC NV017 (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2)) and secured under the DCO.

TBM and Micro-TBM ground-borne noise and vibration impacts

TBM/Micro-TBM ground-borne noise impacts

12.6.77 TBM/Micro-TBM activity associated with the Project could generate both ground-borne noise and vibration impacts.

12.6.78 Table 12.45 presents the predicted TBM/Micro-TBM ground-borne noise levels at the representative receptors based on the assumptions made within the calculations presented within Appendix 12.6: Assessment of Ground-borne Noise and Vibration at land-based receptors (Application Document 6.3).

12.6.79 In addition to the main TBM activities under the River Thames, additional consideration is required for an advanced grouting tunnel (south of the river) and Micro-TBM activities during the construction phase associated with utilities works. With this regard consideration is necessary of the activities associated with the installation of Utilities works No. G3 and G4 as detailed Construction Methodology (Application Document Appendix 2.1 Construction Supporting Information (Application Document 6.3).

12.6.80 These levels for the tunnel boring machinery and Micro-TBM activities have been compared to the relevant assessment criteria detailed within Table 12.5 and show the worst case from either the northbound or southbound tunnels.

Table 12.45 TBM/Micro-TBM ground-borne noise impacts

Receptor ID	TBM**/Micro-TBM** ground-borne noise level range		**Magnitude of impact (Table 12.5)**
Main TBM Tunnel Drive under the River Thames			
	Northbound tunnel	**Southbound tunnel**	
84 & 86 Castle Lane	<35dB $L_{Amax, slow}$	<35dB $L_{Amax, slow}$	Negligible
Viewpoint Place	<35dB $L_{Amax, slow}$	<35dB $L_{Amax, slow}$	Negligible
St Mary's Church	<35dB $L_{Amax, slow}$	<35dB $L_{Amax, slow}$	Negligible
Advanced Grouting Tunnel			
84 & 86 Castle Lane	<35dB $L_{Amax, slow}$		Negligible
Micro-TBM Activities – Utilities Works No. G3 and G4			
	Utility Work No. G3	**Utility Work No. G4**	
No. 37 Thong Lane	<35dB $L_{Amax, slow}$	<35dB $L_{Amax, slow}$	Negligible
Hartshill Bungalow, Thong Lane	<35dB $L_{Amax, slow}$	<35dB $L_{Amax, slow}$	Negligible
No. 38 Thong Lane	<35dB $L_{Amax, slow}$	<35dB $L_{Amax, slow}$	Negligible

12.6.81 As presented in Table 12.45, TBM and Micro-TBM ground-borne noise levels predicted at all of the identified sensitive receptors assessed would be below LOAEL, concluded to represent negligible impacts and would therefore be considered to constitute a **not significant** environmental effect.

TBM/Micro-TBM ground-borne vibration impacts

12.6.82 Table 12.46 presents the predicted TBM and Micro-TBM ground-borne vibration levels at the identified representative receptors based on the assumptions made within the calculations presented within Appendix 12.6: Assessment of Ground-borne Noise and Vibration at land-based receptors (Application Document 6.3).

12.6.83 Again, this assessment considers the main TBM activity under the River Thames, the Advanced Grouting Tunnel and Utilities Works Nos. G3 and G4.

12.6.84 It is further noted that for completeness the main tunnel drives and Advanced Grouting Tunnel pass underneath the Thames and Medway Canal. As such predictions of structural vibration have been undertaken to this potential receptor.

12.6.85 These levels have been compared to the relevant assessment criteria detailed within Table 12.6.

12.6.86 The information presented in Table 12.46 presents both consideration of structural issues in terms of peak particle velocity (PPV) as well as human perception in terms of Vibration Dose Values (VDV).

Table 12.46 TBM ground-borne vibration impacts

Receptor ID	**TBM/Micro-TBM ground-borne vibration level**				**Magnitude of impact (Table 12.6)**
Main TBM Tunnel Drive					
Vibration Effects on Structures					
	Northbound tunnel PPV (mm/s)		**Southbound tunnel PPV (mm/s)**	**Advanced Grouting Tunnel**	
Thames and Medway Canal	0.03 mm/s		0.03 mm/s	0.04 mm/s	Negligible
84 & 86 Castle Lane	0.003 mm/s		0.001 mm/s	0.002 mm/s	Negligible
Viewpoint Place	0.002 mm/s		0.001 mm/s	N/A*	Negligible
St Mary's Church	0.000007 mm/s		0.000012 mm/s	N/A*	Negligible
Vibration Effects on People					
	North and South Tunnels		**Advanced Grouting Tunnel**		
	VDV_{day}	**VDV_{night}**	**VDV_{day}**	**VDV_{night}**	

Receptor ID	TBM/Micro-TBM ground-borne vibration level				Magnitude of impact (Table 12.6)
84 & 86 Castle Lane	0.001ms -1.75	0.001ms -1.75	0.0007ms -1.75	0.0006ms -1.75	Negligible
Viewpoint Place	0.001ms -1.75	0.0009ms -1.75	0.0006ms -1.75	0.0005ms -1.75	Negligible
St Mary's Church	0.00006ms -1.75	0.00005ms -1.75	0.00004ms -1.75	0.00003ms -1.75	Negligible
Micro-TBM Activities – Utilities Works No. G3 and G4					
Vibration Effects on Structures					
	Utility Work No. G3		**Utility Work No. G4**		
Hartshill Nursery, Thong Lane	0.003 mm/s		0.0007 mm/s		Negligible
No. 37 Thong Lane	0.0005 mm/s		0.0002 mm/s		Negligible
Hartshill Bungalow, Thong Lane	0.0006 mm/s		0.0002 mm/s		Negligible
No. 38 Thong Lane	0.0003 mm/s		0.0002 mm/s		Negligible
Vibration Effects on People					
	Utility Work No. G3		**Utility Work No. G4**		
	VDV_{day}	**VDV_{night}**	**VDV_{day}**	**VDV_{night}**	
Hartshill Nursery, Thong Lane	0.003ms-1.75	N/A	0.0007ms-1.75	N/A	Negligible
No. 37 Thong Lane	0.0005ms-1.75	0.0004ms-1.75	0.0003ms-1.75	0.0002ms-1.75	Negligible
Hartshill Bungalow, Thong Lane	0.0006ms-1.75	0.0005ms-1.75	0.0002ms-1.75	0.0002ms-1.75	Negligible
No. 38 Thong Lane	0.0004ms-1.75	0.0003ms-1.75	0.0002ms-1.75	0.0002ms-1.75	Negligible

** Advanced Grouting Tunnel activities in excess of 500m from receptor.*

12.6.87 As presented in Table 12.46, TBM and Micro-TBM ground-borne vibration levels assessed in terms of both PPV and VDV predicted at the identified sensitive receptors would be **negligible** and would therefore be considered to **not constitute a significant environmental effect**.

12.6.88 It is further concluded that the levels predicted are so low that they would actually be unmeasurable at all locations assessed.

Use of the River

12.6.89 Based on the predicted vessel movements associated with the construction of the Project, as outlined in Chapter 2: Project Description (Application Document 6.1), a qualitative assessment of the use of the river by LTC has been carried out.

12.6.90 It is concluded that the number of vessels proposed associated with the Project would be negligible in the context of the number of vessels already using this section of the River Thames (accessing the Port of Tilbury and central London Locations). Coupled with consideration of the fact that the noise generated by said vessels would be low and generation would be a significant distance from any NSR, it is concluded that noise from this element of the Project would not present the potential for significant effects during the construction phase.

Operational phase

Whole-Project impacts

12.6.91 This section discusses the operational impacts of the Project including mitigation, thereby presenting an assessment of residual impacts and their significance. Significance is considered on the basis of impacts both above and below a SOAEL, as well as looking at direct and indirect effects of the Project.

12.6.92 To assess road traffic noise impacts associated with the Project in accordance with DMRB LA 111, the Do-Minimum and Do-Something scenarios have been compared based on the following:

a. The opening year (2030). This shows the change in road traffic noise following the opening of the Project.

b. The future assessment year (2045). This shows the change in road traffic noise in the longer term and accounts for habituation to road traffic noise over time.

12.6.93 Figures 12.7 to 12.8 (Application Document 6.2) present graphical representations of the areas of short-term and long-term changes in road traffic noise within the study area attributable to the Project. Changes in road traffic noise would be due to the following:

a. Direct impacts associated with changes in road traffic noise from the Project itself due to the new alignment passing through an area that previously experienced low levels of road traffic noise.

b. Indirect impacts associated with changes in road traffic noise away from the Project as a result of changes in traffic flow and composition on the existing road network resulting from the use of the Project.

12.6.94 Table 12.47 presents changes in road traffic noise within the entire study area in the short-term comparison by dwelling numbers and OSRs in accordance with the magnitude of change prescribed within DMRB LA 111.

12.6.95 It is specifically noted with regard to the consideration of OSRs during the night-time period in Table 12.47 and Table 12.48 below, that all identified OSRs have been considered during both the daytime and night-time periods as we have not been expressly informed as to which OSRs are daytime only receptors. As such for completeness all OSRs in the study area are considered for daytime and night-time periods.

Table 12.47 Short-term traffic noise impacts inside study area with Project (DMOY versus DSOY)

Change in noise level		Daytime		Night-time	
		Number of dwellings	Number of Other Sensitive Receptors	Number of dwellings	Number of Other Sensitive Receptors
Increase in noise level, $L_{A10, 18hr}$ / L_{night}	<1.0	18,810	58	19,029	58
	1.0–2.9	6,242	33	5,573	29
	3.0–4.9	198	1	175	1
	>5.0	376	0	261	0
No change	0	34,130	55	35,395	60
Decrease in noise level, $L_{A10, 18hr}$ / L_{night}	<1.0	30,437	113	30,845	117
	1.0–2.9	3,639	20	2,880	19
	3.0–4.9	537	5	343	3
	>5.0	338	3	206	1

12.6.96 Table 12.48 presents changes in road traffic noise across the entire study area in the long-term comparison by dwelling numbers and OSRs in accordance with the magnitude of change prescribed within DMRB LA 111.

Table 12.48 Long-term traffic noise impacts inside study area with Project (DMOY versus DSFY)

Change in noise level		Daytime		Night-time	
		Number of dwellings	Number of Other Sensitive Receptors	Number of dwellings	Number of Other Sensitive Receptors
Increase in noise level, $L_{A10, 18hr}$ / L_{night}	<3.0	40,173	138	39,708	137
	3.0–4.9	813	2	523	1
	5.0–9.9	378	1	268	0
	>10+	11	0	7	0

Change in noise level		Daytime		Night-time	
		Number of dwellings	Number of Other Sensitive Receptors	Number of dwellings	Number of Other Sensitive Receptors
No change	0	33,237	65	34,621	72
Decrease in noise level, $L_{A10, 18hr}$ / L_{night}	<3.0	19,612	76	19,466	75
	3.0–4.9	431	5	80	2
	5.0–9.9	51	0	33	1
	>10+	1	1	1	0

12.6.97 Table 12.47 and Table 12.48 above consider changes in road traffic noise in accordance with DMRB LA 111 across the entire study area as defined within Section 12.3 and accounts for a total of 94,707 residential and 288 OSRs.

12.6.98 Furthermore, in accordance with DMRB LA 111, it is necessary to further consider the numerical road traffic noise assessment as presented in Table 12.47 and Table 12.48 to account for specific local circumstances in the area surrounding the Project, including such factors as the following, although, it is noted that the list presented is not exhaustive of the issues requiring consideration:

a. Noise level change with regard to whether the magnitude of change is within 1dB of the minor/moderate boundary

b. Differing magnitude of impact in the long term against the short term

c. Absolute noise level with reference to LOAEL and SOAEL

d. The location of the noise-sensitive parts of the receptors

e. Acoustic context in the area

f. Likely perception of change by residents

12.6.99 This consideration of local circumstances may vary along the Project route and is therefore considered separately within each section of the Project study area as defined below.

12.6.100 In addition, it is necessary to consider the impacts of the Project relative to the do-something SOAEL. With regard to impacts above a SOAEL DMRB LA 111 states that:

a. *"A noise change where all do-something absolute noise levels [road traffic noise] are below SOAEL requires no modification of the initial assessment*

b. *Where any do-something absolute noise levels [road traffic noise] are above the SOAEL, a noise change in the short term of 1.0dB or over results in a likely significant effect".*

12.6.101 This has been accounted for in the assessments and discussions set out in the following sections, with impacts above a SOAEL discussed in detail separately.

12.6.102 As Table 12.47 and Table 12.48 cover an extremely large study area, these numbers are discussed relative to the following identified reporting areas:

a. Between the south shore of the River Thames and the M2/A2/Lower Thames Crossing junction

b. Between the north shore of the River Thames and the A13/A1089 junction

c. Between the A13/A1089 junction and the A122 Lower Thames Crossing/M25 junction

d. Along the A13 between the Project and M25 junction 30

e. Along the M25 between M25 junction 28 and the Dartford Crossing

f. Along the A282 between the Dartford Crossing and M25 junction 2 (with the A2)

g. Along the A2 between M25 junction 2 and the M2/A2/Lower Thames Crossing junction

h. Along the A2 east of the M2/A2/Lower Thames Crossing junction to the M2 and the A228

i. Affected unaltered traffic links outside of bypassed routes area

12.6.103 Each of the reporting areas above are discussed within the following sections.

12.6.104 As required under the DMRB LA 111 methodology, assessment of initial operational noise significance is primarily defined relative to short-term impacts. Therefore, within the following sections, primarily short-term impacts are presented and discussed relative to the semantic description provided in DMRB LA 111.

Between the south shore of the River Thames and the M2/A2/Lower Thames Crossing junction

12.6.105 Within this reporting area there are a total of 12,526 residential dwellings and 26 OSRs (as specified in Section 12.4) which have been considered.

12.6.106 Short-term impacts have been predicted to occur:

a. Daytime: 10,418 dwellings and 20 OSRs; Night-time: 10,637 dwellings and 20 OSRs predicted to experience no change or a negligible change in road traffic noise level.

b. Daytime: 818 dwellings and one OSR; Night-time: 732 dwellings and one OSR predicted to experience a minor adverse change in road traffic noise level.

These impacts are predicted to occur at NSRs located within Astra Drive, Bonaventure Court, Brown Road, Calderwood, Chalk Road, Cobhambury Road, Fairfields, Hampton Crescent, Havisham Road, Hopewell Drive, Ifield

Way, Imperial Drive, Jeskyns Road, Jubilee Crescent, Lawrence Drive, Lindisfarne Close, Michael Gardens, Rochester Road, Silver Road, Sirdar Strand, Sole Street, St Aidans Way, St Albans Close, St Albans Gardens, St Benedicts Avenue, St Columbas Close, St Francis Avenue, St Gregorys Crescent, St Hildas Way, St Patricks Gardens, Sun Lane, The Street, Thelma Close, Thistledown, Thomas Drive, Thong Lane, Truro Road, Valley Drive, Vigilant Way, Winchester Crescent and Wykeham Close

c. Daytime: 101 dwellings and one OSRs; Night-time: 52 dwellings and one OSRs predicted to experience a moderate adverse change in road traffic noise level.

   These impacts are predicted to occur at NSRs located within Henhurst Road, Imperial Drive, Jeskyns Road, Sole Street, The Street, Thong Lane, Vigilant Way and Wykeham Close

d. Daytime: 68 dwellings and zero OSRs; Night-time: 47 dwellings and zero OSRs predicted to experience a major adverse change in road traffic noise level.

   These impacts are predicted to occur at NSRs located within Gazelle Glade, Genesta Glade, Glenrosa Gardens, Thong Lane and Vigilant Way

e. Daytime: 876 dwellings and three OSRs; Night-time: 972 dwellings and three OSRs predicted to experience a minor beneficial change in road traffic noise level.

   These impacts are predicted to occur at NSRs located within Apsledene, Brewers Road, Calderwood, Cambria Crescent, Cimba Wood, Cobsdene, Codrington Crescent, Codrington Gardens, Davys Place, Dorset Crescent, Epsom Close, Franklin Road, Halfpence Lane, Hever Court Road, Ifield Way, Kilndown, Lawrence Drive, Livingstone Gardens, Livingstone Road, Mackenzie Way, Ruffets Wood, Sandown Road, Scott Road, St Francis Avenue, The Drive, The Glades, The Hollies, The Street, Thistledown, Valley Drive, Virginia Walk, Watling Street, Way Volante, Wilberforce Way and Winters Croft

f. Daytime: 219 dwellings and one OSRs; Night-time: 67 dwellings and one OSRs predicted to experience a moderate beneficial change in road traffic noise level.

   These impacts are predicted to occur at NSRs located within Kilndown, Mackenzie Way, Sheldon Heights, The Glades, The Hollies, Thistledown, Thong Lane, Valley Drive and Virginia Walk.

g. Daytime: 26 dwellings and zero OSRs; Night-time: 19 dwellings and zero OSRs predicted to experience a major beneficial change in road traffic noise level.

i. These impacts are predicted to occur at NSRs located within Thong Lane, Valley Drive and Watling Street.

12.6.107 The likely significant effects within this section are presented in Table 12.49. The significance has been determined based on the standards contained within DMRB LA 111 and presented in Section 12.3 of this chapter.

12.6.108 DMRB LA 111 requires the further consideration of specific local circumstances in the area surrounding the Project. Where this is deemed to result in a material effect on the assessment, it is presented below:

a. There are 13 dwellings considered to be adversely affected by local circumstances. These receptors are reported in Table 12.47 and Table 12.48 as experiencing 'minor' impacts, but these are considered to be significant on the basis of the likely perception of change by residents and acoustic context.

b. No beneficial effects at dwellings or OSRs have been adjusted as a result of local circumstances. Therefore, no dwellings or OSRs concluded to present a significant impact within Table 12.47 and Table 12.48 have been revised to present a non-significant impact as a result of any specific local circumstances.

12.6.109 As such, the significant effects presented within Table 12.49 account for both the numerical consideration of road traffic noise change in Table 12.47 and Table 12.48, and any adjustment justified under DMRB LA 111 for local circumstances presented in paragraph 12.6.108.

Table 12.49 Likely significant effects from road traffic noise between the south shore of the River Thames and the M2/A2/Lower Thames Crossing junction

NSR location	Justification of significance conclusion	Conclusion of significance of effect
Four dwellings located in Henhurst Road	Moderate or greater change in road traffic noise during daytime and night-time periods above a SOAEL	Significant (adverse)
Two dwellings located in Henhurst Road	Moderate or greater change in road traffic noise during daytime period and moderate or greater change above an SOAEL during the night-time period	Significant (adverse)
93 dwellings located in Henhurst Road, Thong Lane, Wykeham Close, Vigilant Way, Genesta Glade, Glenrosa Gardens, Gazelle Glade, Astra Drive, Imperial Drive	Moderate or greater change in road traffic noise during daytime and night-time periods	Significant (adverse)

NSR location	Justification of significance conclusion	Conclusion of significance of effect
27 dwellings located in Jeskyns Road, Thong Lane, The Street, Vigilant Way, Sole Street, Astra Drive	Moderate or greater change in road traffic noise during daytime period	Significant (adverse)
13 dwellings located in Fairfields, Wykeham Close, Astra Drive	Minor adverse impact determined to be significant as a result of likely perception of change by residents and acoustic context in accordance with DMRB LA 111	Significant (adverse)
St Aidan's Church (Place of Worship)	Moderate or greater change in road traffic noise during daytime period	Significant (adverse)
Six dwellings located in Brewers Road, Kilndown	Minor change above a SOAEL during the daytime and night-time period	Significant (beneficial)
11 dwellings located in Watling Street	Moderate or greater change in road traffic noise during daytime and night-time periods above a SOAEL	Significant (beneficial)
15 dwellings located in The Glades, Kilndown, Mackenzie Way, The Hollies	Moderate or greater change in road traffic noise during daytime period and minor change above an SOAEL during the night-time period	Significant (beneficial)
50 dwellings located in Valley Drive, Sheldon Heights, Watling Street, The Hollies, Mackenzie Way, Thong Lane	Moderate or greater change in road traffic noise during daytime and night-time periods	Significant (beneficial)
144 dwellings located in Mackenzie Way, Valley Drive, The Hollies, Virginia Walk, Thong Lane, Thistledown, Ifield Way	Moderate or greater change in road traffic noise during daytime period	Significant (beneficial)
25 dwellings located in Watling Street, The Glades, Sheldon Heights, Mackenzie Way	Moderate or greater change in road traffic noise during daytime below a SOAEL and night-time period above a SOAEL	Significant (beneficial)
40 dwellings located in the Glades, Kilndown, Hever Court Road, Valley Drive, Ruffets Wood, The Hollies, Epsom Close, Cobsdene, Thistledown, Abbots Field	Minor change above a SOAEL during the Night-time period	Significant (beneficial)
Inn on the Lake (Hotel)	Moderate or greater change in road traffic noise during daytime and night-time periods above the SOAEL	Significant (beneficial)

Direct Impacts of the Project Above a SOAEL

12.6.110 There are no reported direct significant adverse effects above a SOAEL within the area between the south shore of the River Thames and the M2/A2/Lower Thames Crossing junction.

12.6.111 There are reported a total of 97 significant beneficial effects of the Project above a SOAEL within the area between the south shore of the River Thames and the M2/A2/Lower Thames Crossing junction. These are:

a. Hever Court Road, Kilndown, The Glades, Brewers Road and Watling Street.

b. 36 dwellings: 11 dwellings which report a Moderate or greater beneficial change above a SOAEL during the daytime and night-time periods, with a further 25 dwelling reporting a significant effect during the night-time only.

c. 61 dwellings: Six dwellings which report a Minor beneficial change above a SOAEL during the daytime and night-time periods, with a further 55 dwellings reporting a significant effect during the night-time only.

12.6.112 Therefore, there are concluded to be **97 significant beneficial effects** above a SOAEL as a direct result of the Project.

Indirect Impacts of the Project Above a SOAEL

12.6.113 There are reported a total of **Six significant adverse effects** of the Project above a SOAEL in the short term within the area between the south shore of the River Thames and the M2/A2/Lower Thames Crossing junction. These are:

a. Henhurst Road and Jeskyns Road, Cobham.

b. Six dwellings: Four of which report a Moderate or greater adverse change above a SOAEL during the daytime and night-time periods, with a further two dwellings reporting a significant effect during the night-time only.

12.6.114 Relating to the increases in noise on Henhurst Road and Jeskyns Road, detailed interrogation of both the noise model and the traffic information within, concludes the following:

a. The dwellings are not reported to be in excess of a SOAEL in either the 2030 or 2045 Do Minimum scenarios without the Project.

b. These impacts are concluded to be indirect adverse impacts resulting from flow changes on the existing network, and not as a result of the Project's new or altered highways (c.f. Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2) page 3 of 9 for context in relation to the alignment).

c. The increases in road traffic noise at these receptors results from a 60% increase in traffic flow on the unaltered Henhurst Road and Jeskyns Road and an associated change in the percentage of heavy vehicles using this link from 1.9%, increasing to 5.3% in the opening year. As such the impacts are linked to changes in traffic flow and composition on an unaltered highway.

d. In the long term comparison between 2030 and 2045 the magnitude of the noise change reduces from a moderate to a Minor Impact above a SOAEL.

12.6.115 Detailed consideration of the specifics of Henhurst Road and Jeskyns Road concludes the following with regard to potential mitigation options for these two links:

a. The links have a speed limit below 75km/h and as such this limits the use of low noise surfacing as an effective measure to reduce noise to below a SOAEL.

b. The nature of the properties impacted present dwellings fronting onto the road with countryside views, which would limit the use of barrier options along the road without introducing the potential for visual and access impacts.

c. Restrictions of Speed: as a result of the nature of road traffic noise generation, and the intrinsic link between speed and percentage of heavy vehicles, as a result of the increase in heavy vehicles on the link a restriction to speed would effectively increase the noise generation on the link. As such speed restrictions alone in this context would not aid the situation.

d. Restriction to Heavy Vehicles: limiting heavy vehicle use of the routes, thus reducing the increase in heavy vehicles would translate into a direct reduction in the generated road traffic noise. The feasibility for a heavy vehicle restriction on Henhurst Road and Jeskyns Road is being investigated as they are small country lanes. However, the restriction to vehicles on this road has not yet been confirmed and therefore for the purpose of this assessment it has been assumed that it is not feasible. There are a number of businesses, such as farms which rely on this route; similarly, there roads also provide relief to the wider road network in the event of an accident on the A2. Therefore, for the purpose of this assessment it has been assumed that it is not feasible.

12.6.116 There are no reported indirect significant beneficial effects above a SOAEL within the area between the south shore of the River Thames and the M2/A2/Lower Thames Crossing junction.

Between the north shore of the River Thames and the A13/A1089 junction

12.6.117 Within this reporting area there are a total of 20,548 residential dwellings and 51 OSRs (as specified in Section 12.4) that have been considered.

12.6.118 Short-term impacts have been predicted to occur:

a. Daytime: 18,633 dwellings and 38 OSRs; Night-time: 18,995 dwellings and 41 OSRs predicted to experience no change or a negligible change in road traffic noise level.

b. Daytime: 1,058 dwellings and six OSRs; Night-time: 877 dwellings and five OSRs predicted to experience a minor adverse change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Ashley Gardens, Barry Close, Bata Avenue, Beechcroft Avenue, Blue Anchor Lane, Brennan Road, Bronte Close, Buckingham Hill Road, Cedar Road, Chadwell Hill, Cherry Walk, Chesterton Way, Church Road, Cole Avenue, Coleridge Road, Dock Road, Dunlop Road, Essex Gardens, Foxes Green, Furness Close, Godman Road, Greyhound Lane, Halt Drive, Halton Road, Harding Road, Hazelwood, Heath Road, High Ash Close, Hoford Road, Hornsby Lane, Hume Avenue, Hume Close, Lapwin Close, Lea Road, Leveson Road, London Road, Longhouse Road, Love Lane, Lower Crescent, Meadow Close, Monarch Close, Morant Road, Muckingford Road, Nevell Road, Newton Road, Nicolas Walk, Northumberland Road, Northwood, Pintail Close, Pipit Close and Portsea Road.

c. Daytime: 46 dwellings and zero OSRs; Night-time: 120 dwellings and zero OSRs predicted to experience a moderate adverse change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Church Road, Cole Avenue, Courtney Road, Godman Road, Hornsby Lane, Love Lane, Meadow Close, Muckingford Road, Pipit Close, Shearwater Avenue and Station Road.

d. Daytime: 303 dwellings and zero OSRs; Night-time: 209 dwellings and zero OSRs predicted to experience a major adverse change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Brentwood Road, Church Road, Courtney Road, Godman Road, High House Lane, Hornsby Lane, Low Street Lane, Lower Crescent, Muckingford Road and Station Road

e. Daytime: 503 dwellings and six OSRs; Night-time: 347 dwellings and five OSRs predicted to experience a minor beneficial change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Beechcroft Avenue, Blackshots Lane, Brentwood Road, Buxton Road, Chadwell Hill, Chadwell Road, Chelmer Road, Culverin Avenue, Elmway, Heath Road, Heath View Road, High View Avenue, Hoford Road, King Edward Drive, Kingsley Walk, Lea Road, Lodge Lane, Masefield Road, Milford Road, Muckingford Road, Oakway, Oxford Avenue, Premier

Avenue, Prince Philip Avenue, Rectory Road, River View, Springfield Road, St Stephens Crescent, Stanford Road, Stifford Clays Road, Stour Road, Thames Drive, The Haven, Whitehall Lane, Whitmore Avenue and Wood View.

f. Daytime: 5 dwellings and one OSRs; Night-time: zero dwellings and zero OSRs predicted to experience a moderate beneficial change in road traffic noise level.

   i. These impacts are predicted to occur at NSRs located within Stanford Road

g. Within this reporting area, there are no identified NSRs which would experience a major beneficial noise change of greater than 5.0dB.

12.6.119 The likely significant effects within this reporting area are presented in Table 12.50. The significance has been determined based on the standards contained within DMRB LA 111 and presented in Section 12.3 of this chapter.

12.6.120 As stated in paragraphs 12.6.98 and 12.6.99, DMRB LA 111 requires the further consideration of specific local circumstances in the area surrounding the Project. Where this is deemed to result in a material effect on the assessment, it is presented below:

a. 90 dwellings are considered to be adversely affected by local circumstances. These receptors are reported in Table 12.47 and Table 12.48 as experiencing ‘minor’ impacts, but these are considered to be significant on the basis of the likely perception of change by residents and acoustic context.

b. No beneficial effects at dwellings or OSRs have been adjusted as a result of local circumstances. Therefore, no dwellings or OSRs concluded to present a significant impact within Table 12.47 and Table 12.48 have been revised to present a non-significant impact as a result of any specific local circumstances.

12.6.121 As such, the significant effects presented within Table 12.50 account for both the numerical consideration of road traffic noise change in Table 12.47 and Table 12.48, and any adjustment justified under DMRB LA 111 for local circumstances presented in paragraph 12.6.120.

Table 12.50 Likely significant effects from road traffic noise between the north shore of the River Thames and the A13/A1089 junction

NSR location	Justification of significance conclusion	Conclusion of significance of effect
Two dwellings – Nos. 1 and 2 Brook Farm Cottages, Brentwood Road	Moderate or greater change in road traffic noise during daytime period and moderate or greater change above an SOAEL during the night-time period	Significant (adverse)
327 dwellings located in Hornsby Lane, Courtney Road, Church Road, Muckingford Road, Alexandra Close, Station Road, Low Street Lane, Meadow Close, Godman Road, Pipit Close, Shearwater Avenue, High House Lane, Love Lane, Lower Crescent	Moderate or greater change in road traffic noise during daytime and night-time periods	Significant (adverse)
20 dwellings located in Muckingford Road, Hornsby Lane, Church Road, Alexandra Close, Courtney Road, Pipit Close, Godman Road, Cole Avenue, Shearwater Avenue, Meadow Close	Moderate or greater change in road traffic noise during daytime period	Significant (adverse)
90 dwellings located in Godman Road, Pipit Close, St Francis Way, Courtney Road, Meadow Close, Shearwater Avenue, Lower Crescent, Cole Avenue, Pintail Close, Alexandra Close, Station Road, Love Lane, Church Road	Minor adverse impact below the SOAEL, determined to be significant as a result of likely perception of change by residents and acoustic context in accordance with DMRB LA 111	Significant (adverse)
31 dwellings located in Stanford Road, River View	Minor change above a SOAEL during the daytime and night-time period	Significant (beneficial)
Two dwellings located in Stifford Clays Road, Premier Avenue	Minor change above a SOAEL during the daytime period	Significant (beneficial)
Four dwellings located in Stanford Road	Moderate or greater change in road traffic noise during daytime period and minor change above an SOAEL during the night-time period	Significant (beneficial)
One dwelling located in Stanford Road	Moderate or greater change in road traffic noise above an SOAEL during daytime period and minor change above an SOAEL during the night-time period	Significant (beneficial)
Seven dwellings located in River View, Heath Road	Minor change above a SOAEL during the Night-time period	Significant (beneficial)

Direct Impacts of the Project Above a SOAEL

12.6.122 There are reported a total of two significant adverse effects of the Project above a SOAEL in the short term within the area between the north shore of the River Thames and the A13/A1089 junction. These are Nos. 1 and 2 Brook Farm Cottages, Brentwood Road, Orsett which report a Moderate or greater adverse change above a SOAEL during the night-time period.

12.6.123 No dwellings report Moderate or greater adverse impacts above SOAEL in the daytime.

12.6.124 Relating to the increases in noise at Brook Farm Cottages, detailed interrogation of both the noise model and the traffic information within, concludes the following:

a. The dwellings are not reported to be in excess of a SOAEL in either the 2030 or 2045 Do Minimum scenario without the Project.

b. These impacts are concluded to be adverse impacts associated directly with the new highway.

12.6.125 With regard to the impacts at Brook Farm Cottages, a number of mitigation scenarios have been considered and are detailed further in Appendix 12.10. These are summarised below:

a. Provision for high acoustic performing LNS along the Project adjacent to these receptors implements an RSi of -7.5dB, representing the highest level listed under Highway Authority Product Approval Scheme at the time of assessment (July 2022).

b. Detailed investigation of acoustic screening, and reported in Appendix 12.10, considered various options for lateral extent and height of barriers adjacent to the Project alongside these properties. This considered heights from 2.0m above road surface to 6.0m above road surface. Acoustically the provision of the barriers in this location between 2.0m and 6.0m did not remove the night-time significant effect at these properties or reduce levels to below a SOAEL. Subsequent consultation with Landscape and Visual Impact professionals on the project concluded that the provision of an acoustic barrier in this location with a height above 3.0m would not introduce the potential for significant impacts.

12.6.126 As such the provision of high performing LNS and an acoustic barrier at 3.0m above road surface was concluded to accord with the requirements of the NN NPS in the context of sustainable development.

12.6.127 There are reported a total of 10 significant beneficial effects of the Project above a SOAEL within the area between the north shore of the River Thames and the A13/A1089 junction. These are:

a. One dwelling (No. 1 Potash Cottages, Orsett) which reports a Moderate beneficial change above a SOAEL during the daytime (Overnight, the impact at this dwelling becomes Minor above a SOAEL).

b. Nine dwellings: one dwelling (No. 2 Potash Cottages, Orsett) which reports a Minor beneficial change above a SOAEL during the daytime and night-time periods, with a further nine dwellings reporting a significant effect during the night-time only.

12.6.128 Therefore, there are concluded to be **10 significant beneficial effects** above a SOAEL as a direct result of the Project.

Indirect Impacts of the Project Above a SOAEL

12.6.129 There are reported to be no significant adverse indirect effects of the Project above a SOAEL in either the short or long term within the area between the north shore of the River Thames and the A13/A1089 junction.

12.6.130 There are reported a total of 35 significant beneficial effects of the Project above a SOAEL within the area between the north shore of the River Thames and the A13/A1089 junction. These are:

a. River View Orsett and Premier Avenue Orsett (c.f. Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2) page 7 of 9 for context in relation to the alignment).

b. 35 dwellings: 30 dwellings which report a Minor beneficial change above a SOAEL during both the daytime and night-time. In addition, two dwellings which report a Minor beneficial change during the daytime period only, and three dwellings which report a Minor beneficial change during the night-time only.

12.6.131 Therefore, there are concluded to be **35 significant beneficial effects** above a SOAEL as an indirect result of the Project.

Between the A13/A1089 junction and the A122 Lower Thames Crossing/M25 junction

12.6.132 Within this reporting area there are a total of 1,930 residential dwellings and 11 OSRs (as specified in Section 12.4) that have been considered.

12.6.133 Short-term impacts have been predicted to occur:

a. Daytime: 1,675 dwellings and eight OSRs; Night-time: 1,720 dwellings and eight OSRs predicted to experience no change or a negligible change in road traffic noise level.

b. Daytime: 90 dwellings and zero OSRs; Night-time: 75 dwellings and zero OSRs predicted to experience a minor adverse change in road traffic noise level.

i. These impacts are predicted to occur at NSRs located within Cheelson Road, Fen Lane, Hall Lane, High Road, Nelson Road, North Road, Peartree Close, Stifford Clays Road and Wilsman Road

c. Daytime: five dwellings and zero OSRs; Night-time: three dwellings and zero OSRs predicted to experience a moderate adverse change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Green Lane, North Road and Stifford Clays Road.

d. Daytime: five dwellings and zero OSRs; Night-time: five dwellings and zero OSRs predicted to experience a major adverse change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within North Road

e. Daytime: 99 dwellings and zero OSRs; Night-time: 76 dwellings and two OSRs predicted to experience a minor beneficial change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Bonham Drive, Cassell Close, Daltons Shaw, High Road, Malting Lane, Medbree Court, Pound Lane, Rectory Road, Rowley Road, School Lane, Stifford Clays Road, The Spinney and Woolings Close

f. Daytime: 30 dwellings and two OSRs; Night-time: 41 dwellings and one OSRs predicted to experience a moderate beneficial change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within High Road, Mill Lane, Shelford Close, Stifford Clays Road and Woolings Close.

g. Daytime: 26 dwellings and one OSRs; Night-time: 10 dwellings and zero OSRs predicted to experience a major beneficial change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Stifford Clays Road and Woolings Close.

12.6.134 The likely significant environmental effects within this reporting area are presented in Table 12.51. The significance has been determined based on the standards contained within DMRB LA 111 and presented in Section 12.3 of this chapter.

12.6.135 As stated in paragraphs 12.6.98 and 12.6.99, DMRB LA 111 requires the further consideration of specific local circumstances in the area surrounding the Project. Where this is deemed to result in a material effect on the assessment, it is presented below:

a. Three dwellings are considered to be adversely affected by local circumstances. These receptors are reported in Table 12.47 and Table 12.48 as experiencing 'minor' impacts, but these are considered to be significant on the basis of the likely perception of change by residents and acoustic context.

b. No beneficial effects at dwellings or OSRs have been adjusted as a result of local circumstances. Therefore, no dwellings or OSRs concluded to present a significant impact within Table 12.47 and Table 12.48 have been revised to present a non-significant impact as a result of any specific local circumstances.

12.6.136 As such, the significant effects presented within Table 12.51 account for both the numerical consideration of road traffic noise change in Table 12.47 and Table 12.48, and any adjustment justified under DMRB LA 111 for local circumstances presented in paragraph 12.6.135.

Table 12.51 Likely significant effects from road traffic noise between the A13/A1089 junction and the A122 Lower Thames Crossing/M25 junction

NSR location	Justification of significance conclusion	Conclusion of significance of effect
Eight dwellings located in Fen Lane, Stifford Clays Road, North Road, Green Lane	Moderate or greater change in road traffic noise during daytime and night-time periods	Significant (adverse)
Two dwellings located in North Road	Moderate or greater change in road traffic noise during daytime period	Significant (adverse)
Three dwellings located in Fen Lane, Stifford Clays Road, North Road	Minor adverse impact below the SOAEL, determined to be significant as a result of likely perception of change by residents and acoustic context in accordance with DMRB LA 111	Significant (adverse)
Five dwellings located in Stifford Clays Road	Minor change above a SOAEL during the daytime and night-time period	Significant (beneficial)
Two dwellings located in Stifford Clays Road	Minor change above a SOAEL during the daytime period	Significant (beneficial)
Three dwellings located in Baker Street, Stifford Clays Road	Moderate or greater change in road traffic noise during daytime period and minor change above an SOAEL during the night-time period	Significant (beneficial)
32 dwellings located in Baker Street, Woolings Close, High Road, Stifford Clays Road, Mill Lane	Moderate or greater change in road traffic noise during daytime and night-time periods	Significant (beneficial)
Two dwellings located in Shelford Close, High Road	Moderate or greater change in road traffic noise during daytime period	Significant (beneficial)

NSR location	Justification of significance conclusion	Conclusion of significance of effect
19 dwellings located in Baker Street, Woolings Close	Moderate or greater change in road traffic noise during daytime below a SOAEL and night-time period above a SOAEL	Significant (beneficial)
33 dwellings located in Stifford Clays Road, High Road, Baker Street, Woolings Close	Minor change above a SOAEL during the Night-time period	Significant (beneficial)
Baker Street Guest House (Hotel)	Moderate or greater change in road traffic noise during daytime and night-time periods	Significant (beneficial)

Direct Impacts of the Project Above a SOAEL

12.6.137 There are no reported direct significant adverse effects above a SOAEL within the area between the A13/A1089 junction and the A122 Lower Thames Crossing/M25 junction.

12.6.138 There are reported a total of 62 significant beneficial effects of the Project above a SOAEL within the area between the A13/A1089 junction and the A122 Lower Thames Crossing/M25 junction. These are:

a. Stifford Clays Road, High Street and Baker Street.

b. 19 dwellings: 19 dwellings which report a Moderate or greater beneficial change above a SOAEL during the night-time period only.

c. 43 dwellings: five dwellings which report a Minor beneficial change above a SOAEL during the daytime and night-time periods, with a further 36 dwellings reporting a significant effect during the night-time only and two during the daytime only.

12.6.139 Therefore, there are concluded to be **62 significant beneficial effects** above a SOAEL as a direct result of the Project.

Indirect Impacts of the Project Above a SOAEL

12.6.140 There are no reported indirect significant adverse or beneficial effects above a SOAEL within the area between the A13/A1089 junction and the A122 Lower Thames Crossing/M25 junction.

Along the A13 between the Project and M25 junction 30

12.6.141 Within this reporting area there are a total of 11,645 residential dwellings and 30 OSRs (as specified in Section 12.4) that have been considered.

12.6.142 Short-term impacts have been predicted to occur:

a. Daytime: 10,587 dwellings and 24 OSRs; Night-time: 10,876 dwellings and 26 OSRs predicted to experience no change or a negligible change in road traffic noise level.

b. Within this reporting area, there are no identified NSRs which would experience a minor adverse noise change of greater than 1.0dB

c. Daytime: 688 dwellings and five OSRs; Night-time: 403 dwellings and three OSRs predicted to experience a minor beneficial change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Albert Close, Bodell Close, Bradleigh Avenue, Carew Close, Chestnut Avenue, Clockhouse Lane, Connaught Avenue, Conrad Close, Conrad Gardens, Fairway, Gourney Grove, Grenville Road, Hedingham Road, Hodges Close, Hogg Lane, Hopewell Close, Kingsman Drive, Lennox Close, Lenthall Avenue, Lodge Lane, Long Lane, Lucas Road, Ludlow Place, Marlborough Close, Mary Rose Close, Mead Close, Norfolk Place, Nutberry Avenue, Nutberry Close, Oakway, Orchard Drive, Parnell Close, Plymouth Road, Prince Philip Avenue, Santiago Way, Silverwood Close, Southend Road, Stifford Clays Road, Sylvan Close, Tennyson Avenue, The Griffins, Victoria Avenue, Warren Heights, Warren Lane, Whitmore Avenue, Windsor Avenue

d. Daytime: 98 dwellings and zero OSRs; Night-time: 201 dwellings and one OSR predicted to experience a moderate beneficial change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Galleon Road, Grenville Road, Hedingham Road, Hodges Close, Hopewell Close, John William Close, Lancaster Road, Lennox Close, Mayflower Road, Norfolk Place, Philip Sidney Road Harris Primary Academy (Primary School)

e. Daytime: 272 dwellings and one OSR; Night-time: 165 dwellings and zero OSRs predicted to experience a major beneficial change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Grenville Road, Hopewell Close, John William Close, Lancaster Road, Lennox Close, Maunder Close, Mayflower Road, Parnell Close, Parr Close, Plymouth Road.

12.6.143 The likely significant effects within this reporting area are presented in Table 12.52. The significance has been determined based on the standards contained within DMRB LA 111 and presented in Section 12.3 of this chapter.

12.6.144 As stated in paragraphs 12.6.98 and 12.6.99, DMRB LA 111 requires the further consideration of specific local circumstances in the area surrounding the Project. Where this is deemed to result in a material effect on the assessment, it is presented below:

a. No dwellings or OSRs have been considered to be adversely affected by local circumstances. Therefore, no dwellings or OSRs concluded to present a non-significant impact within Table 12.47 and Table 12.48 have been revised to a significant impact within the scope of this assessment.

b. No beneficial effects at dwellings or OSRs have been adjusted as a result of local circumstances. Therefore, no dwellings or OSRs concluded to present a significant impact within Table 12.47 and Table 12.48 have been revised to present a non-significant impact as a result of any specific local circumstances.

12.6.145 As such, the significant effects presented within Table 12.52 account for both the numerical consideration of road traffic noise change in Table 12.47 and Table 12.48, and any adjustment justified under DMRB LA 111 for local circumstances presented in paragraph 12.6.144.

Table 12.52 Likely significant effects from road traffic noise along the A13 between the Project and M25 junction 30

NSR location	Justification of significance conclusion	Conclusion of significance of effect
92 dwellings located in Lodge Lane, Silverwood Close, Stifford Clays Road, Southend Road	Minor change above a SOAEL during the daytime and night-time period	Significant (beneficial)
17 dwellings located in Nutberry Close, Long Lane, Lodge Lane, Stifford Clays Road	Minor change above a SOAEL during the daytime period	Significant (beneficial)
366 dwellings located in Mayflower Road, Grenville Road, John William Close, Parnell Close, Hopewell Close, Lancaster Road, Maunder Close, Galleon Road, Lennox Close, Plymouth Road, Parr Close, Philip Sidney Road, Hodges Close, Chichester Close, Norfolk Place, Hedingham Road	Moderate or greater change in road traffic noise during daytime and night-time periods	Significant (beneficial)
Four dwellings located in Lennox Close, Grenville Road, Hodges Close	Moderate or greater change in road traffic noise during daytime period	Significant (beneficial)
26 dwellings located in Stifford Clays Road, Lodge Lane, Silverwood Close	Minor change above a SOAEL during the Night-time period	Significant (beneficial)
Harris Primary Academy (Primary School)	Moderate or greater change in road traffic noise during daytime period	Significant (beneficial)

Direct impacts

12.6.146 There are no reported direct significant adverse or beneficial effects above a SOAEL within the area along the A13 between the Project and M25 junction 30.

Indirect Impacts of the Project Above a SOAEL

12.6.147 There are no reported indirect significant adverse effects above a SOAEL within the area along the A13 between the Project and M25 junction 30.

12.6.148 There are reported a total of 135 significant beneficial effects of the Project above a SOAEL within the area along the A13 between the Project and M25 junction 30. These are:

a. Stifford Clays Road and Lodge Lane (c.f. Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2) page 7 of 9 for context in relation to the alignment).

b. 135 dwellings: 92 dwellings which report a Minor beneficial change above a SOAEL during the daytime and night-time periods, with a further 26 dwellings reporting a significant effect during the night-time only and 17 during the daytime only.

12.6.149 Therefore, there are concluded to be **135 significant beneficial effects** above a SOAEL as an indirect result of the Project.

Along the existing M25 between M25 junction 28 and the Dartford Crossing

12.6.150 Within this reporting area there are a total of 2,225 residential dwellings and 14 OSRs (as specified in Section 12.4) that have been considered.

12.6.151 Short-term impacts have been predicted to occur:

a. Daytime: 1,612 dwellings and 11 OSRs; Night-time: 1,842 dwellings and 11 OSRs predicted to experience no change or a negligible change in road traffic noise level.

b. Within this reporting area, there are no identified NSRs which would experience a minor adverse noise change of greater than 1.0dB

c. Daytime: 554 dwellings and two OSRs; Night-time: 337 dwellings and two OSRs predicted to experience a minor beneficial change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Beredens Lane, Church Lane, Clay Tye Road, Codham Hall Lane, Dennis Road, Dennises Lane, Erriff Drive, Folkes Lane, Foyle Drive, Frances Gardens, Fullarton Crescent, Fusedale Way, Fyfield Drive, Garron Lane, Gatehope Drive, Gavenny Path, Groves Close, Hamble Lane, Humber Avenue, Irvine Gardens, Loman Path, Ockendon Road, Park Lane, St Marys Lane, Tomkyns Lane and Warley Road.

d. Daytime: 45 dwellings and zero OSRs; Night-time: 34 dwellings and zero OSRs predicted to experience a moderate beneficial change in road traffic noise level.

i. These impacts are predicted to occur at NSRs located within Church Lane, Dennises Lane, Folkes Lane, Ockendon Road, Pea Lane, St Marys Lane and Warley Road.

e. Daytime: 14 dwellings and one OSR; Night-time: 12 dwellings and one OSR predicted to experience a major beneficial change in road traffic noise level.

i. These impacts are predicted to occur at NSRs located within St Marys Lane.

12.6.152 The likely significant effects within this reporting area are presented in Table 12.53. The significance has been determined based on the standards contained within DMRB LA 111 and presented in Section 12.3 of this chapter.

12.6.153 As stated in paragraphs 12.6.98 and 12.6.99, DMRB LA 111 requires the further consideration of specific local circumstances in the area surrounding the Project. Where this is deemed to result in a material effect on the assessment, it is presented below:

a. No dwellings or OSRs have been considered to be adversely affected by local circumstances. Therefore, no dwellings or OSRs concluded to present a non-significant impact within Table 12.47 and Table 12.48 have been revised to a significant impact within the scope of this assessment.

b. No beneficial effects at dwellings or OSRs have been adjusted as a result of local circumstances. Therefore, no dwellings or OSRs concluded to present a significant impact within Table 12.47 and Table 12.48 have been revised to present a non-significant impact as a result of any specific local circumstances.

12.6.154 As such, the significant effects presented within Table 12.53 account for both the numerical consideration of road traffic noise change in Table 12.47 and Table 12.48, and any adjustment justified under DMRB LA 111 for local circumstances presented in paragraph 12.6.153.

Table 12.53 Likely significant effects from road traffic noise along the M25 between M25 junction 28 and the Dartford Crossing

NSR location	Justification of significance conclusion	Conclusion of significance of effect
15 dwellings located in Dennises Lane, St Marys Lane, Ockendon Road, Belhus Park Lane	Minor change above a SOAEL during the daytime and night-time period	Significant (beneficial)
Five dwellings located in Dennises Lane	Minor change above a SOAEL during the daytime period	Significant (beneficial)
12 dwellings located in Ockendon Road, St Marys Lane, Folkes Lane, Dennises Lane	Moderate or greater change in road traffic noise during daytime and night-time periods above a SOAEL	Significant (beneficial)

NSR location	Justification of significance conclusion	Conclusion of significance of effect
Nine dwellings located in Folkes Lane, Ockendon Road, Warley Road, Dennises Lane, Beredens Lane, St Marys Lane	Moderate or greater change in road traffic noise during daytime period and minor change above an SOAEL during the night-time period	Significant (beneficial)
Eight dwellings located in Pike Lane, Church Lane, Ockendon Road	Moderate or greater change in road traffic noise during daytime and night-time periods	Significant (beneficial)
Four dwellings located in Church Lane, Beredens Lane	Moderate or greater change in road traffic noise during daytime period	Significant (beneficial)
26 dwellings located in Pea Lane, Dennises Lane, St Marys Lane, Ockendon Road, Church Lane	Moderate or greater change in road traffic noise during daytime below a SOAEL and night-time period above a SOAEL	Significant (beneficial)
100 dwellings located in Folkes Lane, Dennises Lane, Ockendon Road, Dennis Road, Clay Tye Road, Hamble Lane, Irvine Gardens, Humber Avenue, St Marys Lane, Gatehope Drive, Church Lane, Warley Road, Erriff Drive	Minor change above a SOAEL during the Night-time period	Significant (beneficial)
Thames Chase Forest Centre (Community Facility)	Moderate or greater change in road traffic noise during daytime period	Significant (beneficial)

Direct Impacts of the Project Above a SOAEL

12.6.155 There are no reported direct significant adverse effects above a SOAEL within the area along the M25 between M25 junction 28 and the Dartford Crossing.

12.6.156 There are reported a total of 108 significant beneficial effects of the Project above a SOAEL within the area along the M25 between M25 junction 28 and the Dartford Crossing. These occur at dwellings along the M25 corridor:

a. 38 dwellings: 12 dwellings which report a Moderate or greater beneficial change above a SOAEL during the daytime and night-time periods, with a further 26 dwellings reporting a significant beneficial effect during the night-time only.

b. 70 dwellings: 14 dwellings which report a Minor beneficial change above a SOAEL during the daytime and night-time periods, with a further 51 dwellings reporting a significant beneficial effect during the night-time only and 5 during the daytime only.

12.6.157 Therefore, there are concluded to be **108 significant beneficial effects** above a SOAEL as a direct result of the Project.

Indirect Impacts of the Project Above a SOAEL

12.6.158 There are no reported indirect significant adverse effects above a SOAEL within the area along the M25 between M25 junction 28 and the Dartford Crossing

12.6.159 There are reported a total of 59 significant beneficial effects of the Project above a SOAEL within the area along the M25 between M25 junction 28 and the Dartford Crossing. These occur at dwellings along the M25 corridor (c.f. Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2) page 6 of 9 for context in relation to the alignment):

a. 59 dwellings: one dwellings which report a Minor beneficial change above a SOAEL during the daytime and night-time periods, with a further 58 dwellings reporting a significant effect during the night-time only.

12.6.160 Therefore, there are concluded to be **59 significant beneficial effects** above a SOAEL as an indirect result of the Project.

Along the A282 between the Dartford Crossing and M25 junction 2 (with the A2)

12.6.161 Within this reporting area there are a total of 6,678 residential dwellings and 25 OSRs (as specified in Section 12.4) have been considered.

12.6.162 Short-term impacts have been predicted to occur:

a. Daytime: 6678 dwellings and 25 OSRs; Night-time: 6,678 dwellings and 25 OSRs predicted to experience no change or a negligible change in road traffic noise level.

b. Within this reporting area, there are no identified NSRs which would experience a minor beneficial or adverse noise change of greater than 1.0dB.

12.6.163 As stated in paragraphs 12.6.98 and 12.6.99, DMRB LA 111 requires the further consideration of specific local circumstances in the area surrounding the Project. Where this is deemed to result in a material effect on the assessment, it is presented below:

a. No dwellings or OSRs have been considered to be adversely or beneficially affected by local circumstances. Therefore, no dwellings or OSRs concluded to present a non-significant impact within Table 12.47 and Table 12.48 have been revised to a significant impact within the scope of this assessment.

12.6.164 Within this section, no NSRs are predicted to experience a significant adverse or beneficial change in road traffic noise level. No significant effects are therefore identified.

Direct and Indirect Impacts of the Project Above a SOAEL

12.6.165 There are no reported direct or indirect significant adverse or beneficial effects above a SOAEL within the area along the A282 between the Dartford Crossing and M25 junction 2 (with the A2).

Along the A2 between M25 junction and the M2/A2/Lower Thames Crossing junction

12.6.166 Within this reporting area there are a total of 6,109 residential dwellings and 15 OSRs (as specified in Section 12.4) that have been considered.

12.6.167 Short-term impacts have been predicted to occur:

a. Daytime: 5,941 dwellings and 15 OSRs; Night-time: 6,010 dwellings and 15 OSRs predicted to experience no change or a negligible change in road traffic noise level.

b. Daytime: four dwellings and zero OSRs; Night-time: zero dwellings and zero OSRs predicted to experience a minor adverse change in road traffic noise level.

   i. These impacts are predicted to occur at NSRs located within Bramble Avenue and Beacon Drive

c. Within this reporting area, there are no identified NSRs which would experience a moderate adverse noise change of greater than 3.0dB

d. Daytime: 164 dwellings and zero OSRs; Night-time: 99 dwellings and zero OSRs predicted to experience a minor beneficial change in road traffic noise level.

   i. These impacts are predicted to occur at NSRs located within Dene Holm Road, Gainsborough Drive, Gore Road, Green Street, Landseer Avenue, Langdale Walk, Painters Ash Lane, Peach Croft, Rowmarsh Close, Wood Lane

e. Within this reporting area, there are no identified NSRs which would experience a moderate beneficial noise change of greater than 3.0dB.

12.6.168 As stated in paragraphs 12.6.98 and 12.6.99, DMRB LA 111 requires the further consideration of specific local circumstances in the area surrounding the Project. Where this is deemed to result in a material effect on the assessment, it is presented below:

a. No dwellings or OSRs have been considered to be adversely affected by local circumstances. Therefore, no dwellings or OSRs concluded to present a non-significant impact within Table 12.47 and Table 12.48 have been revised to a significant impact within the scope of this assessment.

b. No beneficial effects at dwellings or OSRs have been adjusted as a result of local circumstances. Therefore, no dwellings or OSRs concluded to present a significant impact within Table 12.47 and Table 12.48 have been revised to present a non-significant impact as a result of any specific local circumstances.

12.6.169 As such, the significant effects presented within Table 12.54 account for both the numerical consideration of road traffic noise change in Table 12.47 and Table 12.48, and any adjustment justified under DMRB LA 111 for local circumstances presented in paragraph 12.6.168.

Table 12.54 Along the existing A2 between M25 junction and M2/A2/Lower Thames Crossing junction

NSR location	Justification of significance conclusion	Conclusion of significance of effect
18 dwellings located in Green Street Green Road, Gore Road	Minor change above a SOAEL during the daytime and night-time period	Significant (beneficial)
Four dwellings located in Green Street Green Road, Gore Road	Minor change above a SOAEL during the daytime period	Significant (beneficial)
17 dwellings located in Green Street Green Road, Dene Holm Road, Gainsborough Drive, Painters Ash Lane	Minor change above a SOAEL during the Night-time period	Significant (beneficial)

Direct impacts of the Project Above a SOAEL

12.6.170 There are no reported direct significant adverse or beneficial effects above a SOAEL within the area along the existing A2 between M25 junction and M2/A2/Lower Thames Crossing junction.

Indirect Impacts of the Project Above a SOAEL

12.6.171 There are no reported indirect significant adverse effects above a SOAEL within the area along the existing A2 between M25 junction 2 and M2/A2/Lower Thames Crossing junction.

12.6.172 There are reported a total of 39 significant beneficial effects of the Project above a SOAEL within the area along the existing A2 between M25 junction 2 and M2/A2/Lower Thames Crossing junction. These are:

a. Along the A2 corridor – adjacent to Trolling Down Hill, Green Street and Dene Holm Road/Gainsborough Drive (c.f. Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2) page 5 of 9 and page 6 of 9 for context in relation to the alignment).

b. 39 dwellings: 18 dwellings which report a Minor beneficial change above a SOAEL during the daytime and night-time periods, with a further 17 dwelling reporting a significant effect during the night-time only and 4 during the daytime only.

12.6.173 Therefore, there are concluded to be **39 significant beneficial effects** above a SOAEL as an indirect result of the Project.

Along the A2 east of the M2/A2/Lower Thames Crossing junction incorporating the M2 and the A228

12.6.174 Within this reporting area there are a total of 18,310 residential dwellings and 46 OSRs (as specified in Section 12.4) that have been considered.

12.6.175 Short-term impacts have been predicted to occur:

a. Daytime: 14,461 dwellings and 24 OSRs; Night-time: 14,846 dwellings and 26 OSRs predicted to experience no change or a negligible change in road traffic noise level.

b. Daytime: 3,777 dwellings and 22 OSRs; Night-time: 3,441 dwellings and 20 OSRs predicted to experience a minor adverse change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Alex Hughes Close, Amisse Drive, Anderson Close, Annie Road, Apple Close, Ashbee Close, Ashby Close, Aspdin Close, Bavins Court, Benedict Close, Booth Close, Bream Close, Britannia Close, Brompton Farm Road, Brook Lane, Brook Street, Brooks Place, Bush Road, Cantium Place, Carnation Road, Carroll Close, Cemetery Road, Chalgrove Mews, Charles Drive, Church Field, Cobb Close, Cobham Close, Conveyor Drive, Coombe Close, Cooper Road, Copperhouse Road, Covey Hall Road, Crossfield Walk, Dalison Court, Darnley Road, Delamere Gardens, East Street, Edwards Close, Elaine Avenue, Essex Road, Farm Hill Avenue, Formby Road, Formby Terrace, Galahad Avenue, Germander Avenue, Godfrey Close, Hammonds Square, Harold Road, Hawthorn Road, Hayley Close, Hendy Road,

c. Daytime: 46 dwellings and zero OSRs; Night-time: zero dwellings and zero OSRs predicted to experience a moderate adverse change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Elaine Avenue.

d. Within this reporting area, there are no identified NSRs which would experience a major adverse noise change of greater than 3.0dB

e. Daytime: 26 dwellings and zero OSRs; Night-time: 23 dwellings and zero OSRs predicted to experience a minor beneficial change in road traffic noise level.

    i. These impacts are predicted to occur at NSRs located within Brewers Road, Crutches Lane, Old Watling Street, Pondfield Lane, Sharfleet Drive, Squires Close and Watling Street.

f. Within this reporting area, there are no identified NSRs which would experience a moderate beneficial noise change of greater than 3.0dB.

12.6.176 As stated in paragraphs 12.6.98 and 12.6.99, DMRB LA 111 requires the further consideration of specific local circumstances in the area surrounding the Project. Where this is deemed to result in a material effect on the assessment, it is presented below:

a. No dwellings or OSRs have been considered to be adversely affected by local circumstances. Therefore, no dwellings or OSRs concluded to present a non-significant impact within Table 12.47 and Table 12.48 have been revised to a significant impact within the scope of this assessment.

b. No beneficial effects at dwellings or OSRs have been adjusted as a result of local circumstances. Therefore, no dwellings or OSRs concluded to present a significant impact within Table 12.47 and Table 12.48 have been revised to present a non-significant impact as a result of any specific local circumstances.

12.6.177 As such, the significant effects presented within Table 12.55 account for both the numerical consideration of road traffic noise change in Table 12.47 and Table 12.48, and any adjustment justified under DMRB LA 111 for local circumstances presented in paragraph 12.6.176.

Table 12.55 Along the existing A2 east of the M2/A2/Lower Thames Crossing junction incorporating the M2 and the A228

NSR location	Justification of significance conclusion	Conclusion of significance of effect
349 dwellings located in Waghorn Road, Holborough Road, Pilgrims Way, Willowside, Jackdaw Way, Saltings Road, Cantium Place, High Street, Sundridge Hill, Anderson Close, Rochester Road, Kent Road, The Glebe, Ashbee Close, Coombe Close, Hillcrest Drive, Aspdin Close, Brooks Place, May Street, Hollycroft, Vicarage Road, Essex Road, Simpson Road, Stanford Way, Acre Grove, Sandways, Brook Lane, Lambarde Close, Stake Lane, Britannia Close, Lakeside, Carroll Close, Bush Road, Lakeview Close, Sylvestre Close, Germander Avenue, Station Road, Conveyor Drive, Brook Street, Church Field	Minor change above a SOAEL during the Night-time period	Significant (adverse)
Three dwellings located in Old Watling Street, Old Watling Street, Old Watling Street	Minor change above a SOAEL during the daytime and night-time period	Significant (beneficial)
Four dwellings located in Brewers Road, Squires Close, Old Watling Street	Minor change above a SOAEL during the Night-time period	Significant (beneficial)

NSR location	Justification of significance conclusion	Conclusion of significance of effect
200 dwellings located in Pilgrims Way, Cantium Place, Rochester Road, Formby Terrace, Brook Street, Holborough Road, Willowside, The Glebe, Sundridge Hill, Aspdin Close, Coombe Close, Brooks Place, Vicarage Road, Sandways, High Street, Jackdaw Way, Delamere Gardens, Saltings Road, Germander Avenue, Ashbee Close, Bush Road, Anderson Close, Waghorn Road, Kent Road	Minor change above a SOAEL during the daytime and night-time period	Significant (adverse)
Two dwellings located in Cantium Place, Willowside	Minor change above a SOAEL during the daytime period	Significant (adverse)

Direct Impacts of the Project Above a SOAEL

12.6.178 There are reported to be no significant adverse direct effects of the Project above a SOAEL along the existing A2 east of the M2/A2/Lower Thames Crossing junction incorporating the M2 and the A228.

12.6.179 There are reported a total of seven significant beneficial effects of the Project above a SOAEL within the area along the existing A2 east of the M2/A2/Lower Thames Crossing junction incorporating the M2 and the A228. These are:

a. Along the A2 corridor – adjacent to Watling Street.

b. 7 dwellings: three dwellings which report a Minor beneficial change above a SOAEL during the daytime and night-time periods, with a further four dwellings reporting a significant effect during the night-time only.

12.6.180 Therefore, there are concluded to be **seven significant beneficial effects** above a SOAEL as a direct result of the Project.

Indirect Impacts of the Project Above a SOAEL

12.6.181 There are reported a total of 551 significant adverse effects of the Project above a SOAEL within the area along the existing A2 east of the M2/A2/Lower Thames Crossing junction incorporating the M2 and the A228. These are:

a. A228 Corridor including immediately adjacent residential roads (c.f. Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2) page 1 of 9 and 3 of 9 for context in relation to the alignment).

b. 200 dwellings which report a Minor adverse change above a SOAEL during the daytime and night-time.

c. 349 dwellings which report a Minor adverse change above a SOAEL during the night-time only.

d. 2 dwellings which report a Minor adverse change above a SOAEL during the daytime only.

12.6.182 Relating to the increases in noise along the A228 corridor, detailed interrogation of both the noise model and the traffic information within, concludes the following:

a. Of the 202 dwellings identified as exceeding the daytime value of a SOAEL, 151 are calculated to be in excess of a SOAEL in the 2030 Do Minimum scenario without the Project, and 169 in excess of SOAEL in the 2045 Do Minimum.

b. Of the 549 dwellings identified as exceeding the night-time value of a SOAEL, 458 are calculated to be in excess of a SOAEL in the 2030 Do Minimum scenario without the Project, and 482 in excess of SOAEL in the 2045 Do Minimum.

c. These impacts are concluded to be indirect adverse impacts resulting from flow changes on the existing network, and not as a result of the Projects new or altered highways.

d. Certain of these significant adverse effects occur within nine identified NIAs along the A228 (NIA 5975, 5992, 5993, 5994, 6007, 6011, 6012, 12245 and 14636).

e. The increases in road traffic noise along the A228 corridor results from an approximately 10% increase in traffic flow and an associated 5% increase in the percentage of heavy vehicles using the corridor in the opening year. As such the impacts are linked to changes in traffic flow and composition on an unaltered highway.

f. In the long term comparison between 2030 and 2045 the magnitude of the noise change reduces to a Negligible Impact above a SOAEL.

g. In the future year baseline comparison between 2030 and 2045 without the Project, the magnitude of the noise change along the A228 corridor is also a Negligible Impact.

12.6.183 Detailed consideration of the specifics of the A228 corridor concludes the following with regard to potential mitigation options for this corridor:

a. The links have a speed limit below 75km/h and as such this limits the use of low noise surfacing as an effective measure to reduce noise to below a SOAEL.

b. The nature of the properties impacted present dwellings fronting onto the road with countryside views, which would limit the use of barrier options along the road without introducing the potential for visual and access impacts.

c. Restrictions of Speed: as a result of the nature of road traffic noise generation, and the intrinsic link between speed and percentage of heavy vehicles within the methodology i.e. slower HGVs are generally noisier as a result of engine noise being more dominant; as a result of the increase in heavy vehicles on the link a restriction to speed would effectively increase the noise generation on the link. As such speed restrictions alone in this context would not aid the situation.

d. Restriction to Heavy Vehicles: limiting heavy vehicle use of the routes, thus reducing the increase in heavy vehicles would translate into a direct reduction in the generated road traffic noise. However, on the A228 corridor there are a number of businesses based along the route which use the road. A restriction on the use of the road by heavy vehicles would compromise existing businesses.

12.6.184 There are no reported indirect significant beneficial effects above a SOAEL within the area between the south shore of the River Thames and the M2/A2/Lower Thames Crossing junction.

Affected unaltered traffic links outside of bypassed area

12.6.185 Within this reporting area there are a total of 14,736 residential dwellings and 70 OSRs (as specified in Section 12.4) have been considered.

12.6.186 Short-term impacts have been predicted to occur:

a. Daytime: 13,372 dwellings and 61 OSRs; Night-time: 13,665 dwellings and 63 OSRs predicted to experience no change or a negligible change in road traffic noise level.

b. Daytime: 495 dwellings and four OSRs; Night-time: 448 dwellings and three OSRs predicted to experience a minor adverse change in road traffic noise level.

   i. These impacts are predicted to occur at NSRs located within Bakers Close, Bridge Place, Bush Row, Chatham Road, Firs Close, Forstal Road, Hall Road, Heathcote Close, Keefe Close, Kissick Gardens, London Road, Lower Warren Road, Maidstone Road, Mckenzie Close, Medway Court, Mill Lane, Mount Pleasant, Powell Close, Pratling Street, Rochester Road, Station Road, Sycamore Drive, The Avenue, Toddington Crescent, Unwin Close, Vicarage Close, Victoria Close and Warren Road

c. Within this reporting area, there are no identified NSRs which would experience a moderate adverse noise change of greater than 3.0dB

d. Daytime: 729 dwellings and four OSRs; Night-time: 623 dwellings and four OSRs predicted to experience a minor beneficial change in road traffic noise level.

i. These impacts are predicted to occur at NSRs located within Bancroft Road, Battlefields Road, Brentwood Road, Button Street, Church Lane, Church Road, Doesgate Lane, Evenden Road, Fairlight Cross, Fairseat Lane, Farningham Hill Road, Farriers Way, Fen Close, Glenwood Gardens, Gravesend Road, Hartley Bottom Road, Hill View Road, Hillcrest Close, Hillcrest Road, Hollywood Lane, Howlands, Huntingfield Road, Kemsing Road, Kirkham Road, Kirkham Shaw, Laindon Road, Laurel Drive, London Road, Longfield Road, Lower Dunton Road, Main Drive, Main Road, Malvina Close, Manor Road, Melliker Lane, Nepicar Lane, North Hill, Nurstead Lane, Old London Road, Peartree Lane, Pells Lane, Pilgrims Way, Pincroft Wood, Randall Hill Road, Ryecroft, School Close, School Lane, Speedgate, St Clere Hill Road, Stanley Road and The Drive

e. Daytime: 140 dwellings and one OSR; Night-time: zero dwellings and zero OSRs predicted to experience a moderate beneficial change in road traffic noise level.

i. These impacts are predicted to occur at NSRs located within Blackthorne Close, Church Road, Doesgate Lane, Farriers Way, Fieldwood Way, Kirkham Road, Laurel Drive, Lower Dunton Road and Malvina Close.

f. Within this reporting area, there are no identified NSRs which would experience a moderate beneficial noise change of greater than 3.0dB.

12.6.187 As stated in paragraphs 12.6.98 and 12.6.99, DMRB LA 111 requires the further consideration of specific local circumstances in the area surrounding the Project. Where this is deemed to result in a material effect on the assessment, it is presented below:

a. No dwellings or OSRs have been considered to be adversely affected by local circumstances. Therefore, no dwellings or OSRs concluded to present a non-significant impact within Table 12.47 and Table 12.48 have been revised to a significant impact within the scope of this assessment.

b. No dwellings or OSRs have been considered to be beneficially affected by local circumstances.; therefore, no dwellings or OSRs concluded to present a significant impact within Table 12.47 and Table 12.48 have been revised to non-significant within the scope of this assessment.

12.6.188 As such, the significant effects presented within Table 12.56 account for both the numerical consideration of road traffic noise change in Table 12.47 and Table 12.48, and any adjustment justified under DMRB LA 111 for local circumstances presented in paragraph 12.6.187.

Table 12.56 Affected unaltered traffic links outside of bypassed area

NSR location	Justification of significance conclusion	Conclusion of significance of effect
155 dwellings located in Rochester Road, Station Road, Maidstone Road, Hall Road, London Road, High Street, Pratling Street, Heathcote Close, The Avenue, Unwin Close, Mckenzie Close, Forstal Road, Medway Court, Firs Close, Sycamore Drive	Minor change above a SOAEL during the daytime and night-time period	Significant (adverse)
Four dwellings located in The Avenue, Hall Road, Heathcote Close	Minor change above a SOAEL during the daytime period	Significant (adverse)
138 dwellings located in Toddington Crescent, Station Road, Rochester Road, Heathcote Close, Medway Court, Unwin Close, Bush Row, Bridge Place, Hall Road, Sycamore Drive, Maidstone Road, The Avenue, Firs Close, Lower Warren Road, High Street, Warren Road, Mount Pleasant, Pratling Street	Minor change above a SOAEL during the Night-time period	Significant (adverse)
20 dwellings located in London Road, Tilbury Road, Brentwood Road, Lower Dunton Road, Nepicar Lane, Button Street, Main Road, Longfield Road	Minor change above a SOAEL during the daytime and night-time period	Significant (beneficial)
32 dwellings located in Brentwood Road, London Road, Nepicar Lane, Farningham Hill Road, Wrotham Water Road, Old London Road, Church Road	Minor change above a SOAEL during the daytime period	Significant (beneficial)
Three dwellings located in Lower Dunton Road	Moderate or greater change in road traffic noise during daytime period and minor change above an SOAEL during the night-time period	Significant (beneficial)
107 dwellings located in Lower Dunton Road, Farriers Way, A130 New Bypass, Kirkham Road, Laurel Drive, Malvina Close, Doesgate Lane, Church Road, Blackthorne Close, Fieldwood Way	Moderate or greater change in road traffic noise during daytime period	Significant (beneficial)
30 dwellings located in Farriers Way	Moderate or greater change in road traffic noise above an SOAEL during daytime period and minor change above an SOAEL during the night-time period	Significant (beneficial)
13 dwellings located in Ryecroft, Longfield Road, Main Road, Button Street, Pilgrims Way, Gravesend Road, Farningham Hill Road	Minor change above a SOAEL during the Night-time period	Significant (beneficial)
St. Lukes Hospice (Care Home)	Moderate change in road traffic noise during daytime period	Significant (beneficial)

Direct Impacts of the Project Above a SOAEL

12.6.189 There are no reported direct significant adverse or beneficial effects above a SOAEL along the affected unaltered traffic links outside of bypassed area.

Indirect Impacts of the Project Above a SOAEL

12.6.190 There are reported a total of 297 significant adverse effects of the Project above a SOAEL in the short term within the affected unaltered traffic links outside of bypassed area. These are located along the A229 Corridor including Rochester Road, Hall Road and the A229/M2 Junction 3 area, including immediately adjacent residential roads (c.f. Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2) page 1 of 9 for context in relation to the alignment) with the following impacts identified:

a. 155 dwellings which report a Minor adverse change above a SOAEL during the daytime and night-time.

b. 4 dwellings which report a Minor adverse change above a SOAEL during the daytime only.

c. 138 dwellings which report a Minor adverse change above a SOAEL during the night-time only.

12.6.191 Relating to the changes in road traffic noise along the A229 corridor detailed interrogation of both the noise model and the traffic information within, concludes the following:

a. Of the 159 dwellings identified as exceeding the daytime value of a SOAEL, 107 are calculated to be in excess of a SOAEL in the 2030 Do Minimum scenario **without the Project**, and 119 in excess of SOAEL in the 2045 Do Minimum.

b. Of the 293 dwellings identified as exceeding the night-time value of a SOAEL, 253 are calculated to be in excess of a SOAEL in the 2030 Do Minimum scenario without the Project, and 268 in excess of SOAEL in the 2045 Do Minimum.

c. These impacts are concluded to be indirect adverse impacts and not as a result of any aspect of the Project's new or altered highways.

A229 Corridor (including Rochester Road, Hall Road and the A229/M2 Junction 3 area)

a. The increases in road traffic noise along the A229 Corridor (including Rochester Road, Hall Road and the A229/M2 Junction 3 area) results from an approximately 6-11% increase in traffic flow and an associated 6-10% increase in the percentage of heavy vehicles using the corridor in the opening year. As such the impacts are linked to changes in traffic flow and composition on an unaltered highway.

b. In the long term comparison between 2030 and 2045 the magnitude of the noise change reduces to:

i. Negligible Impact above a SOAEL in the daytime at 158 of these receptors, remaining at Minor above a SOAEL for only 5 of the receptors.

ii. Negligible Impact above a SOAEL in the night-time at 297 of these receptors, remaining at Minor above a SOAEL for only 2 of the receptors.

iii. In the future year baseline comparison between 2030 and 2045 without the Project, the magnitude of the noise change along the A229 corridor is a Negligible/No change Impact.

12.6.192 Detailed consideration of the specifics of the A229 corridor concludes the following with regard to potential mitigation options:

a. The links have a speed limit below 75km/h and as such this limits the use of low noise surfacing as an effective measure to reduce noise to below a SOAEL.

b. The nature of the properties impacted present dwellings fronting onto the road with countryside views, which would limit the use of barrier options along the road without introducing the potential for visual and access impacts.

c. Restrictions of Speed: as a result of the nature of road traffic noise generation, and the intrinsic link between speed and percentage of heavy vehicles, as a result of the increase in heavy vehicles on the link a restriction to speed would effectively increase the noise generation on the link. As such speed restrictions alone in this context would not aid the situation.

d. Restriction to Heavy Vehicles: limiting heavy vehicle use of the routes, thus reducing the increase in heavy vehicles would translate into a direct reduction in the generated road traffic noise. However, on the A229 corridor there are a number of businesses based along the route which use the road. A restriction on the use of the road by heavy vehicles would compromise existing businesses.

12.6.193 There are reported to be **106 indirect significant beneficial effects** above a SOAEL along the affected unaltered traffic links outside of bypassed area. These occur along the M20 corridor, Brentwood Road/A128, B1007 Knott Hill/Lower Dunton Road and Longfield Road, presenting:

a. 20 dwellings that report a beneficial impact during the daytime and night-time periods.

b. 62 dwellings that report a beneficial impact during the daytime period only.

c. 24 dwellings that report a beneficial impact during the night-time period only.

12.6.194 Of the 106 impacts listed above, 30 are Moderate beneficial impacts, with the remaining being Minor beneficial impacts. Therefore, there are concluded to be **106 significant beneficial effects** above a SOAEL as an indirect result of the Project.

Noise Important Areas – Project-wide

12.6.195 Table 12.57 presents the predicted change in road traffic noise levels in the short term in the opening year of 2030, with the specified mitigation implemented into the Project design. It should be noted that magnitude of impact and significant effects at these receptors have already been reported within the previous section and that the magnitude of change presented is with regard to the NIA as a whole as required by DMRB LA 111 and NN NPS.

12.6.196 All 51 of the NIAs identified within the study area have been considered and are presented on Figure 12.3: Operational Road Traffic Noise Study Area (Application Document 6.2).

12.6.197 However, while a total of 51 NIAs are identified in the study area, all receptors in two of the identified NIAs would be demolished as a result of the Project:

a. NIA 5698 – receptors removed

b. NIA 5695 – receptors removed

Table 12.57 Short-term traffic noise impacts at NIAs with Project (DMOY versus DSOY)

NIA number	Road	Change in road traffic noise level	Description of impact and mitigation
NIAs within Order Limits			
5694	A1013	Negligible/no change	12 dwellings predicted to experience a negligible change in road traffic noise level, mitigated through low noise road surface
5696	A1013	Decrease	Four dwellings predicted to experience a moderate change in road traffic noise level, mitigated through low noise road surface
846	A2	Decrease	12 dwellings predicted to experience a moderate change in road traffic noise level, mitigated through low noise road surface
921	A2	Negligible/no change	368 dwellings predicted to experience a negligible change in road traffic noise level, mitigated through low noise road surface
5697	A1013	Decrease	Two dwellings predicted to experience a moderate change in road traffic noise level, mitigated through low noise road surface
5570	M25	Decrease	One dwelling predicted to experience a minor change in road traffic noise level, mitigated through low noise road surface
6019	A2	Negligible/no change	31 dwellings predicted to experience a negligible change in road traffic noise level, mitigated through low noise road surface

NIA number	Road	Change in road traffic noise level	Description of impact and mitigation
5571	B1421	Decrease	12 dwellings located west of M25 demolished as a result of Project, remaining three dwelling located east of M25 predicted to experience a minor change in road traffic noise level, mitigated through low noise road surface.
5695	B188	N/A	Dwellings within NIA demolished as a result of Project.
5698	A1013	N/A	Dwellings within NIA demolished as a result of Project.
NIAs outside of Order Limits			
5692	A1013	Negligible/no change	11 dwellings predicted to experience a negligible change in road traffic noise level
5975	A228	Increase	One dwelling predicted to experience a minor change in road traffic noise level. NIA is within noise study area but outside of Order Limits, so mitigation of road traffic noise would not be feasible within the context of sustainable development and the Project design as stated within paragraph 12.6.183
5992	A228	Increase	34 dwellings predicted to experience a minor change in road traffic noise level. NIA is within noise study area but outside of Order Limits, so mitigation of road traffic noise would not be feasible within the context of sustainable development and the Project design as stated within paragraph 12.6.183.
5993	A228	Increase	One dwelling predicted to experience a minor change in road traffic noise level. NIA is within noise study area but outside of Order Limits, so mitigation of road traffic noise would not be feasible within the context of sustainable development and the Project design as stated within paragraph 12.6.183.
5994	A228	Increase	60 dwellings predicted to experience a minor change in road traffic noise level. NIA is within noise study area but outside of Order Limits, so mitigation of road traffic noise would not be feasible within the context of sustainable development and the Project design as stated within paragraph 12.6.183
6007	A228	Increase	Four dwellings predicted to experience a minor change in road traffic noise level. NIA is within noise study area but outside of Order Limits, so mitigation of road traffic noise would not be feasible within the context of sustainable development and the Project design as stated within paragraph 12.6.183.
6011	A228	Increase	140 dwellings predicted to experience a minor change in road traffic noise level. NIA is within

NIA number	Road	Change in road traffic noise level	Description of impact and mitigation
			noise study area but outside of Order Limits, so mitigation of road traffic noise would not be feasible within the context of sustainable development and the Project design as stated within paragraph 12.6.183.
6012	A228	Increase	Three dwellings predicted to experience a minor change in road traffic noise level. NIA is within noise study area but outside of Order Limits, so mitigation of road traffic noise would not be feasible within the context of sustainable development and the Project design as stated within paragraph 12.6.183.
12245	A228	Increase	Three dwellings predicted to experience a minor change in road traffic noise level. NIA is within noise study area but outside of Order Limits, so mitigation of road traffic noise would not be feasible within the context of sustainable development and the Project design as stated within paragraph 12.6.183.
14636	A228	Increase	14 dwellings predicted to experience a minor change in road traffic noise level. NIA is within noise study area but outside of Order Limits, so mitigation of road traffic noise would not be feasible within the context of sustainable development and the Project design as stated within paragraph 12.6.183.
13480	A1013	Negligible/no change	32 dwellings predicted to experience a negligible change in road traffic noise level
5700	A13	Decrease	Two dwellings predicted to experience a minor change in road traffic noise level.
5699	A13	Decrease	Two dwellings predicted to experience a minor change in road traffic noise level.
5567	M25	Decrease	20 dwellings predicted to experience a minor change in road traffic noise level
5957	A282	Decrease	18 dwellings predicted to experience a minor change in road traffic noise level.
5962	M20	Negligible/no change	30 dwellings predicted to experience a negligible change in road traffic noise level
5963	M20	Negligible/no change	Two dwellings predicted to experience a negligible change in road traffic noise level
6261	M20	Negligible/no change	Five dwellings predicted to experience a negligible change in road traffic noise level
13463	A128	Decrease	Six dwellings predicted to experience a minor change in road traffic noise level.
13479	A128	Negligible/no change	Two dwellings predicted to experience a negligible change in road traffic noise level

NIA number	Road	Change in road traffic noise level	Description of impact and mitigation
5693	A1089	Negligible/no change	One dwelling predicted to experience a negligible change in road traffic noise level
5565	A13	Negligible/no change	12 dwellings predicted to experience a negligible change in road traffic noise level
5566	A13	Negligible/no change	10 dwellings predicted to experience a negligible change in road traffic noise level
927	A206	Negligible/no change	12 dwellings predicted to experience a negligible change in road traffic noise level
1219	A2	Negligible/no change	257 dwellings predicted to experience a negligible change in road traffic noise level
1220	A2	Negligible/no change	109 dwellings predicted to experience a negligible change in road traffic noise level
6265	A2	Negligible/no change	Two dwellings predicted to experience a negligible change in road traffic noise level
5958	A2	Negligible/no change	10 dwellings predicted to experience a negligible change in road traffic noise level
5959	A2	Negligible/no change	21 dwellings predicted to experience a negligible change in road traffic noise level
5960	A2	Negligible/no change	One dwelling predicted to experience a negligible change in road traffic noise level
924	B262	Negligible/no change	Two dwellings predicted to experience a negligible change in road traffic noise level
1121	A2	Negligible/no change	2369 dwellings predicted to experience a negligible change in road traffic noise level
5680	A127	Negligible/no change	Four dwellings predicted to experience a negligible change in road traffic noise level
5964	A20	Negligible/no change	25 dwellings predicted to experience a negligible change in road traffic noise level
5965	A20	Negligible/no change	10 dwellings predicted to experience a negligible change in road traffic noise level
5966	M26	Negligible/no change	One dwelling predicted to experience a negligible change in road traffic noise level
5974	A228	Negligible/no change	Four dwellings predicted to experience a negligible change in road traffic noise level
6020	M2	Negligible/no change	243 dwellings predicted to experience a negligible change in road traffic noise level
6272	M20	Negligible/no change	11 dwellings predicted to experience a negligible change in road traffic noise level
13483	A126	Negligible/no change	68 dwellings predicted to experience a negligible change in road traffic noise level
13489	A20	Negligible/no change	32 dwellings predicted to experience a negligible change in road traffic noise level

12.6.198 As detailed within Table 12.57, it is evident that none of the NIAs within the study area that fall within the Order Limits, are demonstrated to result in any level of adverse change in road traffic noise. This is due to the implementation of low noise surfacing and the demolishment of dwellings within two NIA's as a result of the Project.

12.6.199 NIAs within the operational road traffic noise study area that are outside of the Order Limits are shown to, at worst, result in minor adverse changes in road traffic noise as a result of changes in traffic flow patterns resulting from the Project. As these are outside of the Order Limits, and not as a direct result of road traffic noise generated by the Project, physical mitigation is not feasible. In addition, and outside of the scope of the Project, these NIAs would be mitigated through the mechanisms already in place by National Highways including relevant noise action plans.

Noise Insulation Regulations assessment

12.6.200 A Noise Insulation Regulations assessment has been carried out using the predicted noise levels from the operational noise assessment and is presented in Appendix 12.7: Noise Insulation Regulations Assessment (Application Document 6.3).

12.6.201 The results of the Noise Insulation Regulations assessment based upon the current Project design and traffic data indicate no residential dwellings are expected to meet all of the required criteria, and therefore no dwellings qualify under the scheme.

12.6.202 A final assessment and verification of possible eligibility under the Regulations will be undertaken within the first year of the Project opening.

Operational road traffic vibration

12.6.203 The new road surface would be constructed in accordance with the Manual of Contract Documents for Highway Works, Volume 1, Specification for Highway Works, Series 700 Road Pavements – General (Highways Agency, 2016), which would ensure any surface irregularities would not be permitted, resulting in a smooth road surface.

12.6.204 TRL RR 246 (TRL Limited, 1990) provides a methodology for predicting peak particle velocity (PPV), accounting for surface irregularity, speed and a ground scaling factor to account for geology. The following formulae calculates the maximum PPV at a building foundation:

$$PPV = 0.028 \times A \times (V/48) \times T \times P \times (R/6)^{x}$$

12.6.205 Where:

a. *A is the maximum height or depth of the surface defect in mm.*

b. *V is the maximum expected speed of HGVs in km/h.*

c. *T is the ground scaling factor.*

d. *P where the surface defect occurs in one wheel path = 0.75, otherwise P =1.*

e. *R is the distance of the foundation from the defect in metres.*

f. *X is the power factor for the most appropriate soil type.*

12.6.206 As a result of compliance with Series 700 Road Pavements – General (Highways Agency, 2016), the Project will not present any surface irregularities, so factor 'A' would be 0mm. This would mean that the calculation carried out to predict road traffic induced ground-borne vibration would result in a value of 0mm/s.

12.6.207 Therefore, ground-borne vibration impacts from road traffic movements on the Project would have a negligible magnitude of impact, resulting in effects that are **not significant**.

12.6.208 In 2018, National Highways (then known as Highways England) commissioned a report entitled 'Effects of Vibration from Road Traffic' which is included as Appendix 12.9 (Application Document 6.3). It is noted that the scope of the report was to consider if the assertion that there are no impacts from operational vibration is valid and to provide assurance that the issue can be scoped out of assessments, as advised under DMRB LA 111.

12.6.209 The study concluded that the '*measurement results from the location adjacent to the carriageway* [10m from the A20 southbound carriageway] *were well below perceptible levels, supporting the conclusions of the literature review in the first part of this task, that under "normal conditions" ground-borne vibration may be scoped out of assessment*'. Furthermore, the report concluded that '*ground-borne vibration from road traffic within tunnels for receptors located above a tunnel is unlikely to result in disturbance for receptors*'. It is noted, however, that the Project tunnel does not pass directly under any residential receptors or OSRs.

12.6.210 The measurement results presented within the report were concluded to provide sufficient evidence that ground-borne vibration from operational road traffic activities is not a significant effect under 'normal conditions', with these defined as '*a road with free-flow traffic conditions and where the road surface is smooth and continuous*'.

12.6.211 This is the case for the Project where it runs very close to any receptors, with no receptors identified anywhere along the Project route within 10m of the carriageway. Within the scope of the study, no vibration was recorded at the 10m distance to exceed 0.3mm/s, with the majority of the levels monitored to be below 0.05mm/s.

12.6.212 The information contained within Appendix 12.4: Construction Noise and Vibration Assessment (Application Document 6.3) confirms the assertions made within this Chapter that operational ground-borne vibration associated with the Project would result in effects that are **not significant**.

Operational ventilation assessment

12.6.213 Table 12.58 presents the results of the tunnel ventilation assessment, considered in accordance with BS 4142. A full detailed assessment of operational tunnel ventilation noise is presented in Appendix 12.2: Operational Ventilation Noise Assessment: South Portal and Appendix 12.3: Operational Ventilation Noise Assessment: North Portal (Application Document 6.3).

Table 12.58 Tunnel ventilation noise assessment

Receptor ID	Receptor description	Background sound level (dB L_{A90})		Rating level (dB(A))	Difference (rating level minus background)	
		Day	Night		Day	Night
North Portal						
Norrsken	Nearest residential property group	34	31	25	-9	-6
Buckland	Nearest residential property group	34	31	27	-7	-4
South Portal						
Three Points	Nearest residential receptor to the south-west	41	32	25	-16	-7
73/75 Thong Lane	Nearest residential receptor to the west	41	32	27	-14	-5
Polperro	Nearest residential receptor to the north-west	41	32	28	-13	-4
Viewpoint Place	Nearest residential receptor to the north	41	32	32	-9	0
16/18 Church Lane	Nearest residential receptor to the north-east	41	32	31	-10	-1
Keats House	Nearest residential receptor to the east	41	32	24	-17	-8

12.6.214 The predicted rating levels from the tunnel ventilation system for both daytime and night-time periods are below or equal to the existing background sound levels. This indicates that the tunnel ventilation would not have a significant impact on identified sensitive receptors.

12.6.215 Based on the assessment presented in Table 12.58, noise impacts from the tunnel ventilation system would have a negligible magnitude of impact, resulting in a neutral significance of effect.

12.6.216 The predicted impact is considered to be significantly below a SOAEL criteria and therefore **not a significant effect**.

Operational National Grid electricity transmission network

12.6.217 Assessment has been undertaken of the likely operational audible noise impacts of the proposed permanent diversion of four National Grid Electricity Transmission (NGET) high voltage (HV) overhead transmission lines (OHLs).

12.6.218 The sections of OHL that will be considered are defined in Appendix 12.8 and include:

a. Alignment 1: The ZB 275kV OHL between ZB026 west of Orsett to ZB019 north of Orsett Heath (Work No. OH7).

b. Alignment 2: The YYJ 400kV OHL between YYJ116 east of Chafford Hundred and YYJ119 north of Orsett Heath (Work No. OH6).

c. Alignment 3: The ZJ 400kV OHL between ZJ012 and ZJ010 near East Tilbury (Work No. OH4).

d. Alignment 4: The 4YN 400kV OHL between 4YN046 near Riverview Park and 4YN051 near the A2 dual carriageway (Work No OH1).

12.6.219 Table 12.59 presents the results of the electricity transmission network noise assessment, considered in accordance with the 3 Tier methodology for the consideration of OHL noise as set out in National Grid Policy Statement PS(T)134 (Section 12.3).

Table 12.59 National Grid electricity transmission network noise assessment

National Grid Policy Statement PS(T)134 Tier Stage	Assessment of OHL Noise		
	Alignment 1 and 2	**Alignment 3**	**Alignment 4**
TIER 1 Screening: Worst Case Wet noise assessment	All 15 receptors considered in the vicinity of these Alignments exceed the Tier 1 Noise Criteria for Residential, School and Hotel receptors **Conclusion: Further Assessment Necessary proceed to Tier 2 assessment**	All 3 receptors considered in the vicinity of this Alignment exceed the Tier 1 Noise Criteria for Residential receptors **Conclusion: Further Assessment Necessary proceed to Tier 2 assessment**	All 12 receptors considered in the vicinity of this Alignment exceed the Tier 1 Noise Criteria for Residential receptors **Conclusion: Further Assessment Necessary proceed to Tier 2 assessment**
TIER 2 Screening: Combined Wet and Dry Noise assessment	All 15 receptors considered in the vicinity of these Alignments are below the Tier 2 Noise Criteria for Residential, School and Hotel receptors when account is taken for the number of hours of rainfall based upon Met Office historical rainfall data (<450 hours rainfall per year) **Conclusion: No Adverse Impact expected, receptors Screened out of further consideration.**	All 3 receptors considered in the vicinity of this Alignment are below the Tier 2 Noise Criteria for Residential, receptors when account is taken for the number of hours of rainfall based upon Met Office historical rainfall data (<450 hours rainfall per year) **Conclusion: No Adverse Impact expected, receptors Screened out of further consideration.**	All 12 receptors considered in the vicinity of this Alignment are below the Tier 2 Noise Criteria for Residential, receptors when account is taken for the number of hours of rainfall based upon Met Office historical rainfall data (<450 hours rainfall per year) **Conclusion: No Adverse Impact expected, receptors Screened out of further consideration.**

National Grid Policy Statement PS(T)134 Tier Stage	Assessment of OHL Noise		
	Alignment 1 and 2	**Alignment 3**	**Alignment 4**
Tier 3: Detailed Assessment to BS 4142:2014 (+A1: 2019)	TIER 3 Assessment not required	TIER 3 Assessment not required	TIER 3 Assessment not required

12.6.220 In conclusion, of the 30 receptor locations assessed, none would experience an adverse impact due to noise from the realigned OHL sections. The predicted OHL noise levels would be below the Tier 2 'No Adverse Impact' criteria at all identified noise sensitive receptors.

12.6.221 Based on the assessment presented in Table 12.59 and the supporting information within Appendix 12.8: National Grid Electricity Transmission Network, Assessment for Audible Noise (Application Document 6.3), noise impacts due to the realignment of the high voltage overhead line transmission network would **not constitute a significant effect**.

National policy compliance

12.6.222 In accordance with the requirements of NPSE, paragraph 5.195 of the NPSNN, paragraph 5.11.9 of the NPS EN-1 and requirements of the DMRB LA 111, 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:

a. Aim 1: Avoid significant adverse impacts on health and quality of life from noise as a result of the new development.

b. Aim 2: Mitigate and minimise other adverse impacts on health and quality of life from noise from the new development.

c. Aim 3: Contribute to improvements to health and quality of life through the effective management and control of noise, where possible.

12.6.223 Sustainable development provision as set out in the NPPF, which defines the achievement of such within the planning system in accordance with 3 over arching objectives, delivered through the "*preparation and implementation of plans and the application of the policies*". The NPPF states that these 3 objects are "*interdependent and need to be pursued in mutually supportive ways*":

a. *An economic objective; to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure*

b. *A social objective; to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being*

c. *An environmental objective. to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.*

12.6.224 Within the Explanatory Note to the NPSE it is noted that "*Sustainable development is a core principle underpinning all government policy. For the UK Government the goal of sustainable development is being pursued in an integrated way through a sustainable, innovative and productive economy that delivers high levels of employment and a just society that promotes social inclusion, sustainable communities and personal wellbeing. The goal is pursued in ways that protect and enhance the physical and natural environment, and that use resources and energy as efficiently as possible*".

12.6.225 The NPSE sets out a requirement to consider the economic and social benefits of a scheme, including a requirement for consideration of the impact of noise on health and quality of life. However, the NPSE specifically states that this action should "*avoid noise being treated in isolation in any particular situation, i.e. not focussing solely on the noise impact without taking into account other related factors*".

12.6.226 As such in the consideration of compliance with UK Policy on noise, the overarching objectives in the definition of sustainable development from within the NPSNN, the NPPF and the NPSE have been accounted for.

12.6.227 It is specifically noted that in terms UK noise Policy the aims are tied to health and quality of life; and as such significant adverse noise effects only occur above a SOAEL (considered under Aim 1), with adverse effects occurring between LOAEL and a SOAEL (considered under Aim 2).

Construction

12.6.228 Adverse effects associated with the construction of the Project have been identified as reported within the relevant sections of this chapter.

a. Aim 1: Through design, the Project has sought to avoid significant adverse impacts on sensitive receptors within the study area, which represent the closest and potentially worst-affected receptors to the Project. This has been carried out where possible through key considerations including locating compounds further away from sensitive receptors, keeping the Project low in the environment, placing the main alignment where possible in a position to optimise separation distances to activities, restricting evening earthworks sites, restricting the duration of overnight construction works and removing all overnight construction traffic movements on the surrounding highways.

   Based upon the information used for this assessment, it has been reasonably concluded that the significant adverse impacts on health and quality of life would be avoided through the implementation of BPM and other specifically identified mitigation strategies, secured under REAC Ref.

NV001 to NV010, NV015 and NV017. This is concluded to be acceptable in the context of sustainable development defined under the NNNPS, NPPF and NPSE, as a result of the practicalities and complexities of construction. These secured controls would avoid and mitigate significant adverse impacts on health and quality of life in accordance with the UK Policy. On this basis, it is considered that the first aim is met during construction.

b. Aim 2: Measures implemented to accord with the requirements of Aim 1 would also provide accordance with the requirements of Aim 2, which is to 'mitigate and minimise' adverse effects occurring between LOAEL and SOAEL.

The control measures secured under REAC Ref. NV001 to NV010, NV015 and NV017, are concluded to be acceptable to control adverse impacts on health and quality of life occurring between LOAEL and SOAEL in the context of sustainable development. Controls have been implemented to avoid and mitigate adverse impacts on health and quality of life; and as such it is considered that Aim 2 is also met during construction.

c. Aim 3: By virtue of the nature of construction activities, the potential to 'improve' quality of life is limited during construction works; however, it should be noted that construction activities associated with the Project are temporary in nature. As such, it is concluded that the requirements of Aim 3 in this instance are not possible to achieve in association with the construction of the Project; however, this should be viewed in the context of the NPSE which qualifies that Aim 3 is only applicable 'where possible'.

Operation

12.6.229 Adverse effects associated with the operation of the Project have been identified and are reported within the relevant sections of this chapter.

a. Aim 1: In accordance with UK Policy, through design, the Project has sought to avoid significant adverse impacts occurring above a SOAEL at noise sensitive receptors. This has been carried out where possible through key considerations including keeping the Project low in the environment, placing the main alignment where possible in a position to optimise separation distances, and through a detailed scheme of mitigation.

In an attempt to avoid significant adverse impacts above a SOAEL, a detailed mitigation strategy for the operational phase is secured through controls inherent within the REAC, specifically NV011, NV013 and NV014. Even though mitigation has been implemented as part of the Project, as embedded, good practice and essential (Section 12.5), significant effects above a SOAEL have not been completely avoided and within the Project, there remain receptors where significant effects above a SOAEL are predicted:

i. The Project results in 2 significant adverse effects above a SOAEL during the night-time as a direct result of road traffic noise generated by the new alignment.

ii. Outside of the direct influence of the new alignment, along existing routes affected by changes in traffic flow and composition, the Project results in 854 significant adverse effects above a SOAEL during either the daytime or night-time periods. These are predicted to occur along Henhurst Road (6 dwellings), the A228 Corridor between the M2 and M20 (551 dwellings) and the A229/Rochester Road Corridor between the M2 and M20 (297 dwellings).

However, due to the scale and nature of the Project, avoiding all significant adverse effects was not possible when considering the principles of sustainable development, and for the reasons as detailed in paragraphs 12.6.115 (Henhurst Road), 12.6.125 (Brook Farm Cottages), 12.6.183, (A228 Corridor) and 12.6.192 (A229 Corridor). Therefore, based upon the reasons quoted and within the context of Government policy on sustainable development the Project is considered to be in accordance with the requirements of Aim 1.

b. Aim 2: Within the design of the Project, substantial amounts of groundworks, including bunds, false cuttings and cuttings are combined with specific acoustic mitigation in the form of Thin Surfacing System and acoustic fencing provision. This was designed in association with other environmental topics and considering engineering factors to avoid new significant impacts and ensure buildability as detailed within Section 12.5. These measures were designed and implemented to reduce the environmental impact of the Project along the length of the alignment.

Therefore, through the mitigation proposed (secured through the REAC, specifically NV011, NV013 and NV014), and in achieving the requirements of Aim 1 to avoid significant adverse impacts above a SOAEL, the design also minimises adverse impacts of the Project occurring between LOAEL and a SOAEL along the alignment, and so by proxy achieves the requirements of Aim 2. On this basis, it is concluded that the second aim is met during operation.

c. Aim 3: Through the implementation of the Project, road traffic noise at receptors near the bypassed existing road network would be reduced and therefore presents both significant beneficial effects above a SOAEL, and beneficial effects between LOAEL and a SOAEL; and therefore presents significant beneficial and beneficial effects on health and quality of life.

This specifically relates to receptors near sections of the M25, the A282, the A13 and the A2 as traffic flow patterns change following vehicles diverting onto the Project. Across the whole operational noise study area of 94,707 dwellings there are predicted to be more dwellings that would experience a decrease in road traffic noise as a result of the Project than an increase:

i. 167 less dwellings above a SOAEL during the daytime;

ii. 366 less dwellings above a SOAEL during the night-time; and,

In addition, a number of the dwellings detailed to present these significant beneficial effects occur within 10 identified NIAs.

Therefore, it is concluded that the requirements of Aim 3 are achieved and the Project results in beneficial impacts on health and quality of life recognised.

12.6.230 Based on the assessments presented within the scope of this chapter, it can be concluded that, through implementing the identified mitigation, the Project would meet the aims of the NPSNN, defined within the context of Government policy on sustainable development in relation to noise. These are defined around the principles of avoiding significant impacts on health and quality of life, and mitigating adverse impacts to a minimum in the context of sustainable development.

12.7 Cumulative effects

Intra-project effects

12.7.1 Cumulative effects of the Project can occur as a result of interrelationships between different environmental topics, which are referred to as 'intra-project effects'. For noise and vibration, interrelationships are identified with cultural heritage (Chapter 6), landscape and visual (Chapter 7), terrestrial biodiversity (Chapter 8) and population and human health (Chapter 13) and are summarised below:

a. Cultural heritage – effects on heritage assets as a result of increased audibility of the Project during construction and operational phases and impacts resulting from ground-borne vibration during construction activity.

b. Landscape and visual – effects on landscape and visual receptors as a result of increased audibility of the Project during construction and operational phases resulting in effects on perceived tranquillity within the study area.

c. Terrestrial biodiversity – disturbance to species, including some that form qualifying features of designated sites.

d. Population and human health – effects arising from changes in noise levels are also a consideration within the assessment of human health undertaken within the Health and Equalities Impact Assessment (Application Document 7.10).

12.7.2 The above interrelationships have been considered as part of the assessments reported in the respective topic chapters. Noise and vibration effects have been considered as part of the assessment of intra-project effects on residential receptors reported in Chapter 16: Cumulative Effects Assessment.

Inter-project effects

12.7.3 In addition to intra-project effects, cumulative effects can also occur due to the Project in combination with other existing and proposed developments. These are known as 'inter-project' effects and are considered separately in Chapter 16: Cumulative Effects Assessment.

12.7.4 Cumulative construction noise effects would be localised to within 300m of the activities being undertaken within the Project at the time. The locations of potential cumulative developments are shown on Figure 16.2: Developments in the Cumulative Shortlist (Application Document 6.2).

12.7.5 The traffic forecasts include traffic growth associated with future developments as explicitly contained within the Project's Uncertainty Log (produced in line with TAG Unit M4 (Department for Transport, 2019), and as set out within Appendix C: the Transport Forecasting Package of the ComMA (Application Document 7.7) and more widely in line with growth forecast by the Department for Transport within the National Trip End Model. Traffic data used in the assessment of noise accounts for traffic generated by developments that are already under construction, have planning consent, the development application is within the consent process or planning consent is imminent. Developments included are listed in the Uncertainty Log, which is provided in Appendix C: Transport Forecasting Package of the ComMA (Application Document 7.7). In accordance with the Planning Inspectorate's (2019) Advice Note Seventeen: Cumulative Effects Assessment, no additional cumulative assessment of these aspects is required. Developments not included in the transport model have been assessed for inter-project noise and vibration effects and reported in Chapter 16.

12.8 Monitoring

12.8.1 The findings of this chapter have concluded that there would be some environmentally significant effects as a result of the Project. Where this is the case, in line with DMRB LA 111, the following monitoring and evaluation would be implemented.

Construction

12.8.2 With regard to construction monitoring, Section 4 of DMRB LA 111 (National Highways, 2020a) states the following:

'Likely significant environmental effects from noise and/or vibration during construction shall be monitored.

12.8.3 *Monitoring of likely significant effects should include one or more of the following:*

a. *verification that specific noise and vibration mitigation measures are in place for activities where there is potential for likely significant effects to occur in their absence;*

b. *measurement of noise and/or vibration;*

c. *checking that noise and vibration management procedures and practices are sufficient to ensure that adverse effects are no worse than set out in the assessment report.*'

12.8.4 This would be agreed as part of the REAC commitments NV009: Noise and Vibration Monitoring.

Operation

12.8.5 With regard to operational monitoring, Section 4 of DMRB LA 111 (National Highways, 2020a) states the following:

'Likely significant environmental effects from noise during operation shall be monitored and include:

a. *ensuring mitigation measures included with the project design are incorporated with the as-built project. Where they are not included, ensuring resultant noise levels, taking account of any additional mitigation installed but not included in the assessed design, are no higher than set out in the project assessment;*

b. *ensuring specifications of noise mitigation measures, including barriers and low noise surfaces, meet design specifications.*'

12.8.6 However, DMRB LA 111 notes the following:

'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, this is due to the following reasons: 1) the assessment is based on annual average conditions with and without the project to ensure a like-for-like comparison, which is not possible to replicate through monitoring within a reasonable timescales; 2) monitoring in the absence of the project would need to be completed before the start of the construction works, and would therefore be a number of years before the with-scheme monitoring and the assessment completed for the environmental statement is based on calculated road traffic noise levels, whereas ambient noise monitoring can be affected by other noise sources such as people, agricultural activities, military activities, aircraft etc.'

12.8.7 While, for the reasons outlined in paragraph 12.8.5, physical monitoring of noise levels as a means of verification will not be undertaken as part of the Project, the performance specification of specific operational mitigation measures would be confirmed at preopening stage. This would consider issues such as the following:

a. Visual surveys to ensure that mitigation secured through REAC Ref. NV011 are implemented appropriately and correctly onsite (length, height and position), and fitment is to a good quality of workmanship.

b. Review of installation specifications (Highway Authority Product Approval Scheme Certification, sound reduction index performance certification) to ensure the performance assumptions in the ES assessment, secured under REAC commitment NV013, are achieved by the products installed onsite, including consideration of deterioration.

c. Ongoing maintenance and upkeep of acoustic mitigation measures to ensure that performance does not deteriorate outside of allowable tolerances from DMRB LD 119 (National Highways, 2020e) through ongoing maintenance programmes associated with the Project.

12.8.8 On this basis, following the consideration of the above, no further monitoring of mitigation is proposed.

12.9 Summary

Construction

12.9.1 An assessment of temporary construction noise and vibration impacts has been undertaken following the guidance contained within BS 5228-1, BS 5228-2 and DMRB LA 111. Table 12.60 provides a summary of all predicted construction impacts in this chapter, taking into account the Project design and mitigation set out in Section 12.5.

Table 12.60 Construction noise and vibration summary

Impact Description	Mitigation	Magnitude	Effect	Significance
Construction Noise Impacts	During the construction of the Project, through the implementation of BPM (REAC Ref. NV001 to NV010 and NV015) and site-specific noise controls agreed with local planning authorities, noise from all programmed activities would be mitigated as far as reasonably practicable	Negligible to minor 140 NSRs – day 140 NSRs – eve 140 NSRs – night	**Adverse/ neutral**	**Not significant**
Construction road traffic noise impacts	During the construction of the Project, through the implementation of BPM (REAC (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2) and other specific noise controls agreed with local planning authorities, noise during the six years of	No change to minor 2025 – 4,118 dwellings and 14 OSRs 2026 – 4,345 dwellings and 18 OSRs	Adverse/ neutral	**Not significant**

Impact Description	Mitigation	Magnitude	Effect	Significance
	construction would be mitigated as far as reasonably practicable.	2027 – 4,307 dwellings and 18 OSRs 2028 – 4,136 dwellings and 17 OSRs 2029 – 4,353 dwellings and 18 OSRs 2030 – 4,355 dwellings and 19 OSRs		
		Moderate to major 2025 – 237 dwellings and 5 OSRs 2026 – 10 dwellings and 1 OSR 2027 – 48 dwellings and 1 OSR 2028 – 219 dwellings and 2 OSRs 2029 – 2 dwellings and 1 OSR 2030 – 0 dwellings and 0 OSRs	**Adverse**	**Significant**
Construction road traffic noise diversion route impacts	During the construction of the Project, through the implementation of BPM (REAC (Section 7 of the CoCP (Application Document 6.3, Appendix 2.2) and other specific noise controls agreed with local planning authorities, noise during the six years of construction would be mitigated	No change to minor Diversion route: RSTM25 RNTM52 RNTM104	Adverse/ neutral	**Not significant**

Impact Description	Mitigation	Magnitude	Effect	Significance
	as far as reasonably practicable.	Moderate to major Diversion route: RNTM58 (206) RNTM38 (185) RNTM20 (185)	**Adverse**	**Significant**
Construction Vibration Impacts – percussive piling	During the construction of the Project, with the implementation of BPM techniques associated with Percussive Piling activities within 65m of receptors secured through the CoCP (REAC (Section 7 of CoCP (Application Document 6.3, Appendix 2.2).	Minor or less; or moderate for less than 10 days duration 29 VSRs	Adverse/ neutral	**Not significant**
		Moderate or greater for more than 10 days duration 15 VSRs	Adverse	**Significant**
Construction Vibration Impacts – vibratory piling	During the construction of the Project, with the implementation of BPM including vibratory piling techniques associated with Vibratory Piling activities within 45m of receptors secured through the CoCP (REAC (Section 7 of CoCP (Application Document 6.3, Appendix 2.2).	Minor or less; or moderate for less than 10 days duration 41 VSRs	Adverse/ neutral	**Not significant**
		Moderate or greater for more than 10 days duration 3 VSRs	Adverse	**Significant**

Impact Description	Mitigation	Magnitude	Effect	Significance
TBM Impacts	During the construction of the Project, through the implementation of BPM (REAC Ref. NV001 to NV010 and NV015) and site-specific noise controls agreed with local planning authorities, noise from all programmed activities would be mitigated as far as reasonably practicable	Negligible (six receptors)	Neutral	**Not significant**

Operation

12.9.2 An assessment of permanent operational road traffic noise has been undertaken in accordance with DMRB LA 111, which has considered road traffic noise impacts in both the short term and long term, 15 years after opening. Table 12.61 provides a summary of all the predicted operational impacts in this chapter, taking into account the Project design and mitigation set out in Section 12.5.

Table 12.61 Operational noise and vibration summary

Receptors	Impact description	Magnitude	Effect	Significance
Project-wide	NSRs experiencing a noise change (increase) relating to changes in road traffic noise along the Project. However, in accordance with UK policy on noise, these have been mitigated as far as reasonably practicable	Moderate or greater change in road traffic noise during daytime period (49 NSRs and 1 OSR) • St Aidan's Church (Place of Worship)	Adverse	**Significant**
		Moderate or greater change in road traffic noise during daytime and night-time periods (428 NSRs)	Adverse	**Significant**
		Minor change above a SOAEL during the night-time period (487 NSRs)	Adverse	**Significant**
		Minor change above an SOAEL during the daytime period (6 NSRs)	Adverse	**Significant**
		Minor change above an SOAEL during the daytime and night-time period (355 NSRs)	Adverse	**Significant**
		Minor adverse impact below an SOAEL, determined to be significant as a result of likely perception of change by residents (106 NSRs)	Adverse	**Significant**

Receptors	Impact description	Magnitude	Effect	Significance
		Moderate or greater change in road traffic noise during daytime and night-time periods above a SOAEL (4 NSRs)	Adverse	**Significant**
		Moderate or greater change below a SOAEL during the daytime and Moderate or greater change above a SOAEL during the night-time (4 NSRs)	Adverse	**Significant**
	NSRs experiencing a noise change (neutral) relating to changes in road traffic noise along the Project.	Negligible/minor change in road traffic noise level	Neutral	**Not significant**
	NSRs experiencing a noise change (decrease) relating to changes in road traffic noise along the Project.	Moderate or greater change in road traffic noise during daytime period and minor change above an SOAEL during the night-time period (34 NSRs)	Beneficial	**Significant**
		Moderate or greater change in road traffic noise during daytime period (261 NSRs and 3 OSRs) • Harris Primary Academy (Primary School) • Thames Chase Forest Centre (Community Facility) • St. Lukes Hospice (Care Home)	Beneficial	**Significant**
		Moderate or greater change in road traffic noise during daytime and night-time periods (456 NSRs and 2 OSRs) • Baker Street Guest House (Hotel) • Inn on the Lake (Hotel)	Beneficial	**Significant**
		Minor change above an SOAEL during the night-time period (240 NSRs)	Beneficial	**Significant**
		Minor change above an SOAEL during the daytime period (62 NSRs)	Beneficial	**Significant**

Receptors	Impact description	Magnitude	Effect	Significance
		Minor change above an SOAEL during the daytime and night-time period (190 NSRs)	Beneficial	**Significant**
		Moderate or greater change in road traffic noise above a SOAEL during daytime period and minor change above an SOAEL during the night-time period (31 NSRs)	Beneficial	**Significant**
		Moderate or greater change in road traffic noise during the daytime and night-time above a SOAEL (23 NSRs)	Beneficial	**Significant**
		Moderate or greater change in road traffic noise below a SOAEL during daytime period and moderate change above a SOAEL during the night-time period (70 NSRs)	Beneficial	**Significant**
	Operational road traffic generated ground-borne vibration along the Project corridor and affected links	Negligible	Neutral	**Not significant**
Closest NSRs to portal buildings	Operational tunnel noise associated with static plant and equipment.	Negligible (eight NSRs)	Neutral	**Not significant**
Closest NSRs to OHL diversions	Change in overhead transmission network generated noise.	Negligible (30 NSRs)	Neutral	**Not significant**

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