Lower Thames Crossing

9.89 Responses to the Examining Authority's ExQ1 Appendix G – 11. Biodiversity (Part 5 of 6)

Infrastructure Planning (Examination Procedure) Rules 2010

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Lower Thames Crossing

9.89 Responses to the Examining Authority's ExQ1 Appendix G – 11. Biodiversity (Part 5 of 6)

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Annex S1 - 04 June 2020 Jetty Refurbishment Use and Decommissioning Paper

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Annex DD2 - 24 June 2021 Feedback received from Natural England

Annex EE - 12 February 2021 Technical Note - Habitat enhancement to maintain baseline functionality of functionally linked land

Annex FF - 23 February 2021 Technical Note - Habitat enhancement to maintain baseline functionality of functionally linked land (Revision 1)

Annex GG - 09 March 2021 Technical Note – Dust measures

Annex HH - 09 March 2021 Technical Note - Operational Noise & Visual Disturbance

Annex II - 09 March 2021 Technical Note - No LSE from Lighting Construction and Operation

Annex JJ - 13 April 2021 Technical Note - Construction Noise and Mitigation

Annex KK - 13 April 2021 Technical Note - Ramsar Surface Water Ecology Baseline (Construction surface water discharge)

Annex LL1 - 22 April 2021 Technical Note - Habitat enhancement to maintain baseline functionality of functionally linked land (Revision 2)

Annex LL2 - 28 July 2021 Feedback (partial) received from Natural England

Annex MM - 22 April 2021 Technical note - Iteration of the extent of functionally linked land

Annex NN - 12 May 2021 Technical Note - Ramsar Surface Water Ecology Baseline (Construction surface water discharge) Revision 1

Annex OO - 12 May 2021 Revised Technical Note - Dust measures (Revision 1)

Annex PP - 12 May 2021 Technical Note - No LSE from Lighting Construction and Operation

Annex QQ1 - 11 August 2021 HRA Evidence Technical Note Rev 0: Air Quality from vehicle emissions

Annex QQ2 - 03 December 2021 Feedback received from Natural England

**Annex G not used*

Annex QQ1 11 August 2021 HRA Evidence Technical Note Rev 0: Air Quality from vehicle emissions

Lower Thames Crossing

6.5 Habitats Regulations Assessment - Statement to Inform an Appropriate Assessment

APFP Regulation 5(2)(g)

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

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6.5 Habitats Regulations Assessment - Statement to Inform an Appropriate Assessment

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1 Executive summary

1.1 Introduction

1.1.1 Highways England (the Applicant) has submitted an application under section 37 of the Planning Act 2008 for an order to grant development consent for the A122 Lower Thames Crossing (the Project).

1.1.2 A Habitats Regulations Assessment (HRA) refers to the stages of assessment which must be undertaken in accordance with the Conservation of Habitats and Species Regulations 2017 (as amended), in circumstances where the plan or project that is not directly connected with or necessary to the management of a European site is likely to have a significant effect on that site.

1.1.3 This document comprises the Habitats Regulations Assessment that reports the results of the Stage 1 Screening, determining the likely significant effects on European sites, and the Stage 2 Appropriate Assessment, assessment of adverse effects on the integrity of a European site(s) as a result of the Project.

1.1.4 This HRA has been completed primarily using the standard described within Design Manual for Roads and Bridges (DMRB) LA 115 Habitats Regulations Assessment (Highways England, et al., 2020a), which sets out the requirements for assessment and reporting of the implications, from construction, operation and maintenance of highways and/or road projects on European sites. These assessments are compatible with and incorporate relevant guidance from Natural England and the Planning Inspectorate's Advice Notes.

1.2 European sites identified

1.2.1 The screening process identified the following European sites with the potential to be affected by the Project (see Figure 1):

a. Thames Estuary and Marshes SPA and Ramsar
b. Medway Estuary and Marshes SPA and Ramsar
c. The Swale SPA and Ramsar
d. Epping Forest Special Area of Conservation (SAC)
e. North Downs Woodland SAC

1.3 European sites: no likely significant effect (LSE)

1.3.1 Table 1.1 shows the European sites and potential effect pathways that were identified and assessed with a conclusion of no LSE as a result of the Project alone and in-combination.

PLACEHOLDER - The AQ modelling to predict the changes in nitrogen deposition as a result of operational vehicle emissions has not been completed for inclusion in this draft.

Table 1.1 European sites and potential effect pathways where no LSE identified

European site	Potential effect pathways
Thames Estuary and Marshes SPA and Ramsar	Change in air quality – dust emissions – construction Change in air quality – vehicle emissions – construction Change in air quality – vehicle emissions – operation Changes in groundwater quality and quantity – tunnel construction and operation Changes in surface water quality and quantity – operation Introduction/spread of Invasive Non-Native Species Changes in noise and vibration – tunnel construction only. Underwater and above ground Change in recreational pressure – construction and operation Changes in light levels – construction and operation Vehicle collision Utilities infrastructure collision Climate change

1.4 European sites: potential LSE

1.4.1 Table 1.2 shows the European sites and potential effect pathways that were identified and assessed with a conclusion that uncertainty remains as to whether or not LSE could occur as a result of the Project alone or in combination (see paragraphs 4.2.23 to 4.2.25) and these are considered in the Stage 2 Appropriate Assessment within this report.

PLACEHOLDER - The AQ modelling to predict the changes in nitrogen deposition as a result of operational vehicle emissions has not been completed for inclusion in this draft.

Table 1.2 European sites and effects where uncertainty on LSE remains

European site	Potential LSE
Thames Estuary and Marshes SPA and Ramsar	Reduction in habitat area as a result of land take in the terrestrial and aquatic environment (bird qualifying features supporting habitat) Changes in surface water quality and quantity – construction Disturbance to key species (bird qualifying features) as a result of changes in noise and vibration – construction works and vehicles, intertidal works only (outfall construction) Disturbance to key species (bird qualifying features) as a result of changes in visual disturbance - construction (people/machines in eyeline) Disturbance to key species (bird qualifying features) as a result of changes in noise and vibration and changes in visual disturbance (vehicles in eyeline) - operation

1.5 Mitigation measures

1.5.1 The Project has committed to the following mitigation measures to avoid and reduce the potential LSEs on the Thames Estuary and Marshes SPA and Ramsar identified:

a. RDWE033 sets the standard for water discharged to the Thames Estuary and Marshes Ramsar to avoid any changes in the receiving water.

b. HR004 and HR005 relate to noise attenuation barriers which minimise the changes in noise in the Thames Estuary and Marshes Ramsar and functionally linked land associated with the Thames Estuary and Marshes SPA and Ramsar.

c. HR001, HR002, HR005, HR006 relate to timing constraints on specific construction activities and avoid visual disturbance effects during the over wintering period within the Thames Estuary and Marshes Ramsar and functionally linked land associated with the Thames Estuary and Marshes SPA and Ramsar.

d. HR003 relates to timing constraints during severe winter weather and avoids effects on qualifying species using functionally linked land associated with the Thames Estuary and Marshes SPA and Ramsar.

e. Design Principle S9.13 and HR007 provide enhanced habitat areas to avoid and reduce the effect of habitat loss and disturbance within the functionally linked land associated with the Thames Estuary and Marshes SPA and Ramsar.

PLACEHOLDER – Further measures may be included once AQ modelling and assessment has been finalised.

1.6 Assessment of effect on integrity

1.6.1 The effects of the Project have been assessed against the conservation objectives of the Thames Estuary and Marshes SPA and Ramsar and were found not to undermine them. Consequently, the Project would not have an adverse effect on the integrity of these sites.

PLACEHOLDER - The AQ modelling to predict the changes in nitrogen deposition as a result of operational vehicle emissions has not been completed for inclusion in this draft. Once complete the final assessment of effect on integrity will be completed.

2 Introduction

2.1 Purpose of this document

2.1.1 The Applicant has submitted an application under Section 37 of the Planning Act 2008 for an order to grant development consent for the A122 Lower Thames Crossing project (the Project).

2.1.2 This document comprises the Habitats Regulations Assessment that reports the results of the Stage 1 Screening, determining the likely significant effects on European sites, and the Stage 2 Appropriate Assessment, assessment of adverse effects on the integrity of a European site(s) as a result of the Project.

2.1.3 This document is part of a suite of documents which accompanies the application to grant development consent. A full description of all the Application Documents is provided in the 'Introduction to the Application' (Application Document 1.3).

2.2 HRA process overview

2.2.1 The Conservation of Habitats and Species Regulations 2017 has recently been amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, however the wording of the regulations applicable to this assessment is unchanged. The legislation applicable to HRA assessment is hereafter referred to as the Habitats Regulations and any specific regulation referred to in this document is a reference to the relevant regulation in the Habitats Regulations.

2.2.2 A HRA required under Regulation 63(1) of the Habitats Regulations in certain circumstances. Regulation 63(1) provides as follows:

'A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which—

(a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects), and

(b) is not directly connected with or necessary to the management of that site,

must make an appropriate assessment of the implications of the plan or project for that site in view of that site's conservation objectives.'

2.2.3 The Project is not directly connected with or necessary to the management of a European site, and therefore Regulation 63(1) applies.

2.2.4 The HRA process is made up of several stages to fulfil the requirements of Regulations 63, 64 and 68 and these are illustrated in Plate 2.1 (figure 2.3 in DMRB LA 115 (Highways England, et al., 2020a) and Plate 2.2 (figure 1 in PINS Advice Note 10 (Planning Inspectorate, 2017) and described as follows:

a. Stage 1 Screening, the process to determine if there are any likely significant effects (LSE) on European sites.

b. Stage 2 Appropriate Assessment, to determine whether it can be

ascertained, in view of the conservation objectives, that the plan or project (either alone or in combination with other projects and plans) would have no adverse effect on the integrity of a European site. If the potential for adverse effects on the integrity of a European site cannot be ruled out, potential mitigation measures to alleviate those adverse effects should be proposed and assessed. Stages 1 and 2 would provide the information to allow the competent authority to fulfil Regulation 63.

c. Stage 3 assessment of alternatives and Stage 4 consideration of imperative reasons of overriding public interest. Where it is not possible to rule out no adverse effect on the integrity of a European site, the decision maker may only grant consent if satisfied that there are no alternative solutions and that the plan or project must be carried out by imperative reasons of overriding public interest.

d. Stage 5 compensatory measures would provide the information to allow the competent authority to fulfil Regulation 68 and ensure the overall coherence of the network is protected.

2.2.5 European sites include Sites of Community Importance (SCIs), Special Protection Areas (SPAs) and potential SPAs (pSPAs), Special Areas of Conservation (SACs) and candidate (cSAC) or possible (pSAC) sites, and Ramsar sites and potential Ramsar sites (pRamsar).

Plate 2.1 The HRA process (figure 2.3 in DMRB LA 115 (Highways England, et al., 2020a))

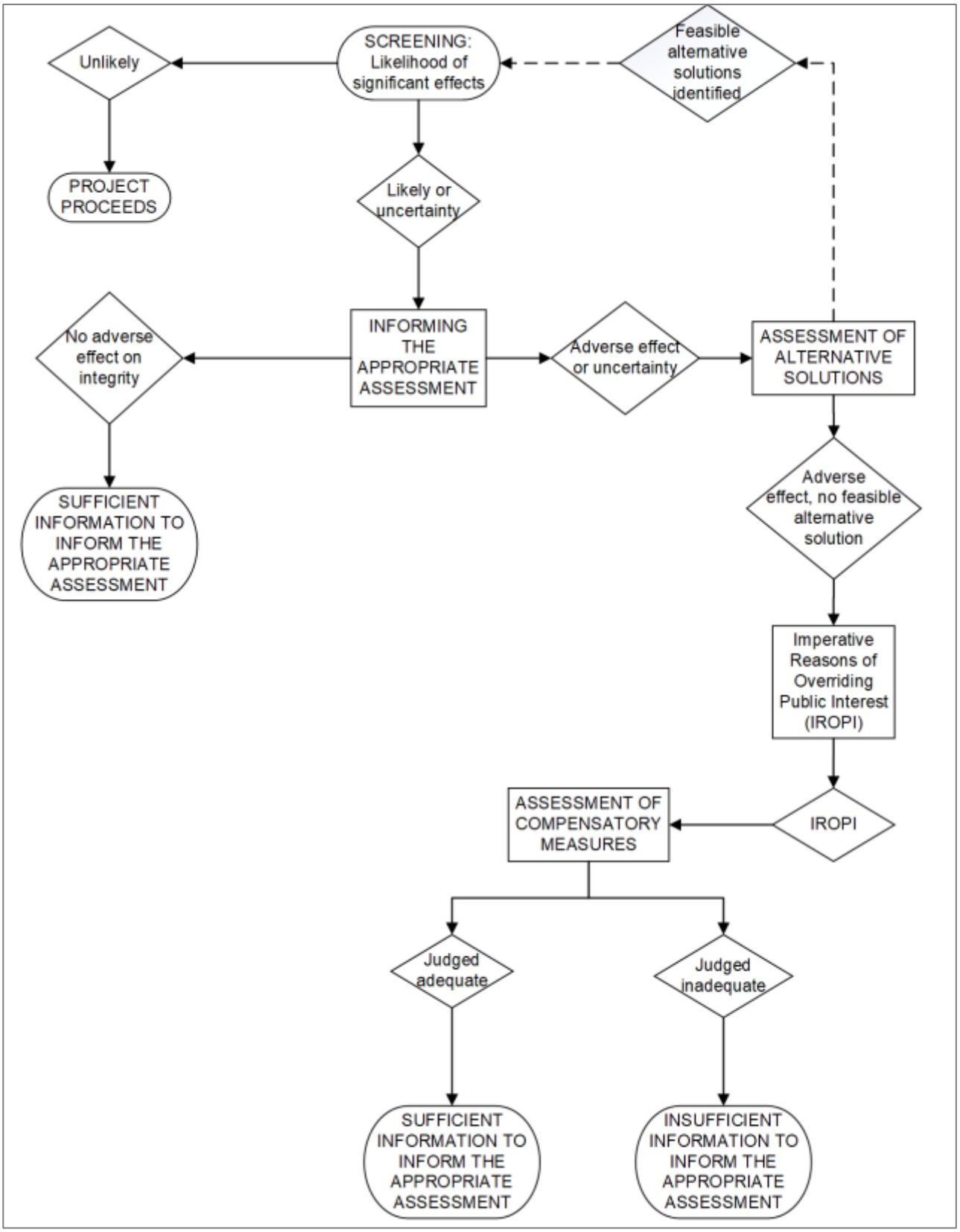
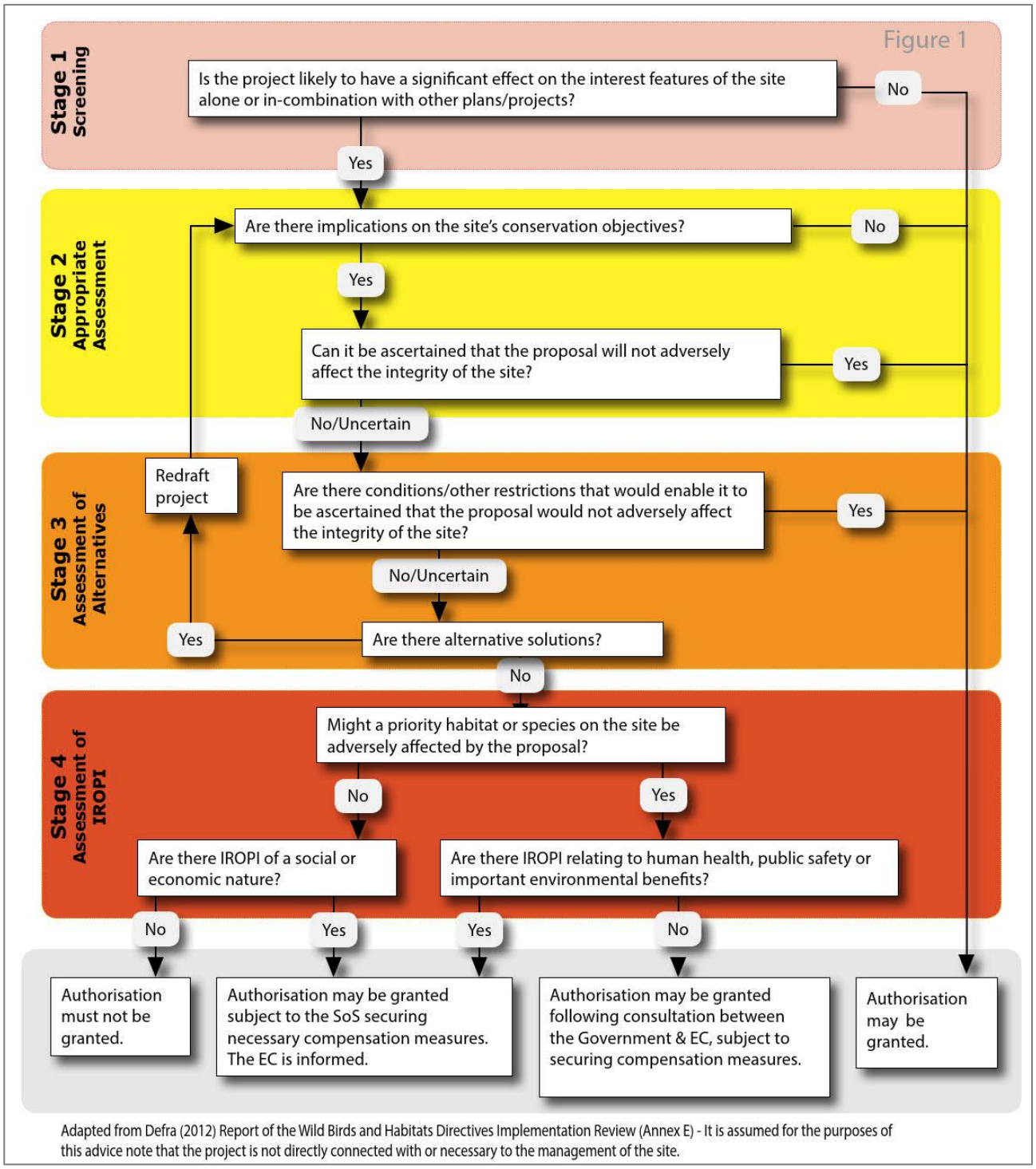


Plate 2.2 The HRA process (figure 1 in PINS Advice Note 10 (Planning Inspectorate, 2017))



2.3 Standards and guidance used in the assessment

2.3.1 The Project is a Nationally Significant Infrastructure Project (NSIP) and the following Highways England standard and Planning Inspectorate advice has been used in completing this assessment:

a. Highways England, Transport Scotland, Welsh Government, Department for Infrastructure (2020a) Design Manual for Roads and Bridges (DMRB)

LA 115 Habitats Regulations Assessment

b. Planning Inspectorate (2017) Habitats Regulations Assessment Advice note ten: Habitats Regulations Assessment relevant to nationally significant infrastructure projects Version 8

2.3.2 This HRA has been completed using DMRB LA 115 Habitats Regulations Assessment (Highways England, et al., 2020a), which sets out the requirements for assessment and reporting of the implications, from construction, operation and maintenance of highways and/or road projects on European sites.

2.3.3 The matrices from DMRB LA 115 (Highways England, et al., 2020a) have been completed and are provided in Appendix E. As the Project requires a DCO, the matrices required by the Planning Inspectorate in accordance with their Advice Note 10 (Planning Inspectorate, 2017) have also been completed and these are provided in Appendix F and Appendix G.

2.3.4 The assessment of the effects of changes in air quality on European sites has been carried out in accordance with DMRB LA 115 (Highways England, *et al*., 2020a) and DMRB LA 105 (Highways England, *et al*., 2019) which is consistent with the process, described within the Natural England internal guidance document NEA001 (Natural England, 2018).

2.3.5 In completing this HRA, other documents have been used as guidance for specific elements of the process and these are listed as follows:

a. The Planning Inspectorate Advice Note Eleven: Working with public bodies in the infrastructure planning process Annex H – Evidence Plans for Habitats Regulations Assessments of Nationally Significant Infrastructure Projects, February 2021 (Planning Inspectorate, 2021)

b. The Planning Inspectorate Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects Version 2, August 2019 (Planning Inspectorate, 2019)

c. Design Manual for Roads and Bridges LA 105 Air quality (Highways England, *et al*., 2019)

d. Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations (NEA001) (Natural England, 2018)

e. Functional linkage: How areas that are functionally linked to European sites have been considered when they may be affected by plans and projects - a review of authoritative decisions. Natural England Commissioned Reports, Number 207 (Chapman & Tyldesley, 2016)

2.4 Evidence plan

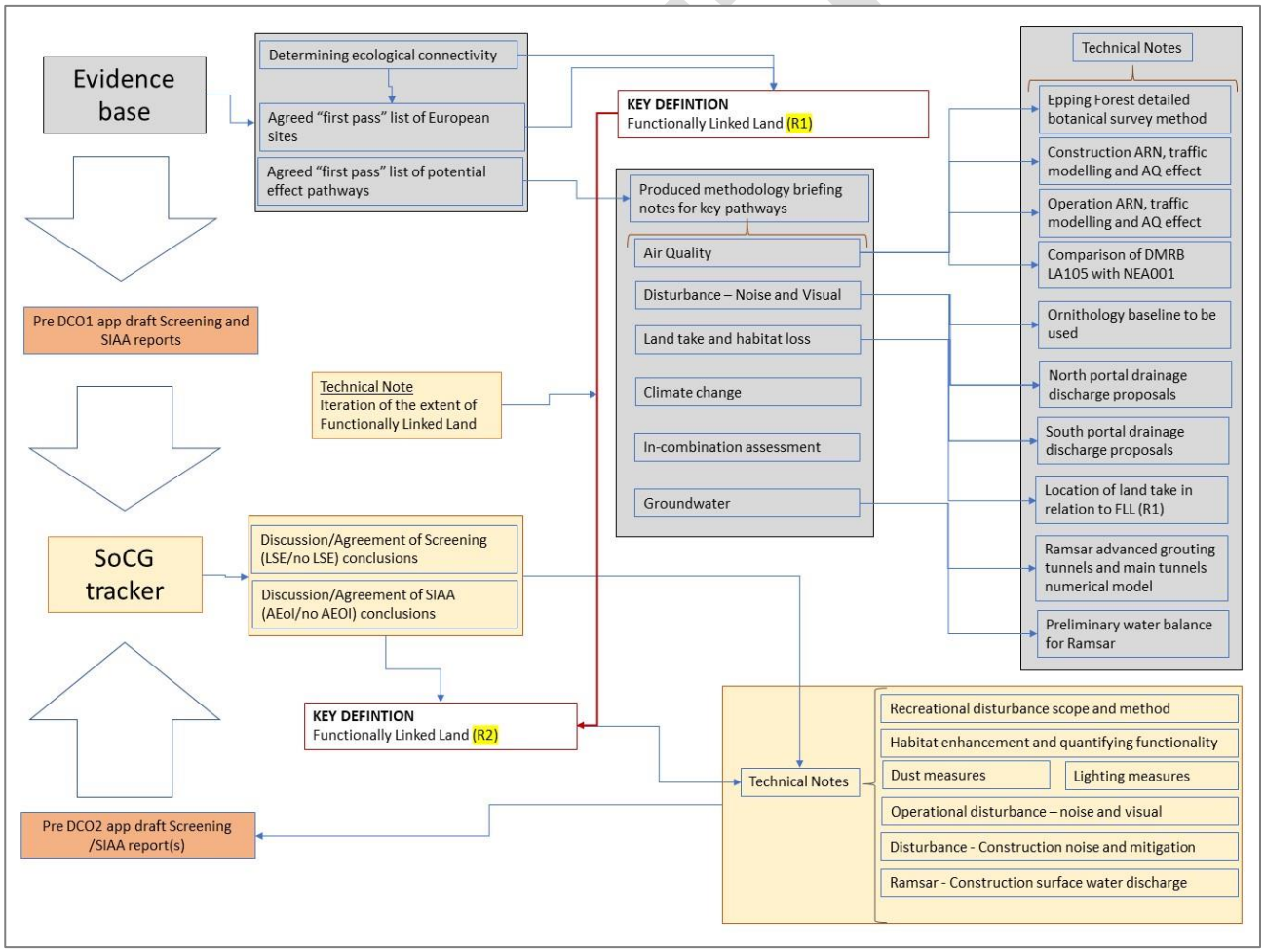
2.4.1 An Evidence Plan is required by both DMRB LA115 and PINS advice note 11 Annex H (Planning Inspectorate, 2021) to support the Habitats Regulations Assessment (HRA). It aims to provide certainty on the amount and range of

evidence to be collected and help address and agree issues prior to application supporting robust and streamlined decisions.

2.4.2 Whilst a formal Evidence Plan was not adopted at the scoping stage (completed before the current iterations of DMRB LA115 and PINS advice note 11 annex H), substantial consultation with Natural England has been undertaken on the elements of such a plan, including iterations of drafts of an 'Evidence Base' that contained the majority of the elements of a formal Evidence Plan.

2.4.3 An Evidence Plan has subsequently been documented and is included in Appendix C. It sets out the scope of the evidence required and the ongoing iteration that occurred with Natural England in completing this assessment. The flow chart in Plate 2.3 illustrates the key evidence documents used within the consultation to scope, discuss and agree issues with Natural England.

Plate 2.3 Evidence plan – key documents and process



2.5 Scope of the assessment

Data used

2.5.1 The data used in this assessment have been collected for the Project to inform the Environmental Impact Assessment (EIA). The desk-based and field survey requirements were subject to consultation with Natural England via the EIA scoping process and reported within the Scoping Report for the Project (Application Document 6.3). The field survey methods followed standard good practice guidelines and specific consultation with Natural England on survey methodologies was carried out, as reported within the ES Chapter 8 Terrestrial Biodiversity and Chapter 9 Marine Biodiversity (Application Document 6.1).

2.5.2 The assessment has used the following sources of evidence when describing the baseline conditions of the receptors potentially affected by the Project.

a. SACs, SPAs and Ramsar Environmental Systems Research Institute (ESRI) shapefiles (Joint Nature Conservation Committee (JNCC, 2019))

b. SAC and SPA with marine components ESRI shapefiles (JNCC, 2019)

c. SAC and SPA citations – Natural England Designated Sites View (https://designatedsites.naturalengland.org.uk/SiteSearch.aspx) & JNCC (https://jncc.gov.uk/)

d. Ramsar citations – Ramsar Sites Information Service (https://rsis.ramsar.org/)

e. Corine Land Cover Habitat Mapping 2018 ESRI shapefile (European Environment Agency and the Joint Research Centre, 2020)

f. Site of Special Scientific Interest Impact Risk Zones ESRI shapefile (Natural England, 2019)

g. Watercourses ESRI shapefile (Ordnance Survey, 2019)

h. Thames Estuary intertidal mudflats map – ESRI shape file (Thames Estuary Partnership, 2003)

i. Intertidal mudflats layer for England – ESRI shape file (Natural England, 2003)Kent Wildlife Trust species records

j. Essex Wildlife Trust Biological Records Centre species records

k. British Trust for Ornithology Wetland Bird Survey (WeBS) data for Higham Bight, Thames Estuary and Marshes SPA, Belhus Woods Country Park as requested for the Preliminary Environmental Information Report (PEIR) (Highways England, 2018)

l. Kent and Medway Biological Records Centre species records

m. Essex Field Club species records

n. Map data from the Royal Society for the Protection of Birds (RSPB)

o. WeBS Alerts data (Woodward, et al., 2019)

p. Project field survey data – Ornithology survey data as reported in the Environmental Statement (ES) Appendix 8.7 (Application Document 6.3)

q. Project field survey data – Phase 1 Habitat Survey data as reported in ES Figure 8.2 (Application Document 6.2)

r. Project field survey detailed botany data for Epping Forest SAC as described in Appendix D

s. What do we know about the birds and habitats of the North Kent Marshes? (Liley, 2011)

t. Marine Biodiversity baseline information – Desk-based review of literature and third-party development data within the ES Chapter 9 Marine Biodiversity (Application Document 6.1).

u. Responses from consultation with Natural England (see Section 8)

2.5.3 The assessment has used the following sources of evidence when describing the likely changes to the environment as a result of the Project:

a. PLACEHOLDER – When available the predicted changes in N deposition as calculated by the Project team according to the methods described in ES Chapter 5: Air Quality (Application Document 6.1)

b. PLACEHOLDER – When available the results of the air quality modelling for the operational phase and specifically the European sites as reported in full within the ES Appendix 5.4: Air Quality Operational Phase Results (Application Document 6.3)

c. PLACEHOLDER – When available the predicted noise levels for the construction phase as calculated by the Project team according to the methods described in the ES Chapter 12: Noise and Vibration (Application Document 6.1)

d. The baseline noise levels are reported in full within the ES Appendix 12.5: Baseline Noise Survey Information (Application Document 6.3)

e. The predicted changes in construction and operation lighting levels are reported in full within ES Appendix 8.16 (Application Document 6.3).

f. The predicted changes in groundwater are reported within the Hydrogeological Risk Assessment (ES Appendix 14.5, Application Document 6.3).

g. The land take calculations have been carried out using the Project Land Plans 5(2)(i) as shown in Volume 2 Book of Plans (Application Document 2.2) and the Phase 1 Habitat survey data as reported in ES Appendix 8.2 Plants and Habitats Technical Appendix (Application Document 6.3)

h. Thames Estuary and Marshes SPA: The Supplementary Advice on Conservation Objectives (Natural England, 2018)

i. Medway Estuary and Marshes SPA: The Supplementary Advice on Conservation Objectives (Natural England, 2019c)

j. The Swale SPA: The Supplementary Advice on Conservation Objectives (Natural England, 2016)

k. European Site Conservation Objectives: Supplementary Advice on conserving and restoring site features. Epping Forest SAC (Natural England, 2019a)

l. European Site Conservation Objectives: Supplementary Advice on conserving and restoring site features. North Downs Woodlands SAC (Natural England, 2019b)

Identifying sites

2.5.4 DMRB LA 115 (Highways England, et al., 2020a) includes screening criteria and these have been used to identify the European sites that could potentially be affected by the Project.

2.5.5 The Planning Inspectorate Advice Note 10 (Planning Inspectorate, 2017) states that the list of European sites should be taken as including, all of which have been considered in this report:

a. Sites of Community Importance (SCIs)

b. Special Protection Areas (SPAs) and potential SPAs (pSPAs)

c. Special Areas of Conservation (SACs), and candidate or possible SACs (cSACs or pSACs)

d. Ramsar sites and proposed Ramsar sites (pRamsar)

Functionally linked land

2.5.6 Functionally linked land has been defined in the Natural England commissioned report 207 (Chapman & Tyldesley, 2016) as follows:

'*The term "functional linkage" refers to the role or "function" that land or sea beyond the boundary of a European site might fulfil in terms of ecologically supporting the populations for which the site was designated or classified. Such land is therefore "linked" to the European site in question because it provides an important role in maintaining or restoring the population of qualifying species at favourable conservation status.*'

2.5.7 The following definitions of functionally linked land and supporting habitat apply to this assessment:

a. Functionally linked land is habitat used by the birds outside the European site boundary.

a. Supporting habitat is habitat used by the birds within the European site boundary and is defined within the Supplementary Advice (Natural England, 2016; Natural England, 2017; Natural England, 2018; Natural England, 2019) for each European site.

2.5.8 The extent of the functionally linked land, see Figure 2, has been developed over a number of iterations in close consultation with Natural England. The Evidence Plan in Appendix C sets out the data and process used to refine the extent of functionally linked land.

Zone of influence

2.5.9 The construction and operation of the Project would result in various changes in the surrounding environment and these changes are termed potential impacts. The area over which those changes would occur is described as the zone of influence (ZoI). The potential impacts and associated ZoI are described in Table 2.1.

2.5.10 The changes in air quality on the wider road network are not included within this ZoI as they have been included within the specific screening criteria that identify the European sites within 200m of the ARN.

Table 2.1 The potential impacts and ZoI at construction and operation

Potential Impact	ZoI
Land take - terrestrial and aquatic (marine) environment - construction	Area within the Order Limits such as construction compounds CA5, CA3A, and CA3B. Project will only be constructed on land that is controlled within the powers of the DCO and so no land take could occur outside the Order Limits.
Vehicle collision with species during operation	Area of new carriageway Area where species interaction with vehicles is possible
Species collision with overhead utilities infrastructure - operation	Area of overhead utilities realignment Area where species interaction with overhead utilities infrastructure is possible
Change in air quality – dust emissions – construction	Area within the 200m of the Order Limits where dust effects could occur in absence of mitigation. Defined by DMRB LA 105 (Highways England, et al., 2019)
Change in air quality – vehicle emissions – construction	Area within 200m of construction phase ARN. Defined by DMRB LA 105 (Highways England, et al., 2019)
Change in air quality – vehicle emissions – operation	Areas within 200m of the operational (2029 opening year) ARN. Defined by DMRB LA 105 (Highways England, et al., 2019)
Changes in noise and vibration – vehicles – operation	Area within 600m of the Project alignment and existing routes that are bypassed/improved or new routes identified. Defined by DMRB LA 111 (Highways England, et al., 2020d)
Changes in noise and vibration – all construction work and associated vehicle movements	Areas within 300m of the Order Limits defined by DMRB LA 111 (Highways England, et al., 2020d). Defined by DMRB LA 111 (Highways England, 2020) as: '*The*

Potential Impact	ZoI
	study area for the construction vehicle assessment for the ES will consider any road/route identified within the Transport Assessment as experiencing temporary increases in heavy vehicle movements accounting for a predicted increase in road traffic noise of greater than 1dB during the construction phase. The study area will consider the effects resulting from temporary road closures and diversions where appropriate.'
Changes in noise and vibration – underwater and above ground – tunnel construction only	Changes within the surrounding area where the TBM is in operation.
Changes in light levels – construction	Within Order Limits, primarily construction compounds and work areas, where lighting is used such as construction compounds CA5, CA3A and CA3B.
Changes in light levels – operation	Highway lighting is associated with the main line and junctions across the Project and within the tunnel. The ZoI is limited to the area immediately either side of the highway.
Changes in visual disturbance – people/machines in eyeline – construction	Sensitivity to visual disturbance is limited to areas within 300m of the activity (Cutts, et al., 2009).
Changes in visual disturbance – vehicles in eyeline – operation	Sensitivity to visual disturbance is limited to areas within 300m of the Project (Cutts, et al., 2009).
Change in recreational pressure – construction and operation	During construction the Project may affect PRoWs and recreational users, in particular dog walkers, could increase use in other areas of functionally linked land or the European sites. Operation of the road could result in easier access to PRoW and the countryside in general with the potential that an increase in recreational use, in particular dog walking could occur in areas of functionally linked land or within European sites.
Changes in surface water quality and quantity – construction	The risk is associated with construction compounds CA03 and CA05 and associated earthworks areas where rainfall run off enters the water course network within European sites or associated functionally linked land (see Section 6.1). It is generally limited to areas within 500m of the Order Limits as set out in ES Chapter 14 Road Drainage and Water Environment (Application Document 6.1).
Changes in surface water quality and quantity – operation	Project design is such that no change is anticipated. ZoI not applicable as Project to be built with an attenuated road drainage system so discharges will comply with quality and permit standards and chemical composition within Environment Agency agreed parameters. Discharge will be at agreed rates pre-determined by the Environment Agency and would be equivalent to greenfield runoff rates. The size and tidal

Potential Impact	ZoI
	influence of the receiving watercourse will be such that no changes are expected to be perceivable.
Changes in groundwater quality and quantity – tunnel construction and operation	Groundwater modelling outputs are reported within the ES Appendix 14.7 Water Framework Directive (Application Document 6.3) and discussed in further detail within paragraphs 5.6.12 - 5.6.17.
Introduction/spread of non-native species – terrestrial environment	The risk is particularly associated with earthworks areas where non-natives could be spread or introduced with imported material.

Determining significance

2.5.11 Following the gathering of information on the Project and the European sites, an assessment has been undertaken to predict the likely significant effects of the Project on the European sites 'alone'. To inform this process, all parts of the Project were assessed to see if they could result in likely significant effects on the European sites. The evidence and rationale used to determine the significance of effect are documented within Appendix C Evidence Plan.

2.5.12 An effect is likely to be significant if:

b. It cannot be excluded, in that it is capable of having an effect, on the basis of objective information

c. It is likely to undermine the site's conservation objectives

2.5.13 In concluding that a theoretical pathway would not result in likely significant effects alone due to the limited scale of effect (but not absolutely certainty of being entirely absent); but would not be sufficient in scale to significantly contribute to any in combination effect with no LSE effects from other plans and projects, the conclusion of an inconsequential effect has been made.

Air quality assessment

2.5.14 The change in air quality, in particular nitrogen deposition, as a result of vehicle emissions (Project construction and operation) has been assessed at all European sites within 200m of the relevant affected road network. The air quality model predicts the nitrogen deposition as a result of both nitrogen oxides and ammonia emissions from road traffic.

Climate change

2.5.15 The purpose of including climate change in the assessment is to ascertain whether the effects of the Project would be likely to exacerbate expected future consequences of climate change on European sites. The relationship between the Project, European sites and climate change is broadly split as follows:

a. The contribution of the effects of the Project to climate change: This is considered to relate to the contribution to greenhouse gases and is assessed as part of the environmental impact assessment for the Project within the climate topic chapter and air quality effect pathway in the HRA. The Project's contributions to environmental changes that are thought to be

causes of climate change are not considered in the HRA assessment as there is no direct pathway to effect on European sites from greenhouse gases.

b. The effects of the Project potentially exacerbating the consequences of climate change on European sites: This is considered to relate to exacerbation of consequences of climate change such as coastal squeeze as a result of sea level rise, changes in ecological climate space as a result of global warming and changes in water resource/precipitation as a result of erratic weather patterns.

2.5.16 The assessment is therefore specifically focused on the consequences of climate change and whether or not the Project would result in an exacerbation of those effects at European sites.

2.6 Structure of this document

2.6.1 This document comprises ten sections as described below:

a. Section 1 Executive summary

b. Section 2 Introduction

c. Section 3 Background to the Project

d. Section 4 Assessment methodology and assumptions

e. Section 5 European sites potentially affected by the proposals

f. Section 6 Mitigation

g. Section 7 Assessment of effect on integrity of European sites

h. Section 8 Proposals for monitoring and reporting

i. Section 9 Consultation

j. Section 10 Conclusions

2.7 Statement of qualification

2.7.1 The lead author is a Chartered Environmentalist and Member of the Chartered Institute of Ecology and Environmental Management. She has over 15 years' experience in consultancy and has written numerous HRA reports for a variety of developments. In recent years she has authored and peer reviewed HRA reports including the Wylfa Newydd Nuclear New Build, A5025 On-line Highway Improvements Scheme, North Devon Link Road, and acted as the competent authority for various planning applications on behalf of Torbay Council.

3 Background to the Project

3.1 Introduction

3.1.1 The Project is described in detail within Chapter 2 of the Environmental Statement (Application Document 6.1) and the supporting Appendix 2.1 Construction Supporting Information (Application Document 6.3).

3.1.2 The description of the Project presented in this chapter focuses on the specific elements that are relevant to this assessment.

3.2 Project elements and timescales

3.2.1 The key Project elements are those contiguous with European sites and within the extent of functionally linked land. The locations of these Project elements within the Order Limits is shown on Figure 3. Table 3.1 lists those relevant to this assessment along with the assumptions made with regards to the approximate timescales, with the following paragraphs providing a summary of other key assumptions that are relevant to this assessment.

3.2.2 As part of the most recent public consultation the construction compounds have been named as follows, but hereafter have been referred to by their number rather than name each time.

a. Northern tunnel entrance compound (Construction compound CA5)

b. Southern tunnel entrance compound (Construction compound CA3)

c. A226 Gravesend Road compound (Construction compound CA3A)

d. Milton compound (Construction compound CA3B)

Ecology mitigation areas

3.2.3 These are two parcels of land north and north west of Coalhouse Fort, totalling approximately 66 hectares, required as mitigation for terrestrial biodiversity (ES Chapter 8, Document reference 6.1). The area would be converted from agricultural land to habitats comprising open mosaic, wet grassland and an area of translocated acid grassland. The new habitat creation would be carried out as soon as possible following approval of the DCO and would be completed over approximately 3-6 months. The work is likely to be carried out with standard agricultural machinery, for example JCB digger, tractor-mounted plough and seeding machinery. The works are unlikely to be more than one tractor unit at any one time and involve a small workforce (approximately five to ten people).

Utilities diversions

3.2.4 Numerous existing utilities, owned by the respective statutory undertakers, will require diversion or protection to allow the Project to be built in accordance with the design and to avoid the impact of the construction works on these assets. Within the functionally linked land the utilities works would occur as part of the pre-enabling works as well as being contiguous with the main construction phase.

3.2.5 The works that would be carried out within the pre-enabling works phase comprise underground works between Tilbury and compound CA5 and are

primarily within the existing road or alongside the Tilbury Loop railway line. They The work would be completed within 6-12 months and would be likely to involve a small workforce (approximately five to ten people) with standard installation equipment.

3.2.6 The works that would be completed alongside the main construction phase are contiguous with the areas required for construction compound CA5 and the highways construction works for Tilbury Viaduct and north to Hoford Road. This would involve a specific workforce likely to number approximately five to ten staff for any one diversion with standard installation equipment for the underground or overhead diversions.

Construction compound CA5

3.2.7 The area of land, approximately 270 hectares, immediately north of the River Thames and south of the Tilbury Loop railway line, would be used as a construction compound for the tunnelling operation. The more central part of the compound comprises standard infrastructure such as offices, equipment and machinery storage, welfare facilities and some overnight accommodation. The area would also have stockpiles, batching plant, and dewatering and construction drainage water treatment/settlement areas. There would be 24-hr activity/working within this compound whilst the tunnel boring machine (TBM) is in operation. The southern part would receive material from the excavations which would be reprofiled to the final land form as shown in Figure 2.4 Environmental Masterplan (Application Document 6.2). Palisade fencing or similar, or solid hoarding would be used to secure compound perimeters, and both options would be up to 3m in height.

Construction access/haul road

3.2.8 The main access into the compound would be via the proposed Port of Tilbury2's private road to Fort Road. The main access road would be appropriately engineered as it crosses poor ground and is required for large numbers of Heavy Goods Vehicles and some abnormal loads, including the delivery of the TBM components.

North Portal dewatering discharge pipeline

3.2.9 A dewatering system would be installed as part of the north portal excavations and the water collected, treated and discharged to the River Thames, west of the existing Tilbury Main outfall, via a pipeline crossing the intertidal mud and a new outfall at mean low water. The new outfall will also discharge the compound site runoff after it has passed through the treatment ponds/lagoons.

3.2.10 The installation and decommissioning of the pipeline across the intertidal mudflats would be at low tide (not when the work area is either fully submerged, or partially covered by water where this would result in the transmission through the water column of noise and vibration or the generation of suspended sediments). The work would include vibro-piling and be completed from shore to channel in 40m lengths from a dumb barge. The workforce would be likely to number five to ten people including those operating the plant required.

Operational road drainage discharge

3.2.11 The road drainage south of the River Thames would be collected treated and discharged to soakaway. All of the drainage infrastructure would not be contiguous with any European site or the functionally linked land.

3.2.12 North of the River Thames the road drainage would be collected, treated and discharged into the Tilbury Main. The tunnel drainage system would include collection, treatment and discharge via a pipeline and outfall to the River Thames. The final outfall location has not yet been determined and could be one of two options. For the purposes of this HRA the “worst case” scenario has been assessed which assumes that the outfall will be close mean low water and require a pipeline to be constructed across the intertidal mud as described in paragraph 3.2.10.

Highways construction works – Tilbury Viaduct north to just south of Hoford Road

3.2.13 These works are in the northern most part of functionally linked land affected comprising an area of approximately 86 hectares. The works include the construction of the Tilbury Viaduct, flood compensation areas north of the Tilbury Loop railway line and the earthworks to Hoford road.

3.2.14 The construction site would operate according to the normal working hours that are proposed as 07:00 to 19:00 weekdays and 07:00 to 16:00 Saturday. The Code of Construction Practice (CoCP) (Application Document 7.11) includes the working hours strategy for the Project. Standard earthmoving machinery and plant would be used and the workforce is expected to be over 100 people during the construction phase.

Drainage discharge and treatment array for compound CA3

3.2.15 The rainwater run off from compound CA3 will be collected and treated via a series of settlement lagoons/ponds adjacent to Compound CA3A before being discharged, via a pipeline and outfall on the western ditch 10-20m south of the Thames Estuary and Marshes Ramsar.

3.2.16 The drainage discharge pipe will be directionally drilled under the Lower Higham Road and the Thames Estuary and Marshes Ramsar and specialist equipment would be used for this. The assumption is that this would be equivalent in size to a small excavator. The remaining pipeline to the outfall would be buried in a trench across the agricultural land and the assumption is that this would be completed within a working width 8-10m. The outfall itself would be a pre-cast unit within the ditch bank.

3.2.17 The installation work would be completed during normal construction working hours (07:00 to 19:00 weekdays and 07:00 to 16:00 Saturday, see CoCP (Application Document 7.11)), requiring a small workforce of three to five people and a small excavator or equivalent to dig the settlement treatment array and trenches for the pipe work, and lift the precast outfall structure in to place.

Construction compounds CA3A and CA3B

3.2.18 The temporary construction compounds accommodate the shafts that facilitate the construction of the ground treatment tunnel beneath the Thames Estuary

and Marshes Ramsar. Both compounds would operate 24 hours. The ground treatment tunnel would be completed before the main tunnel TBM drives reach the south side of the River Thames. Once the ground treatment tunnel is completed the compounds would remain on standby, with limited/no activity until the main tunnel TBM drive is complete.

3.2.19 Palisade fencing or similar, or solid hoarding would be used during the construction period to secure compound perimeters, and both options would be up to 3m in height. Construction compound CA3B is adjacent to the Met Police firing range and retains the safety bund on its northern edge.

Table 3.1 Indicative timeline for Project elements that are relevant to this assessment

Project element	Road construction																						Road open			
	2024				2025				2026				2027				2028				2029		2030			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Ecology mitigation areas																												
Early underground utilities diversions																												
Main works underground utilities diversions																												
Construction compound CA5 – North Portal																												
set up																												
operation																												
decommissioning (potentially up to 2030)																												
North Portal dewatering discharge pipeline																												
construction																												
operation																												
decommissioning																												
Construction haul road Port of Tilbury – compound CA5																												
Highways construction works – Tilbury Viaduct north to just south of Hoford Rd																												
Drainage discharge and treatment array for construction compound CA3																												
construction works																												

Project element	Road construction																						Road open			
	2024				2025				2026				2027				2028				2029		2030			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
operation (includes compound CA3 decommissioning)																												
decommissioning																												
Construction compound CA3A																												
set up																												
shaft and tunnel construction																												
grouting works																												
decommissioning																												
Construction compound CA3B																												
set up																												
shaft construction																												
grouting works																												
decommissioning																												

3.3 Project design and environmental measures

3.3.1 The measures discussed in this section are integral to the Project (as described in paragraph 3.3.2 and 3.3.3) and would all be required on this Project irrespective of whether any potential effect pathways on European sites were present. Therefore, all of the measures described in paragraphs 3.3.5 to 3.3.38 have been taken into account within the assessment of LSE.

3.3.2 The Project includes a range of environmental commitments as part of the DCO application. Commitments made within each topic of the ES of relevance to the HRA are set out in this section and include:

a. *Embedded*: 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*: any additional Project-specific measures needed to avoid, reduce or offset potential impacts that could otherwise result in effects considered significant in the context of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017. Essential measures were identified by environmental topic specialists, taking into account the embedded mitigation and good practice commitments.

3.3.3 These measures would be undertaken irrespective of whether any potential effect pathways on European sites were present and are not proposed primarily to mitigate effects on European sites and therefore are not 'mitigation' for HRA purposes.

3.3.4 Embedded measures would be secured through commitments made within the Design Principles[1] (Application Document 7.5), with features presented on ES Figure 2.4: Environmental Masterplan (Application Document 6.2). Good practice and essential measures would be secured through their inclusion in the Register of Environmental Actions and Commitments (REAC). The REAC is

[1] The Design Principles are commitments that will be secured through Schedule 16 Requirement 3 of the DCO, which states: '*The authorised development must be designed in detail and carried out in accordance with the design principles document and the preliminary scheme design shown on the engineering drawings and sections, and the general arrangement drawings, unless otherwise agreed in writing by the Secretary of State following consultation by the undertaker with the relevant planning authority on matters related to its functions, provided that the Secretary of State is satisfied that any amendments to those documents showing departures from the preliminary scheme design would not give rise to any materially new or materially different environmental effects in comparison with those reported in the environmental statement*.'

provided in within the Code of Construction Practice[2] (CoCP) ES Appendix 2.2 (Application Document 6.3). The relevant REAC commitment reference codes are shown in square brackets.

Change in air quality – dust emissions – construction

Construction

3.3.5 The following measures would be implemented by the Project CoCP to minimise and manage dust at source during the construction phase. The committed measures are all established good practice methods designed to supress dust at source and avoid emission. These methods are considered to be effective at containing dust when used at source and are defined in many industry standards for use on construction sites, for example the “Environmental good practice on site guide (CIRIA C741)” (Charles & Edwards, 2015).

3.3.6 Implement good practice measures to reduce dust during demolition works such as [AQ002]:

a. Soft strip inside buildings before demolition (i.e. retain external walls and windows where safe and practicable to provide a screen against dust).

b. Use water suppression where practicable for dust control, during demolition operations.

c. Avoid explosive blasting, using appropriate manual or mechanical alternatives.

d. Bag and remove any biological debris or damp down such material before demolition.

3.3.7 Implement good practice controls to reduce dust during works, such as [AQ0003]:

a. Cover with topsoil and re-vegetate earthworks and exposed areas including soil stockpiles to stabilise surfaces.

b. Use a cover such as hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil.

c. The specification of the seeding mix used to revegetate stockpiles will be such that no undesirable or non-target species are introduced to the

[2] Requirement 4 in Schedule 2 (Part 1) of the DCO states that no part of the authorised development (the Project) is to commence until an Environmental Management Plan Iteration 2 (EMP2) (also referred to as the Construction EMP) in accordance with this CoCP has been submitted to and approved in writing by the Secretary of State following consultation with the relevant planning authority to the extent that it relates to the matters relevant to its function.

seedbank.

d. Remove the cover systematically during work to reduce exposure of areas that are not being worked on.

e. Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless required for a particular process, in which case ensure that appropriate additional control measures are in place to prevent escape.

f. Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored with suitable emission control systems to prevent escape.

g. For small supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

3.3.8 Implement good practice controls to reduce track-out during works such as [AQ0004]:

a. Use of water-assisted dust sweepers on the access and local roads to remove any material tracked out of the site.

b. Avoid dry sweeping of large areas.

c. Ensure vehicles entering and leaving worksites are securely covered to prevent escape of materials during transport.

d. Inspect haul routes for integrity, instigate necessary repairs and record in site log book.

e. Access gates to be sited at least 10m from receptors e.g. residential properties where practicable.

f. Apply dust suppressants to locations where large volume of vehicles enter and exit the construction site.

3.3.9 Implement good practice controls to manage dust during construction such as [AQ0005]:

a. Undertake onsite and offsite inspections to monitor dust.

b. Plan site layout so that machinery and dust-causing activities are located away from receptors, as far as this is reasonably practicable.

c. Erect suitable solid screens or barriers around dusty activities or the site boundary.

d. Avoid site runoff of water or mud.

e. Remove waste materials that have a potential to produce dust from site as soon as reasonably practicable.

f. Cover, seed or fence stockpiles to prevent wind whipping.

g. Cutting/grinding/sawing equipment to use water as dust suppressant or

suitable local extract ventilation.

h. Ensure an adequate water supply on the site for effective dust/particulate matter suppression, using recycled water where reasonably practicable.

i. Use enclosed chutes, conveyors and covered skips to reduce escape of dust.

j. Reduce drop heights from conveyors, loading shoves, hoppers and other loading or handling equipment to a practical minimum; and use fine water sprays on such equipment where appropriate.

k. Ensure equipment is readily available onsite to clean any spillages and clean up spillages as soon as the spill is identified.

l. Reuse and recycle waste to reduce dust from waste materials.

Changes in surface water quality – construction and operation

Construction

3.3.10 The Project has committed to a number of embedded measures associated with construction drainage to manage the risks of water pollution during the construction phase and these are described within ES Chapter 2 Project Description (Application Document 6.1) and Appendix 2.1 Construction Supporting Information (Application Document 6.3).

3.3.11 The Project would install drainage systems to remove surface water from worksites and haul roads, and to minimise the impact of runoff on the surrounding environment. Worksite drainage systems would incorporate pollution control systems designed in line with industry good practice guidance.

3.3.12 The methods for removal and treatment include:

a. Discharging directly into an existing sewer using pipework to the nearest sewerage connection point

b. Sustainable drainage systems – slowing waterflows associated with surface runoff to allow settlement, natural filtration and other treatment before discharging

c. Disposal of water offsite using tankers – water would be stored onsite in temporary ponds or, where possible, permanent drainage ponds. The water would then be transported by tankers

d. Settlement ponds and lagoons – as above, a temporary or permanent pond would be used for this purpose

e. Filtration system (including mechanical filtration) – aggregate, straw or similar material would be used as a filter Irrigation of crops and grassland where appropriate

3.3.13 At the South Portal compound, CA3, due to the size of the site, rainwater runoff cannot be managed by the temporary drainage methods. Some rainwater would be harvested and used for site processes such as greywater flushing and dust

suppression, but the remaining would require discharge to a receiving waterbody. Rainwater falling into the proposed highway and South Portal excavation footprint and material stockpiles would require collection and pumping to ground level for treatment (suspended chalk solids removal) and discharge.

3.3.14 In order to effectively treat the water to meet discharge consent standards, a full collection and management regime would be implemented and be in operation on the site until full reinstatement of the compound area is complete.

3.3.15 A series of ponds/lagoons and weirs would be constructed within the Order Limits to serve three purposes:

a. Provide a volume of storage for attenuation

b. Encourage gravitational settlement of solid fraction

c. Offer a degree of re-infiltration into the chalk ground

3.3.16 The treated water from the final lagoon in compound CA3 would be pumped into the ditch network which forms part of the Thames Estuary and Marshes Ramsar site. The flow would be regulated to ensure the discharge flow rates are managed at greenfield runoff rates.

3.3.17 At the North Portal compound, CA5, there would be similar issues as at the South Portal compound CA3 regarding management of rainwater runoff. The approach described above would be followed for rainwater harvesting and the collection and treatment of water, prior to discharge. As at the South Portal compound CA3 a series of treatment ponds/lagoons and weirs would be constructed within the Order Limits. The water from the treatment process in compound CA5 would be pumped into a new outfall pipe and then subsequently pumped into the River Thames

3.3.18 The following good practice measures which would be implemented via the Project CoCP to manage the risks of water pollution during the construction phase. The committed measures are all established good practice methods designed to avoid water pollution. These methods are considered to be effective at managing the risk and are defined in many industry standards for use on construction sites for example the “Control of Water Pollution from Construction Sites (C532)” (Masters-Williams, et al., 2001).

3.3.19 Work site drainage systems would incorporate pollution control systems designed in line with Control of Water Pollution from Construction Sites C532 (Masters-Williams, et al., 2001) or as agreed with the Secretary of State. Watercourses near work sites would be regularly inspected for signs of siltation or other forms of pollution in line with CIRIA C741 guidance (Charles & Edwards, 2015) and pumped groundwater, process effluents and construction site runoff would be tested to ensure compliance with discharge consent requirements [RDWE001].

3.3.20 Work site drainage systems would be inspected and maintained to ensure they continue to operate to their design standard, safeguarding surface and groundwater quality [RDWE002].

3.3.21 Wastewater generated from the compound welfare facilities would be discharged to sewer, subject to the agreements with the utility providers, or in

locations where a sewer connection is not reasonably practicable, collected and tankered offsite for disposal at a licensed treatment facility [RDWE005].

3.3.22 Surface water drainage would be provided for all surfaced roads and yards, buildings and any other hard or impermeable surfaces. Berms and bunds would be constructed to manage surface water runoff where necessary to protect watercourses, prevent ponding and to keep general runoff separate from contaminated runoff. Rainfall runoff from areas where there is a risk of contamination would be managed using temporary drainage systems and would be subject to treatment prior to discharge to any surface watercourse or drain. Rainfall runoff from areas of low contamination risk would be captured and re-used where reasonably practicable e.g. to supply wheel-wash facilities or for dust suppression, to reduce consumptive water use [RDWE006].

3.3.23 Construction site compounds where chemical, waste oils or fuel storage and refuelling activities take place would be managed in line with the following measures [GS004]:

a. Within the construction site compounds, specific areas would be designated for the storage of chemicals, waste oils and fuel and refuelling activities.

b. These designated areas would be bunded to provide capacity for at least 110% of the largest container and placed on hardstanding to prevent downward migration of contaminants.

c. These designated areas would be designed with drainage to include measures for isolating spillages.

d. Any transfer of fuel or other potentially contaminated liquids would only take place within a designated transfer area.

e. Drip trays would be provided to reduce the risk of spillages.

3.3.24 To mitigate potential effects on water quality and hydrodynamics within the River Thames, the discharge arrangement described in REAC ref. RDWE028 would be constructed and operational in advance of the excavation of the North Portal and tunnelling works and would be used as the temporary discharge for treated construction phase effluents. All effluents would receive treatment prior to discharge into the River Thames to ensure compliance with any limits detailed in the conditions of discharge as agreed with the Environment Agency [RDWE023].

3.3.25 Drainage from the North Portal construction compound is proposed to outfall from the north side of the River Thames. The design of the discharge pipeline and outfall to the River Thames would provide for a subtidal, mid-water discharge for effective dilution and dispersal, and to reduce disturbance to the intertidal zone. The discharge infrastructure would be designed in accordance with measures agreed with the Marine Management Organisation (MMO) as detailed in the Deemed Marine Licence (DCO Schedule 15) [RDWE028].

Operation

3.3.26 The measures that avoid changes within the receiving water bodies are embedded within the Project drainage design as shown on the Drainage Plans

(Application Document 2.16) and include the following commitments that are relevant to this assessment.

3.3.27 Drainage design would include a treatment train for highway runoff designed in accordance with DMRB CG 501 (Highways England, et al., 2020f) and DMRB CD 532 (Highways England, et al., 2020g) to meet the requirements specified for each outfall to surface watercourses identified in ES Appendix 14.3 Operational Surface Water Drainage Pollution Risk Assessment (Application Document 6.3). Further survey and sampling to define the flow regime and water quality of receiving watercourses would be carried out at proposed points of discharge to inform the detailed design of treatment measures [RDWE025].

3.3.28 The following good practice and essential measures, that are also relevant to this assessment, would be implemented via the Project CoCP to manage the risks of water pollution during the operational phase.

3.3.29 To reduce the potential for scour and associated hydromorphological change, highway drainage outfall headwall arrangements would be set back from the banks of the receiving watercourses and outfall designs would accord with DMRB CD 529 (Highways England, et al., 2020h) [RDWE011].

3.3.30 The drainage system (refers to operational tunnel) would include provision for the capture and isolation of contaminated waters to prevent pollution of the receiving watercourse. Discharges would be restricted to high tide conditions to maximise available dilution and mixing and to prevent scour/erosion of the intertidal zone [RDWE026].

Changes in lighting construction and operation

Construction

3.3.31 The Project CoCP sets out the following measures design to avoid and reduce light pollution during the construction phase.

3.3.32 Site lighting and signage will be provided by the Contractors to ensure the safety and security of the construction sites. It will be at the appropriate luminance required to provide safe working conditions. Where needed and appropriate, lighting to site boundaries will be provided, and illumination will be sufficient to provide a safe route for the passing public. Precautions will be taken to avoid shadows cast by the site hoarding on surrounding footpaths, roads and amenity areas. Where appropriate, lighting will be activated by motion sensors to prevent unnecessary usage.

3.3.33 Site lighting, including internal site roads and car parks will comply with the Institute of Lighting Professionals Guidance Notes for the Reduction of Obtrusive Light GN01/20 (2020) and where applicable, the provisions of BS 5489-1, Code of Practice for the Design of Road Lighting (BSI, 2020).

3.3.34 Lighting will also be designed, positioned and directed to prevent or minimise light disturbance to nearby residents, ecological receptors, as well as motorists and rail and marine operations. This provision will apply particularly to sites where night working or security lighting will be required.

3.3.35 Low energy fittings shall be used unless otherwise accepted by Highways England. Any site-specific lighting controls will be described in Contractors' EMP2s.

Operation

3.3.36 The operational lighting design is described in ES Chapter 2 Project Description (Application Reference 6.1) include the following measures, relevant to this assessment, that would reduce the effect of light spill on the surrounding habitat.

a. Column heights have been kept as low as practicable while still providing a compliant lighting design

b. Luminaires have been selected which emit no light above the horizontal to reduce skyglow and ensure light is only projected to where it is needed

c. Lighting levels would be linked to the live traffic flow, so that during quiet periods the lighting is dimmed to reduce energy consumption

d. The lighting columns would be placed in the verges projecting towards the central reserve wherever practicable to reduce light spill into adjacent areas

Introduction/spread of invasive non-native species terrestrial and marine environment

Construction

3.3.37 Good practice measure - Invasive species would be identified prior to construction and would be removed or treated to prevent their spread, following the Construction Industry Research and Information Association's (CIRIA) guidance in Invasive Species Management for Infrastructure Managers and the Construction Industry (Wade, et al., 2008) [TB005].

3.3.38 Essential measure (Marine biodiversity) - A biosecurity risk assessment and method statement will be developed and implemented in line with the International Convention for the Control and Management of Ships' Ballast Water and Sediment (adopted in 2004; entry into force in 2017). This will outline the risks and control measures for managing the introduction of Invasive Non-Native Species [MB006].

Change in noise and vibration

Operation

3.3.39 The following measures are included within the Project design and CoCP and aim to minimise the noise from the new road during operation.

3.3.40 A 'Level 3', very quiet road surfacing system, as defined by Highways England Specification for Highways Work Volume 1, Series 900, Table 9-17, shall be provided on all new and altered trunk roads and associated slip roads forming part of the Project [NV013].

3.3.41 ES Figure 12.7: Operational Road Traffic Noise Mitigation (Application Document 6.2) illustrates the measures within the Project design that reduce noise once the road is operational. Earthwork bunds and false cutting would be provided within the functionally linked land at the locations listed in Table 3.2 (relevant locations extracted from Table 12.29, ES Chapter 12 Noise and Vibration (Application Reference 6.1)). Reflective acoustic barriers [NV011] that will be provided within the functionally linked land are listed in Table 3.3

(relevant locations extracted from Table 12.30, ES Chapter 12, Noise and Vibration (Application Document 6.1)).

Table 3.2 Embedded earthwork elements – operational within functionally linked land

Location	False cutting, embankment or cutting height
Flood bunding and protection bund to the portal maintenance access road either side of the Project road	7.65m AOD flood bunding with 9m AOD bund for future fill by IVL
Project road in tunnel approach structure	Up to 12.8m deep
Project road 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 Project/noise mitigation
Muckingford Road slackened slopes to blend landscaping in with green bridge	Up to 7m high

Table 3.3 Acoustic barriers within functionally linked land

Acoustic barrier location reference	Height	Length	Barrier type	Justification
Station Road (AB5)	2.0m	219m	BS EN 1793-2 Class B2 reflective barrier	Acoustic barrier positioned to protect residential amenity of dwellings on Station Road, including one receptor above a SOAEL prior to this mitigation. Design philosophy to reduce noise to below a SOAEL in accordance with national policy. Height of barrier controlled to prevent the introduction of new landscape and visual impacts.
Tilbury Viaduct (AB6)	1.0m	667m	BS EN 1793-2 Class B2 reflective barrier	Feature is a robust bridge parapet for safety reasons, with acoustic attributes. 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.

4 Assessment methodologies and assumptions

4.1 Assessment methods

4.1.1 The impacts and effects considered in the assessment were developed in a series of methodology briefs which were shared with Natural England for comment prior to the production of this report as set out within the Evidence Plan in Appendix C.

Assessing LSE

4.1.2 Potential interactions (effect pathways) between the European sites and the Project were identified where there was an overlap between the European sites and functionally linked land and the ZoI of the Project, categorised by the potential impacts set out in Table 2.1. Section 5.2 reviews all of the effect pathways and sets out where there is a potential for LSE on European sites to occur as a result of the Project.

4.1.3 Potential LSEs have been broadly categorised using the following terminology in line with those described in Table A.4 and assessment criteria in the screening template in A.3 from DMRB LA 115 (Highways England, et al., 2020a). Categories/criteria have been amalgamated in some cases to avoid repetition and/or overlap of consideration of potential effects (e.g. 'loss' has been amalgamated with both 'reduction of habitat' and 'reduction in species'). The categories used in this assessment are:

a. Reduction in habitat area/habitat loss/degradation
b. Disturbance to key species
c. Habitat/species fragmentation
d. Reduction in species/species density/species loss
e. Changes to key indicators of conservation value (e.g. water quality)
f. Climate change

4.1.4 Disruption and interference with key relationships that define the structure and function of the site are considered within the assessment of the potential effect pathways listed above.

Mitigation

4.1.5 The Project has been developed to avoid reduce or offset significant effects on the environment. A number of integral design or embedded measures have been incorporated into the design irrespective of any potential pathways to effects on European sites as a matter of good practice or ensure legal compliance, comply with the Water Framework Directive (WFD) and/or permitting requirements. Such integral measures are considered within the screening assessment as they would happen whether an HRA considered the pathway or not, and form part of the Project design. The integral measures that have been relied upon for the Stage 1 screening assessment have been highlighted within the assumptions in Section 4.5.

Use of thresholds

Changes in air quality

4.1.6 The air quality assessment is carried out with respect to the appropriate Lower Critical Load (LCL) for the habitats within 200m of the ARN. The LCLs are set out for each European site on the Site Relevant Critical Loads tab of the Air Pollution Information System[3]. Table 4.1 sets out the LCLs that have been used to assess LSE on each of the European sites identified.

Table 4.1: The relevant lower critical loads used to determine LSE

European site	Habitat within 200m of the ARN	Relevant N Critical load class	Lower critical load kg ha^{-1} yr^{-1}
Thames Estuary and Marshes Ramsar	Coastal flood and plain grazing marsh	Low and medium altitude hay meadows	20
Medway Estuary and Marshes SPA and Ramsar	Coastal and flood plain grazing marsh Saltmarsh Good quality semi improved grassland	Low and medium altitude hay meadows Pioneer, low-mid, mid-upper saltmarshes	20
The Swale SPA and Ramsar	Coastal and flood plain grazing marsh Saltmarsh Good quality semi improved grassland	Low and medium altitude hay meadows Pioneer, low-mid, mid-upper saltmarshes	20
Epping Forest SAC	w1c5 Beech forests on acid soils (H9120)	Fagus woodland	10
North Downs Woodland SAC	w1c6 Asperulo-Fagetum Beech Forest (H9130) with yew in the shrub layer	Coniferous woodland	5

4.1.7 The methodology used to determine the potential for the Project to result in an LSE as a result of vehicle emissions, follows the flow chart in Figure 2.98 of the DMRB LA 105 (Highways England, et al., 2019) up to the 1% LCL threshold. Where the 1% LCL is exceeded there is potentially an LSE on the European site as a result of the Project.

[3] www.APIS.ac.uk

Disturbance

4.1.8 Change in noise and vibration and changes in visual disturbance are considered together within this assessment as the Project elements that result in these changes require people (visual stimuli) to operate the plant (visual stimuli) that will generate the noise and vibration. European sites and suitable habitat within the extent of functionally linked land that had predicted noise levels of greater than 55dB (Cutts*, et al.,* 2013; Hirvonen, 2001), or a change in noise from the baseline of greater than 3dB, and the areas within 300m (Cutts*, et al.,* 2013) of the Project elements, were identified. These were the areas where there was the potential to disturb qualifying bird species resulting in an LSE.

4.1.9 Changes in lighting have been assessed according to a threshold of 0.5 lux following due regard of advice from Natural England as the level above which sensitive species may be disturbed.

Duration

4.1.10 Project impacts such as land take have been assessed with reference to duration, temporary or permanent. In line with consultation advice from Natural England, for the purposes of this assessment land take has been considered to be permanent if the loss of habitat would occur for five years or more, to ensure a highly precautionary assessment. However, for clarity and for a wider understanding of the effect pathways, the following terms have been used when describing the loss of habitat:

a. Permanent – any land take required for more than five years which has been assigned two sub-sets to account for the fact that some of the areas lost will be replaced in the long term:

   i. Permanent – any land take that would be within highways infrastructure or habitats of limited value for the qualifying features being assessed once the Project is operational.

   ii. Semi-permanent – any land take during construction of more than five years, where habitats are lost during construction, but then reinstated or replaced, as per the Project Design Principle LSP.05 and LSP.04 (Application Document 7.5), with habitats of similar value for the qualifying features being assessed.

b. Temporary – any land take during construction of less than five years[4], where habitats are lost, but then reinstated or replaced with habitats of similar utility for the qualifying features being assessed.

Assessment of effect on the integrity of the European site

Effects as a result of changes in air quality

4.1.11 The methodology used to determine the potential for the Project to result in an adverse effect on integrity continues the flow chart (from the 1% Lower Critical Load (LCL) threshold) in Figure 2.98 of the DMRB LA 105 (Highways England, et al., 2019) which was started at when assessing LSEs.

Information used to explore the magnitude/significance of the effect

4.1.12 For the European sites identified, the following steps, from Figure 2.98 of DMRB LA 105, were completed to explore the magnitude of the effect.

a. Identify whether the site air quality attribute target is either restore or maintain:
Restore – Use the lowest change in N deposition regardless of background N deposition which would bring about a change of a loss of one species corresponding to the lower critical load range.
Maintain – Use change values to bring about loss of one species corresponding to background N deposition.

b. Identify if the change in N deposition associated with the Project (the Do Something scenario) would lead to the loss of one species.

c. If the change in N deposition is greater than or equal to 0.4kg N ha-1yr-1 then it is assumed that the loss of one species could occur and the assessment proceeds to the next step.

d. Undertake detailed site investigation and identify if there are species located in the area where the assessment has determined an increase in N deposition that could lead to loss of one species.

4.1.13 The criterion of loss of one species is not used alone to assess effects on integrity. In considering the results of the detailed site investigation, the Applicant has used the following factors to explore the magnitude of the effect on the integrity of the European site:

[4] As there is no specific guidance with regard to the permanence of effects the project team discussed the threshold with Natural England and agreed to use five years as an appropriately precautionary threshold for temporary effects

a. What conditions is the habitat affected currently exposed to (e.g. existing exceedance of critical load)?[5]
b. What is the area and quality of the habitat affected as a proportion of the qualifying habitat within the European site?
c. Will there be any direct loss of habitat or change to the distribution of such habitats?
d. Are N deposition/NOx operation changes predicted below the current baseline deposition levels? (e.g. due to technological improvements in vehicle emissions between now and the time the Project is operational)?
e. Using professional judgement and taking into account the above factors, will there be a reduction in habitat area that significantly contributes to the favourable conservation status of the European site?

Assessment of effect on integrity

4.1.14 The attributes and targets contained with the Natural England's supplementary advice (listed in Table 5.4) was used as a basis for the assessment of the Project's impacts on the integrity of the European sites by identifying whether the magnitude of the effect would be likely to undermine achievement of the target for each attribute.

Effects as a result of land take and disturbance

4.1.15 The following paragraphs describe the approach used to determine how the land take and disturbance as a result of the Project may reduce the functionality of the habitats and whether this effect (habitat loss/disturbance) would result in an adverse effect on the integrity of the European site.

Information used to explore magnitude/ significance of the effect

4.1.16 For areas within the functionally linked land, the following data were collated and calculated to provide a measure of the effects on the functionally linked land and the potential contribution of the areas to the populations of the European sites identified.

a. The qualifying features and peak counts present within the functionally linked land, where surveys were completed and specifically within the areas

[5] '*Small contributions of nitrogen deposition from the air have the potential to lead to more significant changes in vegetation composition where a site is below but near to the Critical Load, compared to a site which significantly exceeds a critical load*.' NECR210, Natural England 2016 as referenced in NEA001. '*Habitats that have already been subject to high background nitrogen deposition can develop an effective tolerance to the effects of further deposition*.' NECR210, Natural England 2016 as referenced in NEA001.

of land take and disturbance.

b. The qualifying features peak count recorded in the functionally linked land and specifically within the land take and disturbance areas was calculated as a percentage of the European site populations. The population sizes for each site were derived from the targets described in the supplementary advice and the latest British Trust for Ornithology (BTO) WeBS Alert data regarding the population trends.

c. The functionality of the areas affected by the Project during construction and operation. The abundance of birds within the functionally linked habitats provides a measure of its functionality[6] and the assessment has been completed using this measure to illustrate how the Project has mitigated the loss and disturbance of functionally linked land during the construction and operation phases.

Assessment of effect on integrity

4.1.17 The attributes and targets contained within the supplementary advice were used as a basis for the assessment. Using the data and information collated, the assessment of adverse effects on integrity has been carried out against the 18 attributes of the conservation objectives supplementary advice (listed in Table 5.3), to identify whether the magnitude of the effect would be likely to undermine achievement of the target for each attribute.

Assessing effects In-combination

4.1.18 An assessment of the Project in combination with other plans or projects has been completed at Stage 1 screening and Stage 2 appropriate assessment.

4.1.19 At Stage 1 screening the assessment is limited to the European sites and effect pathways where no LSE has been found as a result of the Project alone. It is not completed for potential effects where no pathway exists or where any changes may occur but have been shown to be inconsequential (see paragraph 2.5.13).

4.1.20 Any interactions between the European sites and the Project where a conclusion of potential LSE alone has been reached has been considered in combination with other plans and projects at Stage 2 Appropriate Assessment.

[6] The use of this measure of functionality was discussed with Natural England, see Appendix C Evidence Plan

Identifying other plans and projects

4.1.21 The in-combination assessment includes consideration of the reasonably foreseeable plans and projects considered in ES Chapter 16: Cumulative Effects Assessment (CEA) (Application Document 6.1) undertaken for the EIA, amended to ensure compliance for the HRA, e.g. through refining potential pathways and receptors. The in-combination assessment for air quality effects uses the shortlist of plans and projects derived for the CEA as well as permitting information from the Environment Agency (permitting searches completed in July 2020). This list of reasonably foreseeable plans and projects is based on Advice Note 17 (The Planning Inspectorate, 2019), with the following types of development considered:

a. Projects that are under construction
b. Permitted application(s) not yet implemented
c. Submitted application(s) not yet determined
d. All refusals subject to appeal procedures not yet determined
e. Projects on the National Infrastructure Commission's programme of projects
f. Projects identified in the relevant development plans and emerging development plans

4.1.22 Past projects and projects for which potential effects are fully determined were included in the environmental baseline and do not feature in the in-combination assessment. Rejected and withdrawn planning applications were also not included in the in-combination assessment as they are not considered to be reasonably foreseeable developments.

4.1.23 Effects were considered to be potentially acting in combination where there are spatial and temporal overlaps of Project effects with similar effects from other projects on relevant receptors.

Spatial extent used to identify other plans or projects

Changes in air quality

4.1.24 The contribution of changes in traffic from other plans or projects has already been considered with the 'Effects of the Project alone' assessment, as the data used within the traffic model include the predicted changes in traffic from other plans and projects. The scope of the in-combination assessment for this effect pathway considers other potential sources of N deposition. Other plans and projects that potentially contribute to N deposition in ways other than traffic (and could be identified via a permitting system) would be broadly limited to industrial processes and intensive agricultural units. Both of these types of development are given permission (at least in part) via Environment Agency permitting.

4.1.25 The search area for other plans or projects that may also contribute to N deposition at these European sites has been defined as follows and is illustrated on Figure 23. The size of search area has been determined based on the advice given by the Environment Agency in 'Risk assessments for your environmental permit' (Environment Agency, 2020) and includes project types within the following distances from each European site:

a. 15km – coal or oil-fired power stations or >50 megawatt emitters
b. 10km – industrial emissions, e.g. energy generation plants
c. 5km – intensive livestock units
d. 500m – agricultural biomass boilers

Land take

4.1.26 The European site(s) potentially affected by the Project alone have functionally linked land associated with them. Therefore, the area of the European site and its functionally linked land was searched to identify any other plans or projects proposed where the habitat types listed in the supplementary advice could be impacted and therefore having potential to contribute to in-combination effects.

Disturbance

4.1.27 Other projects with potential for in-combination effects of disturbance were considered as those with construction activities that could affect the same area as potentially affected by the Project alone. Construction activities from other projects were considered within a precautionary 1km of the Order Limits (i.e. over three times the zone of influence for visual disturbance (300m, based on Cutts *et al* (2013)). The 1km distance was used as being beyond that distance that, were two projects to have an effect, the affected areas would not overlap and indeed would have a buffer zone between the two affected areas of the equivalent of the effect distance.

Assessment method

Changes in air quality

4.1.28 The predicted contribution of N deposition has been identified where available for the other plans and projects located within the search area. The combined contribution to N deposition was calculated by summing together the predicted N deposition (kg N $ha^{-1}yr^{-1}$) for each of the projects within the search area and determining the percentage of the critical load for the habitats of each site. The likelihood of an effect of all the projects in combination was determined based on the combined figure with consideration given to the likely sensitivity of the habitats present and in view of the conservation objectives of the European sites.

Land take

4.1.29 The Project land take would affect functionally linked land used by bird features of SPAs and Ramsar sites. In-combination assessment of land take therefore only includes identification of other projects and plans that would also result in additional land take of suitable habitat within functionally linked land.

4.1.30 The list of projects was reviewed in terms of habitat loss from developments and compared with the attributes and targets relating to supporting habitat in the supplementary advice, to provide a measure of likely prevention of achieving the targets and therefore having an effect on the integrity of the identified European site.

Disturbance

4.1.31 The timeline of projects taken from the cumulative effects list identified potentially important construction phases as well as noise levels and visual stimuli within the 300m zones.

4.1.32 Any spatial and temporal overlaps were considered in terms of the season, the use of habitats affected, and the activities proposed. The assessment considered the potential effects on the individual birds and the likely proportion of the European site populations affected at any one time and therefore considered whether there would be an adverse effect on integrity.

4.2 Assumptions

Consideration of case law

4.2.1 In completing this HRA, due regard has been given to the relevant judgments listed in Table 4.2.

Table 4.2 Case law relevant to HRA Stage 1 Screening

Case Ref	Name	Summary of ruling
C-258/11	Sweetman v An Bord Pleanála	Article 6(3) of Council Directive 92/43/EEC must be interpreted as meaning that a plan or project not directly connected with or necessary to the management of a site will adversely affect the integrity of that site if it is liable to prevent the lasting preservation of the constitutive characteristics of the site that are connected to the presence of a priority natural habitat whose conservation was the objective justifying the designation of the site in the list of sites of Community importance, in accordance with the directive. The precautionary principle should be applied for the purposes of that appraisal.
C521-12	Briels v Minister van Infrastructuur en Milieu	Future creation or expansion of the habitat on a different part of the same site is too uncertain to be taken account of at the appropriate assessment stage and is compensatory not mitigation. Competent national authorities could not disguise compensatory measures as mitigation to authorise projects which adversely affect the integrity of a site by avoiding the cumulative process in articles 6(3) and 6(4) of the Habitats Directive.
C-387/15 and C-388/15	Hilde Orleans, Rudi Van Buel, Marina Apers, Denis Malcorps, Myriam Rijssens, Guido Van De Walle v Vlaams Gewest	Article 6(3) of Council Directive 92/43/EEC must be interpreted as meaning that measures, contained in a plan or project not directly connected with or necessary to the management of a site of Community importance, providing, prior to the occurrence of adverse effects on a natural habitat type present thereon, for the future creation of an area of that type, but the completion of which will take place subsequently to the assessment of the significance of any adverse effects on the integrity of that site, may not be taken into consideration in that assessment. Such measures can be categorised as 'compensatory measures', within the meaning of Article 6(4), only if the conditions laid down therein are satisfied.
C-164/17	Edel Grace, Peter Sweetman v An Bord Pleanála (Ireland)	Article 6 must be interpreted as meaning that, where it is intended to carry out a project on a site designated for the protection and conservation of certain species, of which the area suitable for providing for the needs of a protected species fluctuates over time, and the temporary or permanent effect of that project will be that some parts of the site will no longer be able to provide a suitable habitat for the species in question, the fact that the project includes measures to ensure that, after an appropriate assessment of the implications of the project has been carried out and throughout the lifetime of the project, the part of the site that is in fact likely to provide a suitable habitat will not be reduced and indeed may be enhanced may not be taken into account for the purpose of the

Case Ref	Name	Summary of ruling
		assessment that must be carried out in accordance with Article 6(3) of the directive to ensure that the project in question will not adversely affect the integrity of the site concerned; that fact falls to be considered, if need be, under Article 6(4) of the directive.
C-293/17 and C-294/17	Coöperatie Mobilisation for the Environment UA, Vereniging Leefmilieu v College van gedeputeerde staten van Limburg, College van gedeputeerde staten van Gelderland (C-293/17), Stichting Werkgroep Behoud de Peel v College van gedeputeerde staten van Noord-Brabant (C-294/17)	1. Article 6(3) must be interpreted as meaning that the grazing of cattle and the application of fertilisers on the surface of land or below its surface in the vicinity of Natura 2000 sites may be classified as a 'project' within the meaning of that provision, even if those activities, in so far as they are not a physical intervention in the natural surroundings, do not constitute a 'project' within the meaning of Article 1(2)(a) of Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment. 2. Article 6(3) must be interpreted as meaning that a recurring activity, such as the application of fertilisers on the surface of land or below its surface, authorised under national law before the entry into force of that directive, may be regarded as one and the same project for the purposes of that provision, exempted from a new authorisation procedure, in so far as it constitutes a single operation characterised by a common purpose, continuity and, inter alia, the location and the conditions in which it is carried out being the same. If a single project was authorised before the system of protection laid down by that provision became applicable to the site in question, the carrying out of that project may nevertheless fall within the scope of Article 6(2) of that directive. 14.1.2019 EN Official Journal of the European Union C 16/13 3. Article 6(3) must be interpreted as not precluding national programmatic legislation which allows the competent authorities to authorise projects on the basis of an 'appropriate assessment' within the meaning of that provision, carried out in advance and in which a specific overall amount of nitrogen deposition has been deemed compatible with that legislation's objectives of protection. That is so, however, only in so far as a thorough and in-depth examination of the scientific soundness of that assessment makes it possible to ensure that there is no reasonable scientific doubt as to the absence of adverse effects of each plan or project on the integrity of the site concerned, which it is for the national court to ascertain. 4. Article 6(3) must be interpreted as not precluding national programmatic legislation, such as that at issue in the main proceedings, exempting certain projects which do not exceed a certain threshold value or a certain limit value in terms of nitrogen deposition from the requirement for individual approval, if the national court is satisfied that the

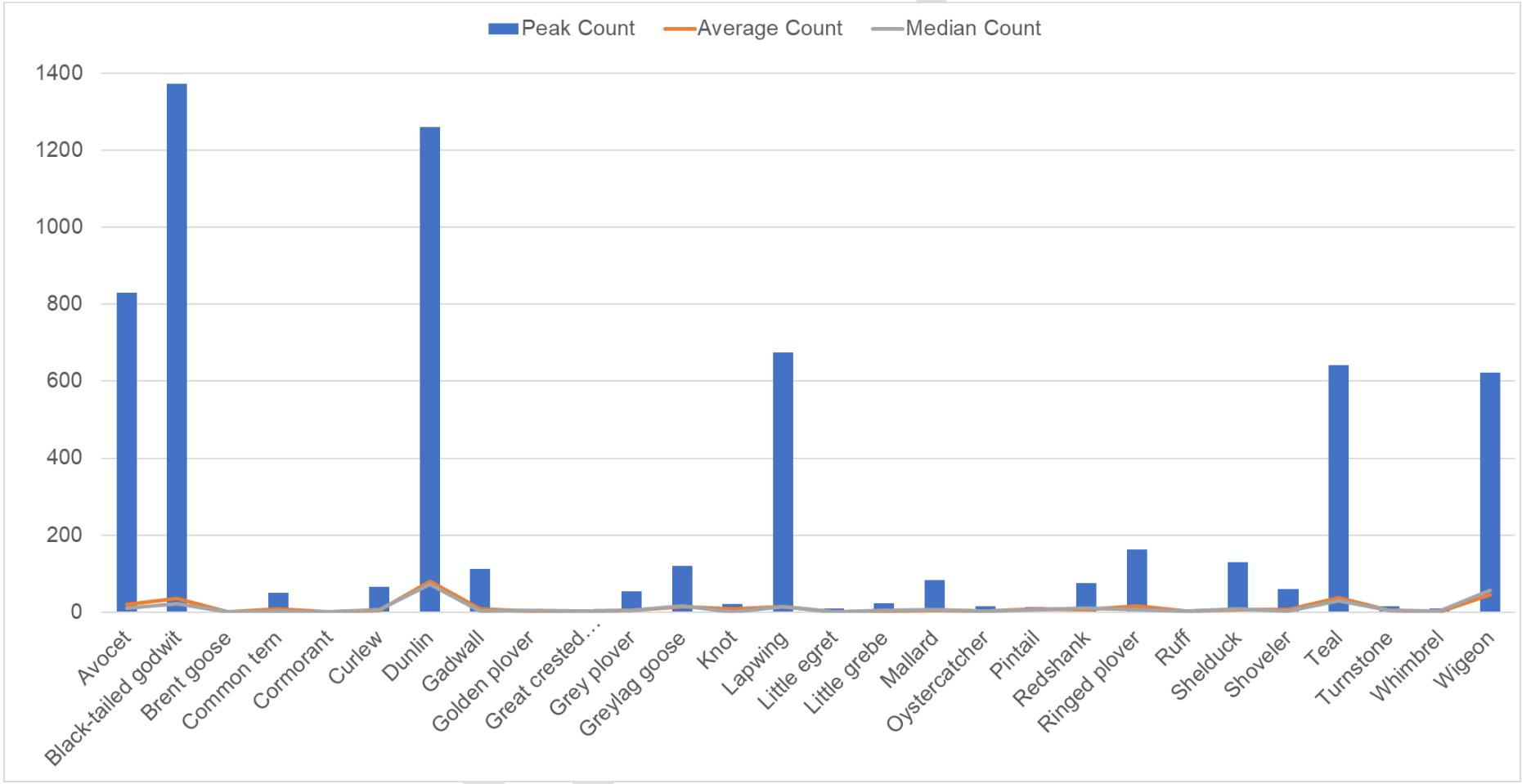
Case Ref	Name	Summary of ruling
		'appropriate assessment' within the meaning of that provision, carried out in advance, meets the criterion that there is no reasonable scientific doubt as to the lack of adverse effects of those plans or projects on the integrity of the sites concerned. 5. Article 6(3) must be interpreted as precluding national programmatic legislation, such as that at issue in the main proceedings, which allows a certain category of projects, in the present case the application of fertilisers on the surface of land or below its surface and the grazing of cattle, to be implemented without being subject to a permit requirement and, accordingly, to an individualised appropriate assessment of its implications for the sites concerned, unless the objective circumstances make it possible to rule out with certainty any possibility that those projects, individually or in combination with other projects, may significantly affect those sites, which it is for the referring court to ascertain. 6. Article 6(3) must be interpreted as meaning that an 'appropriate assessment' within the meaning of that provision may not take into account the existence of 'conservation measures' within the meaning of paragraph 1 of that article, 'preventive measures' within the meaning of paragraph 2 of that article, measures specifically adopted for a programme such as that at issue in the main proceedings or 'autonomous' measures, in so far as those measures are not part of that programme, if the expected benefits of those measures are not certain at the time of that assessment. 7. Article 6(3) of Directive 92/43 must be interpreted as meaning that measures introduced by national legislation, such as that at issue in the main proceedings, including procedures for the surveillance and monitoring of farms whose activities cause nitrogen deposition and the possibility of imposing penalties, up to and including the closure of those farms, are sufficient for the purposes of complying with that provision.
C–323/17	People Over Wind, Peter Sweetman v Coillte Teoranta (Ireland)	Article 6(3) must be interpreted as meaning that, in order to determine whether it is necessary to carry out, subsequently, an appropriate assessment of the implications, for a site concerned, of a plan or project, it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site.
2017 EWHC 351	Judgment in Wealden District Council v Secretary of State for Communities and Local Government, Lewes District	It is no longer appropriate to scope out the need for a detailed assessment of an individual project or plan using, for example, the 1000 annual average daily traffic (AADT) increase in the Design Manual For Roads and Bridges (DMRB) or the 1% of the critical level or load used by Defra/Environment Agency without first considering the in-combination impact with other projects and plans.

Case Ref	Name	Summary of ruling
	Council and South Downs National Park Authority	
C-461/17	Holohan *et al* v An Bord Pleanala	Article 6(3) must be interpreted as meaning that an 'appropriate assessment' must, on the one hand, catalogue the entirety of habitat types and species for which a site is protected, and, on the other, identify and examine both the implications of the proposed project for the species present on that site, and for which that site has not been listed, and the implications for habitat types and species to be found outside the boundaries of that site, provided that those implications are liable to affect the conservation objectives of the site. Article 6(3) must be interpreted as meaning that the competent authority is permitted to grant to a plan or project which leaves the developer free to determine subsequently certain parameters relating to the construction phase, such as the location of the construction compound and haul routes, only if that authority is certain that the development consent granted establishes conditions that are strict enough to guarantee that those parameters will not adversely affect the integrity of the site. Article 6(3) must be interpreted as meaning that, where the competent authority rejects the findings in a scientific expert opinion recommending that additional information be obtained, the 'appropriate assessment' must include an explicit and detailed statement of reasons capable of dispelling all reasonable scientific doubt concerning the effects of the work envisaged on the site concerned.
[2019] EWCACiv 1562 (Court of Appeal) [2018]EWHC 2190 (Admin) (Divisional Court)	Langton v Secretary of State for Environment, Food and Rural Affairs	Measures which can properly be characterised as integral features of a plan or project [in Langton the measures in question were the conditions attached to a badger culling licence by Natural England] may be distinguished from 'mitigating or protective' measures as referred to in the *People Over Wind* case and may therefore be taken into account at the 'screening' stage of the HRA process.

Use of peak count data

4.2.2 The numbers of birds recorded as part of the over winter field survey effort for the Project are summarised in Plate 4.1 The graph clearly shows the difference between the peak counts recorded for species, compared to the average (mean) and median counts recorded based on the numbers generally observed on each winter survey visit. This highlights that the use of peak counts, which is standard practice when reporting bird data, provides a worst-case view of bird use of an area (in terms of the potential magnitude of effect) and therefore, when used as the basis of the baseline condition at all times, provides a highly precautionary interpretation of the habitat use, which is used within the assessment in this report.

Plate 4.1 Comparison of peak and average numbers of HRA species in the functionally linked land within the Project survey area (Apr 2017 – Feb 2020)



5 European sites potentially affected by the proposals

5.1 Sites identified

5.1.1 The European sites that have been identified as a result of applying the screening criteria are set out in the following headings, with details of each site set out in Table 5.2.

Is the project within 2km of a European site or functionally linked land (see point f below)?

5.1.2 The Thames Estuary and Marshes Ramsar and Thames Estuary and Marshes SPA are within 2km, as shown in Figure 1.

5.1.3 The zone of influence of the Project includes functionally linked land associated with the Thames Estuary and Marshes SPA and Ramsar as shown in Figure 2.

Is the project within 30km of a SAC where bats are one of the qualifying features?

5.1.4 There are no sites identified, as shown on Figure 4.

Does the project cross or lie adjacent to, upstream of or downstream of a watercourse which is designated in part or wholly as a European site?

Upstream sites

5.1.5 No sites were identified upstream, as shown on Figure 5.

Downstream sites

5.1.6 The following sites were identified downstream, as shown on Figure 5:

a. Benfleet and Southend Marshes SPA and Ramsar

b. Outer Thames Estuary SPA

c. Thames Estuary and Marshes SPA and Ramsar

5.1.7 Although European sites have been identified downstream, the Project design is such that the only potential pathway to effect could be via changes in water quality or quantity as a result of Project drainage discharges. However as set out in Table 2.1, the zone on influence for such a pathway would not exceed 500m. Therefore, only the Thames Estuary and Marshes SPA/ Ramsar would be identified.

Does the project have a potential hydrological or hydrogeological linkage to a European site containing a groundwater dependent terrestrial ecosystem (GWDTE) which triggers the assessment of European sites in accordance with DMRB LA 113?

5.1.8 There is a potential hydrological linkage between the Project and the habitats it crosses, which include the Thames Estuary and Marshes Ramsar and functionally linked land associated with the Thames Estuary and Marshes SPA and Ramsar.

5.1.9 The Project has collected data from the Thames Estuary and Marshes Ramsar site to establish if any GWDTE are present (ES Appendix 14.5 Hydrogeological Risk Assessment (Application Document 6.3)). The functionally linked land is comprised of agricultural and intertidal habitat and did not include any GWDTEs.

5.1.10 Table 5.1 summarises the results, which indicated that the Filborough Marshes and Shorne Marshes, see Figure 6, supported habitats with low groundwater dependency, as defined by the UK Technical Advisory Group for the Water Framework Directive (2014). Therefore, the Thames Estuary and Marshes Ramsar site has been identified as potentially hydrological or hydrogeological linked.

Table 5.1 Groundwater dependency scores for the habitat communities recorded on the Filborough and Shorne Marshes

Communities **Closest National Vegetation Classification community**	**UK (England) groundwater dependency (GW) score**
Filborough Marshes	
Mosaic 1 – Floating A2 *Lemnetum minoris* with development towards A1 *Lemnetum gibbae* in some areas	Not listed
Mosaic 2 - Submerged A5 *Ceratophylletum demersi* and A6 *Ceratophylletum submersi*	Not listed
Mosaic 3 - Emergent S4 *Phragmitetum australis*, S19 *Eleocharis palistris*, and S21 *Scirpus maritimus*	3 - low
Mosaic 4 - Bankside S18 *Caricetum otrubae* and S4 *Phragmitetum australis*	3 - low
Shorne Marshes	
Mosaic 1 - Floating A2 *Lemnetum minoris* with development towards A1 *Lemnetum gibbae* in some areas	Not listed
Mosaic 2 - Submerged A5 *Ceratophylletum demersi*	Not listed
Mosaic 3 - Emergent and Bankside	3 - low

Communities **Closest National Vegetation Classification community**	**UK (England) groundwater dependency (GW) score**
S4a *Phragmites australis*, *Phragmites australis* sub-community, S13 *Typha angustifolia*, S19 *Eleocharispalistris*, S20 *Scirpus lacustris ssp. tabernaemontani*, and S21 *Scirpus maritimus*	
Mosaic 4 - Ponds 1, 3, 4, and 5 S21c *Scirpus maritimus*, *Agrostis stolonifera* sub-community	3 - low
Mosaic 5 - Pond 2 S21a *Scirpus maritimus, Scirpus maritimus* sub-community, and S4a *Phragmites australis*, *Phragmites australis* sub-community	3 - low
Mosaic 6 - Pond 6 A5 *Ceratophylletum demersi*, A6 *Ceratophylletum submersi* S21a *Scirpus maritimus, Scirpus maritimus* sub-community, S4a *Phragmites australis, Phragmites australis* sub-community, and S20 *Scirpus lacustris ssp. tabernaemontani*	Not listed 3 - low
Mosaic 7 - Pond 7 A5 *Ceratophylletum demersi* S21a *Scirpus maritimus, Scirpus maritimus* sub-community, S4a Phragmites australis, Phragmites australis sub-community; and S20 *Scirpus lacustris ssp. tabernaemontani*	Not listed 3 - low

Does the project have an Affected Road Network (ARN) which triggers the criteria for assessment of European sites in DMRB LA 105?

5.1.11 A 200m buffer from the operational ARN has been used to identify the following potentially affected sites, as shown in Figure 7:

a. Epping Forest SAC

b. Medway Estuary and Marshes SPA and Ramsar

c. North Downs Woodlands SAC

d. Thames Estuary and Marshes Ramsar

e. The Swale SPA and Ramsar

5.1.12 A 200m buffer from the construction ARN, as shown in Figure 8, intersects with the Thames Estuary and Marshes Ramsar.

Is there ecological connectivity between the project and other European sites?

5.1.13 The Evidence Plan in Appendix C documents the process that has been used, in consultation with Natural England to identify any ecological connectivity between the Project and other European sites. No other European sites where identified.

England National Application Annex to LA 115 E/1 Screening

5.1.14 Those European sites with SSSI Impact Risk Zones (IRZs) within the Order Limits or footprint should be subject to HRA screening.

5.1.15 Figure 9 illustrates interactions between the Project and the IRZs and the following European sites have been identified:

a. Thames Estuary and Marshes Ramsar

b. Thames Estuary and Marshes SPA

Table 5.2 European sites identified

European site name and code	Location and distance	Size (ha)	Key features including the primary reasons for designation and any other qualifying interests	Vulnerability	Conservation objectives
Thames Estuary and Marshes SPA UK9012021	Approximately 0.1km east of the Project	55.7 (marine) 4,802.47	ARTICLE 4.1 QUALIFICATION (79/409/EEC) Over winter the area regularly supports: *Circus cyaneus* 1% of the population in Great Britain five-year peak mean for 1993/94 to 1997/98 *Recurvirostra avosetta* (Western Europe/Western Mediterranean - breeding) 28.3% of the population in Great Britain five-year peak mean for 1993/93 to 1997/98 ARTICLE 4.2 QUALIFICATION (79/409/EEC) Over winter the area regularly supports: *Calidris alpina alpina* (Northern Siberia/Europe/Western Africa) 2.1% of the population five-year peak mean for 1993/94 to 1997/98 *Calidris canutus* (North-eastern Canada/Greenland/Iceland/North-western Europe) 1.4% of the population five-year peak mean for 1993/94 to 1997/98 *Limosa limosa islandica* (Iceland - breeding) 2.4% of the population five-year peak mean for 1993/94 to 1997/98 *Pluvialis squatarola* (Eastern Atlantic - wintering) 1.7% of the population five-year peak mean for 1993/94 to 1997/98 *Tringa totanus* (Eastern Atlantic - wintering) 2.2% of the population five-year peak mean for 1993/94 to 1997/98 On passage the area regularly supports: *Charadrius hiaticula* (Europe/Northern Africa - wintering) 2.6% of the population five-year peak mean for 1993/94 to 1997/98 ARTICLE 4.2 QUALIFICATION (79/409/EEC): An internationally important assemblage of birds. Over winter the area regularly supports: 75,019 waterfowl (five-year peak mean 1991/92-1995/96) Included within JNCC SPA 3rd Review (Stroud, et al., 2016) as a site with boundary review needs for the following species: European white-fronted goose *Anser albifrons albifrons* Lapwing *Vanellus vanellus*	M01 Changes in abiotic conditions I01 Invasive Non-Native Species G01 Outdoor sports and leisure activities, recreational activities M02 Changes in biotic conditions	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features • The distribution of the qualifying features within the site. Natural England also provides supplementary advice on conservation objectives for this site (Natural England, 2018).

European site name and code	Location and distance	Size (ha)	Key features including the primary reasons for designation and any other qualifying interests	Vulnerability	Conservation objectives
Thames Estuary and Marshes Ramsar UK11069	Approximately 0km east of the Project	5,588.59	Ramsar criterion 2 The site supports one endangered plant species and at least 14 nationally scarce plants of wetland habitats. The site also supports more than 20 British Red Data Book invertebrates Ramsar criterion 5 Assemblages of international importance: Species with peak counts in winter: 45,118 waterfowl (five-year peak mean 1998/99-2002/2003) Ramsar criterion 6 – species/populations occurring at levels of international importance. Qualifying Species/populations (as identified at designation): Species with peak counts in spring/autumn: Ringed plover, *Charadrius hiaticula*, Europe/Northwest Africa 595 individuals, representing an average of 1.8% of the GB population (five-year peak mean 1998/9-2002/3) Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe 1,640 individuals, representing an average of 4.6% of the population (five-year peak mean 1998/9-2002/3) Species with peak counts in winter: Grey plover, *Pluvialis squatarola*, E Atlantic/W Africa - wintering 1,643 individuals, representing an average of 3.1% of the GB population (five-year peak mean 1998/9-2002/3) Red knot, *Calidris canutus islandica*, W & Southern Africa (wintering) 7,279 individuals, representing an average of 1.6% of the population (five-year peak mean 1998/9-2002/3) Dunlin, *Calidris alpina alpina*, W Siberia/W Europe 15,171 individuals, representing an average of 1.1% of the population (five-year peak mean 1998/9-2002/3) Common redshank, *Tringa totanus*, 1,178 individuals, representing an average of 1% of the GB population (five-year peak mean 1998/9- 2002/3)	Dredging Erosion Eutrophication General disturbance from human activities	The Applicant considers that the SPA conservation objectives are sufficient to support the management of the Ramsar[7] interests, as follows: Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring • The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features • The distribution of the qualifying features within the site.

[7] For Ramsar sites, a decision has been made by Defra and Natural England not to produce Conservation Advice packages, instead focusing on the production of High Level conservation objectives. As the provisions on the Habitats Regulations relating to Habitats Regulations Assessments (HRAs) extend to Ramsar sites, Natural England considers the Conservation Advice packages for the overlapping European Marine Site designations to be, in most cases, sufficient to support the management of the Ramsar interests. If there are Ramsar qualifying features not covered by overlapping European Marine Sites, Natural England will consider the best approach on addressing these (e.g. to produce advice on a feature basis) if there is an operational risk.

European site name and code	Location and distance	Size (ha)	Key features including the primary reasons for designation and any other qualifying interests	Vulnerability	Conservation objectives
Medway Estuary and Marshes SPA UK9012031	Approximately 9km east of the Project	69.1 (marine) 4,686.32	ARTICLE 4.1 QUALIFICATION (79/409/EEC) During the breeding season the area regularly supports: *Recurvirostra avosetta* (Western Europe/Western Mediterranean - breeding) 6.2% of the GB breeding population five-year mean, 1988-1992 *Sterna albifrons* (Eastern Atlantic - breeding) 1.2% of the GB breeding population five-year mean, 1991-1995 *Sterna hirundo* (Northern/Eastern Europe - breeding) 0.6% of the GB breeding population Count, as at 1994 Over winter the area regularly supports: *Cygnus columbianus bewickii* (Western Siberia/North-eastern & North-western Europe) 0.2% of the GB population five-year peak mean 1991/92-1995/96 *Recurvirostra avosetta* (Western Europe/Western Mediterranean - breeding) 24.7% of the GB population five-year peak mean 1991/92-1995/96 ARTICLE 4.2 QUALIFICATION (79/409/EEC) Over winter the area regularly supports: *Anas acuta* (North-western Europe) 1.2% of the population five-year peak mean 1991/92-1995/96 *Anas clypeata* (North-western/Central Europe) 0.8% of the population in Great Britain five-year peak mean 1991/92-1995/96 *Anas crecca* (North-western Europe) 1.3% of the population in Great Britain five-year peak mean 1991/92-1995/96 *Anas penelope* (Western Siberia/North-western/North-eastern Europe) 1.6% of the population in Great Britain five-year peak mean 1991/92-1995/96 *Arenaria interpres* (Western Palearctic - wintering) 0.9% of the population in Great Britain five-year peak mean 1991/92-1995/96 *Branta bernicla bernicla* (Western Siberia/Western Europe) 1.1% of the population five-year peak mean 1991/92-1995/96 *Calidris alpina alpina* (Northern Siberia/Europe/Western Africa) 1.9% of the population five-year peak mean 1991/92-1995/96 *Calidris canutus* (North-eastern Canada/Greenland/ Iceland/North-western Europe) 0.2% of the population five-year peak mean 1991/92-1995/96 *Charadrius hiaticula* (Europe/Northern Africa - wintering) 1.6% of the population five-year peak mean 1991/92-1995/96 *Haematopus ostralegus* (Europe & Northern/Western Africa) 1% of the population in Great Britain five-year peak mean 1991/92-1995/96	M01 Changes in abiotic conditions M02 Changes in biotic conditions G01 Outdoor sports and leisure activities, recreational activities I01 Invasive Non-Native Species	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features • The distribution of the qualifying features within the site. Natural England also provides supplementary advice on conservation objectives for this site (Natural England, 2019).

European site name and code	Location and distance	Size (ha)	Key features including the primary reasons for designation and any other qualifying interests	Vulnerability	Conservation objectives
			Limosa limosa islandica (Iceland - breeding) 12.9% of the population in Great Britain five-year peak mean 1991/92-1995/96 *Numenius arquata* (Europe - breeding) 1.7% of the population in Great Britain five-year peak mean 1991/92-1995/96 *Pluvialis squatarola* (Eastern Atlantic - wintering) 2% of the population five-year peak mean 1991/92-1995/96 *Tadorna tadorna* (North-western Europe) 1.5% of the population five-year peak mean 1991/92-1995/96 *Tringa nebularia* (Europe/Western Africa) 2.6% of the population in Great Britain No count period specified. *Tringa totanus* (Eastern Atlantic - wintering) 2.1% of the population five-year peak mean 1991/92-1995/96 ARTICLE 4.2 QUALIFICATION (79/409/EEC): An internationally important assemblage of birds. Over winter the area regularly supports: 65,496 waterfowl (five-year peak mean 1991/92-1995/96) Included within JNCC SPA 3rd Review (Stroud, et al., 2016) as a site with boundary review needs for the following species: Dark-bellied brent goose *Branta bernicla bernicla* Lapwing *Vanellus vanellus* Curlew *Numenius arquata*		
Medway Estuary and Marshes Ramsar UK11040	Approximately 9km east of the Project	4,696.74	Ramsar criterion 2 The site supports a number of species of rare plants and animals. The site holds several nationally scarce plants and a total of at least twelve British Red Data Book species of wetland invertebrates have been recorded on the site. Ramsar criterion 5 Assemblages of international importance: Species with peak counts in winter: 47,637 waterfowl (five-year peak mean 1998/99-2002/2003) Ramsar criterion 6 – species/populations occurring at levels of international importance. Qualifying Species/populations (as identified at designation): Species with peak counts in spring/autumn: Grey plover, *Pluvialis squatarola*, E Atlantic/W Africa - wintering 3,103 individuals, representing an average of 1.2% of the population (five-year peak mean 1998/9-2002/3) Common redshank, *Tringa totanus*, 3,709 individuals, representing an average of 1.4% of the population (five-year peak mean 1998/9-2002/3) Species with peak counts in winter:	Water diversion for irrigation/domestic/ industrial use Dredging Erosion Eutrophication Recreational/tourism disturbance Transport infrastructure development	The Applicant considers that the SPA conservation objectives are sufficient to support the management of the Ramsar[7] interests as follows: Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features • The distribution of the qualifying features within the site.

European site name and code	Location and distance	Size (ha)	Key features including the primary reasons for designation and any other qualifying interests	Vulnerability	Conservation objectives
			Dark-bellied brent goose, *Branta bernicla bernicla*, 2,575 individuals, representing an average of 1.1% of the population (five-year peak mean 1998/9-2002/3) Common shelduck, *Tadorna tadorna*, NW Europe 2,627 individuals, representing an average of 3.3% of the GB population (five-year peak mean 1998/9-2002/3) Northern pintail, *Anas acuta*, NW Europe 1,118 individuals, representing an average of 1.8% of the population (five-year peak mean 1998/9-2002/3) Ringed plover, *Charadrius hiaticula*, Europe/Northwest Africa 540 individuals, representing an average of 1.6% of the GB population (five-year peak mean 1998/9-2002/3) Red knot, *Calidris canutus islandica*, W & Southern Africa (wintering) 3,021 individuals, representing an average of 1% of the GB population (five-year peak mean 1998/9-2002/3) Dunlin, *Calidris alpina alpina*, W Siberia/W Europe 8,263 individuals, representing an average of 1.4% of the GB population (five-year peak mean1998/9-2002/3) Species/populations identified subsequent to designation for possible future consideration under criterion 6. Species with peak counts in spring/autumn: Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe 721 individuals, representing an average of 2% of the population (five-year peak mean 1998/9-2002/3)		
The Swale SPA UK9012011	Approximately 23km east of the Project	44.5 (marine) 6,509.88	ARTICLE 4.2 QUALIFICATION (79/409/EEC) Over winter the area regularly supports: *Branta bernicla bernicla* (Western Siberia/Western Europe) 0.7% of the population five-year peak mean 1991/92-1995/96 *Calidris alpina alpina* (Northern Siberia/Europe/Western Africa) 2.3% of the population in Great Britain five-year peak mean 1991/92-1995/96 *Tringa totanus* (Eastern Atlantic - wintering) 0.9% of the population five-year peak mean 1991/92-1995/96 ARTICLE 4.2 QUALIFICATION (79/409/EEC): AN INTERNATIONALLY IMPORTANT ASSEMBLAGE OF BIRDS Over winter the area regularly supports: 65588 waterfowl (five-year peak mean 1991/92-1995/96) Included within JNCC SPA 3rd Review (Stroud, et al., 2016) as a site with boundary review needs for the following species: European white-fronted goose *Anser albifrons albifrons* Dark-bellied brent goose *Brenta bernicla bernicla* Golden plover *Pluvialis apricaria* Lapwing *Vanellus vanellus* Curlew *Numenius arquata*	M01 Changes in abiotic conditions M02 Changes in biotic conditions F02 Fishing and harvesting aquatic resources G01 Outdoor sports and leisure activities, recreational activities I01 Invasive Non-Native Species	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features • The distribution of the qualifying features within the site.

European site name and code	Location and distance	Size (ha)	Key features including the primary reasons for designation and any other qualifying interests	Vulnerability	Conservation objectives
The Swale Ramsar UK11071	Approximately 23km east of the Project	6,514.71	Ramsar criterion 2 The site supports nationally scarce plants and at least seven British Red data book invertebrates Ramsar criterion 5 Assemblages of international importance: Species with peak counts in winter: 77501 waterfowl (five-year peak mean 1998/99-2002/2003) Ramsar criterion 6 – species/populations occurring at levels of international importance. Qualifying Species/populations (as identified at designation): Species with peak counts in spring/autumn: Common redshank, *Tringa totanus*, 1,712 individuals, representing an average of 1.4% of the GB population (five-year peak mean 1998/9-2002/3) Species with peak counts in winter: Dark-bellied brent goose, *Branta bernicla bernicla*, 1,633 individuals, representing an average of 1.6% of the GB population (five-year peak mean 1998/9-2002/3) Grey plover, *Pluvialis squatarola*, E Atlantic/W Africa - wintering 2,098 individuals, representing an average of 3.9% of the GB population (five-year peak mean 1998/9-2002/3) Species/populations identified subsequent to designation for possible future consideration under criterion 6. Species with peak counts in spring/autumn: Ringed plover, *Charadrius hiaticula*, Europe/Northwest Africa 917 individuals, representing an average of 1.2% of the population (five-year peak mean 1998/9- 2002/3) Species with peak counts in winter: Eurasian wigeon, *Anas penelope*, NW Europe 15,296 individuals, representing an average of 1% of the population (five-year peak mean 1998/9-2002/3) Northern pintail, *Anas acuta*, NW Europe 763 individuals, representing an average of 1.2% of the population (five-year peak mean 1998/9- 2002/3) Northern shoveler, *Anas clypeata*, NW & C Europe 483 individuals, representing an average of 1.2% of the population (five-year peak mean 1998/9-2002/3) Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe 1,504 individuals, representing an average of 4.2% of the population (five-year peak mean 1998/9-2002/3)	Erosion	The Applicant considers that the SPA conservation objectives are sufficient to support the management of the Ramsar interests[7], as follows: Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.
Epping Forest SAC UK0012720	Approximately 19km west of the Project	1,630.74	Annex I habitats that are a primary reason for selection of this site: 9120 Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae or Ilici-Fagenion*)	M02 Changes in biotic conditions H04 Air pollution, air-borne pollutants	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

European site name and code	Location and distance	Size (ha)	Key features including the primary reasons for designation and any other qualifying interests	Vulnerability	Conservation objectives
			Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 4010 Northern Atlantic wet heaths with *Erica tetralix* 4030 European dry heaths Annex II species that are a primary reason for selection of this site: 1083 Stag beetle *Lucanus cervus* Other features present: 1166 Great crested newt *Triturus cristatus*	G01 Outdoor sports and leisure activities, recreational activities J02 Human induced changes in hydraulic conditions A04 Grazing	• The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • The populations of qualifying species • The distribution of qualifying species within the site. Natural England also provides supplementary advice on conservation objectives for this site (Natural England, 2019).
North Downs Woodlands SAC UK0030225	Approximately 5km south of the Project	288.58	Annex I habitats that are a primary reason for selection of this site: 9130 *Asperulo-Fagetum* beech forests 91J0 *Taxus baccata* woods of the British Isles * Priority feature Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	I01 Invasive Non-Native Species H04 Air pollution, air-borne pollutants G01 Outdoor sports and leisure activities, recreational activities B02 Forest and Plantation management & use	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: • The extent and distribution of the qualifying natural habitats • The structure and function (including typical species) of the qualifying natural habitats • The supporting processes on which the qualifying natural habitats rely. Natural England also provides supplementary advice on conservation objectives for this site (Natural England, 2019).

5.2 Conservation objectives and site integrity

SPA and Ramsar Sites

5.2.1 The conservation objectives used to inform the assessment for each of the European sites are set out within Table 5.2. Natural England has produced supplementary advice on conserving and restoring the site features of each of the SPAs and the attributes that are of relevance to this assessment are summarised in the following paragraphs. Where conservation objectives or targets are not available for the qualifying feature subject to assessment, proxy information has been used from the Natura 2000 standard form (in the case of the population size targets).

Supplementary advice relating to qualifying bird features

5.2.2 The potential LSEs identified in section 5.5 relate to the effects of habitat loss and disturbance on qualifying bird features from the Thames Estuary and Marshes SPA and Ramsar. Therefore, the attributes summarised in Table 5.3 below are those that relate to the population sizes in the European site and requirements for supporting habitat for the qualifying features. These attributes have targets associated with them and the targets are used as part of the assessment of effects on the integrity of the European sites in Section 7.

Supplementary advice relating to air quality

5.2.3 The potential LSEs identified in section 5.2 relate to the effects of changes in air quality as a result of vehicle emissions on Medway Estuary and Marshes SPA and Ramsar, The Swale SPA and Ramsar and Thames Estuary and Marshes Ramsar. The supplementary advice provided by Natural England relating to the air quality attribute was the same for all three sites and had the following target for all qualifying features:

a. Maintain concentrations and deposition of air pollutants at below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System

Table 5.3 Summary of the attribute types that apply to each qualifying feature of the Thames Estuary and Marshes SPA

Attribute	Avocet	Black-tailed godwit	Dunlin	Grey plover	Hen harrier	Knot	Redshank	Ringed plover	Waterbird assemblage
Assemblage of species: abundance									Yes
Assemblage of species: diversity									Yes
Non-breeding population: abundance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Connectivity with supporting habitats	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Disturbance caused by human activity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Supporting habitat: conservation measures	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Supporting habitat: extent and distribution of supporting habitat for the non-breeding season	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Supporting habitat: food availability	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Supporting habitat: landform	Yes	Yes	Yes	Yes		Yes	Yes	Yes	
Supporting habitat: landscape	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Supporting habitat: quality of supporting non-breeding habitat									Yes
Supporting habitat: vegetation characteristics					Yes				
Supporting habitat: vegetation characteristics for nesting							Yes		
Supporting habitat: vegetation characteristics for roosting		Yes	Yes	Yes	Yes	Yes	Yes	Yes	

Note – species all non-breeding unless otherwise specified

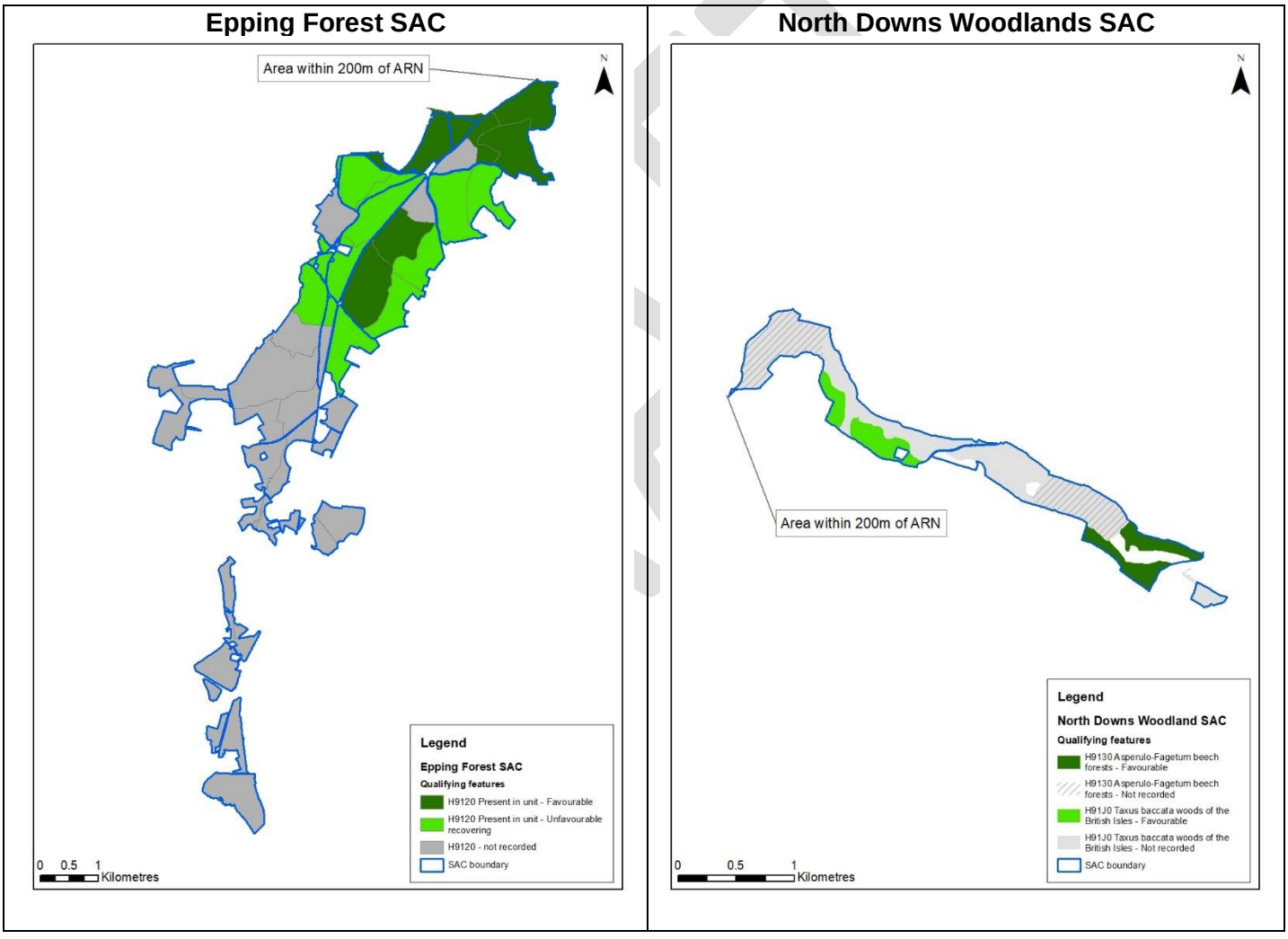
SAC sites

Supplementary advice relating to air quality

5.2.4 The conservation objectives for the Epping Forest and North Downs Woodlands SACs are set out within Table 5.2.

5.2.5 The distribution of the qualifying habitats potentially affected (see paragraph 5.2.6) within the European sites are shown in Plate 5.1. These are displayed using the information provided by the Natural England Designated Sites View and relate to the SSSI units where the qualifying features have been recorded. Other smaller fragments of the qualifying habitat exist as recorded during field surveys, particularly within the North Downs Woodlands SAC.

Plate 5.1 Extent of qualifying features within the European sites



5.2.6 The survey work completed within the areas potentially affected (see paragraph 5.3.24 to 5.3.27) found that the qualifying features likely to be present were:

a. Epping Forest: H9120. Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (*Quercion robori-petraeae* or *Ilici-Fagenion*); Beech forests on acid soils and therefore S1083 Stag beetle *Lucanus cervus*
a. North Downs Woodland: H9130 *Asperulo-Fagetum* beech forests and

potentially H91J0 Taxus baccata woods of the British Isles

5.2.7 Natural England has produced supplementary advice (Natural England, 2019a; Natural England, 2019b) on conserving and restoring the site features of each of the SACs, and the attributes that are of relevance to this assessment are set out within Table 5.4.

5.2.8 The potential LSEs identified in section 5.5 relate to effects of nitrogen (N) deposition resulting in habitat loss/degradation. Therefore, the attributes summarised are those that relate to air quality and the targets associated with these attributes are used as part of the assessment of effects on the integrity of the European sites.

Table 5.4 Summary of the attributes and targets that apply to this assessment

Qualifying feature	Attribute	Target	Reason for target
Epping Forest			
H9120. Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion robori-petraeae or Ilici-Fagenion*); Beech forests on acid soils	Supporting processes (on which the feature relies) Air quality	Restore as necessary, the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this H9120 woodland feature of the site on the Air Pollution Information System (www.apis.ac.uk).	The annual mean critical levels for NH_3 and critical loads for N deposition are being exceeded for the H9120 woodland feature (and the defined mosaic). In addition to this, site–based evidence indicates that the annual mean critical level for NOx is also being exceeded, notably for areas close to main roads.
S1083 Stag beetle *Lucanus cervus*	Supporting processes (on which the feature relies) Air quality	Maintain or, where necessary, restore concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	The relevant Critical Levels and Critical Loads for the S1083 stag beetle feature at Epping Forest broadly align with the thresholds for the H9120 woodland feature.
North Downs Woodland			
H9130 *Asperulo-Fagetum* Beech forests on neutral to rich soils	Supporting processes (on which the feature relies) Air quality	Restore as necessary, the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution	This habitat type is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition and

Qualifying feature	Attribute	Target	Reason for target
		Information System (www.apis.ac.uk).	causing the loss of sensitive typical species associated with it. N Deposition (kg ha^{-1} yr^{-1}): 25.9 which is above Critical Loads (kg ha^{-1} yr^{-1}): 10-20
H91J0 Taxus baccata woods of the British Isles *Priority feature	Supporting processes (on which the feature relies) Air quality	Restore as necessary, the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	This habitat type is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition and causing the loss of sensitive typical species associated with it. N Deposition (kg ha^{-1} yr^{-1}): 25.9 which is above Critical Loads (kg ha^{-1} yr^{-1}): 5-15.

5.3 Baseline conditions

Background

5.3.1 Site baseline conditions are only presented for the qualifying features potentially affected by the Project, i.e. those recorded within the Project ZoI during field surveys. Where sites have only been identified as potentially affected by vehicle emissions (i.e. within 200m of the ARN) then only the baseline pertinent to the assessment of changes in air quality has been included.

5.3.2 The Project field surveys comprised:

a. Ornithology

5.3.3 The survey locations that are relevant to this HRA are shown on Figure 10. Table 5.5 identifies the survey areas/transects that are within the functionally linked land and the data collected at these locations have been extracted from the wider Project dataset for use within this assessment.

Table 5.5 Survey locations (shown on Figure 10) that are within the functionally linked land

Diurnal surveys	Nocturnal surveys (winter months only)	Intertidal vantage point surveys
Biggin Farm	Bowaters Farm	NE
Bird transect 21 and 22	Chalk	NE2
Bretts Farm	Eastcourt Marshes	NW
Coalhouse Fort	East Tilbury Battery	SE
Coles Farm	Tilbury Fort	SW

Diurnal surveys	Nocturnal surveys (winter months only)	Intertidal vantage point surveys
East Tilbury Battery	Ingrebourne valley	
East Tilbury Marshes	East Tilbury jetty at Goshem's Farm	
Filborough Marshes	Mott Farm	
Parsonage Farm	Scrapheap and Cole's Farm	
Rochester Bridge		
Shorne Marshes		
Tilbury Fort		
Tilbury Power Station		

b. Habitats

5.3.4 A preliminary site walkover was completed at the end of February 2020 and described the habitat types within the areas of the European sites potentially affected by changes in air quality, i.e. the areas within 200m of the ARN. The walkover was carried out from the road network or PRoW and for some areas it was not possible to clearly see all of the area potentially affected however the findings of the site walkover are considered a robust basis for assessment. The habitat types have been described in accordance with the UKHab classification system (The UKHab Working Group, 2018) where it was possible to do so.

5.3.5 A detailed site investigation for Epping Forest was carried out in May 2020 and the survey report is included in Appendix D. The survey was carried out on three 500m transects with plots spaced at 100m intervals along each transect. The locations of the transects and quadrats are shown in Appendix D Figure 1. The transects were aligned along gradients of modelled N deposition, with origins at the point in the north of the SAC where changes in N deposition were highest. Along each transect, 50m x 50m plots for sampling vegetation were spaced at 100m intervals. Plots along transects one and three were truncated at 400m and 300m, respectively, as plots at these locations would have been, respectively, over a wide track and outside of the SAC.

Thames Estuary and Marshes SPA & Ramsar

Qualifying species and assemblages

5.3.6 This section presents the baseline conditions of the SPA or Ramsar qualifying bird species for the area potentially affected by the Project. These include both individual qualifying species and species that make up the assemblage qualifying feature as set out in Table 5.6, and throughout this assessment are referred to as HRA species. HRA species that have been recorded in the functionally linked land (and therefore potentially affected by the Project) are included in the assessment. For the purposes of this assessment the Overwinter assemblage has been defined as follows:

a. Overwintering waterfowl – the species that make up the assemblage include all of the overwintering qualifying species and any other waterfowl species for which a European site could be designated, recorded during the

winter months (November to March inclusive) in the Project survey area.

5.3.7 Table 5.6 provides a list of the species that have been recorded during the ornithology surveys, whether or not they are a qualifying feature of the European sites and whether or not they are considered to contribute to the overwintering assemblage. Figure 11a-i indicates the numbers and distribution of each of the individual qualifying species and the overwintering assemblage recorded during the ornithology surveys.

Table 5.6 Species recorded within the functionally linked land during Project ornithology surveys (and therefore potentially affected by the Project)

Common name	Scientific name	Peak count recorded during Project ornithology surveys (month)	Individual qualifying feature	Part of overwintering assemblage
Avocet	*Recurvirostra avosetta*	830 (Jan)	Yes (Wi)	Yes
Black-tailed godwit	*Limosa limosa islandica*	1,372 (Aug)	Yes (Wi, Pa)	Yes
Brent goose (dark-bellied)	*Branta bernicla bernicla*	1 (Nov)		Yes
Common tern	*Sterna hirundo*	50 (Apr)		No
Cormorant	*Phalacrocorax carbo*	6 (Dec)		Yes
Curlew	*Numenius arquata*	66 (Jan)		Yes
Dunlin	*Calidris alpina alpina*	1260 (Nov)	Yes (Wi)	Yes
Gadwall	*Anas strepera*	113 (Jan)		Yes
Golden plover	*Pluvialis apricaria*	2 (Mar)		Yes
Great crested grebe	*Podiceps cristatus*	8 (Jun)		Yes
Grey plover	*Pluvialis squatarola*	55 (Nov)	Yes (Wi)	Yes
Greylag goose (British/Irish)	*Anser anser*	120 (Jan)		Yes
Knot	*Calidris canutus*	21 (Mar)	Yes (Wi)	Yes
Lapwing	*Vanellus vanellus*	675 (Jan)	Yes (Wi**)	Yes
Little egret	*Egretta garzetta*	10 (Nov)		Yes
Little grebe	*Tachybaptus ruficollis*	23 (Dec)		Yes
Mallard	*Anas platyrhynchos*	84 (Dec)		Yes
Oystercatcher	*Haematopus ostralegus*	16 (Aug)		Yes
Pintail	*Anas acuta*	13 (Mar)		Yes
Redshank	*Tringa totanus*	75 (Apr)	Yes (Wi)	Yes
Ringed plover	*Charadrius hiaticula*	162 (Oct)	Yes (Pa)	Yes
Ruff	*Philomachus pugnax*	2 (Jul)		Yes
Shelduck	*Tadorna tadorna*	129 (Dec)		Yes

Common name	Scientific name	Peak count recorded during Project ornithology surveys (month)	Individual qualifying feature	Part of overwintering assemblage
Shoveler	*Anas clypeata*	60 (Feb)		Yes
Teal	*Anas crecca*	641 (Dec)		Yes
Turnstone	*Arenaria interpres*	16 (Nov)		Yes
Whimbrel	*Numenius phaeopus*	10 (Dec)		Yes
Wigeon	*Anas penelope*	623 (Nov)		Yes
White-fronted goose (European)	Anser albifrons albifrons	NOT RECORDED	Yes (Wi**)	Yes
Hen harrier	Circus cyaneus	NOT RECORDED	Yes (Wi)	

** indicates SPA 3rd Review SPAs with boundary review needs (Stroud, et al., 2016)
Wi – Overwinter, Pa – Passage

Project field surveys

5.3.8 Ornithological surveys have been completed for the Project and the results of these, where they relate to the SPA and Ramsar qualifying bird features, are presented in the following paragraphs.

5.3.9 Figure 10 illustrates the distribution of HRA species recorded during the Project field work. This clearly indicates that the majority of birds were recorded along and either side of the River Thames, within the Thames Estuary and Marshes SPA/Ramsar and the associated functionally linked land. The intertidal areas recorded the greatest peak counts and diversity of species, with the standing water and wet grassland associated with Tilbury Fort and the RSPB managed area east of the Metropolitan Police firing range also recording greater species numbers and diversity when compared to agricultural habitats within the functionally linked land.

Intertidal vantage point survey

5.3.10 The intertidal areas on both the north and south sides of the River Thames were subject to intertidal vantage point surveys. Figure 12 shows the location of the vantage points and the distribution of the species recorded in each season. Table 5.7 sets out the peak counts (all vantage points) for each of the HRA species in each season.

Table 5.7 Seasonal peak counts of HRA species recorded during the intertidal vantage point surveys within the Thames Estuary and Marshes SPA/Ramsar and associated functionally linked land

Species	Peak count per season					
	Br. 2017	Pa. 2017	Wi. 2017/18	Br. 2018	Pa. 2018	Wi. 2018/19
Avocet	59	1	141	42	300	830
Black-tailed godwit	300	28	270	246	590	255

Species	Peak count per season					
	Br. 2017	Pa. 2017	Wi. 2017/18	Br. 2018	Pa. 2018	Wi. 2018/19
Brent goose			1			
Common tern	1	50		5	35	13
Cormorant	2	2	5	2	2	4
Curlew	13	60	19	6	58	62
Dunlin	1	120	750	2	450	524
Gadwall				3		
Golden plover			2			
Great crested grebe	2		1	1		3
Grey plover		11	41		13	15
Greylag goose	1	2				45
Knot		15	21		1	
Lapwing	3	5	83	3		70
Little egret	2	2	1	1	3	2
Little grebe			1		1	
Mallard	6	3	20	4	7	28
Oystercatcher	5	8	3	3	4	4
Redshank	72	7	42	25	6	52
Ringed plover	15	162	75	9	48	52
Ruff	2					
Shelduck	23	15	30	78	18	129
Shoveler			3	2		11
Teal	12	16	180	142	35	500
Turnstone	8	7	16	1	1	6
Whimbrel	4	3	5	3	2	
Wigeon		8	350	6	20	400

Br. – breeding season (April to July, inclusive) Pa. – passage season (August to October, inclusive) Wi. – wintering season (November to March, inclusive)
Blank cells indicate no birds were recorded

5.3.11 The main areas of importance for birds using the intertidal areas within the study area was around the mudflats and saltmarsh south and south-east of Coalhouse Fort (Vantage Point (VP) NE2 on Figure 12).

5.3.12 The mudflats to the east of the site of Tilbury Power Station (VP NW on Figure 12) were also found to have good numbers of HRA species, although much lower compared to those recorded around Coalhouse Fort.

5.3.13 On the Kent side of the River Thames, the mudflats around Shorne Fort (VP SE on Figure 12) had some good numbers of HRA species, although much reduced in comparison with the Essex bank of the Thames.

5.3.14 The mudflats to the north of the Metropolitan Police firing range (VP NW on Figure 12) held no considerable aggregations of birds.

Diurnal and nocturnal surveys

5.3.15 Table 5.8 summarises the seasonal peak counts of HRA species recorded during the diurnal and nocturnal surveys within the functionally linked land. Figure 13 illustrates the diurnal survey areas and the records of SPA/Ramsar species by season in relation to the Project Order Limits. Figure 14 illustrates the nocturnal survey areas and the records of SPA/Ramsar species (winter survey season only) in relation to the Project Order Limits.

Table 5.8 Seasonal peak counts of SPA/Ramsar species recorded during the diurnal and nocturnal surveys within the Thames Estuary and Marshes SPA/Ramsar and associated functionally linked land

Species	Diurnal Peak count per season						Nocturnal Peak count per season	
	Br. 2017	Pa. 2017	Wi. 2017/18	Br. 2018	Pa. 2018	Wi. 2018/19	Wi. 2017/18	Wi. 2018/19
Avocet			6			1	11	14
Black-tailed godwit			36		8	7	20	
Cormorant	2	3	6	3	1	3		
Curlew	2		63	1		46	2	1
Dunlin					10	1	800	320
Gadwall	2		4	7	6	113	3	1
Great crested grebe			1	8				2
Grey plover							1	2
Greylag goose	23	43	117	12	62	120	5	96
Knot	1							
Lapwing	31	25	520	40	80	675	30	70
Little egret	2	2	2	6	7	10		
Little grebe	4	14	10	4	18	23	12	16
Mallard	30	12	40	12	30	84	20	20
Oystercatcher	3			2		1	1	1
Pintail			13	3		2		
Redshank	60		20	20		25	50	60
Ringed plover					27	16		1
Ruff	1							

Species	Diurnal Peak count per season						Nocturnal Peak count per season	
	Br. 2017	Pa. 2017	Wi. 2017/18	Br. 2018	Pa. 2018	Wi. 2018/19	Wi. 2017/18	Wi. 2018/19
Shelduck	8		26	20	6	40	5	10
Shoveler	18	4	42	19	2	60	7	31
Teal	9	6	70	12	18	160	15	60
Whimbrel	1							
Wigeon	3		30			82	35	20

Br. – breeding season (April to July, inclusive) Pa. – passage season (August to October, inclusive) Wi. – wintering season (November to March, inclusive)
Blank cells indicate no birds were recorded

5.3.16 North of the River Thames, the marshes around Tilbury Fort, approximately 1km west of the North Portal construction area, were found to support a sizable nocturnal roost for dunlin and other wading birds, including avocet, black-tailed godwit, redshank and ringed plover. No HRA species were recorded breeding.

5.3.17 South of the River Thames, the Shorne Marshes recorded the most significant numbers of HRA species, including teal, shoveler, curlew, shelduck, redshank and wigeon. The survey on the Metropolitan Police firing range recorded very few species. No HRA species were recorded breeding.

Review of published datasets

Natural England Commissioned Report NECR082

5.3.18 Natural England Commissioned Report NECR082 (Liley, 2011) provided a collation of existing baseline information relating to the Thames Estuary and Marshes, Medway Estuary and Marshes, and The Swale (European sites), summarising the designated interest features, their status and trends, habitat issues and potential threats.

5.3.19 The baseline data collated for the SPA bird features used the British Trust for Ornithology (BTO) WeBS counts which include those presented in Table 5.9. The report highlighted marked declines in some wintering bird species, particularly with the Medway site, where 14 bird species had undergone recent declines of 25% or more. The reasons were not clarified, and the report highlighted the need to complete further work to determine the causes.

BTO WeBS data

5.3.20 Table 5.9 sets out the WeBS data collated for the Thames Estuary and Marshes SPA & Ramsar qualifying features and assemblage.

Table 5.9 WeBS five-year annual peak means for Thames Estuary and Marshes SPA/Ramsar qualifying features from WeBS count areas

WeBS survey area	Thames Estuary and Marshes SPA	Shorne Marshes	Shorne Marshes offshore	Higham Bight	Higham Marsh	Belhus Woods Country Park
Years included within five-year annual peak mean	**2011/12 to 2015/16**	**2013/14 to 2017/18**	**2008/09, 2010/11, 2011/12**	**2011/12 to 2015/16**	**2011/12 to 2015/16**	**2011/12 to 2015/16**
Species	**Five-year annual peak mean**					
Avocet	1,956			82		
Black-tailed godwit	5,195	16		19	37	
Dunlin	13,300		100	684		
Grey plover	1,321		28	128		
Redshank	639	18	6	132	2	
Ringed plover	328					

5.3.21 The WeBS Alerts data (Woodward, et al., 2019) for the Thames Estuary and Marshes SPA provides the short, medium and long-term trends in the numbers of qualifying species as set out in Table 5.10.

5.3.22 This information provides some insight as to how the population trends at each site compare to that being experienced within the region and UK as a whole and sets the context for the numbers of birds recorded in the baseline field surveys.

Table 5.10 WeBS Alerts: Thames Estuary and Marshes SPA

Note: red shading indicates >50% decline and amber shading indicates >25% decline in numbers

Species	Info	First winter	Ref winter	Short term % Δ	Medium term % Δ	Long term % Δ	Baseline winter	% Δ since baseline
Avocet	–	91/92	16/17	14	73	645	95/96	247
Grey plover	–	91/92	16/17	-41	-4	-18	95/96	-20
Ringed plover	–	91/92	16/17	43	-37	-56	95/96	-37
Black-tailed godwit	–	91/92	16/17	3	202	641	95/96	504
Knot	–	91/92	16/17	-63	20	342	95/96	-12
Dunlin	–	91/92	16/17	11	15	55	95/96	13
Redshank	–	91/92	16/17	-39	-49	-61	95/96	-57
Waterbird assemblage	–	91/92	16/17	-11	14	30	95/96	1

Ramsar habitats

5.3.23 The ARNs cross the Ramsar as shown on Figure 7 and Figure 8, noting however that for the operational ARN the new road is in tunnel throughout. The Project Phase 1 habitat surveys indicate that the area within 200m of the construction and operational ARN is poor semi-improved grassland with a network of ditches. The ditches have a variety of emergent, submerged and floating vegetation. The combination of pasture and ditch habitats would constitute coastal and floodplain grazing marsh.

Epping Forest SAC

5.3.24 The SAC is approximately 10m south east of the M25 as shown on Figure 7. All of the plots supported mature broadleaved semi-natural woodland, with two woodland habitat and vegetation types recorded. The woodland nearest the M25 was generally more heavily disturbed by public use with a sparse understory and younger trees and heavily disturbed ground. The boundary between the two was very marked, following the route of a footpath, with younger oak woodland lying to the north and mature mixed woodland in the interior of the site to the south. The majority of plots comprised the UK Habitat Classification type ‘w1c5 Beech forests on acid soils (H9120)’, an Annex I habitat and qualifying feature of Epping Forest SAC.

5.3.25 The Ellenberg values of species recorded during the field survey (see Table 3.2 in Appendix D) did not identify any species likely to be sensitive to N deposition. The qualifying features being assessed are habitat features which are listed as nitrogen-sensitive habitats in the Air Pollution Information System, but no species with an Ellenberg value of less than 3 (indicative of more-or-less infertile sites, and only bracken had this score) were recorded in the affected area. The lack of nitrogen-sensitive species recorded in the survey therefore shows the habitat in this area is not nitrogen sensitive but does not imply the qualifying feature as a whole is not nitrogen sensitive.

North Downs Woodland SAC

Area adjacent to the A229

5.3.26 The SAC is approximately 160m east of the A229 as shown on Figure 7. The woodland block is narrow (approximately 20m wide) and bisected by a sunken lane (The North Downs Way Public Right of Way) comprising bare ground and vegetated banks. The woodland comprises no more than two lines of trees and shrubs at this point of the SAC. The canopy comprised semi-mature coppice ash with a shrub layer of scattered ash, yew and hazel, over a ground flora of abundant ivy with dog’s mercury, wood melic, wood false brome, honeysuckle, hearts tongue fern and stinking iris. The area was relatively heavily disturbed due to presence of the public footpath.

5.3.27 Given the size of this block of woodland and relatively young vegetation, it is difficult to fully assign a community type, however it is contiguous with the remainder of the woodland which was degraded H9130 *Asperulo-Fagetum* Beech Forest (w1c6). Further away (approximately 500m) from the A229, where the SAC boundary widens, the composition of the woodland had more abundant yew in the shrub layer and wild privet. Where areas were of more mature

woodland they included a well-spaced canopy of mature beech and ash over a relatively well-developed shrub layer of hazel, wild cherry, yew and regenerating ash and beech. The ground flora was dominated by ivy and dog's mercury and the composition was akin to H9130 *Asperulo-Fagetum* Beech Forest (w1c6).

The Swale SPA and Ramsar and the Medway Estuary and Marshes SPA and Ramsar

5.3.28 The SPA/Ramsar sites are adjacent to the A249 as shown on Figure 7. The habitat types on both sides of the A249 included the tidal river, areas of intertidal mud and areas of salt marsh on intertidal mud with scattered plants including sea purslane (t2a). The grassland areas, which were observed at a distance, appeared to comprise predominantly semi-improved grassland crossed by ditches and creeks, with (currently) flooded hollows and would be considered floodplain grazing marsh important for waders and wildfowl. The area is likely to support an important invertebrate community and rare and uncommon plants. UKHab (The UKHab Working Group, 2018) coastal and floodplain grazing marsh (g3c other neutral grassland), reedbeds and other swamp vegetation (f2e and f2f) are likely to be present.

5.4 Future changes in baseline conditions

Bird population trends

5.4.1 The populations of qualifying features within the Thames Estuary and Marshes SPA have varied since the site was classified in the 1990s. The percentage change in the populations of the qualifying features has been identified within the British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) Alerts (Woodward, et al., 2019), based on 2018/19 count data, and Natural England's supplementary advice for each of these sites has set targets to restore or maintain the populations based on the WeBS Alerts information.

5.4.2 The population data for the SPA is considered, by the Applicant, to be the same for the Ramsar sites. The Thames Estuary and Marshes Ramsar site boundary is not coincident with the Thames Estuary and Marshes SPA. The Ramsar site is slightly larger and includes the Shorne and Filborough Marshes, however the population sizes are considered to be the same for both sites for the purposes of this assessment. The qualifying features for the SPA and Ramsar sites are shown in Table 5.11, which indicates where species form part of both designations. The BTO population data the Applicant uses include all birds (both qualifying features and not) that are present on each SPA site.

Table 5.11: Qualifying features of the Thames Estuary and Marshes European sites

European site	Qualifying feature	Overwintering or breeding importance
Thames Estuary and Marshes SPA	Hen harrier	Overwinter
	Avocet	Overwinter
	Grey plover	Overwinter
	Redshank	Overwinter
	Ringed plover	Overwinter

European site	Qualifying feature	Overwintering or breeding importance
Thames Estuary and Marshes SPA and Ramsar	Dunlin	Overwinter
	Knot	Overwinter
	Black tailed godwit	Overwinter SPA Overwinter and Passage Ramsar
	Waterfowl assemblage	Overwinter

5.4.3 Table 5.12 shows the population sizes and percentage changes for the qualifying features. The estimated current population data have been calculated by multiplying the population size at classification by the percentage change stated in the BTO WeBS Alerts (Woodward, et al., 2019). The estimated current population figure is used within this assessment, as advised within the supplementary advice for the Thames Estuary and Marshes SPA, when investigating the percentage of birds potentially affected by the Project.

Table 5.12 Changes in populations of the qualifying features at Thames Estuary and Marshes SPA/Ramsar

Qualifying feature All overwintering/passage unless otherwise specified	Population when classified	WeBS Alerts % change since baseline[8]	Estimated current population
Avocet	283	247%	982
Black-tailed godwit	1,699	504%	10,262
Dunlin	29,646	13%	33,500
Grey plover	2,593	-20%	2,074
Knot	4,848	-12%	4,266
Lapwing	3,444	-47%	1,825
Redshank	6,251	-57%	2,688
Ringed plover	1,324	-37%	834
Waterbird assemblage	75,019	1%	75,769

5.4.4 The WeBS data for the each of the estuaries in Table 5.13 are a compilation of the data for the sectors that comprise each estuary site. These sectors include

[8] WeBS Alerts % change since baseline is calculated by the BTO as the change since the mid-point in the baseline period (baseline winter) (i.e. the period that site designation was based on) to the reference winter for which each alert status is being reported (Woodward, et al., 2019). For the Thames Estuary and Marshes SPA the Baseline winter was 1995/96 and Reference winter was 2016/17.

the SPA/Ramsar sites but, unlike the WeBS Alerts data, the counts are not specific to them and generally cover a wider area.

5.4.5 The Thames Estuary WeBS site includes various count sectors that extend from Foulness Point in the east to Tower Bridge, City of London in the west. The Thames Estuary and Marshes and Benfleet and Southend SPAs form part of the sectors that make up this WeBS site.

Table 5.13 A comparison of the BTO WeBS five-year average counts (Frost, et al., 2020) for each of the qualifying species

Qualifying feature	Thames Estuary	
	2009/10 – 2013/14	2014/15 – 2018/19
Avocet	1,854 (Sep)	3,255 (Aug)
Black-tailed godwit	5,928 (Feb)	5,960 (Sep)
Dunlin	26,025 (Dec)	27,630 (Jan)
Grey plover	4,652 (Nov)	3,059 (Dec)
Knot	30,610 (Dec)	23,601 (Jan)
Lapwing	11,970 (Feb)	9,862 (Feb)
Redshank	3,318 (Nov)	2,403 (Sep)
Ringed plover	781 (Sep)	775 (Sep)
Waterbird assemblage	164,113	143,257

5.4.6 A review of the WeBS Alerts dataset (Woodward, et al., 2019) showed that the trends in all of the species are comparable with those seen in the region and the UK as a whole. Therefore, the populations within the European site are considered to reflect the overall trend in the number of these species within the region/UK and therefore the factors influencing the populations within the sites themselves, as highlighted within the Site Improvement Plan (Natural England, 2014), are not likely to be the primary factors influencing population stability. The absence of site-specific alerts does not necessarily mean there are no local factors influencing populations, but it does imply that these are not significant at present to trigger alerts.

Air quality trends

5.4.7 The effect of traffic emissions on local air quality is recognised. Defra indicates that the trend in emissions of nitrogen oxides (NOx) has been decreasing since the 1990s with the introduction of catalytic converters in vehicles and increasingly stringent emission standards, with emission estimates for 2020 indicating a 51% reduction on the 2005 UK emissions total (Dore, et al., 2009). To some extent the reduction in emissions is being matched by a similar trend in nutrient N deposition. Rowe, *et al* (2020) showed that, for SACs in England, the percentage of sites with nutrient N exceedance decreased from 98.5% in 1996 to 94.4% in 2017.

5.4.8 The SPA/Ramsar sites that have been identified are large and the areas within 200m of the operational ARN comprise coastal floodplain grazing marsh habitat. The trends in nitrogen deposition at these sites published on the Air Pollution

Information System (Centre for Ecology & Hydrology (CEH), 2019) and are generally within the critical loads(20-30kgha^{-1}yr^{-1}) for the habitat type.

5.4.9 Both of the SAC sites identified have been exposed to atmospheric N deposition in excess of the critical loads, for the features within 200m of the operational ARN, for many decades as shown in the deposition trends published on the Air Pollution Information System (Centre for Ecology & Hydrology (CEH), 2019). The information recorded during the detailed habitat survey for Epping Forest appears to support this trend as no nitrogen-sensitive species were recorded within any of the transects surveyed, suggesting that the habitat within that area could have been adversely affected by long-term excess N deposition. Pristine or high-quality examples of the qualifying habitat might be expected to support nitrogen-sensitive species, but the surveys have shown that the area affected does not.

5.4.10 Both Epping Forest and the North Downs Woodlands SAC citations highlight air quality as a key attribute underpinning the conservation objectives of the sites. The Epping Forest Site Improvement Plan (Natural England, 2016) lists '*air pollution: impact of atmospheric nitrogen deposition*' as the highest priority issue for the site. Whilst air pollution is listed as an issue in the North Downs Woodlands Site Improvement Plan (Natural England, 2014) it was not the highest priority.

5.4.11 Both Epping Forest and North Downs Woodlands SAC have 'restore' targets for the air quality attribute of the conservation objectives which relate to the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values. The current trends indicate that progress is being made however Rowe *et al* (2020) stated that '*Reducing deposition to below the critical load does not mean that ecosystems immediately recover. There are time lags before chemical recovery takes place, and further delays before biological recovery. The timescales for both chemical and biological recovery, could be very long, particularly for the most sensitive ecosystems*'.

5.4.12 Therefore, the qualifying features at these SACs are unlikely to change significantly in composition based on predicted improvements in air quality alone and this is recognised within the pressures and issues listed and measures proposed in the Site Improvement Plans for both European sites.

5.5 Potential interactions between the Project and European sites

5.5.1 The construction and operation of the Project would result in a number of changes in the surrounding environment, as set out in Table 2.1. All potential interactions between the Project and the European sites identified in section 5.1 have been considered and the following sections set out where the interactions identified have potential for LSE, as assessed in section 5.6.

Thames Estuary and Marshes SPA

5.5.2 This site was identified because the site itself is within 2km of the Project and has functionally linked land within the Project ZoI. Table 5.14 lists the Project impacts, sets out where an actual pathway is present and whether there is potential for LSE as a result of the Project alone or in combination with other plans and projects.

Table 5.14: Identifying the Project impacts that could result in LSE for Thames Estuary and Marshes SPA

Project impact	Pathway	Effect	Potential for LSE
• Land take - terrestrial and aquatic (marine) environment – construction • Change in air quality – dust emissions – construction • Changes in surface water quality and quantity – construction & operation • Introduction/spread of non-native species – terrestrial environment	Qualifying features from this European site use functionally linked land that is within the ZoI	Reduction in habitat area	Yes
• Change in air quality – vehicle emissions – construction & operation • Changes in groundwater quality and quantity – tunnel construction and operation	European site does not occur within the ZoI	Reduction in habitat area	No
• Vehicle collision with species during operation • Species collision with overhead utilities infrastructure – operation	Qualifying features from this site use functionally linked land that is within the ZoI	Reduction in species density	Yes
• Change in recreational pressure – construction and operation	European site itself is within the ZoI	Disturbance to key species	Yes
• Changes in noise and vibration – construction works and vehicles • Changes in noise and vibration – underwater and above ground – tunnel construction only	Qualifying features from this European site use functionally linked land that is within the ZoI	Disturbance to key species	Yes

Project impact	Pathway	Effect	Potential for LSE
• Changes in noise and vibration – vehicles – operation • Changes in light levels – construction & operation • Changes in visual disturbance – people/machines in eyeline – construction • Changes in visual disturbance – vehicles in eyeline – operation			

Thames Estuary and Marshes Ramsar

5.5.3 This site was identified in section 5.1 because the site itself is within 2km of the Project, and has functionally linked land within the Project ZoI, outside the European site boundary and it is within 200m of the construction and operational ARN. Table 5.15 lists the Project impacts, sets out where an actual pathway is present and whether there is potential for LSE as a result of the Project alone or in combination with other plans and projects.

Table 5.15: Identifying the Project impacts that could result in LSE for Thames Estuary and Marshes Ramsar

Project impact	Pathway	Effect	Potential for LSE
• Change in air quality – dust emissions – construction • Change in air quality – vehicle emissions – construction and operation • Changes in groundwater quality and quantity – tunnel construction and operation • Changes in surface water quality and quantity – construction	European site itself is within the ZoI	Reduction in habitat area	Yes
• Land take - terrestrial and aquatic (marine) environment – construction • Changes in surface water quality and quantity – operation • Introduction/spread of non-native species – terrestrial environment	Qualifying features from this European site use functionally linked land that is within the ZoI	Reduction in habitat area	Yes
• Change in air quality – vehicle emissions – construction	European site does not occur within the ZoI	Reduction in habitat area	No
• Vehicle collision with species during operation • Species collision with overhead utilities infrastructure – operation	Qualifying features from this site use functionally linked land that is within the ZoI	Reduction in species density	Yes

Project impact	Pathway	Effect	Potential for LSE
• Changes in noise and vibration – construction works and vehicles • Changes in noise and vibration – underwater and above ground – tunnel construction only • Changes in light levels – construction • Changes in visual disturbance – people/machines in eyeline – construction • Change in recreational pressure – construction and operation	European site itself is within the ZoI	Disturbance to key species	Yes
• Changes in noise and vibration – construction works and vehicles • Changes in noise and vibration – underwater and above ground – tunnel construction only • Changes in noise and vibration – vehicles – operation • Changes in light levels – construction & operation • Changes in visual disturbance – people/machines in eyeline – construction • Changes in visual disturbance – vehicles in eyeline – operation	Qualifying features from this European site use functionally linked land that is within the ZoI	Disturbance to key species	Yes

Medway Estuary and Marshes SPA/Ramsar

5.5.4 This site was identified in section 5.1 because the site itself is within 200m of the operational ARN. Table 5.16 lists the Project impacts, sets out where an actual pathway is present and whether there is potential for LSE as a result of the Project alone or in combination with other plans and projects.

Table 5.16: Identifying the Project impacts that could result in LSE for Medway Estuary and Marshes SPA/Ramsar

Project impact	Pathway	Effect	Potential for LSE
• Change in air quality – vehicle emissions – operation	European site itself is within the ZoI	Reduction in habitat area	Yes

The Swale SPA/Ramsar

5.5.5 This site was identified in section 5.1 because the site itself is within 200m of the operational ARN. Table 5.17 lists the Project impacts, sets out where an

actual pathway is present and whether there is potential for LSE as a result of the Project alone or in combination with other plans and projects.

Table 5.17: Identifying the Project impacts that could result in LSE for The Swale SPA/Ramsar

Project impact	Pathway	Effect	Potential for LSE
• Change in air quality – vehicle emissions – operation	European site itself is within the ZoI	Reduction in habitat area	Yes

Epping Forest SAC

5.5.6 This site was identified in section 5.1 because the site itself is within 200m of the operational ARN. Table 5.18 lists the Project impacts, sets out where an actual pathway is present and whether there is potential for LSE as a result of the Project alone or in combination with other plans and projects.

Table 5.18: Identifying the Project impacts that could result in LSE for Epping Forest SAC

Project impact	Pathway	Effect	Potential for LSE
• Change in air quality – vehicle emissions – operation	European site itself is within the ZoI	Reduction in habitat area	Yes

North Down Woodlands SAC

5.5.7 This site was identified in section 5.1 because the site itself is within 200m of the operational ARN. Table 5.19 lists the Project impacts, sets out where an actual pathway is present and whether there is potential for LSE as a result of the Project alone or in combination with other plans and projects.

Table 5.19: Identifying the Project impacts that could result in LSE for North Down Woodlands SAC

Project impact	Pathway	Effect	Potential for LSE
• Change in air quality – vehicle emissions – operation	European site itself is within the ZoI	Reduction in habitat area	Yes

5.6 Assessment of LSE

5.6.1 In considering section 5.1 and 5.5, the risk of LSE on European sites as a result of this Project alone and in combination with other projects is associated with according to the following pathway groups:

a. Effects on the Thames Estuary and Marshes Ramsar

i. Reduction in habitat area as a result of dust emissions, changes in

surface water quality and groundwater quality

ii. Disturbance to key species as a result of changes, during construction only, in noise and vibration, light levels and visual disturbance

b. Effects on the Thames Estuary and Marshes SPA and Ramsar

i. Disturbance to key species as a result of changes, during construction and operation, in recreational disturbance

c. Effects on functionally linked land associated with the Thames Estuary and Marshes SPA and Ramsar site

i. Reduction in habitat area as a result of land take, dust emissions, changes in surface water quality/quantity, introduction of non-native invasive species

ii. Reduction in species density as a result of vehicle collision and collision with utilities infrastructure

iii. Disturbance to key species as a result of changes during construction and operation, in noise and vibration, light levels and visual disturbance.

d. Changes in air quality from vehicle emissions, effect on European sites identified within 200m of the operational ARN

e. Climate change risks

Thames Estuary and Marshes Ramsar

Reduction in habitat area

5.6.2 The following Project impacts could result in a reduction in habitat area within the Thames Estuary and Marshes Ramsar:

a. Changes in air quality - dust emissions - construction

b. Changes in surface water quality and quantity during construction

c. Changes in groundwater quality and quantity – tunnel construction and operation

Change in air quality – dust emissions – construction

Efficacy of committed measures

5.6.3 Whilst no studies of the efficacy of the good practice measures are available in the literature to specifically demonstrate their effectiveness in preventing significant effects on nearby receptors, the measures have been developed over many years by the industry and there is very high confidence in their efficacy. The construction industry standards have been in place for many years and there has been no call or need for updating it in recent years, suggesting that they represent a mature and successful set of guidelines. There is no reasonable scientific doubt that measures that have proved successful on

multiple projects in the past; protecting multiple habitat types and people without significant complaint; would not be equally successful at mitigating dust effects on European site habitats.

Alone

5.6.4 Changes in air quality as a result of dust emissions could occur during construction of the Project and dust deposition has the potential to reduce the area of habitat available to qualifying species. Figure 15 shows how the European site and functionally linked land interact with the area potentially affected by dust emissions.

5.6.5 The Project would minimise the dust effects at receptors by managing dust at source as outlined in paragraphs 3.3.6 to 3.3.9. These measures are integral to the Project and would prevent any LSE on the Thames Estuary and Marshes Ramsar as any pathway to effect would be disrupted.

In combination

5.6.6 The pathway to effect alone would be disrupted at source, therefore there cannot be a feasible risk of this effect acting in combination with other plans and projects, so the Project could not contribute to any in combination effect.

5.6.7 Therefore, a conclusion is reached of no LSE on the Thames Estuary and Marshes SPA / Ramsar due to construction dust as a result of the Project alone or in-combination with other plans and projects.

Changes in surface water quality and quantity during construction

Alone

5.6.8 There is a potential pathway to effect as a result of the construction site drainage discharge from Compound CA3. The site drainage from Compound CA3 will be discharged into the western ditch as shown on Figure 16. This ditch is part of the Thames Estuary and Marshes Ramsar, with the Ramsar boundary located approximately 10-20m downstream from the discharge point.

5.6.9 The Project is to be constructed in accordance with integral good practice measures, including a site drainage system with attenuation so that any discharges will comply with quality and permit standards, and at greenfield runoff rates.

5.6.10 The measures are aimed at avoiding changes in surface water quality and quantity at source, disrupting any pathway to effect, therefore the risk of LSE within the Thames Estuary and Marshes Ramsar is considered to be low. However, during consultation Natural England advised that the good practice and project design measures did not provide sufficient certainty and further mitigation commitments were required to avoid the effect with certainty. Therefore, it is uncertain whether or not the discharge of construction run off would result in LSE on the Thames Estuary and Marshes Ramsar.

In combination

5.6.11 As uncertainty remains as to whether or not the Project would result in LSE alone, then the risk of LSE in combination with other plans and projects also exists. Therefore, it is uncertain whether or not any significant effect, from the Project alone or in combination with other plans or projects, would result in LSE

on the Thames Estuary and Marshes Ramsar as a result of changes in surface water quality and quantity during construction.

Changes in groundwater quality and quantity – tunnel construction and operation

Alone

5.6.12 The Project includes a proposed ground improvement tunnel, main tunnel and cross passages, the construction of which have the potential to cause groundwater lowering of the shallow water system at the Thames Estuary and Marshes Ramsar site.

5.6.13 Table 5.1 summarised the results of the surveys (of the Filborough Marshes and Shorne Marshes) within the Thames Estuary and Marshes Ramsar, and showed that the habitats recorded were categorised, according to the UK Technical Advisory Group on the Water Framework Directive (2014) as having either low or no dependency on groundwater.

5.6.14 The Project Hydrogeological Risk Assessment (ES Appendix 14.5, Application Document 6.3) included a preliminary water balance calculation for the Thames Estuary and Marshes Ramsar and found that:

a. The major source of water to the study area is precipitation.

b. Groundwater flow is mostly horizontal and contribution to the system is small with <2% of the total water input per month from diffuse shallow groundwater seepage.

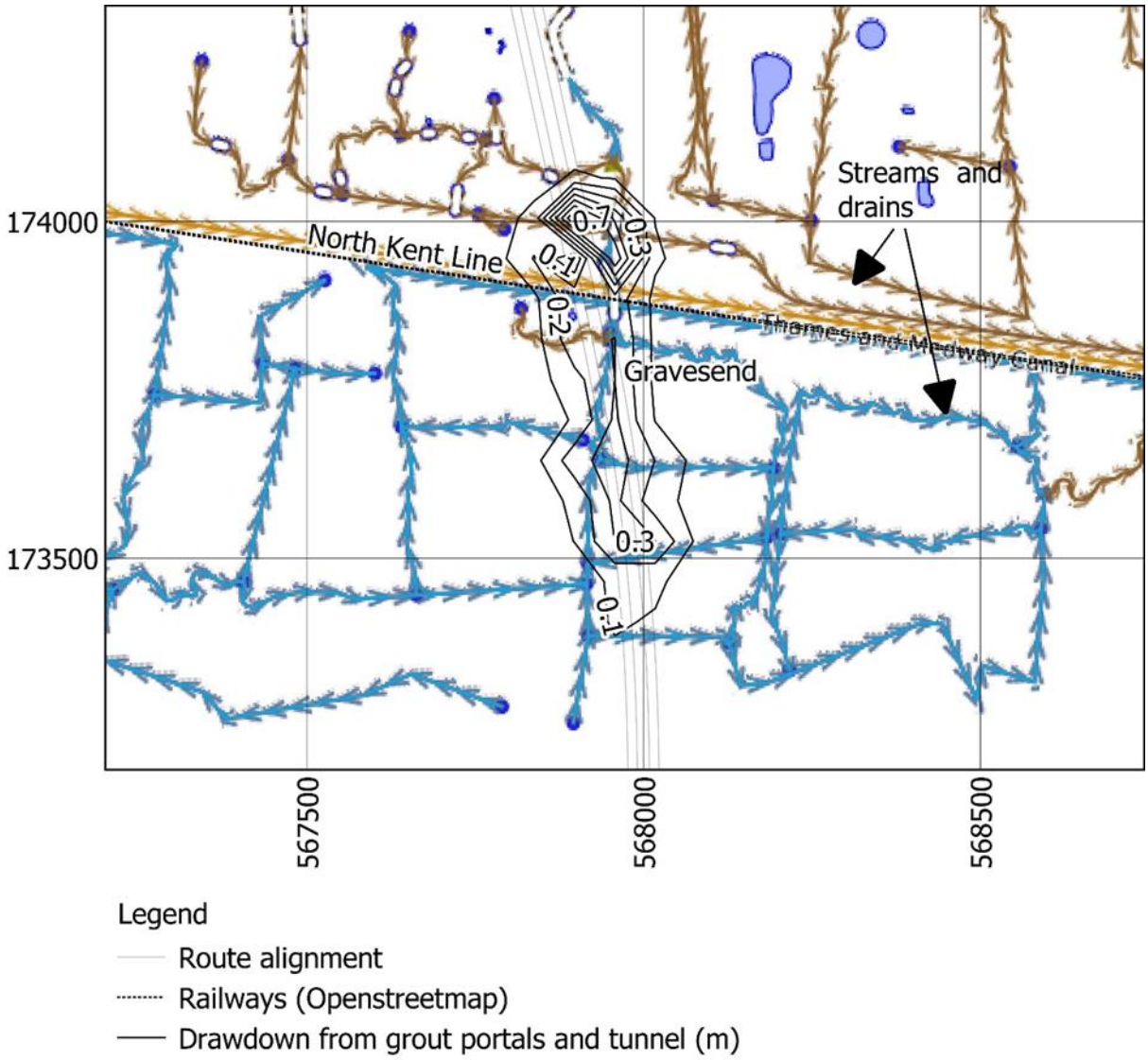
c. The Thames and Medway canal has the potential to contribute up to 17% of the total annual water input, however this is likely to be a conservative (high) estimate of the actual contribution to the system.

d. The major outflows of water from the study area are evapotranspiration from the soil and evaporation from surface water ditches.

5.6.15 The Hydrogeological Risk Assessment (ES Appendix 14.5, Application Document 6.3) also includes the modelling of groundwater flows for the construction of the Ground Protection Tunnel and main tunnels.

5.6.16 South of the River Thames, the groundwater model included the advance grout tunnel as well as the main tunnel within the modelled scenario. Plate 5.2 illustrates that the predicted changes in groundwater under the Ramsar site are negligible as the drawdown is predicted to be less than 0.3m which is within the numerical accuracy of the calibrated model.

Plate 5.2 Drawdown of the water table from the Ground Protection Tunnel with inflow rate of 0.1 L/s/m^2 south of the river (taken from ES Appendix 14.5 annex 11 figure 33)



5.6.17 The evidence from the groundwater modelling indicates that the proposed tunnels would not result in any material change in groundwater levels and the water balance model shows that the Thames Estuary and Marshes Ramsar is not dependent on groundwater, therefore it is considered any effects on the Ramsar are inconsequential and no LSEs are predicted to occur as a result of the Project alone.

5.6.18 At the request of Natural England the following commitment has been included within the REAC:

a. HR008. Surveillance of groundwater levels will be carried out within the Thames Estuary and Marshes Ramsar in the vicinity of the tunnelling works for the duration of the construction period at borehole locations to be agreed with SoS in consultation with Natural England and Environment Agency.

The contractor would complete an annual review, for the period of construction and first five years of operation, of the groundwater levels and consult on any implications for qualifying features of the Ramsar site, and any necessary remedial measures with Natural England and the Environment Agency.

In combination

5.6.19 The pathway to effect has been shown to not be feasible, as the water balance model indicated that the Ramsar was not dependent on groundwater. Therefore, there cannot be a feasible risk of this effect acting in combination with other plans and projects. Also, the Project tunnelling activities would have an inconsequential effect on groundwater and so could not contribute to any in combination effects.

5.6.20 Therefore, a conclusion is reached of no LSE on the Thames Estuary and Marshes Ramsar due to changes in ground water quality or quantity as a result of the Project alone or in-combination with other plans and projects.

Disturbance to key species

5.6.21 South of the river the majority of Project construction activities would be carried out approximately 500m south of the Ramsar site at construction compound CA3, but also at the satellite construction compounds, CA3A and CA3B, associated with the construction of the ground treatment tunnel; and construction of the surface water drainage treatment system and outfall infrastructure within the western ditch. These activities would result in changes noise and vibration and visual stimuli potentially disturbing the qualifying features within the Ramsar site. Figure 17 illustrates the areas disturbed in relation to the Thames Estuary and Marshes Ramsar.

5.6.22 The use of the TBM under the river itself may result in underwater noise and vibration which could result in disturbance to the birds and their prey items.

Changes in noise and vibration – underwater and above ground – tunnel construction only

Alone

5.6.23 The noise and vibration associated with the construction of the tunnel with the TBM has been modelled using the Rupert Taylor Finite Difference Time Domain model FINDWAVE® (ES Appendix 12.3: TBM Noise and Vibration Assessment, Application Document 6.3). The modelling has been completed using geotechnical data from ground investigations, with details of tunnel lengths and soil parameters used. The intended construction mechanism is for there to be a lag between the construction of the two tunnels, therefore the modelling assumes one TBM for the purposes of generating levels of underwater noise. The modelling has been undertaken to provide both the sound pressure level as well as particle velocity at the following locations:

a. At a point above the TBM representing worst case

b. At the edge of the mudflats on the north and south of the river above the tunnel alignment

5.6.24 The results of modelling show that the highest levels of underwater noise associated with TBM operations are 130dB re 1µPa (SPL), at a frequency of 100Hz. This result is from a point in the river directly above the TBM head and represents the worst-case noise level and would decrease with increasing distance. In terms of particle velocity, the worst-case levels from above the TBM head were 0.01mms-1 reducing to 0.001mms-1 at the edge of the intertidal mudflats.

5.6.25 The noise associated with the TBM would not be perceived beyond the water column, particularly given the background level of noise from shipping, therefore birds are unlikely to react when the TBM is in use. The potential disturbance to invertebrate prey items is also discounted as the changes in particle velocity predicted would not result in any change in prey distribution during the TBM operation. Therefore, it has been concluded that LSE can be ruled out for this effect pathway.

In combination

5.6.26 The pathway to effect for the Project alone is inconsequential and so could not contribute to any in combination effects.

5.6.27 Therefore, a conclusion is reached of no LSE on the Thames Estuary and Marshes Ramsar due to changes in noise and vibration from tunnel construction as a result of the Project alone or in-combination with other plans and projects.

Changes in noise and vibration and visual disturbance – construction works and vehicles

Alone

5.6.28 Figure 17 illustrates the areas where construction work would be visible to the birds foraging or roosting and also illustrates the area where changes in noise as a result of Project construction may result in the disturbance of qualifying features within the Thames Estuary and Marshes Ramsar. The qualifying features have the potential to be disturbed by changes in noise and visual stimuli as a result of the following activities.

a. Activity within construction compounds CA3A and CA3B

b. Construction of the infrastructure associated with the surface water discharge associated with construction compound CA3

5.6.29 The habitats recorded in the potentially disturbed areas are agricultural comprising semi improved grassland and wet ditches. The qualifying species using these areas include redshank and various species such as lapwing and mallard that are part of the over wintering waterbird assemblage. The areas where the noise significance and/or visual disturbance thresholds are exceeded (see paragraph 4.1.8) include approximately 56.6 hectares of habitat within the Thames Estuary and Marshes Ramsar.

5.6.30 It is uncertain whether or not any significant disturbance to the individual birds using the affected habitat areas would result in LSE on the Thames Estuary and Marshes Ramsar.

In combination

5.6.31 As uncertainty remains as to whether or not the Project would result in LSE alone, then the risk of LSE in combination with other plans and projects also exists.

5.6.32 Therefore, it is uncertain whether or not any significant disturbance, from the Project alone or in combination with other plans or projects, would result in LSE on the Thames Estuary and Marshes Ramsar.

Changes in light levels – construction

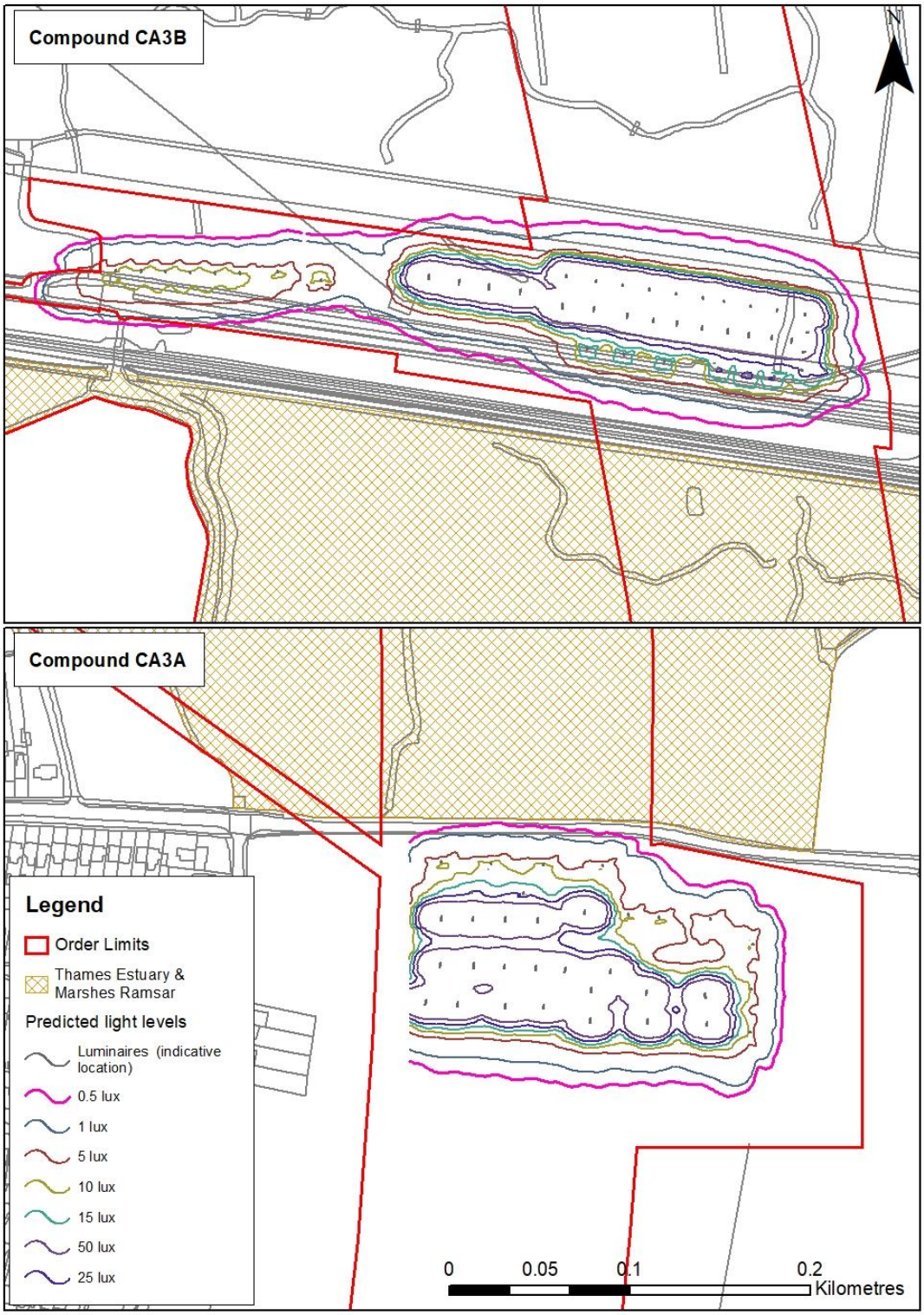
Efficacy of committed measures

5.6.33 Whilst no studies of the efficacy of the committed measures are available in the literature to specifically demonstrate their effectiveness in preventing significant effects on nearby receptors, the measures have been developed over many years by the industry and there is very high confidence in their efficacy. The construction industry standards have been in place for many years and there has been no call or need for updating it in recent years, suggesting that they represent a mature and successful set of guidelines. There is no reasonable scientific doubt that measures that have proved successful on multiple projects in the past; protecting multiple habitat types and people without significant complaint; would not be equally successful at mitigating dust effects on European site habitats.

Alone

5.6.34 The Project is committed to minimising and managing lighting emissions at source on the construction site (see Section 3.3.31 to 3.3.35). These measures are integral to the Project and would prevent any LSE on the Ramsar as any pathway to effect would be disrupted. Plate 5.3 illustrates the predicted lux levels at Compounds CA3A and CA3B. The 0.5 lux contour is almost entirely within the Order Limits and no light spill would be perceivable within the Ramsar. Also, the existence of lighting associated with the various ports and other developments along this part of the River Thames means any construction lighting for this Project would not materially change overall light levels, as shown in the Landscape and Visual Figure 7.18 (Application document reference 6.2), viewpoint S38a and N04 which clearly illustrate the “night-time glow” associated with the river. Therefore, lighting within the construction compounds would not result in any disturbance to the birds feeding and roosting in these parts of the Ramsar.

Plate 5.3 Predicted lux levels from lighting within compound CA3A and CA3B, extracted from ES Appendix 8.16 Construction and Operational Lighting Contours



In combination

5.6.35 The pathway to effect alone would be disrupted at source, therefore there cannot be a feasible risk of this effect acting in combination with other plans and projects, so the Project could not contribute to any in combination effect.

5.6.36 Therefore, a conclusion is reached of no LSE on the Thames Estuary and Marshes Ramsar, due to lighting as a result of the Project alone or in-combination with other plans and projects.

Thames Estuary and Marshes SPA and Ramsar

Changes in recreational disturbance

5.6.37 Recreational disturbance is listed as a vulnerability for the Thames Estuary and Marshes SPA/Ramsar site. The qualifying species for which these European sites are designated are sensitive to human disturbance, in particular to walkers with dogs within intertidal habitats (Liley, et al., 2012; Natural England, 2014). Within this part of Essex and Kent the risk of recreational pressures on European sites is recognised as being related to the proximity of residential development to site access points and the zones of influence for each site, have been developed (Essex County Council, 2019; Birdwise North Kent SAMMS Project Board, 2018). North of the River Thames (Essex) the zone of influence applicable to the Thames Estuary and Marshes SPA/Ramsar is 8.1km and south of the river (Kent) it is 6km.

5.6.38 The Project objectives do not include facilitation of residential development, however theoretically it could provide easier access to the European sites north and south of the River Thames once the road is operational.

5.6.39 The construction of the Project could also change the distribution of PRoW users in the locality and result in increases in PRoW use within functionally linked land or nearby European sites, for example the Thames Estuary and Marshes Ramsar/SPA.

Alone

Construction

5.6.40 During construction, there is potential that the users of the PRoWs that cross the Project Order Limits would have to change their use of those PRoWs, due to the presence of the construction works, to alternatives in areas that could subsequently increase the disturbance pressures on the qualifying species using functionally linked land and the Thames Estuary and Marshes SPA/Ramsar both north and south of the River Thames.

5.6.41 The PRoWs on both sides of the River Thames are likely to be used by the local population (Tilbury, East Tilbury, Gravesend) for dog walking and other daily recreational activities.

5.6.42 The intertidal habitat is considered to be the habitat in which the HRA species are most sensitive to disturbance by walkers and in particular dog walkers. There are existing PRoWs along the sea wall/shoreline of both the north and south sides of the River Thames that are crossed by the Order Limits.

5.6.43 To the south of the River Thames, the Order Limits relate to the underground works only and the PRoW; the Saxon Shore Way, is approximately 300m north of the proposed construction compound CA3b. To the north of the River Thames the Order Limits relate to construction compound CA5 and the PRoW is immediately adjacent to the part of the compound proposed for storage and levelling of material from the tunnel arisings, and approximately 250m south of the North Portal itself.

5.6.44 Given these PRoWs are likely to be predominantly used by the local population, if the users did not want to walk through the areas disturbed and opted to walk in the opposite direction it is reasonable to assume that they would not be changing the overall use of the other PRoWs as they would already form part of the users of those anyway, so no increase overall would be expected. No change in the route or use of these paths has been predicted as a result of the Project as assessed in ES Chapter 13 Population and Human Health (Application Document 6.1). No material changes in PRoW use within the local area are predicted and subsequently a conclusion of no LSE on the Thames Estuary and Marshes SPA/Ramsar is reached.

Operation

5.6.45 The Project provides a new route across the River Thames and could therefore theoretically result in greater visitor numbers to the parts of the Thames Estuary and Marshes SPA/Ramsar north and south of the river. However, the Project only has junctions with the existing road network at the A2, south of the River Thames and the A13, north of the River Thames with the distance between these approximately 12km. Therefore, any use of the Project by visitors to the SPA/Ramsar on the “other side” of the River Thames would have to drive at least 12km and so would be outside of the ZoI distances discussed within the Essex and Kent recreational disturbance strategy documents. Therefore, the Project itself would not “bring” any additional residential areas into the zone of influence.

5.6.46 Access to open space has been assessed within ES Chapter 13 Population and Human Health (Application Document 6.1) and the Project would provide increased opportunities to access open space as shown on ES Figure 13.4 (Application Document 6.2). These improved opportunities, for example Chalk Park, are not within or adjacent to any European sites nor in areas that would facilitate greater access to habitats used by European site qualifying bird species.

5.6.47 A conclusion of no LSE on the Thames Estuary and Marshes SPA/Ramsar is reached for this pathway.

In combination

5.6.48 The Project would not result in any material change in recreational disturbance and so could not contribute to any in combination effects.

5.6.49 Therefore, a conclusion is reached of no LSE on the Thames Estuary and Marshes Ramsar due to changes in recreational disturbance as a result of the Project alone or in-combination with other plans and projects.

The effect on functionally linked land

Reduction in habitat area

5.6.50 The following Project impacts could result in a reduction in habitat area within the land functionally linked to the Thames Estuary and Marshes SPA/Ramsar.

a. Land take - terrestrial and aquatic (intertidal) environment – construction
b. Change in air quality – dust emissions – construction
c. Changes in surface water quality and quantity – construction & operation
d. Introduction/spread of non-native species – terrestrial environment

Land take - terrestrial and aquatic (intertidal) environment – construction

Alone

5.6.51 Land within the Order Limits would be acquired to construct the Project. The requirements within the functionally linked land, approximately 374 ha, north and south of the River Thames are associated with the following Project elements as shown on Figure 3:

a. Construction compounds CA3A, CA3B and CA5
b. Construction of north portal dewatering discharge pipeline and outfall
c. Operational tunnel drainage discharge pipeline and outfall
d. Construction of the drainage discharge and treatment array for construction compound CA3
e. Construction haul roads, access and utilities diversions are included with the construction works area that they are contiguous with.
f. Highway works north of and including Tilbury Viaduct

5.6.52 The ecology mitigation areas would comprise two areas of open mosaic habitat for terrestrial invertebrates, great crested newts and reptiles. These areas are currently agricultural land and the work to convert the habitat is not considered as habitat loss and has not been included within the assessment. The habitat changes would not result in any effects on HRA species and would provide the HRA species that currently use the agricultural land with areas of equivalent or better function.

5.6.53 Table 5.20 sets out the land take within the areas of functionally linked land, required to construct various Project elements. All of the habitat is currently used for agriculture, except for the areas of spoil immediately north of the River Thames and the intertidal zone.

Table 5.20: Project element land take resulting in habitat loss within the functionally linked land

Project element	Approximate area (ha)	Habitat types present with area lost	Duration of habitat loss
North portal dewatering discharge pipeline and outfall	0.61	Intertidal mud	Temporary. The loss is limited to installation of the pipeline, no more than 3 months and the habitat reforms with the tide cycle.
Operational tunnel drainage discharge pipeline and outfall	0.61	Intertidal mud	
Construction compound 3a	3.91	Cultivated/disturbed land - arable	Temporary. The loss is limited to part of the construction phase, after which the land is re-instated.
Construction compound 3b (includes land required for access)	4.91	Other tall herb and fern - ruderal Ditches with running water Hardstanding of existing roadway	
Compound 3 construction drainage discharge pipeline and outfall (includes land required for access)	1.97	Improved grassland Cultivated/disturbed land - arable Ditch with scrub/running water	Semi-permanent. The loss will occur for the whole construction phase after which the land is re-instated.
CA 3 construction drainage treatment area	5.55	Cultivated/disturbed land - arable	

Project element	Approximate area (ha)	Habitat types present with area lost	Duration of habitat loss
Construction compound 5 (includes land required for utilities diversions, and access)	283.03	Neutral grassland - semi-improved Poor semi-improved grassland Improved grassland Acid grassland - unimproved Marsh/marshy grassland Swamp/standing water Spoil Cultivated/disturbed land - arable Cultivated/disturbed land - amenity grassland Cultivated/disturbed land - ephemeral/short perennial Hardstanding of existing roadway Scrub	Semi permanent and permanent. The loss will occur for the whole construction phase with 76.95 hectares permanently lost for operation and the remainder reinstated.
Highways construction works	75.02	Improved grassland Poor semi-improved grassland Swamp/standing water Cultivated/disturbed land - arable Cultivated/disturbed land - amenity grassland Cultivated/disturbed land - ephemeral/short perennial	Semi permanent and permanent. The loss will occur for the whole construction phase with 22.81 hectares permanently lost for operation and the remainder reinstated.

5.6.54 The works in these areas, are primarily associated with the tunnel construction and would be completed over the period 2024-2029. A further period of decommissioning of the construction site would occur after the road has opened. The loss of habitat during the construction period is permanent and semi-permanent for the majority of the Project elements listed above.

5.6.55 The areas of temporary land take would be reinstated on completion of any work to the same habitat type. This is secured through inclusion in the Design Principles (Application Document 7.5) and ES Figure 2.4 Environmental Masterplan (Application Document 6.2).

5.6.56 Although considered permanent loss within this assessment, the semi-permanent land take would be reinstated on completion of the Project (as shown on ES Figure 2.4 Environmental Master Plan (Application Document 6.2). Where it is reinstated to agriculture, grassland or wetland habitats it would provide suitable habitat for the HRA species within the functionally linked land in the long term

5.6.57 The habitats within the functionally linked land affected by the Project land take include agricultural land, intertidal, and spoil. The field survey work recorded qualifying bird species foraging and roosting within these habitats as shown on Figures 19 and 20. The largest numbers of birds were recorded using the intertidal areas over winter. The measure of the functionality of the habitats is described within the Evidence Plan (Appendix C) and uses the abundance of qualifying bird species (as recorded during the Project ornithology field surveys) per hectare as a measure of functionality within any given area. The functionality of the habitats lost for each of the Project elements is listed below:

- Compound 5 – 2.7
- Compound 3a – 0
- Compound 3b – 2.9
- Highways construction works – 12.4
- Intertidal area – 97.0

5.6.58 The loss of habitat, temporarily and permanently, within the functionally linked land could affect the individuals using it and uncertainty remains as to whether or not this would result in LSE on the Thames Estuary and Marshes SPA and Ramsar.

In combination

5.6.59 As uncertainty remains as to whether or not the Project would result in LSE alone, as a result of the loss of functionally linked land, then the risk of LSE in combination with other plans and projects also exists for Thames Estuary and Marshes SPA and Ramsar.

Change in air quality – dust emissions – construction

Efficacy of committed measures

5.6.60 Whilst no studies of the efficacy of the good practice measures are available in the literature to specifically demonstrate their effectiveness in preventing significant effects on nearby receptors, the measures have been developed over many years by the industry and there is very high confidence in their efficacy. The construction industry standards have been in place for many years and there has been no call or need for updating it in recent years, suggesting that they represent a mature and successful set of guidelines. There is no reasonable scientific doubt that measures that have proved successful on multiple projects in the past; protecting multiple habitat types and people without significant complaint; would not be equally successful at mitigating dust effects on European site habitats.

Alone

5.6.61 Changes in air quality as a result of dust emissions could occur during construction of the Project and dust deposition has the potential to reduce the area of habitat available to qualifying species. Figure 15 shows how the European site and functionally linked land interact with the area potentially affected by dust emissions.

5.6.62 The Project would minimise the dust effects at receptors by managing dust at source as outlined in paragraphs 3.3.5 to 3.3.9. These measures are integral to the Project and would prevent any LSE on the functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar as any pathway to effect would be disrupted.

In combination

5.6.63 The pathway to effect alone would be disrupted at source, therefore there cannot be a feasible risk of this effect acting in combination with other plans and projects, so the Project could not contribute to any in combination effect.

5.6.64 Therefore, a conclusion is reached of no LSE on the Thames Estuary and Marshes SPA / Ramsar due to construction dust as a result of the Project alone or in-combination with other plans and projects.

Changes in surface water quality and quantity

Construction

5.6.65 There is a potential pathway to effect where construction site drainage from compound CA5 discharges into functionally linked land. The size of compound CA5 is such that a full collection and management regime would be implemented prior to discharge to the River Thames. The north portal tunnel works within compound CA5 would also include dewatering and discharge would also be to the River Thames, see Figure 3.

5.6.66 The Project is to be constructed in accordance with integral good practice measures, including attenuation, settlement and treatment if required so that any discharges will comply with quality and permit standards, and at greenfield runoff rates. Specifically, the measures associated with the site run off and dewatering discharge from Compound CA05 are secured via a discharge consent from the Environment Agency.

5.6.67 The measures are aimed at avoiding changes in surface water quality and quantity at source, disrupting any pathway to effect, therefore the risk of effects within functionally linked land is considered inconsequential with no LSE on the Thames Estuary and Marshes SPA and Ramsar.

Operation

5.6.68 Operational road drainage will discharge within the functionally linked land area at the following locations:

a. road drainage from the tunnel is discharged to the River Thames south east of the north portal

b. road drainage from the new road between the north portal and Tilbury rail line is discharged to the West Tilbury Main

5.6.69 The Project design is for a road drainage scheme (see Volume 2 Drainage Plans (Application Document Reference 2.16)) that, collects and attenuates road surface runoff, and discharges clean water at green field run off rate. The retention ponds are fitted with a shut off device to enable flows to be staunched in the event of an accidental spillage.

5.6.70 The measures within the design are aimed at avoiding changes in surface water quality and quantity at source, disrupting any pathway to effect, therefore the risk of effects within functionally linked land is considered inconsequential with no LSE on the Thames Estuary and Marshes SPA and Ramsar.

In combination

5.6.71 The pathway to effect has been disrupted at source at construction and operation, so there cannot be a feasible risk of this effect acting in combination with other plans and projects and the Project itself has an inconsequential effect so could not contribute to any in combination effect.

5.6.72 Therefore, a conclusion is reached of no LSE on functionally linked land of the Thames Estuary and Marshes SPA and Ramsar, due to changes in surface water quality or quantity during construction and operation, as a result of the Project alone or in-combination with other plans and projects.

Introduction/spread of non-native species – terrestrial environment

Alone

5.6.73 Terrestrial Invasive Non-Native Species (INNS) have not been recorded within the Order Limits. The Project includes integral measures, as set out in paragraph 3.3.37, to identify any area of INNS prior to construction and remove or treat to prevent their spread, in accordance with standard good practice [TB005].

5.6.74 The measures are aimed at avoiding the introduction/spread of INNS, disrupting any pathway to effect, therefore the risk of effects within functionally linked land is considered inconsequential with no LSE on the Thames Estuary and Marshes SPA and Ramsar.

In combination

5.6.75 The pathway to effect has been disrupted at source so there cannot be a feasible risk of this effect acting in combination with other plans and projects

and the Project itself has an inconsequential effect so could not contribute to any in combination effect.

5.6.76 Therefore, a conclusion is reached of no LSE on functionally linked land of the Thames Estuary and Marshes SPA and Ramsar as a result of the Project alone or in-combination with other plans and projects.

Reduction in species density

Collision of qualifying species with vehicles – operation

Alone

5.6.77 The Project includes a number of new road links that would cross habitat potentially used by waders and wildfowl to forage or roost. The operation of the Project could result in species colliding with vehicles, where the new road creates a barrier between roosts and foraging sites or between summer and winter habitats.

5.6.78 Figure 10 clearly illustrates that the majority of SPA/Ramsar bird records are associated with the River Thames and the coastal land immediately adjacent to it. The new road would be in tunnel through this area and therefore the risk of birds colliding with vehicles is inconsequential and a conclusion of no LSE for the SPA/Ramsar sites identified.

In combination

5.6.79 The pathway to effect for the Project alone is inconsequential and so could not contribute to any in combination effects.

5.6.80 Therefore, a conclusion is reached of no LSE on the functionally linked land associated with the Thames Estuary SPA and Ramsar due the collision of qualifying species with vehicles as a result of the Project alone or in-combination with other plans and projects.

Collision of qualifying species with utilities infrastructure – operation

Alone

5.6.81 Proposed utilities and road infrastructure include electricity lines as well as gantries for highway messaging and signage. A number of existing electricity overhead lines would require diversion as part of the Project construction. Literature indicates that birds, in particular large waterbirds, collide with powerlines often resulting in fatal injury (Scottish Hydro-Electric Transmission Ltd and SP Transmission Ltd, 2005). The overhead line diversions are limited to the areas adjacent to the existing infrastructure (see Volume 2 General Arrangement (Application Document Reference 2.5)). Therefore, the changes across the habitat used by waterbirds north and south of the River Thames are such that no increased risk of collision is anticipated.

5.6.82 The habitat availability and existence of these risks already within the extent of sensitivity means the amount of change would not be perceptible in terms of population numbers of the European sites highlighted in Section 5.1. Therefore, a conclusion of no LSE for the SPA/Ramsar sites identified.

In combination

5.6.83 The pathway to effect for the Project alone is inconsequential and so could not contribute to any in combination effects. Therefore, a conclusion is reached of no LSE on the functionally linked land associated with the Thames Estuary SPA and Ramsar, due to collisions of qualifying species with utilities infrastructure, as a result of the Project alone or in-combination with other plans and projects.

Disturbance to key species

5.6.84 The area where disturbance has the potential to affect qualifying bird features is restricted to the functionally linked land north and south of the River Thames and includes the intertidal zone on both sides, as shown on Figures 17 and 18 for Project construction and Figure 21 for Project operation.

5.6.85 The Project could result in disturbance as a result of the following impact pathways:

a. Changes in noise and vibration – underwater and above ground – tunnel construction only
b. Changes in noise and vibration – construction works and vehicles
c. Changes in visual disturbance — construction people/machines in eyeline
d. Changes in noise and vibration – operation
e. Changes in visual disturbance - operation
f. Changes in light levels – construction & operation

Changes in noise and vibration – underwater and above ground – tunnel construction only

Alone

5.6.86 The noise and vibration associated with the construction of the tunnel with the TBM has been modelled using the Rupert Taylor Finite Difference Time Domain model FINDWAVE® (ES Appendix 12.3: TBM Noise and Vibration Assessment, Application Document 6.3). The modelling has been completed using geotechnical data from ground investigations, with details of tunnel lengths and soil parameters used. The intended construction mechanism is for there to be a lag between the construction of the two tunnels, therefore the modelling assumes one TBM for the purposes of generating levels of underwater noise. The modelling has been undertaken to provide both the sound pressure level as well as particle velocity at the following locations:

a. At a point above the TBM representing worst case
b. At the edge of the mudflats on the north and south of the river above the tunnel alignment

5.6.87 The results of modelling show that the highest levels of underwater noise associated with TBM operations are 130dB re 1µPa (SPL), at a frequency of 100Hz. This result is from a point in the river directly above the TBM head and represents the worst-case noise level and would decrease with increasing distance. In terms of particle velocity, the worst-case levels from above the TBM

head were 0.01mms-1 reducing to 0.001mms-1 at the edge of the intertidal mudflats.

5.6.88 The noise associated with the TBM would not be perceived beyond the water column, particularly given the background level of noise from shipping, therefore birds are unlikely to react when the TBM is in use. The potential disturbance to invertebrate prey items is also discounted as the changes in particle velocity predicted would not result in any change in prey distribution during the TBM operation. Therefore, it has been concluded that LSE can be ruled out for this effect pathway.

In combination

5.6.89 The pathway to effect for the Project alone is inconsequential and so could not contribute to any in combination effects.

5.6.90 Therefore, a conclusion is reached of no LSE on the functionally linked land associated with the Thames Estuary SPA and Ramsar due to changes in noise and vibration from tunnel construction as a result of the Project alone or in-combination with other plans and projects.

Changes in noise and vibration and visual disturbance

Construction

5.6.91 Figures 17 and 18 illustrates the area where changes in noise as a result of Project construction may result in the disturbance of qualifying birds.

5.6.92 South of the River Thames, the disturbance (approximately 56.6ha) within the Thames Estuary and Marshes Ramsar has been discussed in paragraphs 5.6.28 to 5.6.30, the changes in noise and vibration associated with the following construction activities could result in significant disturbance of in the area illustrated on Figure 17, noting that:

a. Activity within construction compounds CA3A and CA3B

b. Construction of the infrastructure associated with the surface water discharge associated with construction compound CA3

5.6.93 North of the River Thames the changes in noise and vibration associated with the following construction activities could result in significant disturbance in the area illustrated on Figure 18:

a. Construction of the northern outfall in the intertidal area

b. Activity within the construction compound CA5 and utilities diversions in the same area

c. Use of the access road between the Port of Tilbury and the construction compound CA5

d. Highways construction works – Tilbury Viaduct north to just south of Hoford Road and utilities diversions in the same area

Table 5.21 Project elements that would disturb the SPA/Ramsar bird features within functionally linked land

Project element	Phase 1 Habitat type affected (all suitable habitat for use by SPA/Ramsar birds)	Duration of effect	Hectares of suitable habitat affected
North of the River Thames			
Construction compound CA5 and access – North Portal and any main works utilities diversions in the same area The intertidal area disturbed includes the area affected when the North Portal dewatering discharge pipeline will be constructed.	Poor semi-improved grassland Cultivated/disturbed land – arable	Semi-permanent	203.1
	Intertidal mud/sand (above MLW)	Semi-permanent	40.4
	Intertidal mud/sand/ open water (below MLW)	Semi-permanent	75.6
Highways construction works – Tilbury Viaduct north to just south of Hoford Road and any main works utilities diversions in the same area	Poor semi-improved grassland Cultivated/disturbed land – arable	Semi-permanent	38.3
South of the River Thames			
Construction compound CA3A and CA3B Drainage discharge and treatment array for construction compound CA3	Neutral grassland – semi-improved Poor semi-improved grassland Cultivated/disturbed land – arable Cultivated/disturbed land – amenity grassland	Temporary	62.1
	Intertidal mud/sand (above MLW)	Temporary	9.4

5.6.94 The distribution of the bird records in relation to the potentially disturbed areas are shown on Figure 17 and 18 and the species distribution by season is shown on Figure 11a-i. Generally, the functionally linked land was used by species from the SPA/Ramsar overwintering assemblage other than the intertidal habitats which recorded the greatest numbers and diversity of species including SPA/Ramsar qualifying features. It is uncertain whether or not any significant disturbance to these individual birds within functionally linked land would result in LSE for the Thames Estuary and Marshes SPA and Ramsar.

Operation

5.6.95 The noise and vibration and visual disturbance associated with vehicles using the road has the potential to disturb birds using the adjacent functionally linked land. The road is in tunnel for much of the functionally linked land and the potential for disturbance is only likely within functionally linked land north of the River Thames between the North Portal and the Tilbury loop rail line. The exception is the intertidal zone which would be unaffected as the road is within tunnel, and vehicle movements at the North Portal would not be perceived in the intertidal areas, over 300m away and no disturbance reaction from the birds would be expected. South of the River Thames, no pathway to effect exists in the functionally linked land as the road is in tunnel throughout.

5.6.96 The Project has committed measures to reduce the effects of traffic noise in the form of false cuttings and noise attenuation barriers, as described in paragraphs 3.3.39 - 3.3.41. The noise model for the operational phase includes for presence of these measures in accordance with industry standards with regards to their effectiveness at reducing noise. There is no reasonable scientific doubt that measures that have proved successful on multiple projects in the past; protecting multiple habitat types and people without significant complaint; would not be equally successful at reducing disturbance effects on the European site qualifying features within the functionally linked land.

5.6.97 Figure 21 illustrates the areas of functionally linked land where the change in noise exceeds the thresholds. The locations of the false cuttings and noise attenuation barriers are also shown.

5.6.98 Although there is functionally linked habitat within 300m of the proposed new highway, the road, and therefore passing traffic on the live carriageway, is screened from the surrounding habitat by the false cuttings and noise attenuation barriers therefore there is no scope for visual disturbance of the birds within the functionally linked land.

5.6.99 The change in noise exceeds the thresholds and there is potential for the qualifying features using the functionally linked land to be disturbed. The distribution of the bird records in relation to the potentially disturbed areas are shown on Figure 17 and 18 and the species distribution by season is shown on Figure 11a-i. Figure 21 and Table 5.22 sets out the areas of functionally linked land affected by the changes in noise. These areas were recorded as being used by the over wintering assemblage species lapwing and mallard.

Table 5.22: Area of suitable habitats within the functionally linked land where the noise thresholds are exceeded

Habitat	Hectares affected
Agricultural land (reprovisioned following construction) - arable and pasture	150 ha affected >3dB change Of the 150ha approximately 75.8ha affected by noise >55dB

5.6.100 The Project operation would result in exceeded noise thresholds in functionally linked land and it is uncertain whether or not any significant disturbance to individual birds from the overwintering assemblage using this area would result in LSE for the Thames Estuary and Marshes Ramsar and SPA.

In combination

5.6.101 As uncertainty remains as to whether or not the Project construction and operation would result in LSE alone, then the risk of LSE in combination with other plans and projects also exists.

5.6.102 Therefore, it is uncertain whether or not any significant disturbance within functionally linked land, from the Project alone or in combination with other plans or projects, would result in LSE at the Thames Estuary and Marshes SPA and Ramsar

Changes in light levels

Efficacy of committed measures

5.6.103 The efficacy of the committed measures to avoid light spill during construction and operation of the Project has been assessed by modelling the light levels for the construction compounds and operational road lighting columns.

5.6.104 The lux plots in Plate 5.3 and Plate 5.4 illustrate the effect of construction lighting and show that the 0.5 lux contour is primarily within the construction compound and does not result in any changes in light levels within functionally linked habitats.

5.6.105 The lux plots in Plate 5.5 illustrate the operational lighting at the north portal and clearly show that the 0.5 lux contour is within the cutting and does not affect the adjacent land.

Plate 5.4 Predicted lux levels from lighting within compound CA5, extracted from ES Appendix 8.16 Construction and Operational Lighting Contours

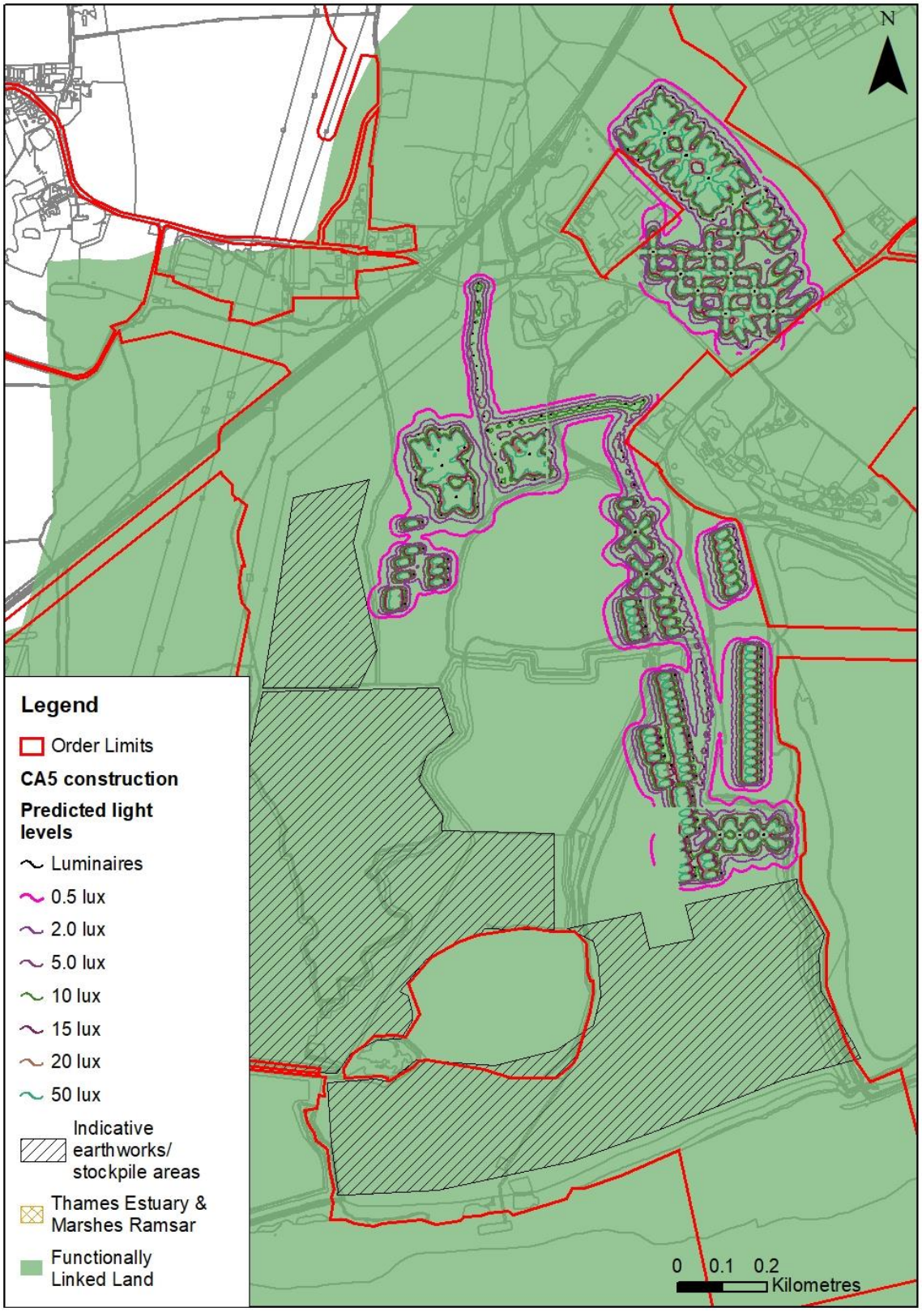
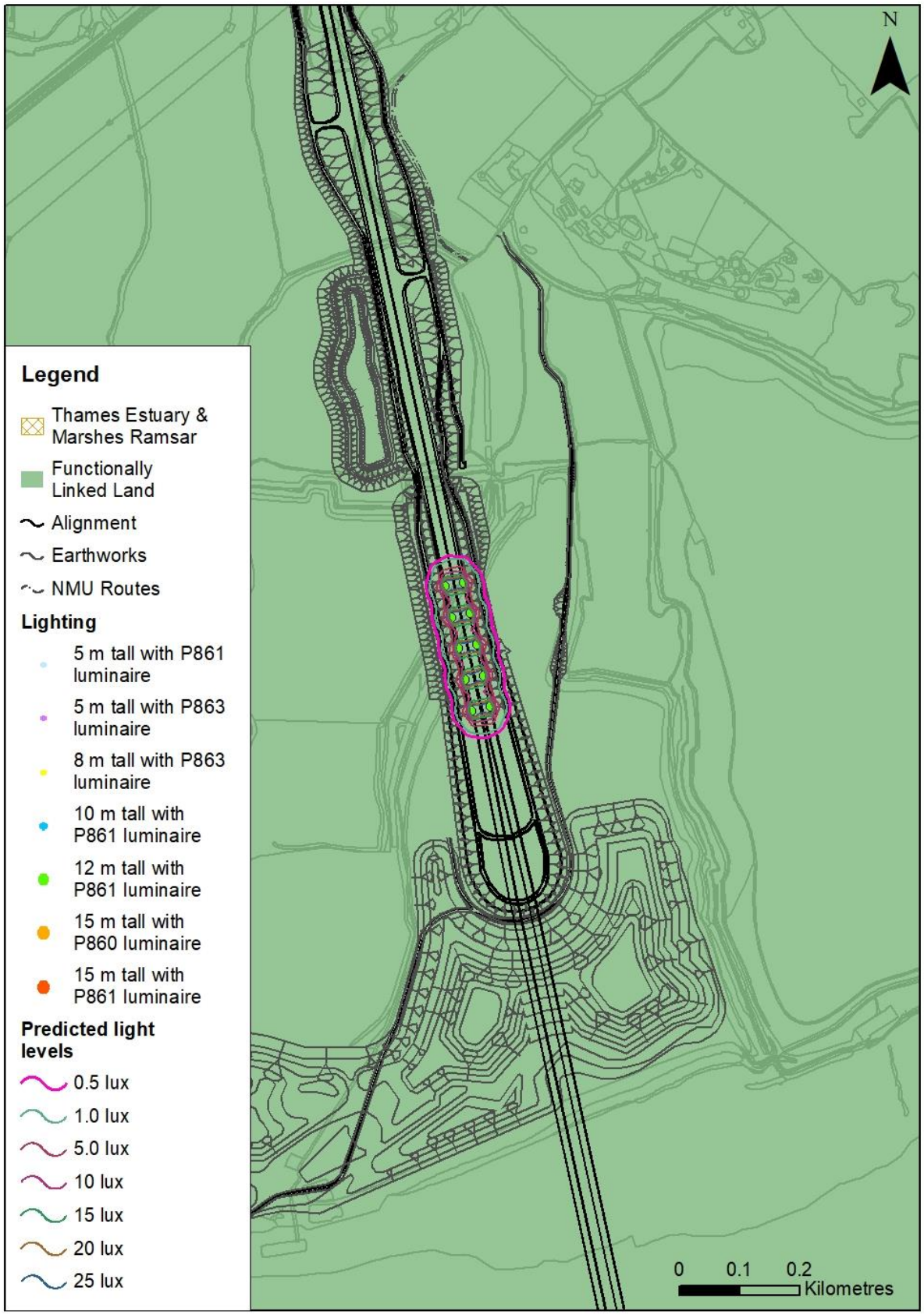


Plate 5.5 Predicted lux levels from operational lighting at the north portal, extracted from ES Appendix 8.16 Construction and Operational Lighting Contours



Construction

5.6.106 The Project is committed to a number of committed measures with regard to lighting on the construction site (see Section 3.3.31 to 3.3.35) such that (noting some land will be lost (see Section 5.6.51)) the remaining functionally linked land adjacent to construction compounds CA3A, CA3B and CA5 would not be affected to the extent that significant effects are likely because the measures reduce and avoid light emissions at source, disrupting any pathway to effect, as demonstrated in Plates 5.3 and Plate 5.4. Plate 5.3 illustrates the predicted lux levels at Compounds CA3A and CA3B and Plate 5.4 illustrates the predicted lux levels at Compound CA5. For all of the compounds the 0.5lux contour is within the Order Limits and therefore no light spill would be perceivable within the Ramsar.

5.6.107 Also, the existence of lighting associated with the various ports and other developments along this part of the River Thames also means any construction lighting for this Project would not materially change overall light levels, as shown in the Landscape and Visual Figure 7.18 (Application Document Reference 6.2), viewpoint S38a and N04 which clearly illustrate the “night-time glow” associated with the river. Therefore, the Project would not be expected to result in any disturbance to the birds feeding and roosting in these parts of the functionally linked land. Therefore, lighting within the construction compounds would not result in any disturbance to the birds feeding and roosting within the functionally linked land.

Operation

5.6.108 The road is in tunnel under the majority of the functionally linked land and is only lit within the tunnel and within the cutting at the north portal where five pairs of lighting columns are proposed on approach to/exit from the tunnel (see Volume 2. General Arrangement Sheet 17 of 47 (Application Document Reference 2.5)).

5.6.109 The Project is committed to a number of design principles relating to the lighting design (see measures listed in Section 3.3) which will reduce the light emissions at source and prevent light spill on to the surrounding land. Plate 5.5 illustrates the predicted lux levels and the 0.5 lux contour is within the cutting earthworks. Therefore, the changes in light levels would not be expected to result in any disturbance to the birds feeding and roosting in these parts of the functionally linked land. The risk of effects within the functionally linked land is considered inconsequential with no LSE on the Thames Estuary and Marshes SPA and Ramsar.

In combination

5.6.110 The pathway to effect alone would be disrupted at source during construction and operation, therefore there cannot be a feasible risk of this effect acting in combination with other plans and projects, so the Project could not contribute to any in combination effect.

5.6.111 Therefore, a conclusion is reached of no LSE on the Thames Estuary and Marshes Ramsar, due to lighting as a result of the Project alone or in-combination with other plans and projects.

Changes in air quality from vehicle emissions, effect on European sites

Alone

Construction

5.6.112 The changes in traffic that were predicted for the road link that triggered the ARN for the Thames Estuary and Marshes Ramsar are summarised in Table 5.23.

Table 5.23: Summary of the traffic changes predicted during construction within 200m of the Thames Estuary and Marshes Ramsar (N/A indicates criteria not met)

Road (Traffic model link ID)	Construction Year	AADT change	HDV change	Speed band change	Carriageway alignment change
Lower Higham Road (20161_86027)	2024	1981	N/A	N/A	N/A
	2025	1877	N/A	N/A	N/A
	2026	1733	N/A	N/A	N/A
	2027	2163	N/A	N/A	N/A
	2028	N/A	N/A	N/A	N/A
	2029	N/A	N/A	N/A	N/A

PLACEHOLDER – The AQ modelling to predict the changes in nitrogen deposition as a result of construction vehicle emissions has not been completed for inclusion in this draft. It will be provided for the Thames Estuary and Marshes Ramsar.

Operation

5.6.113 Changes in air quality as a result of vehicle emissions could occur during operation of the Project. The changes in air quality relevant to this assessment are in nitrogen oxides (NOx) and ammonia (NH_3) which both contribute to the deposition of nitrogen (N deposition). Increases in N deposition have the potential to change habitat composition, depending on the sensitivity of the habitat type. These changes could affect the habitats for which a European site is designated as well as the qualifying species if supporting habitat within the site is affected.

5.6.114 The contribution of changes in traffic from other plans or projects are considered with this 'alone' assessment as the data used within the traffic model includes the predicted changes in traffic from other plans and projects, as represented by the growth factor.

5.6.115 The traffic scoping criteria that were used to determine the ARN are defined by DMRB LA 105 (Highways England, et al., 2019) and Table 5.24 summarises the changes predicted by the traffic model for the road link that triggered the ARN for each European site.

Table 5.24 Summary of the traffic scoping criteria met at each of the European sites identified

European site	Road (Traffic model link ID)	AADT change	HDV change	Speed band change	Carriageway alignment change
Epping Forest SAC	M25 (82844_82671 & 84854_82810)	4,438	879	N/A	N/A
Medway Estuary and Marshes SPA and Ramsar	A249 (88804_88817 & 88818_88805)	1028	-2	N/A	N/A
North Downs Woodlands SAC	A229 (83301_83306 & 83310_88842)	9,782	1,248	N/A	N/A
Thames Estuary and Marshes Ramsar	LTC new alignment (87372_88206 & 88207_87371)	83,868	11,466	New carriageway	New carriageway
The Swale SPA and Ramsar	A249 (88761_88810 & 88802_88764)	1000	-2	N/A	N/A

PLACEHOLDER – The AQ modelling to predict the changes in nitrogen deposition as a result of operational vehicle emissions has not been completed for inclusion in this draft. It will be provided for the sites identified in Table 5.24.

In combination

PLACEHOLDER – This section will be completed when the AQ modelling is complete.

Climate change

5.6.116 A number of European sites considered within this assessment are coastal in location and are therefore vulnerable to sea level rise, coastal flooding and coastal erosion (Government Office for Science, 2017). These direct consequences of climate change could result in loss or fragmentation of habitat and negative effects on the population sizes of the qualifying features, primarily waders and waterfowl. Therefore, the European sites potentially affected by climate change are:

a. Thames Estuary and Marshes SPA and Ramsar

b. Medway Estuary and Marshes SPA and Ramsar

c. The Swale SPA and Ramsar

5.6.117 The following consequences of climate change could conceivably be exacerbated by development:

a. Coastal squeeze resulting from sea level rise

b. Changes to ecological climate space resulting from global warming

c. Changes to water resources and precipitation resulting from erratic weather patterns

Coastal squeeze resulting from sea level rise

5.6.118 Coastal squeeze has been identified as a specific pressure within the Site Improvement Plan (Natural England, 2014) for the Greater Thames Complex of European sites identified within the HRA Screening assessment. Coastal squeeze could conceivably be exacerbated by land take from the Project affecting coastal habitats.

5.6.119 Shoreline Management Plans (SMP) are primarily the way in which the threats of sea level rise are managed and apply to sections of the coast around the UK. The European sites within the Greater Thames Complex are part of the areas covered by Essex to South Suffolk SMP (East Anglia Coastal Group, 2010), Isle of Grain to South Foreland SMP (South East Coastal Group, 2010) and River Medway and Swale Estuary SMP (South East Coastal Group, 2010). The SMPs are each supported by an HRA which assesses the effects of shoreline realignment proposals on European sites and considers coastal squeeze as part of this process.

5.6.120 For the Project to significantly exacerbate the effects of coastal squeeze, it would need to result in the loss of coastal habitat that would compromise the implementation of the SMPs to an appreciable degree.

5.6.121 The Project would lead to permanent land take (land take lasting more than five years) within the intertidal area. In the medium term (over 10 years), the Project would return all intertidal land to pre-construction state.

5.6.122 As part of its obligations under the Water Framework Directive, the Project would contribute financially to a third-party estuary-wide enhancement/restoration programme, such as those delivered by the Environment Agency, Thames21 and the Thames Estuary Partnership. This had been committed to by the Applicant and recorded as (REAC Ref.RDWE042) in the REAC (ES Appendix 2.2, Application Document 6.3).

5.6.123 The HRAs supporting both the Isle of Grain to South Foreland and River Medway and Swale Estuary SMPs indicated that habitat creation measures were required to compensate for the losses of various coastal habitats from coastal squeeze.

5.6.124 The intertidal habitat loss caused by the Project in the short term would be negligible in the context of the predicted changes in the SMPs, as substantial change is predicted e.g. from climate change, and zero in the medium to long term as the habitat would be reinstated. As climate change effects are necessarily long term, the Project is not expected to exacerbate the effects of coastal squeeze in the long term. Therefore, there is no potential for LSE at the European sites identified as a result of the Project exacerbating the effects of climate change.

Changes to ecological climate space

5.6.125 The conservation objectives and supplementary advice do not identify changes in ecological climate space (the range of species in the context of climatic variables) as a key threat or key sensitivity for any European sites that are considered within the HRA. It is therefore not considered necessary to consider potential for exacerbation of this as a result of climate change in the HRA.

Changes to water resources and precipitation patterns

5.6.126 The conservation objectives and supplementary advice do not identify changes to water resources and precipitation patterns through climate change as a key threat or key sensitivity for any European sites that are considered within the HRA. It is therefore not considered necessary to consider the potential for the exacerbation of this as a result of climate change in the HRA.

Habitat or species fragmentation

5.6.127 Habitat and species fragmentation may arise as a result of any reduction in habitat area (see paragraphs 5.6.2 to 5.6.20 and 5.6.50 to 5.6.84) and is considered as part of that effect in the assessment of effects of reduction in habitat area.

Changes in key indicators of conservation value

5.6.128 The key indicators of conservation value for the European sites identified are primarily associated with the environmental conditions that could affect each site in terms of water quality, air quality, noise and light levels.

5.6.129 The Project has the potential to affect air quality, water quality noise and light levels and these have been discussed in terms of the resulting effect on habitat area or disturbance in the preceding sections.

5.7 Summary

PLACEHOLDER – the effects relating to changes in air quality as a result of vehicle emission during construction and operation have not been included within this draft.

5.7.1 The European sites and effect pathways where a conclusion of no LSE alone and in combination with other plans and projects was reached are set out in Table 5.25.

5.7.2 Natural England have been consulted and are in agreement with the conclusions of no LSE for European sites and effect pathways listed in Table 5.25. Natural England have also agreed that the European sites and effect pathways where the LSE conclusion was uncertain, as listed in Table 5.26, would be considered at Stage 2 appropriate assessment. Records of the discussion and agreements are recorded within Appendix C Evidence Plan and the Statement of Common Ground (SoCG).

Table 5.25: Sites and effect pathways where a conclusion of no LSE was reached

European site	Potential effect pathways
Thames Estuary and Marshes SPA and Ramsar	Change in air quality – dust emissions – construction Changes in groundwater quality and quantity – tunnel construction and operation Changes in surface water quality and quantity as a result of the northern tunnel entrance compound construction discharge Changes in surface water quality and quantity – operation Introduction/spread of Invasive Non-Native Species Changes in noise and vibration – tunnel construction only. Underwater and above ground Change in recreational pressure – construction and operation Changes in light levels – construction and operation Vehicle collision Utilities infrastructure collision Climate change

5.7.3 The HRA Stage 2 Appropriate Assessment in Section 7 considers the effects of the Project on the integrity of European sites where uncertainty over LSE remains as set out in Table 5.26.

Table 5.26 European sites and effects where uncertainty on LSE remains

European site	Potential LSE
Thames Estuary and Marshes SPA and Ramsar	Changes in surface water quality and quantity as a result of the southern tunnel entrance compound construction discharge within the Ramsar site only. Reduction in habitat area (bird qualifying features) as a result of land take in functionally linked land of the SPA and Ramsar site. Disturbance to key species (bird qualifying features) as a result of changes in noise and vibration and changes in visual disturbance (people/machines in eyeline) during construction within the Ramsar site and functionally linked land of the SPA and Ramsar site. Disturbance to key species (bird qualifying features) as a result of changes in noise and vibration and changes in visual disturbance (vehicles in eyeline) during operation within functionally linked land of the SPA and Ramsar site.

6 Mitigation

6.1.1 The mitigation measures that have been put in place to avoid or reduce the effect pathways identified at Stage 1 Screening are set out in the following paragraphs and have been included within the Stage 2 appropriate assessment in Section 7.

6.1.2 The following measures are secured via the REAC (Application Document 6.3) or the Design Principles (Application Document 7.5).

6.2 Measures to avoid changes in surface water quality and quantity

6.2.1 RDWE033: Water discharged into the Thames Estuary and Marshes Ramsar western ditch from the South Portal construction compound would be treated to the standard specified within the discharge licence consent granted by the Environment Agency and released at greenfield runoff rates. The runoff collection and management system would be operated until full reinstatement of the compound area is complete.
The water quality standards for the discharge into the western ditch will include (but not be limited to) the following parameters and would not exceed these values unless otherwise agreed by the Environment Agency as part of its discharge licence consents (such agreement not to be unreasonably withheld or delayed) which would be set following consultation with Natural England: Discharge rate of no more that 2ls-1; chemical composition of; pH, biochemical oxygen demand, dissolved oxygen, total ammonia, unionised ammonia, suspended solids, total phosphorus, turbidity, salinity, cover of filamentous green algae (Enteromorpha), water levels (depth) , with standards no greater than that recorded during the pre-construction survey.

Confidence of success

6.2.2 The parameters within the commitment RDWE033 were proposed following a review of the water quality of the receiving ditch network, sensitivities of relevant Ramsar qualifying features and calculations to quantify the effects of additional discharge volumes on water levels in the receiving western ditch and connecting ditches (see Appendix C Evidence Plan). The commitment is directly linked to pre-construction water quality sampling to provide the most current information on the chemical composition of the receiving ditch and ensure that the EA discharge consent will result in any risk of pollution of the receiving water body being removed.

6.2.3 The Applicant is confident that the measures in place to control the discharge of site drainage are such that any effect on the receiving watercourse is avoided.

6.3 Measures to avoid and reduce changes in noise and vibration

Construction phase measures

6.3.1 Figure 24 illustrates the locations of the noise attenuation measures that reduce the changes in noise as a result of the Project construction. The commitments below secure these measures.

6.3.2 **HR004:** Noise attenuation measures shall be incorporated within Compounds CA5, CA3a and CA3b as shown on Figure 24 (and having regard for HR005 & HR006) to ensure that the construction activities do not result in noise levels within the Thames Estuary and Marshes SPA/Ramsar or any land functionally linked to it (as shown in Figure 2) that would cause disturbance (as monitored through HR009) to the wintering bird qualifying interests. The measures shall be in place prior to the operation of those compounds (or areas of compounds) and shall remain until the end of the compound operation.

6.3.3 **HR005:** The compound CA5 earthworks area immediately north of the River Thames shall be no closer than 75m to the existing field boundary and all soil reprofiling shall occur behind a 3m high bund that will delimit the extent of the works from functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar. Construction of the 3m high bund will be substantially started during April, May, June and July only to avoid disturbance of birds in the passage and winter period from completion of construction of the bund and subsequent works behind it. 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 bund does not disturb (as monitored through HR009) the wintering bird qualifying interests.

Confidence of success

6.3.4 The measures have been incorporated into the noise model that the resulting area affected by noise greater than 55dB or change greater than 3dB was significantly reduced. The areas of suitable habitat (worst case) where the noise levels are greater than 55dB or where there is a >3dB change have been reduced from approximately 328.7ha to 106.6 ha.

6.4 Measures to avoid visual disturbance

Construction phase measures

6.4.1 A number of the measures associated within noise mitigation and compound design will also avoid visual disturbance by screening any works from the land adjacent to them. These include:

a. HR004 and HR005; and,

b. The retention of the safety bund south of the Metropolitan Police firing range which forms the north side of Compound CA3b.

6.4.2 **HR001:** Works to construct the infrastructure for the new South Portal construction drainage discharge would not take place within the Thames Estuary and Marshes Ramsar and any work within functionally linked land, as

shown on HRA Figure 2 (Application Document Ref 6.5) would only be undertaken during April, May, June and July only to avoid disturbance to passage and overwintering birds associated with European designated sites unless otherwise agreed with SoS in consultation with Natural England.

6.4.3 **HR002:** Works within the intertidal area to construct the northern outfall would be undertaken during April, May, June, July and August only to avoid disturbance to passage and overwintering birds associated with European designated sites unless otherwise agreed with SoS in consultation with Natural England.

6.4.4 **HR005:** The compound CA5 earthworks area immediately north of the River Thames shall be no closer than 75m to the existing field boundary and all soil reprofiling shall occur behind a 3m high bund that will delimit the extent of the works from functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar. Construction of the 3m high bund will be substantially started during April, May, June and July only to avoid disturbance of birds in the passage and winter period from completion of construction of the bund and subsequent works behind it. 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 bund does not disturb (as monitored through HR009) the wintering bird qualifying interests.

6.4.5 **HR006:** Erection of noise attenuation measures at the boundaries of compounds identified in HR004 will be carried out in April, May, June and July only to avoid disturbance of birds in the passage and winter period.

Confidence of success

6.4.6 The timing of works that are out with construction compound fences avoid the peak overwintering months and therefore avoid effects on qualifying species within the period the Thames Estuary and Marshes SPA/Ramsar site and functionally linked land is important. There is limited risk that some species may arrive early in the passage season, August when there are some limited works occurring outside construction compounds.

6.5 Measures to reduce effects of land take and disturbance

Construction

Severe weather constraints

6.5.1 The following commitment has been included to reduce construction disturbance effects during severe winter weather.

6.5.2 **HR003:** To avoid impacts to wintering birds during prolonged periods of sub-zero temperatures, activities potentially causing disturbance to wintering bird qualifying interests of the Thames Estuary and Marshes SPA/Ramsar would be undertaken in accordance with the general principles of the JNCC's "Scheme to reduce disturbance to waterfowl during severe winter weather" (https://jncc.gov.uk/our-work/severe-weather-scheme/).

Enhanced functionality of habitat

6.5.3 Two habitat parcels within the functionally linked land area will be enhanced to improve functionality during the construction phase. The land parcel adjacent to Coalhouse Fort (Design Principle S9.13) will also continue to provide an enhanced functionality during operation.

6.5.4 **Design Principle S9.13:** The land parcel (34.4 ha) adjacent to Coalhouse Fort shall be used for habitat enhancement to maintain baseline functionality of functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar. The land will be used to create a series of shallow scrape habitats, high tide roost features and coastal grazing marsh habitat suitable for use by the qualifying features of the SPA/Ramsar (LE6.2 Banks and ditches, LE6.1 Water bodies and associated plants, LE6.4 Marsh and wet grassland).

6.5.5 **HR007:** To provide enhanced functionality of functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar during the construction period, the management of the three fields (14.3 ha) in the plot south of the Metropolitan Police firing range and adjacent to the SPA/Ramsar (Land Registry ref. K794941) will consist of either a standing ripe crop ready to be harvested, winter stubbles or grass ley from 1st October – 1st March each year throughout the construction and operation of compounds CA3A and CA3B.

Operation

6.5.6 Habitat enhancement as per Design Principle S9.13 and described in paragraph 6.5.4.

Confidence of success

Severe weather constraints

6.5.7 The severe weather restrictions are in accordance with a recognised scheme to avoid disturbance of overwintering waterfowl, therefore there is high confidence in the efficacy of this measure avoiding disturbance of the Thames Estuary and Marshes SPA/Ramsar qualifying features during severe winter weather.

Enhanced functionality of habitat

6.5.8 The efficacy of the measures has been quantified by using species abundance as a measure of habitat functionality. The approach was developed in consultation with Natural England and was documented as described in the Evidence Plan (Appendix C). To evidence the predicted increase in function of enhanced habitat on the mitigation areas the Applicant has assessed the

abundance of birds on a number of exemplar[9] habitat plots. Based on the survey data of bird use of existing exemplar habitats, it is expected that the new habitats created in the mitigation areas would attract similar numbers of birds, in particular the overwinter and passage features. The increase in functionality of the mitigation areas can therefore be identified by comparing existing use (from survey data) and expected future use (from survey data of existing exemplar habitat) in the habitat to be created).

6.5.9 The proposed change, within the land parcel at Coalhouse Fort (Design Principle S9.13), from arable farmland to a mosaic of coastal grazing marsh, shallow scrapes and high tide roost features is designed to create a similar mosaic of habitats as currently found in the area around Tilbury Fort. The existing ditch system is primarily rainfall fed system with occasional inputs from adjacent land holdings. The ditch system has a single drainage point out to the Tilbury Main and this could be controlled with a simple sluice to ensure that the ditch system and proposed scrapes hold water throughout the winter and passage season. Should the sea wall fail at this location and there is an intrusion of saltwater the value of the enhanced habitat for the qualifying features would not be affected.

6.5.10 In addition, the geographical location of the proposed habitat creation is adjacent to intertidal mud and saltmarsh habitat that has also been shown by surveys to support relatively high concentrations of a range of qualifying species. The geographical location will provide connectivity to upper estuary important areas such as Tilbury Fort and the inter tidal resource further upstream. It would therefore be certain that these birds would be able to find the new habitat easily and there would be no barriers between where the birds are currently using and the new habitats. The functionality of this plot is expected to increase from 2.6 per hectare to 165 per hectare.

6.5.11 The proposed change in management of the three fields south of the Metropolitan Police firing range from winter cereal crops to grassland or winter stubbles is designed to create a habitat more akin to that already present within the Thames Estuary and Marshes Ramsar. The habitat west and east of this plot has been shown by surveys to support relatively high concentrations of a range of qualifying species. It would therefore be certain that these birds would be able to find the new habitat easily and there would be no barriers between where the birds are currently using and the new habitats. The functionality of this plot is expected to increase from 6.2 per hectare to 19 per hectare.

[9] Exemplar – Habitat types include features that would be created in the new mitigation areas for example scrapes, grassland etc.

6.6 Measures to reduce the effects of nitrogen deposition

PLACEHOLDER – this section will be completed once the AQ modelling and assessment has been finalised

7 Assessment of effect on integrity of European sites

7.1 Thames Estuary and Marshes SPA/Ramsar

7.1.1 There is a risk of LSE on the Thames Estuary and Marshes SPA/Ramsar site as a result of the Project for the following effect pathways:

a. Changes in surface water quality and quantity as a result of the southern tunnel entrance compound construction discharge within the Ramsar site.

b. Reduction in habitat area (bird qualifying features) as a result of land take in functionally linked land of the SPA and Ramsar site.

c. Disturbance to key species (bird qualifying features) as a result of changes in noise and vibration and changes in visual disturbance (people/machines in eyeline) during construction within the Ramsar site and functionally linked land of the SPA and Ramsar site.

d. Disturbance to key species (bird qualifying features) as a result of changes in noise and vibration and changes in visual disturbance (vehicles in eyeline) during operation within functionally linked land of the SPA and Ramsar site.

Changes in surface water quality and quantity

Effect alone

7.1.2 The discharge of construction run off from Compound CA03 would be strictly controlled via an EA discharge permit. The Project has committed to a treatment system that will mean any water discharged will not affect the depth, flow or chemical composition of the receiving ditch network, which is part of the Thames Estuary and Marshes Ramsar.

7.1.3 The Projects commitment to the control measures proposed, which have a high confidence of success and mean that any effect on the Thames Estuary and Marshes Ramsar as a result of changes in surface water quality is avoided.

In combination effect

7.1.4 The pathway to effect has been disrupted at source, so there cannot be a feasible risk of this effect acting in combination with other plans and projects.

7.1.5 Therefore, a conclusion is reached of no adverse effect in the integrity of the Thames Estuary and Marshes Ramsar, due to changes in surface water quality or quantity during construction, as a result of the Project alone or in-combination with other plans and projects.

Land take within functionally linked land

Effect alone

7.1.6 The Project has committed to providing two land parcels (Design Principle S9.13 and HR007) where the functionality of the habitat would be enhanced to mitigate the loss of functionally linked land during construction and operation.

7.1.7 The peak counts of HRA species within the land take areas is shown in Table 7.1 along with the potential contribution to the European sites of which it is a qualifying feature, expressed as a percentage of that site's total population. The individual qualifying features hen harrier and knot were not recorded within any land take areas.

7.1.8 The land take within the intertidal area has not been included in these figures as it only relates to the installation of the pipeline for the northern discharge. The area required for the north discharge pipe and outfall is small (approximately 0.61ha) and the loss of habitat would be temporary, reinstated within a tidal cycle after installation. Also the mitigation in place to avoid disturbance on the intertidal area (see HR002, paragraph 6.4.3) will mean that the temporary loss of intertidal habitat occurs out with the important overwintering period. The key effect on the birds using the intertidal zone is as a result of disturbance and this is discussed in paragraph 7.1.21.

Table 7.1 Peak count of qualifying features recorded within the worst-case land take area (construction phase 2022-2024) and the potential percentage contribution to Thames Estuary and Marshes SPA/ Ramsar

Qualifying feature	Peak count	Month peak count recorded	Potential % of Thames Estuary and Marshes SPA/ Ramsar
Avocet (non-breeding)	16	Nov	1.6%
Black-tailed godwit	9	Jul	0.1%
Dunlin	6	Sep	0.0%
Grey plover	2	Dec	0.1%
Lapwing	675	Jan	37.0%
Redshank	3	Apr	0.1%
Ringed plover	16	Nov	1.9%
Waterfowl assemblage	771	Winter months	1.0%
The percentages of the European site population presented in this table do not indicate a scale of effect. The percentages represent the theoretical worst-case proportion of a European site that could be affected if there was a significant effect. Even if a significant proportion of a population of a European site was present, it is still possible that the scale of effect could be sufficiently low that the overall effect would be insignificant			

7.1.9 The percentages presented in Table 7.1 represent the worst-case scenario, i.e. the first two years of the construction phase 2024 – 2026 when the maximum

area of habitat would be unavailable. After 2026 the habitats south of the River Thames are reinstated, as secured by the Design Principles (Application Document 7.5) and Environmental Masterplan (ES Figure 2.4 Application Document 6.2) and would therefore be available for use by the HRA species. The construction phase is expected to be completed in 2029 and in the following years (up to three) the habitats that are not permanently lost would also be reinstated as the construction site is decommissioned and available for use by the HRA species from 2032.

7.1.10 Where the percentages are greater than 1% in Table 7.1 this has been taken (in line with common convention) as an indication that these individuals are potentially an important part of the European site population. Potentially important numbers of HRA species have been recorded within the land take areas.

7.1.11 The graphs in Plate 7.1 and Plate 7.2 show the use of the land take areas by month for the waterfowl overwintering assemblage and for each of the qualifying species. It is clear from these graphs that the peak counts are considerably larger than average counts, particularly in January, which is limited to the high peak count of lapwing recorded.

7.1.12 When considering the overwinter assemblage qualifying feature, the numbers of individuals recorded are generally higher over winter as expected, however there are records all year round. The individual qualifying features generally recorded limited use of the land take areas, as the species are generally associated with the intertidal habitat. The exception was lapwing and ringed plover which are more ubiquitous species with very broad habitat usage. Given the land take is primarily agricultural (which is abundant in the area), the differences shown between peak and average counts indicate that the birds are not using the affected areas exclusively but in conjunction with other agricultural areas within the functionally linked land.

Plate 7.1 Seasonality of use of the land take areas by the waterfowl assemblage

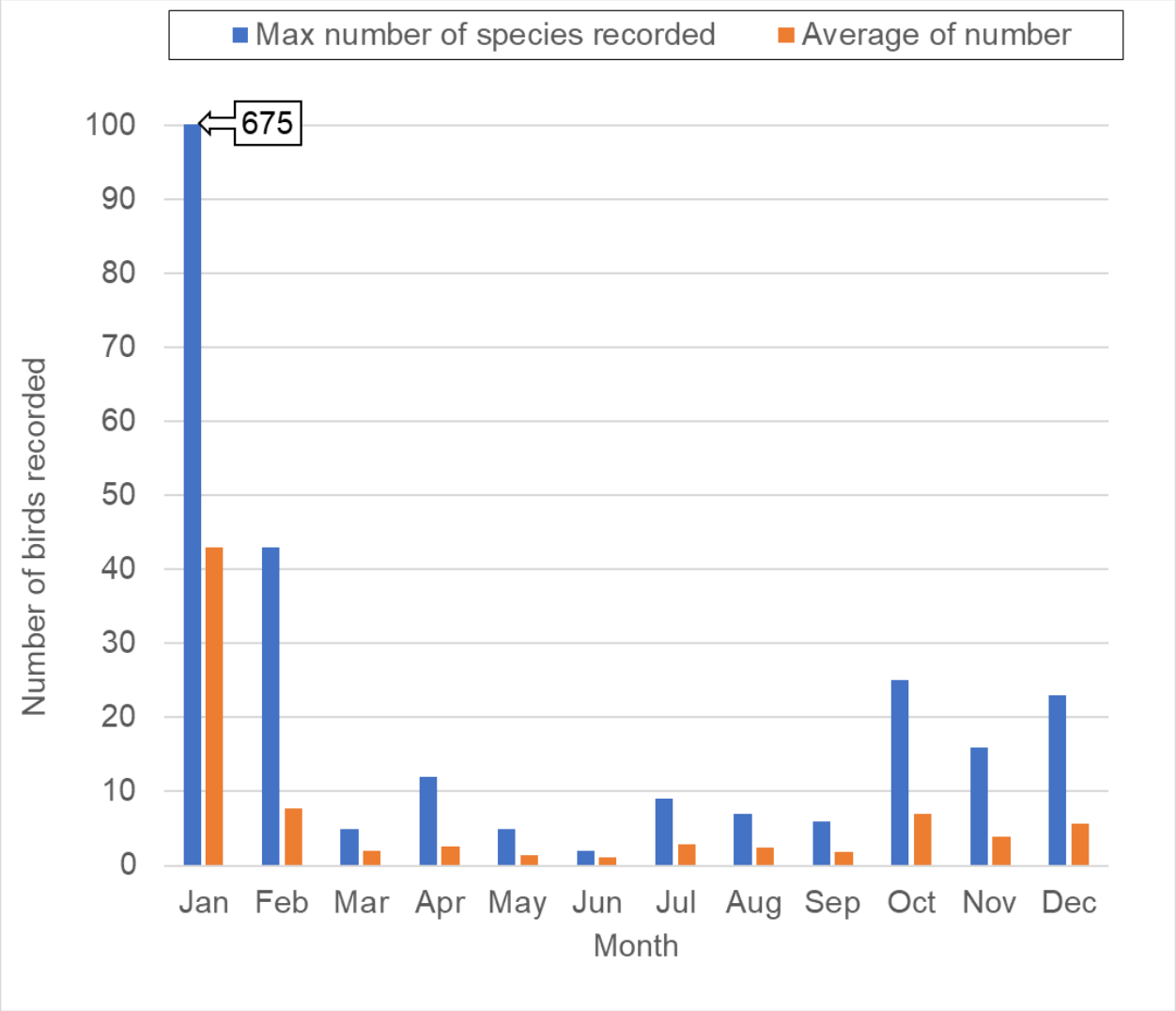
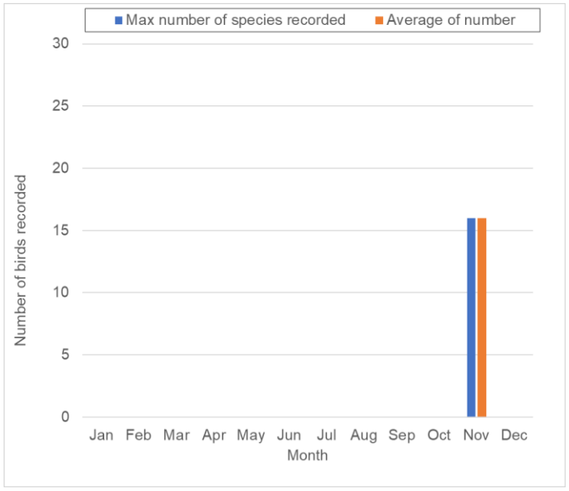


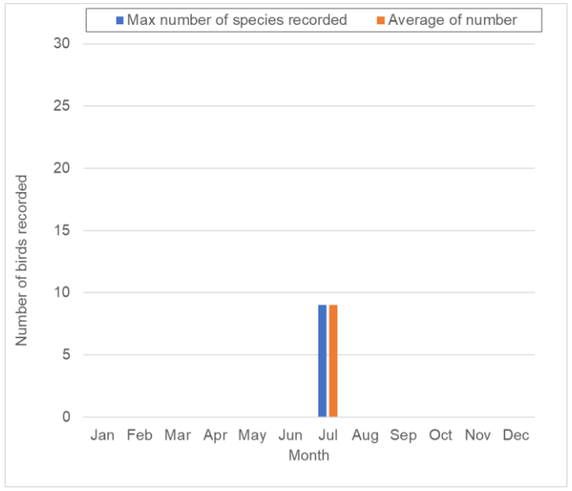
Plate 7.2 Comparison of the seasonality of use of the land take areas by qualifying features

y axis – number of birds 0-30; x axis months January - December

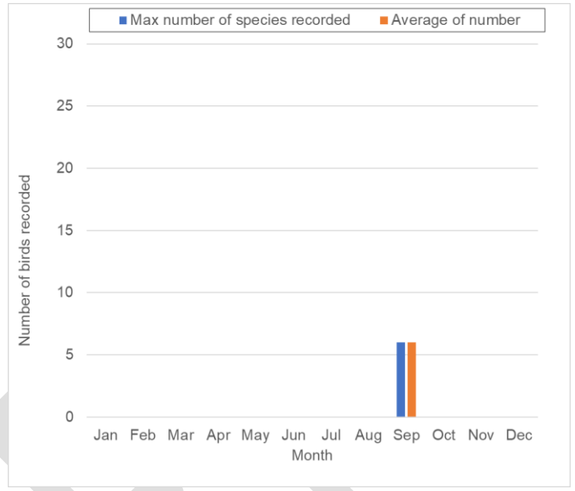
Avocet



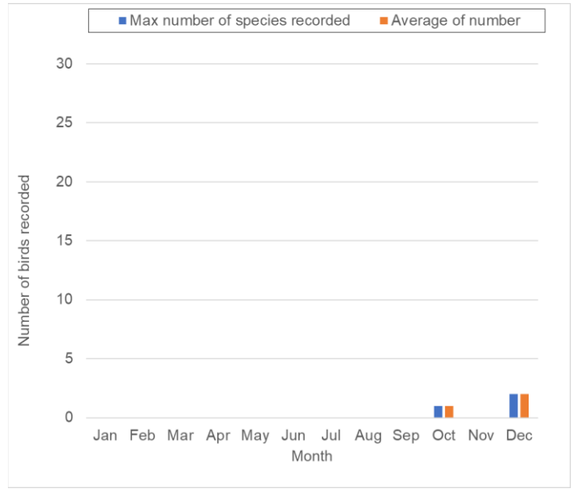
Black tailed godwit



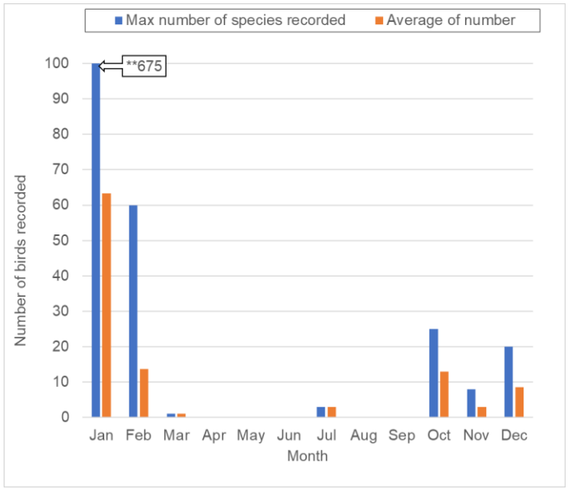
Dunlin



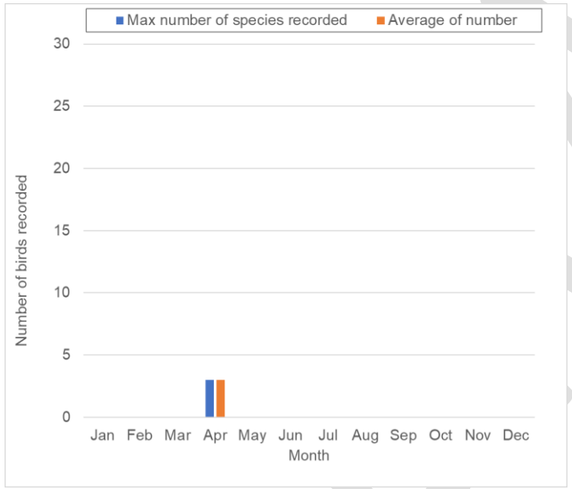
Grey plover



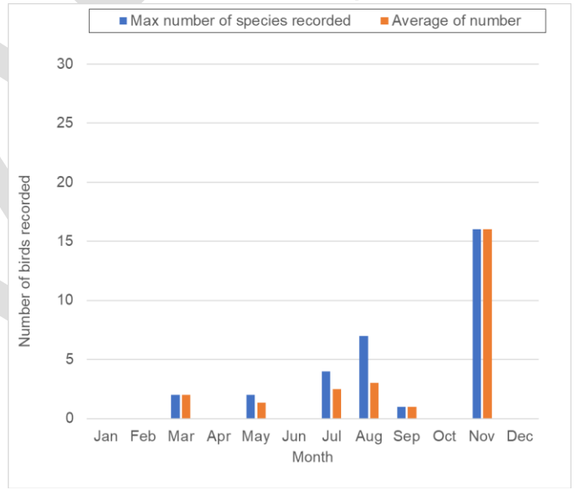
Lapwing **note y axis scale 0-100



Redshank



Ringed plover



7.1.13 The functionality of the habitats lost to the Project have been quantified in conjunction with the functionality of the mitigation land provided to as shown in Table 7.2. This clearly shows that the enhanced functionality provided in the mitigation land will ensure that the functionality of the functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar will be maintained throughout the construction and operation of the Project.

Table 7.2: Predicted change in baseline functionality of the functionally linked land as a result of the Project land take alone

	Functionality (species abundance)		
	Existing	Construction	Operation
FLL within Order limits (Project land take)	1289	0	1113[10]
Mitigation area adjacent to Coalhouse Fort	88	5,676	5,676
Mitigation area 3 arable fields	88	272	0
Total	2759	5948	7185

7.1.14 Although there are potentially significant proportions of the SPA/Ramsar population using the functionally linked land affected by the land take, the provision of the mitigation areas ensure that overall functionality remains throughout the construction and operation of the Project. Therefore, it is considered unlikely that the use of the functionally linked land would be significantly altered as a result of the land take.

In combination effect

7.1.15 Table 7.3 and Table 7.4 provide the list of projects reviewed in the assessment of in-combination effects of land take within the functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar. The locations of these are shown on Figure 27.

7.1.16 The Thames Estuary 2100 programme is another large project within the functionally linked land that will be delivered by the Environment Agency and its partners. The project aims to manage tidal flood risk in the Thames Estuary and

[10] Calculated: Total of abundance of construction land take minus total abundance in permanent land take. i.e the area returned to landowners after construction will record functionality as per existing

the first phase, Phase 1: 2012 until 2035 includes maintenance and improvement of current flood risk management assets including walls, gates, embankments and pumps; protection of land needed for future improvements to flood defences; and monitoring how the estuary is changing. However, there is no detail available as to the exact locations of the projects and how they may influence the suitable habitat availability within the functionally linked land, and it does not form part of the in-combination assessment.

Table 7.3 NSIPs within functionally linked land

Development name	Status	Timing	Approximate distance from the Project	Approximate loss (temporary and permanent) of suitable habitat (ha)
Thurrock Flexible Generation Plant	Submitted 2020	Construction Q2 2021 – Q1 2023 Depending on phasing strategy	Immediately adjacent	0.5ha of intertidal habitat 20ha of coastal agricultural land
The London Resort (Tilbury site only within the FLL)	Pre-application EIA Scoping report 2020	Construction phase 2021-2024	Tilbury site – adjacent Kent site – 6km west	Tilbury site – no suitable habitat lost. Kent site – outside FLL
Oikos Marine & South Side Development	Pre-application EIA Scoping report 2020	Not specified two-year construction period	11km east	No suitable habitat lost
Perrys Farm Hazardous Waste Management Facility	Pre-application Scoping opinion 2013	Not specified	19km east	Not specified but potential loss of approximately 10ha agricultural land

Table 7.4 Local planning projects within functionally linked land

Development Application number	Status	Timing	Approximate distance from the Project	Approximate land take of suitable habitat (ha)
14/01321/OUT & 18/01660/REM	Outline – decided Reserve matters	Not defined but construction likely to overlap	1.5km east	No suitable habitat lost
19/01534/FUL	Application submitted	Not defined but construction potential to overlap	3.5km east	No suitable habitat lost

Development Application number	Status	Timing	Approximate distance from the Project	Approximate land take of suitable habitat (ha)
16/01232/OUT	Application submitted	Not defined but construction likely to overlap	Within and adjacent to Order limits Therefore, 40-50ha habitat loss is already considered with the assessment alone	Not specified but approximately 20ha agricultural land adjacent to Order limits
16/01475/SCR	Screening opinion requested	Undefined	2km north and east	Not specified but approximately 9.5ha of agricultural land
19/00051/CV	Related to other applications at Goshem's Farm/ Ingrebourne Valley Limited jetty/ Tilbury Riverside 17/00412/FUL 17/00224/FUL 13/00497/FUL	Undefined	Within OLB Therefore, habitat loss is already considered with the assessment alone	Suitable habitat within area already being reprofiled as part of existing permissions
CS04	Proposed site allocation in Gravesham Draft Local Plan	Not defined	0.4km west	No suitable habitat lost
20200343 (CS05)	Application submitted	Not defined	1.9km west	No suitable habitat lost
20110713	Outline Application submitted	Not defined	0.5km west	No suitable habitat lost
20/00971/FUL	Application submitted	Not defined	2.3km east	Restoration of suitable habitat 76ha coastal grazing marsh

7.1.17 The total area of suitable habitat predicted to be lost temporarily or permanently as a result of the other plans or projects listed in Table 7.3 and Table 7.4 is approximately 63.5ha and these are within functionally linked land. This assumes that these other projects progress within the first two years of the Project construction however other than the Tilbury 2 project which has been completed, there are no proposed timings for the other projects where suitable habitat is lost. Application 20/00971/FUL relates to the Essex Wildlife Trust Fobbing Marshes Restoration and is a proposal to manage the water within the Fobbing Marshes to maintain optimal water levels all year round with anticipated benefits for the waders and wildfowl recorded there.

7.1.18 The use, by qualifying features, of the habitats potentially lost within the other plans and projects is not reported consistently and therefore to assess the functionality the habitat types lost, the habitat types have been assigned an abundance per hectare based on the abundances recorded within the Project[11]. The agricultural land recorded 2.7ha^{-1} and higher value areas such as the intertidal habitat 97ha^{-1} and coastal grazing marsh 18.6ha^{-1} (unmanaged areas) and 190ha^{-1} (managed areas). The later to measures of functionality have been used to illustrate the anticipated improvement in functionality if the Fobbing Marshes application is granted and proceeds within the same time frame as the Project.

7.1.19 Table 7.5 summarises the effect of habitat loss within the functionally linked land associated with the Thames Estuary and Marshes SPA and Ramsar as a result of the Project in combination with the other plans and projects identified in Table 7.3 and Table 7.4. As a worst case the assessment assumes all other plans and projects would result in habitat being lost concurrently with the Project.

Table 7.5: Predicted change in baseline functionality of the functionally linked land as a result of the Project land take in combination with other plans and projects

	Functionality (species abundance)		
	Existing	**Construction**	**Operation**
FLL within Order limits (Project land take)	1289	0	1113[12]
FLL habitat lost (other plans and projects)	209	0	0[13]
20/00971/FUL – Essex Wildlife Trust Fobbing Marshes Restoration	1414	14,417	14,417
Mitigation area adjacent to Coalhouse Fort	88	5,676	5,676
Mitigation area 3 arable fields	88	272	0
Total	**1743**	**20365**	**21294**

[11] As part of the evidence plan the use species abundance as a measure of functionality presented to Natural England in the LTC HRA Technical Note: Habitat enhancement to maintain baseline functionality of functionally linked land (Rev2). Natural England agreed this was an appropriate measure to illustrate efficacy of habitat enhancement measures.
[12] Calculated: Total of abundance of construction land take minus total abundance in permanent land take. i.e the area returned to landowners after construction will record functionality as per existing
[13] No information available for the other plans and projects

Changes in noise, vibration and visual disturbance

Effect alone

Construction phase

7.1.20 The Project has committed to avoiding and reducing to a minimum the disturbance within the Thames Estuary and Marshes Ramsar and associated functionally linked land. The provision of noise attenuation measures, HR004 and HR005 as shown on Figure 24, will result in significantly less habitat affected as shown on Figure 25 and 26 and set out in Table 7.6.

7.1.21 The disturbance (visual and noise) of the functionally linked land, intertidal habitat, when the North Portal dewatering discharge pipeline is constructed will be avoided by HR002 it occurs out with the important overwintering period.

7.1.22 The disturbance (visual and noise) of the Thames Estuary and Marshes Ramsar and associated functionally linked land, agricultural habitat, when the Compound 3 construction drainage outfall is constructed will be avoided by HR001 as it occurs out with the important overwintering period.

Table 7.6 Project elements where, following mitigation, the noise and visual thresholds are exceeded in the Thames Estuary and Marshes Ramsar and associated functionally linked land

Project element	Phase 1 Habitat type affected (all suitable habitat for use by SPA/Ramsar birds)	Duration of effect	Hectares of suitable habitat affected
North of the River Thames – Functionally Linked Land			
Construction compound CA5 and access – North Portal and any main works utilities diversions in the same area.	Poor semi-improved grassland Cultivated/disturbed land – arable	Semi-permanent	176.6
	Intertidal mud/sand (above MLW)		2.3
Highways construction works – Tilbury Viaduct north to just south of Hoford Road and any main works utilities diversions in the same area	Poor semi-improved grassland Cultivated/disturbed land – arable	Semi-permanent	4.2
South of the River Thames – Functionally linked land			
Construction compound CA3A and CA3B	Poor semi-improved grassland Cultivated/disturbed land – arable	Temporary	3.9
South of the River Thames – Thames Estuary and Marshes Ramsar			
Construction compound CA3A and CA3B	Poor semi-improved grassland	Temporary	1.4

7.1.23 The peak counts of HRA species within the areas disturbed is shown in Table 7.7 along with the potential contribution to each of the European sites of which it is a qualifying feature, expressed as a percentage of that site's total population. The individual qualifying features hen harrier and knot were not recorded within any disturbance areas.

Table 7.7 Peak count of species recorded within the worst-case area disturbed (construction phase 2024-2026) and the potential percentage contribution to each European site population

Species	Peak count	Month peak count recorded	Potential % of Thames Estuary and Marshes SPA/ Ramsar
Avocet (non-breeding)	2	Mar	0.2%
Black-tailed godwit	148	Jul	1.4%
Dunlin	300	Nov	0.9%
Grey plover	2	Nov	0.1%
Lapwing	91	Jan	5.0%
Redshank	5	Nov	0.2%
Ringed plover	16	Mar	1.9%
Overwintering assemblage	544	Oct-Mar	0.7%
The percentages of European site populations presented in this table do not indicate a scale of effect. The percentages represent the theoretical worst-case proportion of a European site that could be affected if there was a significant effect. Even if a significant proportion of a population of a European site was present, it is still possible that the scale of effect could be sufficiently low that the overall effect would be insignificant.			

7.1.24 The percentages presented in this table represent the worst-case scenario, i.e. the first two years of the construction phase 2024 – 2026 when the maximum area of habitat would be disturbed. After 2026, all the work associated with compounds CA3A and CA3B is expected to be completed and the surrounding suitable habitat no longer disturbed, and therefore available for use by the HRA species. The construction phase is due to be completed in 2029 and in the following years (up to three has been assumed) the construction site would be decommissioned, therefore the surrounding suitable habitat would no longer be disturbed and available for use by the HRA species from 2032.

7.1.25 Where the percentages are greater than 1% in Table 7.7 this has been taken (in line with common convention) as an indication that these individuals are potentially important contributors to the Thames Estuary and Marshes SPA/Ramsar. The peak counts for black-tailed godwit and ringed plover were within the intertidal habitat close to the existing operational jetties for Goshems Farm. The lapwing peak count was recorded within agricultural land north of Tilbury Fort.

7.1.26 Although the noise and visual thresholds are exceeded outside the Order Limits during construction, the magnitude of the disturbance response by the individuals using the area during construction is difficult to predict with certainty. The sensitivity of different waterfowl species to visual and auditory disturbance as well

as habituation to disturbance is documented in Cutts *et al* (2013). Of the species with contributions over 1% in Table 7.7, ringed plover and lapwing are considered extremely tolerant of disturbance, and able to habituate quickly. Black tailed-godwit were also considered resilient to disturbance, but this was caveated by Cutts *et al* as understudied with limited observations within their data collection.

7.1.27 Also, birds are commonly understood to habituate to disturbance (especially noise stimuli), as shown by forming tolerance to bird scarers used to protect crops or disperse birds from airports. This is also likely in the environs of the Project, due to the fact that birds are still using the area of the Project despite many years of disturbance from existing developments and land uses.

7.1.28 To mitigate the uncertainty of the disturbance effect the Project includes REAC commitments relating to work during periods of severe weather (HR003), temporary habitat management at the three arable fields south of the Metropolitan Police Firing Range (HR007) and habitat enhancement in the land adjacent to Coalhouse Fort (Design Principle S9.13). These measures ensure that the effects of disturbance on individuals is reduced by avoiding stressors during extreme winter weather when the birds area likely to be more vulnerable and by maintaining the functionality of the functionally linked land as shown in Table 7.8.

Operation

7.1.29 The area affected by the operational noise is shown in Figure 21. The majority (approximately 90%) of the area is within the Order Limits and would have been part of construction compound CA5 and not been available to the birds during the construction period.

7.1.30 Therefore, any birds using this area post construction would have chosen to use it following the construction phase and therefore whilst any disturbing stimuli from operation of the road were present. The birds would therefore perceive the vehicle noise and vibration as the 'normal environment' for that area and any other areas within their range that are similarly subject to disturbing stimuli but that are used because the birds are accustomed to the stimuli.

7.1.31 To mitigate the uncertainty of the effect of operational disturbance on the HRA species, the Project has committed to habitat enhancement in the land adjacent to Coalhouse Fort (Design Principle S9.13). These measures ensure that the effects of disturbance on individuals is reduced by maintaining the functionality of the functionally linked land as shown in Table 7.8.

Table 7.8: Predicted change in baseline functionality of the functionally linked land as a result of the Project disturbance alone

Land affected by the Project	Functionality - Existing	Functionality - Construction	Functionality - Operation
Land disturbed	1294	0	308
Land adjacent to Coalhouse Fort	88	5676	5676
Land south of the Met Police Firing Range	88	272	88
TOTALS	**1470**	**5948**	**6072**

7.1.32 The changes shown in Table 7.8 indicate that with the provision of the habitat enhancement areas the functionality is increased during construction and operation when compared to the baseline and therefore provides additional comfort that provision of the alternative habitats would provide an appropriate level of functionality for the HRA species. Also given the proximity of the enhanced habitat areas to the Project no change in energetic requirements to access the alternative areas is anticipated and would never be likely to be sufficiently high to result in any change in Thames Estuary and Marshes SPA/Ramsar population sizes of the species affected.

Effect In combination

7.1.33 Table 7.10 shows the other plans and projects within 1km (as described in paragraph 4.1.27) that have construction works within functionally linked land, in particular the intertidal habitat. Figure 27 shows the location of these projects. A number of the projects are already in progress as shown in the table and they all overlap temporally with, or immediately precede the Project.

7.1.34 Table 7.9 provides a simple comparison of the peak counts of the SPA/Ramsar qualifying species using the intertidal habitat published within the application documentation of the projects already in progress, with those collected as part of the Project. The data indicate that the projects that have already completed works in the intertidal area, or that are ongoing, do not appear to have altered the use of the intertidal habitat. This is reflected in the peak counts recorded in more recent surveys which are within the range of the peak counts recorded in surveys before these intertidal projects works occurred. Whilst some species show an overall trend of slight declines in populations over the period, such declines are consistent with regional and national declines and the large variance between years of the peak count indicates that it is not a single local effect that is causing differences in annual peaks in numbers. If local disturbance were to be responsible for changes in annual populations, it would be expected to see a steady decline over the period rather than a highly fluctuating population. The table also shows the range of peak counts recorded, which in turn shows that use of this particular stretch of intertidal habitat must be combined with use of with other areas. A more consistent range of peak counts would indicate obligatory use.

7.1.35 The Project alone provides enhanced habitat areas both north and south of the River Thames the efficacy of which has been demonstrated to maintain the baseline functionality of the functionally linked land associated with the Thames Estuary and Marshes Ramsar and SPA. Therefore this in conjunction with the evidence presented in Table 7.9, an in-combination disturbance effect within functionally linked land is unlikely to be any more significant than the Project alone.

Table 7.9 Comparison of the overwinter peak counts of the SPA/Ramsar qualifying species recorded other projects within the intertidal area broadly between Tilbury Fort and Coalhouse Fort

			East Tilbury jetty at Goshem's Farm and the Ingrebourne Valley Limited jetty use/ works approximate start and ongoing. Arrow indicates when project has begun work within the intertidal zone.			Tilbury 2 approximate date of works completed. Arrow indicates when project has begun work within the intertidal zone.		
Project name	**Goshem's Farm (RPS survey data)**	**Mr Paul Larkin (Essex birder)**	**Tilbury 2 DCO application**		**Thurrock Flexible Generation Plant (Tilbury Energy centre data)**	**Lower Thames Crossing Project**		**Thurrock Flexible Generation Plant DCO application**
Survey years	**2007-2008**	**2014-2017**	**2016-2017**		**2017-2018**	**2017-2019**		**2019-2020**
Avocet	450	119	11		200	830		44
Black-tailed godwit	1,479	178	4		721	408		333
Dunlin	3,201	928	36		2,000	1,575		255
Grey plover	75	16	8		60	56		4
Lapwing	86	199	154		4	130		12
Redshank	148	80	12		100	122		26
Ringed plover	135		44		60	75		48

Note – empty cells indicate no count provided in source data – presumed not present

Table 7.10 Projects with overlapping construction programmes to Lower Thames Crossing

	2024				2025				2026				2027				2028				2029			
Project	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Lower Thames Crossing		Construction 2024-2029																						
Thurrock Flexible Generation Plant	Coincides if three phase construction programme taken forward																							
Thames Estuary 2100 Plan	2012 Start – exact projects in area not defined																							
Goshems Farm/ Ingrebourne Valley Limited 19/0051CV	Applications in area have been in operation since 2017. Currently predicted to continue jetty use with works completed by 2032.																							

(***** indicates timing of key construction activities within the intertidal zone)

Assessment of effect on integrity

7.1.36 The Project alone and in combination was considered at screening stage to potentially affect the achievement of the following conservation objectives for the Thames Estuary and Marshes SPA/Ramsar.

e. The extent and distribution of the habitats of the qualifying features
f. The population of each of the qualifying features
g. The distribution of the qualifying features within the site

7.1.37 The Natural England supplementary advice (Natural England, 2018) to the conservation objectives for the Thames Estuary and Marshes SPA/Ramsar includes supporting attributes and targets, as set out in Table 5.3, that could be affected by the Project.

7.1.38 The attributes have been reviewed against the effects of the Project (as set out in section 7.1) and based on the targets presented in the supplementary advice have been refined to those considered when determining the effect of the Project on the integrity of each of the European sites. Table 7.11 provides a summary of that review.

Table 7.11 Summary of the review of attributes against the Project effects

Attribute	Consideration in assessment of adverse effects
Assemblage of species: abundance	The targets for these attributes relate to the population numbers and diversity of species for the European site. The mitigation measures are such that the effects of the Project would not indirectly affect the numbers or diversity of species as a result of loss of function of suitable habitat, including changes in the energetic requirements for species to use alternative suitable habitats. Therefore, the Project would not interfere with the achievement of the conservation objective '*The population of each of the qualifying features*'.
Assemblage of species: diversity	
Non-breeding population: abundance	
Connectivity with supporting habitats	The target to maintain safe passage between feeding and roosting areas has been maintained through provision of mitigation habitats in adjacent areas accessible to the qualifying features.
Disturbance caused by human activity	The provision of mitigation measures reduces the potential for disturbance of qualifying features and the maintains the functionality of retained habitats which together avoid any significant disturbance effect whilst the birds are roosting, foraging, feeding, moulting and/or loafing within functionally linked land.
Supporting habitat: conservation measures	The effects of the Project would not compromise the targets or undermine any necessary conservation measures set out in the Site Improvement Plan (Natural England, 2014).
Supporting habitat: extent and distribution of supporting habitat for the non-breeding season	The mitigation measures provided by the Project to maintain the functionality of habitats within the functionally linked land mean that the Project would not interfere with the achievement of the conservation objective '*The extent and distribution of the habitats of the qualifying features*'.

Attribute	Consideration in assessment of adverse effects
Supporting habitat: food availability	All of these attributes relating to supporting habitat have targets that could only be affected by the Project if the overarching extent and distribution target is affected. The mitigation measures provided by the Project to maintain the functionality of habitats within the functionally linked land mean that the Project would not interfere with the achievement of the conservation objective '*The extent and distribution of the habitats of the qualifying features*'.
Supporting habitat: landform	
Supporting habitat: landscape	
Supporting habitat: quality of supporting non-breeding habitat	
Supporting habitat: vegetation characteristics	
Supporting habitat: vegetation characteristics for feeding	
Supporting habitat: vegetation characteristics for nesting	
Supporting habitat: vegetation characteristics for roosting	

The extent and distribution of the habitats of the qualifying features

7.1.39 The Natural England supplementary advice for the Thames Estuary and Marshes SPA provides the following targets associated with this conservation objective.

a. Thames Estuary and Marshes SPA. Supporting habitat: extent and distribution of supporting habitat for the non-breeding season.
Maintain the extent, distribution and availability of suitable habitat (either within or outside the site boundary) which supports the feature for all necessary stages of the non-breeding/wintering period (moulting, roosting, loafing, feeding) at the following:

i.	Intertidal sand and muddy sand	1.16 ha
ii.	Intertidal mixed sediment	0.61 ha
iii.	Coastal reedbeds	30.83 ha
iv.	Coastal lagoons	136.64 ha
v.	Freshwater and coastal grazing marsh	1,126.11 ha
vi.	Saltmarsh	108.14 ha

7.1.40 The Project would not result in any direct habitat loss from within the Thames Estuary and Marshes SPA/Ramsar. The habitat loss is entirely within functionally linked land and comprises agricultural land (grassland and arable). These habitats are not listed with target in the supplementary advice although the survey data for this Project show there use by the overwintering assemblage, primarily lapwing. Table 7.12 shows that baseline functionality of the functionally linked land is not adversely affected by the Project alone and in combination with other plans and projects. Therefore, the functionally linked land would continue to support the overwintering assemblage for all necessary stages of the non-breeding/wintering period (moulting, roosting, loafing, feeding) therefore the Project would not interfere with this conservation objective.

Table 7.12: Predicted change in baseline functionality of the functionally linked land as a result of the Project alone and in combination with other plans and projects

	Functionality (species abundance)		
	Existing	**Construction**	**Operation**
Project Alone			
FLL within Order limits (Project land take)	1289	0	1113[14]
FLL disturbed by Project	1294	0	308
Mitigation area adjacent to Coalhouse Fort	88	5,676	5,676
Mitigation area 3 arable fields	88	272	0
Other Plans and Projects			
FLL within the red line boundaries of other plans and projects (potential land take)	209	0	0[15]
20/00971/FUL – Essex Wildlife Trust Fobbing Marshes Restoration	1414	14,417	14,417
Total	**4383**	**20,365**	**21,602**

[14] Calculated: Total of abundance of construction land take minus total abundance in permanent land take. i.e the area returned to landowners after construction will record functionality as per existing
[15] No information available for the other plans and projects therefore assume as a worst case no habitat restored or enhanced

The population of the qualifying features

7.1.41 The Natural England supplementary advice includes attributes relating to the abundance and diversity of the assemblage and the abundance of the d non-breeding population. The population targets for the Thames Estuary and Marshes SPA assemblage and qualifying features are presented in Table 5.12 and Table 7.13 to provide a comparison between the estimated current population the European site and the targets set out within the supplementary advice.

7.1.42 Table 7.13 shows that most of the qualifying features are currently estimated to be meeting or exceeding the targets set for the Thames Estuary and Marsh SPA. This suggests therefore that conditions within and around the site are optimal to support the overwintering populations of these species.

Table 7.13 Comparison of the estimated current populations with the targets for the Thames Estuary and Marshes SPA

Qualifying feature **All overwintering/ passage unless otherwise specified**	Estimated current population	Target population	Target as defined in the supplementary advice
Avocet	982	283	Maintain the size of the non-breeding population at a level which is above 283, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
Black-tailed godwit	10,262	1,699	Maintain the size of the non-breeding population at a level which is above 1,699, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
Dunlin	33,500	29,646	Restore the size of the non-breeding population to a level which is above 29,646, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
Grey plover	2,074	2,593	Restore the size of the non-breeding population to a level which is above 2,593, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
Knot	4,266	4,848	Restore the size of the non-breeding population to a level which is above 4,848, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
Lapwing	1,825	-	Not available

Redshank	2,688	3,251	Restore the size of the non-breeding population to a level which is above 3,251, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
Ringed plover	834	1,324	Restore the size of the non-breeding population to a level which is above 1,324, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
Waterbird assemblage	75,769	75,019	Maintain the overall abundance of the assemblage at a level which is above 75,019 birds, whilst avoiding deterioration from its current level as indicated by the latest peak mean count or equivalent.

7.1.43 The effects of the Project could theoretically change the numbers or diversity of species indirectly through loss of functionality of suitable habitat and increased energy requirements to use alternative habitat. However, the provision of mitigation to reduce disturbance and maintain functionality of the functionally linked land means that any change in the energetic requirements to use alternative habitat is considered to be inconsequential. It is therefore predicted that there would be no appreciable change in the populations of the qualifying features that the individuals affected contribute to, from the effects of the Project. Consequently, the Project would not interfere with this conservation objective.

The distribution of the qualifying features within the site

7.1.44 The objective of maintaining distribution of the qualifying features within the site is taken to relate to the effects of disturbance on qualifying features' ability to make use of suitable habitats available to them as the extent and distribution of the habitats of the qualifying features has a separate objective. The Natural England supplementary advice provides the following target relating to disturbance for the Thames Estuary and Marshes SPA:

a. Reduce the frequency, duration and/or intensity of disturbance affecting roosting, nesting, foraging, feeding, moulting and/or loafing birds so that they are not significantly disturbed during the non-breeding (winter and/or passage) season and where relevant breeding season.

b. Significant disturbance is further defined in the supporting notes as follows: Disturbance should be judged as significant if an action (alone or in combination with other effects) impacts on (water) birds in such a way as to be likely to cause impacts on populations of a species through either:

   i. Changed local distribution on a continuing basis

   ii. Changed local abundance on a sustained basis

   iii. The reduction of ability of any significant group of birds to survive, breed, or rear their young.

7.1.45 The mitigation measures to avoid and reduce the changes in noise and visual stimuli mean that the works are highly unlikely to result in disturbance response from the birds that would change local distribution. This is supported by the review of the historical data presented in Table 7.9 in relation to how the peak counts of each qualifying species within the intertidal areas do not appear to have changed despite the construction and operation of the jetties at Tilbury 2 as well and the East Tilbury jetty at Goshem's Farm and the smaller Ingrebourne Valley Limited jetty.

7.1.46 The mitigation measures also include constraints on work within the intertidal zone to avoid the overwintering season and periods of prolonged severe cold weather. Both of these measures specifically avoid disturbance to the birds at times that could reduce the ability of any significant group of birds to survive and are secured through inclusion in the REAC (Application Document 6.3).

7.1.47 The provision of enhanced habitat, north and south of the River Thames throughout the construction phase and north of the river permanently, ensures that alternative habitat is available and maintains the functionality of the functionally linked land. Therefore, even if individuals are displaced through a disturbance response, the availability of enhanced habitat in adjacent areas means that the energetic requirements would not be out of the daily norm and therefore the ability of any significant group of birds to survive, breed or rear young would not be reduced. The Project therefore cannot be considered to undermine achieving the conservation objective relating to the distribution of qualifying species of the Thames Estuary and Marshes SPA.

7.1.48 The conservation objectives of the Thames Estuary and Marshes SPA would not be undermined by the construction and operation of the Project alone or in combination with other plans and projects. Consequently, it is concluded that the Project alone or in combination with other plans and projects would not have an adverse effect on the integrity of the Thames Estuary and Marshes SPA and Ramsar.

7.2 Epping Forest and North Downs Woodlands SAC

Changes in air quality as a result of vehicle emissions in operation

Effect alone

PLACEHOLDER – To be completed once the AQ modelling and assessment has been finalised.

In-combination assessment

PLACEHOLDER – To be completed once the AQ modelling and assessment has been finalised.

8 Proposals for monitoring and reporting

8.1.1 The Project has committed to the following proposals for monitoring and reporting during the construction period.

8.1.2 **HR008:** Surveillance of groundwater levels will be carried out within the Thames Estuary and Marshes Ramsar in the vicinity of the tunnelling works for the duration of the construction period at borehole locations to be agreed with SoS in consultation with Natural England and Environment Agency.
The contractor would complete an annual review, for the period of construction and first five years of operation, of the groundwater levels and consult on any implications for qualifying features of the Ramsar site, and any necessary remedial measures with Natural England and the Environment Agency.

8.1.3 **HR009**: Between 01 July and 30 April inclusive during each year of the LTC construction period, undertake monthly bird survey surveillance visits from fixed vantage points to observe functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar (as identified in Figure 2) that lies within 300m of Order limits of the Project. The surveys will record numbers of waterfowl present and any behaviours in response to disturbance stimuli (including no response) to a specification developed in consultation with Natural England.
If the bird surveillance visits show a change in bird behaviour the contractor will investigate if this is attributable to construction activities, and if confirmed, review mitigation measures in consultation with Natural England."

PLACEHOLDER – To be completed once the AQ modelling and assessment is finalised.

9 Consultation

9.1 Pre-application consultation

9.1.1 Extensive statutory and non-statutory pre-application consultation has been carried out for the Project through options selection, design development and production of deliverables for the DCO application. A summary of key Project consultation milestones is provided in Table 9.1. The Consultation Report (Application Document 5.1) provides a full description of the consultation activities undertaken and the Project response to feedback received. The Natural England Statement of Common Ground (SoCG) will provide a summary of key issues identified by the stakeholder and what has and has not been agreed.

Table 9.1 Key Project pre-application consultation milestones

Date	Project consultation description
21 May to 16 July 2013	Non-statutory public consultation considering the need for a new Lower Thames Crossing and inviting views on three locations and one variant.
July 2014	Response from Department for Transport – Government commissioned Highways England to carry out more detailed assessment of Options A and C (with or without C variant).
September 2014 to December 2015	Programme of engagement to determine constraints/priorities, which would affect the identification and development of feasible options for a new Lower Thames Crossing.
26 January to 24 March 2016	Non-statutory public consultation to present shortlisted routes that performed satisfactorily against the Project objectives and were considered viable.
12 April 2017	Preferred Route (PR) announced. Further design development and refinement resulting in further changes to proposals presented in PR.
10 October to 20 December 2018	Statutory Consultation to invite comment on updated set of proposals for PR. A PEIR and non-technical summary were published to support consultation.
29 January to 2 April 2020	Supplementary Consultation on proposed changes to Project design since consultation in 2018. Included Environmental Impacts Update which presented expected effects on environment and outlined mitigation measures.
14 July to 12 August 2020	Design Refinement Consultation on proposed changes to the Project design following earlier consultation feedback, discussions with local stakeholders, ongoing design development and new technical data.
14 July to 8 September 2021	Community Impacts Consultation on the impacts of the Project and how they would be reduced, as well as the changes to the Project since the Design Refinement Consultation.

9.1.2 Consultation with Natural England has been carried out throughout the Project milestones presented in Table 9.1 through Project optioneering, environmental scoping and the HRA development. The feedback received through engagement with Natural England has informed the scope and content of the

HRA. A complete record of correspondence with Natural England in relation to the HRA development is provided in Appendix C. This consists of:

a. Appendix C.1 – the HRA Evidence Plan developed in consultation with Natural England since November 2019

b. Appendix C.2 - a table tracker of comments from Natural England with regard to the HRA and Project responses

c. Appendix C.3 and Appendix C.4 - a record of meetings (with minutes where relevant) and correspondence which relate to the HRA.

9.2 Options selection stage consultation

9.2.1 Natural England was consulted on early design options, development and assessment of shortlisted routes for the Project between 2013 and 2016. A number of workshops were held with Statutory Environmental Bodies (SEBs) including Natural England to discuss route options in 2015 and 2016. This included early proposals for the approach to HRA. Natural England bilateral meetings were conducted to provide frequent Project updates, initial findings of environmental appraisals and to gain feedback on the HRA approach. Additionally, ecological survey methodologies including ornithology were consulted on to gain baseline data for the HRA. The record of relevant correspondence with Natural England during options selection is provided in Appendix C.4.

Environmental scoping

9.2.2 A draft EIA Scoping Report for comment was issued to Natural England in November 2017 following the announcement of a Preferred Route. A PEIR, detailing the intention to prepare a report to inform the HRA, was issued to Natural England during Statutory Consultation conducted between October and December 2018. Consultation with Natural England continued on key ecological survey methodologies, including ornithology surveys. SEB workshops and specific Natural England meetings were continued through 2018 and 2019 with the ongoing discussion on HRA and designated sites included as a key focus area on the heat map (colour coded tracker of discussion items). The record of relevant correspondence with Natural England during environmental scoping is provided in Appendix C.4.

HRA development

9.2.3 Regular HRA-specific meetings with Natural England began in November 2019 and are ongoing to focus on key aspects of the HRA assessment as it was developed. An early draft of the HRA Stage 1 Screening Report was issued to Natural England for comment in December 2019 with comments received back in February 2020.

9.2.4 Between February and August 2020, twelve HRA document packages were issued to Natural England for comment, providing detailed briefing notes on proposed HRA methodology assessments as well as further background / baseline information. The progression of assessments and early results were discussed during the calls with Natural England as they became available. A

Pre-Application (DCO 1.0) Draft of the Stage 1 Screening Report was issued to Natural England in June 2020 for comment as well as to The Planning Inspectorate.

9.2.5 In addition, reiterations of the Evidence Base (developed into the Evidence Plan provided in Appendix C.1); the Natural England comment response tracker (Appendix C.2); and the draft SoCG HRA tracker have been issued to Natural England for information and comment.

9.2.6 Natural England has also been consulted on a number of EIA topics and underpinning assessments closely linked to the HRA, including terrestrial and marine biodiversity; air quality; noise and vibration; road drainage and the water environment; cumulative impacts; and traffic modelling. This included attendance at meetings and workshops as well as being provided documents for comment such as design options papers. The record of relevant correspondence with Natural England for these wider topics related to HRA is provided in Appendix C.4.

9.3 Provision of draft reports

9.3.1 The Evidence Plan has been the primary vehicle for consultation with NE and recording feedback and agreement with the assessment conclusions. NE confirmed that it is satisfied with the list of European sites identified.

9.3.2 The Pre-Application (DCO 2.0) Draft HRA report was provided to Natural England for comment on 06 August 2021. The purpose of the pre-application draft HRA report was to enable the Applicant to have due regard to any representations made by Natural England within the DCO application.

9.3.3 To facilitate this, and to focus on the key conclusions of the assessment, Table 9.2 provides a summary of the conclusions within the HRA and Natural England's comment on their agreement with each conclusion. The list of conclusions is also used within the draft Statement of Common Ground which is being developed between the Applicant and Natural England.

Table 9.2 Agreement of Natural England with screening conclusions

Site	Effect pathway	Likely significant effect conclusion	Agreement of Natural England with conclusion (Natural England has provided confirmation of this text as part of the ongoing SoCG process)
All European sites	All effect pathways	Scoping of relevant European sites and effect pathways excludes necessity to assess any pathways other than those below.	NE confirms agreement.
All European sites identified within 200m of the ARNs	Reduction in habitat area	Change in air quality – vehicle emissions – construction and operation	PLACEHOLDER – Under discussion, AQ modelling and assessment ongoing
Thames Estuary and Marshes SPA and Ramsar	Reduction in habitat area (within the Ramsar)	No LSE as a result of: • Changes in groundwater quality and quantity – tunnel construction and operation	NE confirms agreement
		Potential LSE as a result of: • Changes in surface water quality and quantity – construction	NE agrees that LSE cannot be excluded.
	Reduction in habitat area (within functionally linked land)	No LSE as a result of: • Change in air quality – dust emissions – construction • Changes in surface water quality and quantity –construction and operation • Introduction/spread of Invasive Non-Native Species	NE confirms agreement.
		Potential LSE as a result of:	NE agrees that LSE cannot be excluded.

Site	Effect pathway	Likely significant effect conclusion	Agreement of Natural England with conclusion (Natural England has provided confirmation of this text as part of the ongoing SoCG process)
		• Land take in the terrestrial and aquatic environment - construction	
	Disturbance to species (within functionally linked land and the Ramsar)	No LSE as a result of: • Change in recreational pressure – construction and operation • Changes in noise and vibration - underwater and above ground - tunnel construction only.	NE confirms agreement
		No LSE as a result of: • Changes in light levels – construction and operation	Under discussion.
		Potential LSE as a result of: • Changes in noise and vibration – construction works and vehicles • Changes in visual disturbance - construction (people/machines in eyeline) • Changes in noise and vibration – operation • Changes in visual disturbance – operation (vehicles in eyeline)	NE agrees that LSE cannot be excluded.
	Reduction in species density (within functionally linked land)	No LSE as a result of: • Vehicle collision with species - operation • Species collision with overhead utilities infrastructure – operation	NE confirms agreement.

Site	Effect pathway	Likely significant effect conclusion	Agreement of Natural England with conclusion (Natural England has provided confirmation of this text as part of the ongoing SoCG process)
	Climate change	No LSE	NE confirms agreement.

Table 9.3 Agreement of Natural England with effect on integrity conclusions

PLACEHOLDER – All conclusions relating to AQ are under discussion and awaiting final AQ modelling and assessment

Site	Effect pathway	Effect on integrity conclusion	Agreement of Natural England with conclusion (Natural England has provided confirmation of this text as part of the ongoing SoCG process)
Thames Estuary and Marshes SPA/Ramsar	Reduction in habitat area (within the Ramsar)	No adverse effect on integrity as a result of: • Changes in surface water quality and quantity – construction (Compound CA03 discharge)	NE confirms agreement
	Reduction in habitat area (within functionally linked land)	No adverse effect on integrity as a result of: • Land take in the terrestrial and aquatic environment (within functionally linked land)	Under discussion.
	Disturbance to species (within the Ramsar and functionally linked land)	No adverse effect on integrity as a result of: • Changes in noise and vibration – construction works and vehicles • Changes in visual disturbance - construction (people/machines in eyeline) • Changes in noise and vibration – operation • Changes in visual disturbance – operation (vehicles in eyeline)	Under discussion.

10 Conclusions

10.1.1 This HRA has been completed primarily using the standard described within DMRB LA 115 Habitats Regulations Assessment (Highways England, et al., 2020a), which sets out the requirements for assessment and reporting of the implications from construction, operation and maintenance of highways and/or road projects on European sites. These assessments are compatible with and incorporate relevant guidance from Natural England and the Planning Inspectorate's Advice Notes.

10.2 Stage 1 Screening

10.2.1 The European sites identified were:

a. Thames Estuary and Marshes SPA and Ramsar

b. Medway Estuary and Marshes SPA and Ramsar

c. The Swale SPA and Ramsar

d. Epping Forest SAC

e. North Downs Woodland SAC

10.2.2 The potential effects of the Project were assessed alone and in combination with other plans and projects, and this identified three categories that reflect whether or not LSEs would occur at the European sites identified (or uncertainty remains):

a. Project effects where no pathway to effect was found

b. Project effects (inconsequential) where no LSE would occur

c. Project effects where uncertainty remains as to whether LSE could occur

10.2.3

10.2.4 Table 10.1 to Table 10.8 summarise the results of the assessment.

10.3 Stage 2 Appropriate Assessment

PLACEHOLDER – To be updated once the AQ modelling and assessment has been updated.

10.3.1 The HRA Stage Appropriate Assessment considers the effects of the Project, limited to those identified where uncertainty over LSE remained, on the integrity of the Thames Estuary and Marshes SPA and Ramsar.

10.3.2 The construction and operation of the Project alone or in combination with other plans and projects would not prevent the achievement of the conservation objectives for the Thames Estuary and Marshes SPA and Ramsar and consequently no adverse effect on the integrity of these sites are predicted to occur.

Table 10.1 Summary of the conclusion of the assessment of LSE on Thames Estuary and Marshes SPA

PLACEHOLDER – To be updated once the AQ modelling and assessment has been updated

Potential LSE	No LSE		LSE uncertain
	Project effects with no pathway to effect	**Inconsequential Project effects resulting in no LSE**	**Project effects where uncertainty remains**
Reduction in habitat area	Changes in groundwater quality and quantity – tunnel construction and operation	Change in air quality – dust emissions – construction (associated functionally linked land)	Land take in the terrestrial and aquatic environment (associated functionally linked land)
		Changes in surface water quality and quantity – construction (associated functionally linked land)	
		Changes in surface water quality and quantity – operation (associated functionally linked land)	
		Introduction/spread of non-native species (associated functionally linked land)	
Reduction in species density	None	Vehicle collision with species during operation (associated functionally linked land)	None
		Utilities infrastructure collision (associated functionally linked land)	
Disturbance to species	None	Changes in noise and vibration – underwater and above ground - tunnel construction only. (associated functionally linked land)	Changes in noise and vibration – construction works and vehicles (associated functionally linked land)
		Changes in light levels – construction (associated functionally linked land)	Changes in noise and vibration – operation
		Changes in light levels – operation (associated functionally linked land)	Changes in visual disturbance – construction (people/machines in eyeline) (associated functionally linked land)

Potential LSE	No LSE		LSE uncertain
	Project effects with no pathway to effect	**Inconsequential Project effects resulting in no LSE**	**Project effects where uncertainty remains**
		Change in recreational pressure – construction and operation	Changes in visual disturbance – operation (vehicles in eyeline)
Changes to key indicators	None	None	None
Climate change	None	None	None

Table 10.2 Summary of the conclusion of the assessment of LSE on Thames Estuary and Marshes Ramsar

PLACEHOLDER – To be updated once the AQ modelling and assessment has been updated

Potential LSE	No LSE		LSE uncertain
	Project effects with no pathway to effect	**Inconsequential project effects resulting in no LSE**	**Project effects where uncertainty remains**
Reduction in habitat area		Change in air quality – dust emissions – construction (within the site itself and associated functionally linked land)	Land take in the terrestrial and aquatic environment (within the site itself and associated functionally linked land)
			Changes in surface water quality and quantity – construction (within the site itself (Compound CA03 discharge))
		Changes in surface water quality and quantity – construction (within associated functionally linked land)	
		Changes in surface water quality and quantity – operation (associated functionally linked land)	
		Changes in groundwater quality and quantity – tunnel construction and operation	
		Introduction/spread of non-native species (associated functionally linked land)	

Potential LSE	No LSE		LSE uncertain
	Project effects with no pathway to effect	**Inconsequential project effects resulting in no LSE**	**Project effects where uncertainty remains**
Reduction in species density	None	Vehicle collision with species during operation (associated functionally linked land)	None
		Utilities infrastructure collision (associated functionally linked land)	
Disturbance to species	None	Changes in noise and vibration – tunnel construction only. Underwater and above ground (within the site itself and associated functionally linked land)	Changes in noise and vibration – construction works and vehicles (within the site itself and associated functionally linked land)
		Changes in light levels – construction (within the site itself and associated functionally linked land)	Changes in noise and vibration – operation (within associated functionally linked land)
		Changes in light levels – operation (within associated functionally linked land)	Changes in visual disturbance – construction (people/machines in eyeline) (within the site itself and associated functionally linked land)
		Change in recreational pressure – construction and operation	Changes in visual disturbance – operation (vehicles in eyeline) (within associated functionally linked land)
Changes to key indicators	None	None	None
Climate change	None	None	None

Table 10.3 Summary of the conclusion of the assessment of LSE on Medway Estuary and Marshes SPA

Potential LSE	No LSE		LSE uncertain
	Project effects with no pathway to effect	Inconsequential project effects resulting in no LSE	Project effects where uncertainty remains
Reduction in habitat area	PLACEHOLDER – To be updated once the AQ modelling and assessment has been updated		
Disturbance to species	None	None	None
Reduction in species density	None	None	None
Changes to key indicators	None	None	None
Climate change	None	None	None

Table 10.4 Summary of the conclusion of the assessment of LSE on Medway Estuary and Marshes Ramsar

Potential LSE	No LSE		LSE uncertain
	Project effects with no pathway to effect	Inconsequential project effects resulting in no LSE	Project effects where uncertainty remains
Reduction in habitat area	PLACEHOLDER – To be updated once the AQ modelling and assessment has been updated		
Disturbance to species	None	None	None
Reduction in species density	None	None	None
Changes to key indicators	None	None	None
Climate change	None	None	None

Table 10.5 Summary of the conclusion of the assessment of LSE on The Swale SPA

Potential LSE	No LSE		LSE uncertain
	Project effects with no pathway to effect	Inconsequential project effects resulting in no LSE	Project effects where uncertainty remains
Reduction in habitat area	PLACEHOLDER – To be updated once the AQ modelling and assessment has been updated		
Disturbance to species	None	None	None
Reduction in species density	None	None	None
Changes to key indicators	None	None	None
Climate change	None	None	None

Table 10.6 Summary of the conclusion of the assessment of LSE on The Swale Ramsar

Potential LSE	No LSE		LSE uncertain
	Project effects with no pathway to effect	Inconsequential project effects resulting in no LSE	Project effects where uncertainty remains
Reduction in habitat area	PLACEHOLDER – To be updated once the AQ modelling and assessment has been updated		
Disturbance to species	None	None	None
Reduction in species density	None	None	None
Changes to key indicators	None	None	None
Climate change	None	None	None

Table 10.7 Summary of the conclusion of the assessment of LSE on Epping Forest SAC

Potential LSE	Project effects resulting in no LSE	Project effects where uncertainty remains
Reduction in habitat area	PLACEHOLDER – To be updated once the AQ modelling and assessment has been updated	
Disturbance to species	None	None
Reduction in species density	None	None
Changes to key indicators	None	None
Climate change	None	None

Table 10.8 Summary of the conclusion of the assessment of LSE on North Downs Woodland SAC

Potential LSE	Project effects resulting in no LSE	Project effects where uncertainty remains
Reduction in habitat area	PLACEHOLDER – To be updated once the AQ modelling and assessment has been updated	
Disturbance to species	None	None
Reduction in species density	None	None
Changes to key indicators	None	None
Climate change	None	None

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Glossary

Term	Explanation
2027 Opening year	A modelled year in the Project's traffic model in which flows are estimated for each option.
2042 Design year	A modelled year in the Project's traffic model. The design year is 15 years after opening. Traffic flows are estimated for each option.
AADT	Annual Average Daily Traffic. An estimate of the average daily traffic along a defined segment of road. This value is calculated from short-term counts taken along the same section, which are then factored to produce the estimate of AADT.
ADS	Advance Directional Sign
AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
Affected Road Network (ARN)	This comprises the area within which roads could be considered within the air quality model (selection of the roads within the model depends upon a number of criteria such as changes in Heavy Duty Vehicle flows).
Alignment	The horizontal (lateral) or vertical (height) position of a road. It can be defined by a series of horizontal tangents and curves or vertical crest and sag curves, and the gradients connecting them.
AMI	Advanced Motorway Indicator. Variable signage, used for managed motorway schemes by delivering 'live' information to regulate motorway speeds and reduce congestion.
AOD	Above ordnance datum, vertical datum used by an ordnance survey as the basis for delivering altitudes on maps
APIS	Air pollution information system
APTR	All-purpose trunk road. A road available for all types of traffic to use, unless restricted by a Traffic Restriction Order. In contrast, a motorway is restricted to use only by certain types of traffic.
AURN	Defra's Automatic Rural and Urban Network: the UK's largest automatic monitoring network and the main network used for compliance reporting against the Ambient Air Quality Directives.
BAP	Biodiversity Action Plan: National, local and sector-specific plans established under the UK Biodiversity Action Plan, with the intention of securing the conservation and sustainable use of biodiversity.
BTO	British Trust for Ornithology: an organisation founded in 1932 for the study of birds in the British Isles.
CCS	Considerate Constructors Scheme
CCTV	Closed-circuit television. Highways England CCTV cameras are used to monitor traffic flows on the English motorway and trunk road network primarily for the purposes of traffic management.
CEA	Cumulative Effects Assessment. Incremental effects that result from the accumulation of a number of individual effects, either caused by different types of effect from the same project (intra-project effects), or by the interactions between the likely effects of other reasonably foreseeable developments with the likely effects of the proposed project (inter-project effects).
CEH	Centre for Ecology and hydrology
CFSA	Compensatory Flood Storage Area
CHP	Combined Heat and Power

Term	Explanation
CIRIA	Construction Industry Research and Information Association: CIRIA is a neutral, independent, not-for-profit organisation that facilitates a range of collaborative activities to help improve the construction industry.
CLOCS	Construction Logistics Community Safety
CLP	Construction Logistics Plan
CoCP	Code of Construction Practice: Contains control measures and standards to be implemented by the Project, including those to avoid or reduce environmental effects.
cSAC	Candidate Special Area of Conservation
CSEMP	Clean safe seas environmental monitoring programme
DCO	Development Consent Order: Means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects (NSIP) under the Planning Act 2008.
Defra	Department for Environment, Food and Rural Affairs: the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland.
DfT	Department for Transport: the government department responsible for the English transport network and a limited number of transport matters in Scotland, Wales and Northern Ireland that have not been devolved.
DM	Do Minimum: A scenario in which the Lower Thames Crossing is not constructed.
DMRB	Design Manual for Roads and Bridges: A comprehensive manual (comprising 15 volumes) which contains requirements, advice and other published documents relating to works on motorway and all-purpose trunk roads for which one of the Overseeing Organisations (Highways England, Transport Scotland, The Welsh Government or the Department for Regional Development (Northern Ireland)) is highway authority. The DMRB has been developed as a series of documents published by the Overseeing Organisations of England, Scotland, Wales and Northern Ireland. For the Lower Thames Crossing the Overseeing Organisation is Highways England.
DS	Do Something: A scenario in which the Lower Thames Crossing is constructed.
EA	Environment Agency: The Environment Agency was established under the Environment Act 1995, and is a Non-Departmental Public Body of Defra. The Environment Agency is the leading public body for protecting and improving the environment in England and Wales. The organisation is responsible for wide-ranging matters, including the management of all forms of flood risk, water resources, water quality, waste regulation, pollution control, inland fisheries, recreation, conservation and navigation of inland waterways.
EB	Eastbound: Direction of travel.
EIA	Environmental Impact Assessment: A process by which information about environmental effects of a proposed development is collected, assessed and used to inform decision making. For certain projects, EIA is a statutory requirement, reported an Environmental Statement.
EoS	Extent of sensitivity
ES	Environmental Statement: A document produced to support an application for development consent that is subject to Environmental Impact Assessment (EIA), which sets out the likely impacts on the environment arising from the proposed development.
ESRI	Environmental Systems Research Institute

Term	Explanation
EU	European Union: A politico-economic union of 27 member states that are located primarily in Europe.
FLL	Functionally Linked Land
FP	Footpath
FRA	Flood Risk Assessment: An assessment of the risk of flooding from all flooding mechanisms, the identification of flood mitigation measures, and identification of actions to be taken before and during a flood.
FSA	Flood Storage Area: a natural or man-made area basin that temporarily fills with water during periods of high river levels.
GIS	Geographic information system: an integrated collection of computer software and data used to view and manage information about geographic places, analyse spatial relationships, and model spatial processes.
GWDTE	Groundwater Dependent Terrestrial Ecosystem: A wetland that critically depends on groundwater flows and chemistries to support sensitive ecosystems.
Ha	Hectares
HDV	Heavy Duty Vehicle: Freight vehicles of more than 3.5 tonnes (e.g. lorries) or passenger transport vehicles of more than eight seats (e.g. buses).
HFS	High Friction Surface
HGV	Heavy Goods Vehicle
HRA	Habitats Regulations Assessment: A tool developed by the European Commission to help competent authorities (as defined in the Habitats Regulations) to carry out assessment to ensure that a project, plan or policy will not have an adverse effect on the integrity of any Natura 2000 or European sites (Special Areas of Conservation, Special Protection Areas and Ramsar sites), (either in isolation or in combination with other plans and projects), and to begin to identify appropriate mitigation strategies where such effects were identified.
Inter-peak	An average hour within the Lower Thames transport model (LTAM) to represent an hour within the period 09:00–15:00.
IRZ	Impact Risk Zone
IVL	Ingrebourne Valley Limited
LA 105 – Air quality	This document sets out the requirements for assessing and reporting the effects of highway projects on air quality.
LA 115 – Habitat Regulations Assessment	This document sets out the requirements for assessment and reporting of the implications, from construction, operation and maintenance, of highways and/or roads projects on European sites.
LCL	Lower Critical Load (air quality)
LED	Light-emitting diode: A semiconductor device that emits visible light when an electric current passes through it.
LGV	Light Goods Vehicle: Vehicles meeting the Department for Transport VEH04 criteria.
LSE	Likely Significant Effect
LTAM	Lower Thames Area Model: Transport model designed to forecast impacts of providing additional road-based capacity across the River Thames at locations at or east of the existing Dartford Crossing.
LTC	Lower Thames Crossing: a proposed new crossing of the Thames estuary linking the county of Kent with the county of Essex, at or east of the existing Dartford Crossing.

Term	Explanation
M25	Orbital motorway that encircles most of Greater London.
MAGIC	Multi-Agency Geographic Information for the Countryside
MLW	Mean Low Water
MMO	Marine Management Organisation: An executive non-departmental public body in the UK established under the Marine and Coastal Access Act 2009. The MMO exists to make a significant contribution to sustainable development in the marine area, and to promote the UK government's vision for clean, healthy, safe, productive and biologically diverse oceans and seas.
N	Nitrogen: a chemical element
NCR	National Cycle Route: a cycle route part of the National Cycle Network created by Sustrans to encourage cycling throughout Britain
NECR	Natural England Commissioned Report
NG	National Grid
NGET	National Grid Electricity Transmission
NO2/ NO_2	Nitrogen dioxide: A reactive gas introduced into the environment by natural causes, including entry from the stratosphere, bacterial respiration, volcanos, and lightning. It is also introduced by the emissions of internal combustion engines burning fossil fuels.
NOx	Nitrogen oxide: A group of seven gases and compounds composed of nitrogen and oxygen, sometimes collectively known as NOx gases.
NPPF	National Planning Policy Framework: published in March 2012 by the UK's Department of Communities and Local Government, consolidating over two dozen previously issued documents called Planning Policy Statements (PPS) and Planning Policy Guidance Notes (PPG) for use in England.
NPS	National Policy Statement (see NPSNN)
NPSNN	National Policy Statement for National Networks: The NPSNN sets out the need for, and Government's policies to deliver, development of nationally significant infrastructure projects on the national road and rail networks in England. It provides planning guidance for promoters of nationally significant infrastructure projects on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State.
NSIP	Nationally significant infrastructure project: major infrastructure developments in England and Wales, such as proposals for power plants, large renewable energy projects, new airports and airport extensions, major road projects etc.
PEIR	Preliminary Environmental Information Report: An early output of the EIA process, and part of the DCO application process.
PM peak period	The hours between 15:00-18:00 within the Project traffic model (LTAM).
PR	Preferred Route
pRamsar	Proposed Ramsar site
PRoW	Public Right of Way: A right possessed by the public, to pass along routes over land at all times. Although the land may be owned by a private individual, the public may still gain access across that land along a specific route. The mode of transport allowed differs according to the type of public right of way which consist of footpaths, bridleways and open and restricted byways.
pSAC	Possible Special Area of Conservation

Term	Explanation
pSPA	Potential Special Protection Area: Sites which are approved by Government that are in the process of being classified as Special Protection Areas.
QF	Qualifying Features
Ramsar	Wetlands of international importance, designated under the Ramsar Convention. Named after the city in Iran where the convention was signed.
REAC	Register of Environmental Actions and Commitments
rMCZ	Recommended Marine Conservation Zone: A site put forward for designation under the Marine and Coastal Access Act 2009 to conserve the diversity of nationally rare, threatened and representative habitats and species.
RSPB	Royal Society for the Protection of Birds: A charitable organisation that works to promote conservation and protection of birds and the wider environment through public awareness campaigns, petitions and through the operation of nature reserves throughout the United Kingdom.
SAC	Special Area of Conservation: defined in the European Union's Habitats Directive (92/43/EEC), also known as the *Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora*. SACs are to protect the 220 habitats and approximately 1000 species listed in annex I and II of the directive which are considered to be of European interest following criteria given in the directive.
SCI	Site of community importance, supporting natural habitats and species of community interest that are listed in the Annexes of the Habitats Directive. A site becomes an SCI when it has been submitted and adopted by the European Commission as an SAC but not yet designated by the government of the member state.
SEB(s)	Statutory Environmental Body(ies): Any principal council as defined in subsection (1) of section 270 of the Local Government Act 1982 for the area where the land is situated. Where the land is situated in England; Natural England, Historic England, the Environment Agency, Natural Resources Wales and the National Assembly for Wales where, in the opinion of the Secretary of State, the land is sufficiently near to Wales to be of interest to them and any other public authority which has environmental responsibilities and which the Secretary of State considers likely to have an interest in the scheme.
SIP	Site Improvement Plan
SMP	Shoreline Management Plan
SoCG	Statement of Common Ground
SPA	Special Protection Area: A designation under the European Union Directive on the Conservation of Wild Birds.
SRN	Strategic road network, the core road network, managed in England by Highways England
SSSI	Site of Special Scientific Interest: A conservation designation denoting an area of particular ecological or geological importance.
SuDS	A sustainable drainage system designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharges.
TBM	Tunnel boring machine, machine used to excavate tunnels with a circular cross section.
TDSCG	Tunnel Design and Safety Consultation Group: formed to ensure effective design, construction and operation within the context of safety.
TSB	Tunnel Services Building
UKPN	United Kingdom Power Network
V/C	Volume over Capacity (volume/capacity)

Term	Explanation
VMS	Variable Message Sign: A road sign able to display different messages, typically mounted on a portal gantry.
VMSL	Variable Mandatory Speed Limits: One of the key features of smart motorways. Speed limits are displayed on the motorway and come into operation when traffic volumes increase and the sensors activate lower speeds. Reducing speed during peak demand decreases stop-start conditions and allows traffic to move smoothly.
VP	Vantage Point (ornithological survey term)
VPD	Vehicles per day
WCH	Walkers, cyclists and horse riders
WebTAG	Department for Transport's web-based multi-modal guidance on appraising transport projects and proposals.
WeBS	Wetland Bird Survey
WFD	Water Framework Directive: A European Community Directive (2000/60/EC) of the European Parliament and council designed to integrate the way water bodies are managed across Europe.
Without Scheme / With Scheme	Without Scheme: The scenario where government takes the minimum amount of action necessary and is used as a benchmark in the appraisal of options. With Scheme: An option that provides enhanced services by comparison to the benchmark Without Scheme scenario.
WKN	Wheelabrator Kemsley North
ZoI	Zone of Influence
ZSL	Zoological Society of London

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PLACEHOLDER – Figures highlighted are not included in this draft – awaiting completion of the AQ modelling and assessment.

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B – Medway Estuary and Marshes Ramsar and SPA

C – North Downs Woodland SAC

D – Thames Estuary and Marshes Ramsar

E – The Swale Ramsar and SPA

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Figure 27: Location of other plans or projects considered within the in-combination assessment (land take & disturbance)

Appendix B European site Natura 2000 Forms

PLACEHOLDER – Unchanged from DCO 1 pre application consultation so not included here

Appendix C Evidence Plan

C.1 Evidence Plan

PLACEHOLDER – Contents list provided for information

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C.1.2 Working arrangements

C.1.3 Scope of evidence required

C.1.4 Approach to uncertainties and likely significant effects

C.1.5 Methodology and standards for data analysis, outputs and consultations

C.1.6 Timetable for implementing and reviewing the plan

C.1.7 Evidence to be collected

C.2 Natural England Comment Response Tracker

PLACEHOLDER – TO BE PROVIDED ONCE REPORT FINALISED

C.3 Record of meetings/workshops

PLACEHOLDER - Complete meeting minutes will be included at application within this appendix (Appendix C.3) where pertinent to HRA development discussions.

C.3.1 A summary of relevant meetings held with Natural England is provided in Table C.1.

Table C.1 Record of meetings held with Natural England

Date	Meeting description	Summary/topics of discussion	Minutes provided
22/01/2015	SEB workshop (1)	Update on development of options for the Project; share draft approach to the options appraisal process and seek feedback on the approach; to understand roles and responsibilities of the environmental bodies and to agree the future programme of engagement.	Available on request
13/03/2015	SEB Workshop (2)	Update on emerging long list of options and those that have been discounted; an overview of the types of river crossings being considered; an overview of the environmental data-gathering and appraisal work completed to date.	Available on request
17/06/2015	SEB Workshop (3)	Obtaining feedback on the draft shortlist of routes and rejected design options; seeking feedback on the detailed assessment of the shortlist; outlining the proposed methodology and survey work to be undertaken; providing an update on the crossing types to enable this information to be reviewed by SEBs.	Available on request
09/07/2015	Natural England Bilateral meeting	Discussion on context for ecological surveys, bird survey methodology including vantage points and transects area.	Available on request
28/07/2015	Natural England Bilateral meeting	Feedback on the proposed approach to the HRA; discuss uncertainty and design parameters; update on modifications to the bird survey methodology; discuss timetable for sharing HRA information with Natural England.	Available on request
01/10/2015	Natural England Bilateral meeting	A Project update: discussion on initial findings of detailed appraisal and to discuss feedback on the draft HRA Appropriate Assessment part 1 report.	N/A

Date	Meeting description	Summary/topics of discussion	Minutes provided
05/10/2015	Natural England Bilateral meeting	Project update on shortlist of route options; discussion on HRA; key impacts; assessment approach; and ecological risks.	Available on request
30/11/2015	SEB Workshop (4)	A Project update including the final shortlist of route options. Gaining feedback on initial environmental appraisal.	Available on request
08/02/2016	SEB Workshop (5)	Discussion on Project public consultation materials.	Available on request
21/07/2016	SEB Workshop (6)	Update on the Project post-consultation and discussion of the Project's next steps. Opportunity to discuss SEB consultation responses and clarify any issues.	Available on request
19/01/2017	Natural England Bilateral meeting	Update on the Project; EIA programme; survey methodology including survey areas for passage and wintering birds to be considered in the HRA. Update on other surveys for EIA including ornithology; marine; air quality and noise.	Available on request
21/03/2017	SEB Meeting	Update on the Project; introduction on approach to EIA; outline the environmental scoping report prior to submission to the Planning Inspectorate and to outline engagement requirements going forward.	Available on request
24/04/2017	Environment Meeting	Review of the Project's proposed approach to bird survey and reduction of extent of surveys in view of the Preferred Route announcement (12 April 2017).	Available on request
18/05/2017	SEB Meeting	Update on Preferred route for Project outlining issues and obtaining feedback to begin more detailed technical discussions. Introduction of Environmental Consents team and introduction of Project Strategic Vision and Goals (SVG).	Available on request
01/07/2017	Natural England Bilateral meeting	Seeking feedback on the proposed approach to the HRA for the shortlist.	N/A
15/09/2017	Surface Water Drainage and Biodiversity Meeting	Update on PR and design; received feedback on options for the surface water disposal; discussion on pump	Available on request

Date	Meeting description	Summary/topics of discussion	Minutes provided
		tests and consents; and discussion on surface water drainage along the A2.	
22/03/2018	SEB Meeting	Provided updates to the SEBs on the Project; the EIA Scoping Opinion; the PEIR; the mitigation approach; and legacy and benefits.	Available on request
09/04/2018	Natural England Post-SEB Meeting	Update on survey work (bird survey work for HRA); discussion on district level protected species licensing; the PEIR; and the HRA scoping document.	Available on request
05/06/2018	Bilateral Meeting	Discussion on feedback from Defra family meeting, a Project update, environmental constraints and the Project's initial approach to mitigation.	Available on request
25/09/2018	SEB Workshop	Overview of the information which was to be presented at Statutory Consultation including: highways alignment design; PEIR; key public-facing and technical materials.	Available on request
25/04/2019	SEB Workshop	To update key stakeholders on the latest thinking on the Project's design development and to seek initial feedback and further suggestions for improving the design.	Available on request
17/09/2019	Natural England Strategic Meeting	Project update and run through of heat maps. No subsequent discussion.	N/A
09/10/2019	Natural England Meeting – Marine Biodiversity	Marine Conservation Zone (MCZ) meeting to discuss Project interactions with the Thames Estuary; baseline data and the MCZ assessment.	Available on request
09/10/2019	Natural England Strategic Meeting	Discussion on ways of working and heat map including the following topics: HRA; designated sites; mitigation/enhancements.	Available on request
06/11/2019	Natural England Meeting - HRA Update	Programme for HRA and Evidence Base introduced by Project team.	Minutes included in Appendix C.3
06/11/2019	Hydrogeology meeting	Discussion on overall hydrogeology modelling approach; the Ramsar model; and the North Portal model.	Available on request
06/11/2019	Utilities Workshop (north and south)	Run through of potential utility diversion and the environmental impacts.	Available on request

Date	Meeting description	Summary/topics of discussion	Minutes provided
07/11/2019	Design Development Workshop (South)	Technical Design Workshop with local authorities (south of Thames) and Statutory Environmental Bodies to update on Supplementary Consultation delivery, pre-enabling works, design refinement and development boundary.	Available on request
11/11/2019	Natural England Area manager meeting	Introductions between the Project and Natural England leadership and discussion on collaborative approach to information sharing to facilitate timely pragmatic regulation.	Available on request
13/11/2019	Design Development Workshop (north)	Technical Design Workshop with local authorities (north of Thames) and SEBs to update on Supplementary Consultation delivery, pre-enabling works, design refinement and development boundary.	Available on request
03/12/2019	Utilities Diversion Workshops (north and south)	With local authorities and SEBs to update on utilities diversions design and the potential impact on environmental designations and development boundary.	Available on request
04/12/2019	Utilities update meeting	Update on utility requirements and environmental impacts.	Available on request
04/12/2019	Natural England Meeting - HRA Update	Run through Evidence Base with Natural England comments. No subsequent discussion.	N/A
11/12/2019	Construction Impacts Workshop (north)	Construction Impacts Workshop with local authorities (north of the River Thames) and SEBs to provide an overview of proposed construction proposals, including compounds, accommodation strategy, HGV access routes and logistics, excavated materials plans, CoCP and REAC and Project's timetable for procurement.	Available on request
11/12/2019	Construction Impacts Workshop (south)	Construction Impacts Workshop with local authorities (south of the river) and SEBs to provide an overview of proposed construction proposals, including compounds, accommodation strategy, HGV access routes and logistics, excavated materials plans, Code of Construction Practice (CoCP) and	Available on request

Date	Meeting description	Summary/topics of discussion	Minutes provided
		REAC and Project's timetable for procurement.	
19/12/2019	Natural England Meeting - HRA Update	Discussions on: • ARN/traffic modelling and in-combination data used • Air quality impacts and sites already exceeding critical loads along with relevant case law and potential compensation • Groundwater dependent Ramsar habitat • Supporting evidence for assessing qualifying species lists / functionally linked habitat • Agreement of zones of influence used in draft screening (10-20km).	Minutes included in Appendix C.3
16/01/2020	Natural England Meeting - HRA Update	Discussions on: • Traffic modelling and in-combination data used • Air quality methodologies	Minutes included in Appendix C.3
28/01/2020	SEBs Supplementary Consultation Pre-Briefing	Introduction to Supplementary Consultation (29 January to 25 March 2020) which builds on 2018 consultation. Discussion on design changes; development boundary; environmental impacts; and utilities.	Available on request
06/02/2020	Construction Impacts Workshop (North)	Second Construction Impacts Workshop with local authorities (north of River Thames) and SEBs to provide and update of likely construction impacts (as a follow up to the workshop on 11 December 2019) and updates on construction traffic modelling and potential utility diversions.	Available on request
06/02/2020	Construction Impacts Workshop (South)	Second Construction Impacts Workshop with local authorities (south of River Thames) and SEBs to provide and update of likely construction impacts (as a follow up to the workshop on 11 December 2019) and updates on construction traffic modelling and potential utility diversions.	Available on request

Date	Meeting description	Summary/topics of discussion	Minutes provided
07/02/2020	Natural England Area Manager meeting	Update on HRA development with briefing on traffic and air quality and presentation of Evidence Base. No subsequent discussion.	Presentation provided in in Appendix C.3
19/02/2020	Natural England Meeting - HRA Update	Plan for HRA information sharing with Natural England including programme and contents of document packages.	Minutes provided in Appendix C.3
12/03/2020	Hydrogeology meeting	Roadmap of hydrogeological assessments; approach and findings of the assessment of Project cuttings and embankments; operational drainage pollution simple risk assessment; infiltration basin detailed assessment; phase 1 pumping tests (south of River Thames).	Available on request
18/03/2020	Natural England Area Manager meeting	Provided project update and discussed ways of working in relation to Covid-19.	Available on request
18/03/2020	Natural England Meeting - HRA Update	Discussions on: • Air quality assessment and use of ARN • In-combination assessment	Minutes provided in Appendix C.3
31/03/2020	Traffic modelling Meeting	Overview of traffic model methodology and inclusion of future projects and developments.	Available on request
01/04/2020	Natural England Area Manager meeting	Discussion on details of the Natural England heat map. With regards to HRA topics covered included South Portal, tunnel (hydrogeological effects), North Portal (hydrogeology) and air quality assessment.	Available on request
09/04/2020	Natural England Meeting – Terrestrial Biodiversity (joint meeting with EA)	Ecological interpretation of hydrogeology study with the Thames Estuary and Marshes Ramsar. Discussion on South Portal discharge.	Available on request
09/04/2020	Natural England Meeting – Terrestrial Biodiversity	Emerging ecological mitigation	Available on request
21/04/2020	EIA - Preliminary environmental impacts and mitigation (north)	Preliminary workshop for discussing EIA impacts and mitigation for local authorities north of the River Thames and SEBS. In particular, the following key purposes: update to Project's approach to assessing potential effects (significance of and mitigation); introduction of the control	Available on request

Date	Meeting description	Summary/topics of discussion	Minutes provided
		plan; provision of an update on the progress of the EMP and technical chapters of the ES; and to provide a forum for open discussion and ideas around mitigation.	
22/04/2020	EIA - Preliminary environmental impacts and mitigation (south)	Preliminary workshop for discussing EIA impacts and mitigation for local authorities south of the river and SEBS. In particular, the following key purposes: update to Project's approach to assessing potential effects (significance of and mitigation); introduction of the control plan; provision of an update on the progress of the EMP and technical chapters of the ES; and to provide a forum for open discussion and ideas around mitigation.	Available on request
29/04/2020	Natural England Meeting - HRA Update	Discussion on: • Air Quality assessment methodology – Epping Forest Botanical Survey • HRA programme and expected Natural England review times • Identification of key issues: air quality, disturbance to birds, changes to groundwater/surface water, climate change.	Minutes provided in Appendix C.3
06/05/2020	Natural England Area Manager Meeting	Discussion regarding consultation including ways of working and sharing of documentation.	Available on request
13/05/2020	Natural England Meeting - HRA Update	Discussion on key issues: • Traffic model methodology • Air quality assessment (construction and operation) • Botanical survey of Epping Forest • Extent of functionally linked land • Disturbance to birds • Water quality (operational and construction) • In-combination assessment	Minutes provided in Appendix C.3

Date	Meeting description	Summary/topics of discussion	Minutes provided
		• Climate change assessment.	
27/05/2020	Natural England Meeting - HRA Update	Discussion on: • Traffic model methodology • Air quality assessment (construction and operation) • Botanical survey of Epping Forest • Extent of functionally linked land • Disturbance to birds • Water quality (operational and construction) • In-combination assessment • Climate change assessment.	Minutes provided in Appendix C.3
29/05/2020	DCO Workshop	Discussion on: • Order Limits update • Further consultation (D-CON) • Lower Thames Crossing 'Digital First' Consultation and Electronic Submission • DCO process - Key Stages • DCO application documentation • Control Plan • Draft Development Consent Order and Schedules • Requirement, Secondary Consents and Permit schemes • Book of Plans • SoCGs – Purpose, Content, Principles and Preparation	Available on request
08/06/2020	South Portal Outfall Meeting	To discuss feedback on South Portal outfall options paper and introduce North Portal jetty options (East Tilbury jetty at Goshem's Farm).	Available on request
09/06/2020	WFD Stage 4 Assessment Update	Update on findings of the updated Stage 4 WFD Assessment including	Available on request

Date	Meeting description	Summary/topics of discussion	Minutes provided
		discussion on Environment Agency comments; underwater noise and vibration during construction and operation; air quality modelling; and M25 cutting.	
09/06/2020	Hydrogeology Update Meeting	Overview of the approach to groundwater modelling including groundwater levels and infiltration basins.	Available on request
10/06/2020	Natural England Meeting - HRA Update	Discussion on: • Screening: general and air quality • In-combination assessment • Appropriate Assessment: extent of functionally linked land; disturbance to birds; land take; and mitigation and monitoring • Securing mechanisms • Programme/documentation of HRA	Minutes provided in Appendix C.3
24/06/2020	Natural England Meeting – HRA Update	Discussion on: • Screening consultation • Appropriate Assessment consultation • Key issues: air quality; extent of functionally linked land; disturbance to birds; land take; water quality; in-combination; and climate change • Securing mechanisms • Programme / documentation of HRA	Minutes provided in Appendix C.3
24/06/2020	Natural England Area Manager Meeting	Discussion on: heat map; DEFRA map (north of the Thames river); draft ES chapters; air quality methodology; South Portal discharge; and legacy and benefits.	Available on request
02/07/2020	Natural England and Environment Agency Meeting North Portal Discharge and Jetty Design / Construction Assumptions	Discussion on the North Portal discharge assumptions paper and East Tilbury jetty at Goshem's Farm design and construction paper issued to Natural England and Environment Agency.	Available on request

Date	Meeting description	Summary/topics of discussion	Minutes provided
08/07/2020	Natural England Meeting – HRA Update	Discussion on: • Consultation on HRA Screening; briefing documents; and SIAA • Securing mechanisms including the process and any Natural England concerns • Programme and consultation process	Minutes provided in Appendix C.3
14/07/2020	Hydrogeology Update Meeting	Update on the North Portal model and the M25 / Lower Thames junction Groundwater Impact Assessment Numerical Model.	Available on request
22/07/2020	Natural England Meeting – HRA Update	Discussion on: • Consultation on HRA Screening; briefing documents; SIAA; and ES chapters • Securing mechanisms including Natural England comments on REAC, CoCP and dDCO requirements.	Minutes provided in Appendix C.3
03/08/2020	Natural England Area Manager Meeting	Discussion on HRA key issues including air quality, level of detail and securing mechanisms as well as current consultation.	Available on request
05/08/2020	Natural England Meeting – HRA Update	Discussion on ongoing consultation process and programme.	Minutes provided in Appendix C.3
26/08/2020	Natural England Meeting – SoCG Workshop 1	Discussion on consultation process for HRA SoCG development and use of the SoCG tracker.	Minutes provided in Appendix C.3
02/09/2020	Natural England Meeting – SoCG Workshop 2	Ongoing discussion on HRA items on SoCG and Key Issues.	Minutes provided in Appendix C.3
09/09/2020	Natural England Meeting – SoCG Workshop 3	Discussion on air quality (operation) and Affected Road Network.	Minutes provided in Appendix C.3
16/09/2020	Natural England Meeting – SoCG Workshop 4	Discussion on: • Securing mechanisms • Water quality • Light levels construction	Minutes provided in Appendix C.3

Date	Meeting description	Summary/topics of discussion	Minutes provided
		• Air quality construction dust emissions air quality construction vehicles • Air quality vessel emissions	
16/09/2020	Natural England Area Manager Meeting	• Discussion on DCO, HRA, water vole mitigation and Kent Downs AONB compensation	Available on request.
23/09/2020	Natural England Meeting – SoCG Workshop 5	Discussion on: • Land take • Operational assessment	Minutes provided in Appendix C.3
25/09/2020	Natural England Meeting – SoCG Workshop 5a	• Discussion with Natural England air quality specialists.	Minutes provided in Appendix C.3
30/09/2020	Natural England Meeting – SoCG Workshop 6	Discussion on: • Actions from previous SoCG workshops and air quality specialist meeting • Future meetings and agendas	Minutes provided in Appendix C.3
07/10/2020	Natural England Meeting – SoCG Workshop 7	Discussion on: • Recreational disturbance • Air quality meeting agendas • Land take and disturbance meeting agendas.	Minutes provided in Appendix C.3
21/10/2020	Natural England Area Management Meeting	• Discussion on project progress, disapplication of Section 28e (Wildlife and Countryside Act), DCO, SoCG and HRA.	Available on request.
28/10/2020	Natural England Meeting – SoCG Workshop 8	Discussion on: • Land take and disturbance: feedback on early sight SIAA; Approach to assessing AEoI; baseline used; species-specific assessments vs broad approach; permanence of effects; re-provisioning of habitat; operational baseline; energetic requirements; and relative disturbance with seasonal constraints.	Minutes provided in Appendix C.3
04/11/2020	Natural England Meeting – SoCG Workshop 9	Discussion on: • Air quality: feedback on early sight SIAA; traffic model; air quality assessment; verification approach;	Minutes provided in Appendix C.3

Date	Meeting description	Summary/topics of discussion	Minutes provided
		ammonia; vessel contribution; construction ARN; dust; use of LA105 vs NE001; presence of veteran trees; alignment with conservation objectives.	
11/11/2020	Natural England Meeting – SoCG Workshop 10	Discussion on: • Land take and disturbance: feedback on early sight SIAA; assessment of AEoI; sterilisation of land; baseline used; species-specific assessments vs broad approach; permanence of effects; re-provisioning of habitat; operational baseline; energetic requirements; and relative disturbance with seasonal constraints.	Minutes provided in Appendix C.3
25/11/2020	Natural England Meeting – SoCG Workshop 11	Discussion on: • SoCG Tracker and ongoing consultation and programme	Minutes provided in Appendix C.3
02/12/2020	Natural England Meeting – SoCG Workshop 12	Discussion on: • SoCG Tracker and ongoing consultation and programme	Minutes provided in Appendix C.3
09/12/2020	Natural England Meeting – SoCG Workshop 13	Discussion on: • SoCG Tracker and ongoing consultation and programme • Approach to screening and SIAA.	Minutes provided in Appendix C.3
16/12/2020	Natural England Meeting – SoCG Workshop 14	Discussion on: • SoCG Tracker and ongoing consultation and programme • Draft mitigation.	Minutes provided in Appendix C.3
20/01/2021	Natural England Meeting – SoCG Workshop 15	Discussion on: • SoCG Tracker and ongoing consultation and programme • Draft mitigation	Minutes provided in Appendix C.3
03/02/2021	Natural England Meeting – SoCG Workshop 16	Discussion on: • SoCG Tracker and ongoing consultation and programme • Draft mitigation	Minutes provided in Appendix C.3
11/02/2021	Natural England Meeting – SoCG Workshop 17	Discussion on: • SoCG Tracker and ongoing consultation and programme	Minutes provided in Appendix C.3

Date	Meeting description	Summary/topics of discussion	Minutes provided
		• Groundwater and surface water monitoring	
17/02/2021	Natural England Meeting – SoCG Workshop 18	Discussion on: • SoCG Tracker and ongoing consultation and programme • Groundwater and surface water monitoring.	Minutes provided in Appendix C.3
17/02/2021	Natural England Area Manager Meeting	• Discussion on key milestones, resourcing, HRA air quality and high priority issues.	Available on request.
03/03/2021	Natural England Meeting – SoCG Workshop 19 (with Environment Agency)	Discussion on: • Securing mechanisms and Hydrogeological risk assessment	Minutes provided in Appendix C.3
17/03/2021	Natural England Area Manager Meeting	• Discussion on invertebrate study, SoCG dashboard and high priority issues and programme milestones.	Available on request.
31/03/2021	Natural England Meeting – SoCG Workshop 20	Discussion on: • Programme • Air quality dust • Disturbance lighting (operation/ construction) • Disturbance noise and visual (operation) • Habitat enhancement • Groundwater • Approach to Shorne Woods as dormouse receptor site • Tilbury Fields – landscape and invertebrate proposals	Minutes provided in Appendix C.3
21/04/2021	Natural England Meeting – SoCG Workshop 21	Discussion on: • Programme • Air quality dust • Disturbance lighting (operation/ construction) • Disturbance noise and visual (operation) • Habitat enhancement Groundwater	Minutes provided in Appendix C.3
22/04/2021	Natural England Area Manager Meeting	Discussion on invertebrate study, SoCG dashboard and high	Available on request.

Date	Meeting description	Summary/topics of discussion	Minutes provided
		priority issues and programme milestones.	
05/05/2021	Natural England Meeting – SoCG Workshop 22	Discussion on: • Disapplication of Section 28E (Wildlife and Countryside Act) • Programme • Air quality dust • Disturbance lighting (operation/ construction) • Disturbance noise and visual (operation) • Habitat enhancement Groundwater	Minutes provided in Appendix C.3
19/05/2021	Natural England Meeting - SoCG Workshop 23	Discussion on: • Invertebrate Mitigation • Shorne Woods car park • Programme • Air quality dust • Disturbance lighting (operation/ construction) • Disturbance noise and visual (operation) • Construction water quality & groundwater	Minutes provided in Appendix C.3
02/06/2021	Natural England Meeting – SoCG Workshop 24	Discussion on: • Programme • Air quality dust • Disturbance lighting (operation/ construction) • Disturbance noise and visual (operation) • Construction water quality & groundwater	Minutes provided in Appendix C.3
16/06/2021	Natural England Meeting – SoCG Workshop 25	Discussion on: • Programme • Shorne Woods Country Park - Car Park • Shorne Woods Country Park - Management Plan / Dormouse Receptor Site • Operational air quality • Lighting construction and operation	Minutes provided in Appendix C.3

Date	Meeting description	Summary/topics of discussion	Minutes provided
		• Sufficiency of habitat enhancement • Sufficiency of construction noise mitigation Verbal agreement on: • Construction ground water – No LSE • Air quality dust – No LSE • Construction water quality REAC commitment • Operational disturbance – No AEoI	
30/06/2021	Natural England Meeting – SoCG Workshop 26	Discussion on: • Programme • Operational air quality • NE feedback received on 24 June	Minutes provided in Appendix C.3
14/07/2021	Natural England Meeting – SoCG Workshop 27	Discussion on: • Programme • Operational air quality • Likely agreement on sufficiency of habitat enhancement • Likely agreement on sufficiency of construction noise mitigation	Minutes provided in Appendix C.3
28/07/2021	Natural England Meeting – SoCG Workshop 28	Discussion on: • Programme • Operational air quality	Minutes provided in Appendix C.3

C.4 Correspondence copies

C.4.1 A summary of documents and correspondence with Natural England pertinent to the development of the HRA is provided in Table C.2.

Table C.2 Correspondence with Natural England pertinent to HRA development

Date	Summary
06/2013	From Natural England – Written feedback on potential options for a new Lower Thames Crossing
12/07/2013	From Natural England – Response to Options for Project Consultation Document
11/2014	Letter issued to request technical information to inform route options development work, response received.
2015	Note to inform on the HRA / Template
04/2015	From Natural England - Email feedback regarding the environmental appraisal approach requested by project team at Environment Workshop 2
07/2015	From Natural England - Email feedback on draft shortlist of options; survey and appraisal approach; design and opportunities requested at Workshop 3.
03/2016	From Natural England - Written response to the 2016 Public Consultation.
02/2017	Habitats Regulations Assessment Screening Matrix for the Preferred Option
02/2017 05/2017	Bird Survey Methodology – Preferred Route (Draft)
02/11/2017	EIA scoping report issued via Planning Inspectorate
04/ 2018	HRA Scoping document
09/2018	Habitats Regulations Assessment Screening Matrix for the Preferred Option (updated)
10/10/2018	Preliminary Environmental Information Report (PEIR)
19/10/2018	Proposed Marine Monitoring and Modelling Programme Comments received from Natural England 04/12/2018 (DAS advice letter: Development proposal and location: Lower Thames Crossing – Goshem's Jetty)
21/10/2019	North Portal Stage 1 Numerical Model Technical Note
21/10/2019	Ramsar Advanced Grouting Tunnel and Main Tunnels Numerical Model Technical Note
08/11/2019	Advanced Grout Tunnel Technical Note
28/11/2019	HRA Briefing note issued for comment: HRA Evidence Base
17/12/2019	SOCG Draft Template
17/12/2019	CoCP Skeleton
19/12/2019	Draft HRA Stage 1 Screening Report Comments received from Natural England 12/02/2020
13/01/2020	HRA Briefing note issued for comment:

Date	Summary
	HRA Evidence Base
29/01/2020	Letter to inform consultees of Supplementary Consultation
30/01/2020	NE Activity Map and Technical Note for SoCG
25/02/2020	Hydrogeology – Pumping test interpretation report – south of the River Thames
26/02/2020 (reissued 18/03/2020)	HRA Briefing note issued for comment: • Air quality assessment methodology Comments received from Natural England 02/04/2020
	HRA Briefing note issued for comment: • Disturbance assessment methodology Comments received from Natural England 02/04/2020
	Updated HRA Evidence Base
	Updated Draft SoCG including HRA Tracker Comments received from Natural England 28/04/2020
	Natural England Consultation Process Agenda Discussed at HRA Update Meeting 19/02/2020
11/03/2020 (reissued 18/03/2020)	HRA Briefing note issued for comment: • Groundwater assessment methodology Comments received from Natural England 02/04/2020
19/03/2020	Consultation extension letter
02/04/2020	From Natural England – Comments in relation to Supplementary Consultation
06/04/2020	SoCG Technical Note
08/04/2020	HRA Briefing note issued for comment: • Botanical survey of Epping Forest methodology Comments received from Natural England 30/04/2020. Additional references provided 12/05/2020.
24/04/2020	Stage 4 WFD Assessment
06/05/2020	HRA Briefing note issued for comment: • Defining functionally linked land Comments received from Natural England 18/05/2020.
07/05/2020	Infiltration Basins Detailed Assessment South of the River Thames
07/05/2020	M25/Project Junction Groundwater Impact Assessment Numerical Model - Technical Note
07/05/2020	Design Briefing note issued for comment: • South Portal Discharge Options Paper Comments received from Natural England 25/06/2020
13/05/2020	WFD Marine habitat compensation proposal
13/05/2020	Provision of weblink to traffic modelling updates from Supplementary Consultation

Date	Summary
18/05/2020	HRA Briefing notes issued for comment: • Ornithology Baseline (comments received from Natural England 30/06/2020) • Epping Forest Botanical Survey Update • Figures detailing European site locations in relation to ARN
22/05/2020	HRA Briefing notes issued for comment: • In-combination assessment methodology • Approach to climate change methodology • Figure showing land take in relation to European sites and functionally linked land. • Comments received from Natural England 30/06/2020
02/06/2020	• HRA Stage 1 Screening Report – Pre-Application Draft (comments received from Natural England 30/06/2020) • NE Response Tracker and Draft HRA SoCG • Construction traffic modelling and AQ effects briefing (comments received from Natural England 30/06/2020)
03/06/2020	Draft Code of Construction Practice Comments received from Natural England 21/06/2020
04/06/2020	Design Briefing notes issued for comment: • North Portal Discharge Construction paper (comments from Natural England received 25/06/2020) • Jetty Refurbishment Use and Decommissioning Paper (comments received from Natural England 26/06/2020) (Refers to East Tilbury jetty at Goshem's Farm)
05/06/2020	Ramsar Advanced Grouting Tunnel and Main Tunnels Numerical Model Technical Note
05/06/2020	Baseline Water Balance for the Ramsar site (Filborough Marshes) Technical Note
05/06/2020	WFD Stage 4 report
05/06/2020	Draft Environmental Masterplan - South
10/06/2020	Shortlist for Cumulative Effects Assessment
10/06/2020	HRA Briefing notes issued for comment • Mitigation and monitoring • Land take methodology • Comments received from Natural England 30/06/2020
11/06/2020	Draft Air Quality ES Chapter Comments received from Natural England 27/08/2020
11/06/2020	Draft Marine Biodiversity ES Chapter
12/06/2020	Draft Environmental Masterplan - North
15/06/2020	Traffic Modelling query from Natural England and the Project's response – traffic forecasting in AADT terms (Project's responses 18/06/2020-25/06/2020)

Date	Summary
24/06/2020	Draft Development Consent Order Comments received from Natural England 21/07/2020 (Project response to comments issued 24/08/2020)
26/06/2020	Local Model Validation Report and Air Quality ES chapter with technical appendices
07/07/2020	Draft Noise and Vibration ES Chapter Draft Climate ES Chapter
13/07/2020	Statement to Inform the Appropriate Assessment – Pre-Application Draft Comments received from Natural England 10/08/2020
13/07/2020	Draft Cumulative Effects ES Chapter
14/07/2020	Design Refinement Consultation
15/07/2020	Draft Terrestrial Ecology ES Chapter Comments received from Natural England 28/07/2020
15/07/2020	Draft Road Drainage and Water Environment ES Chapter
22/07/2020	Stage 1 Screening Figure 31 – Predicted change in nitrogen deposition at European sites
06/08/2020	HRA Document package issued for information: • SIAA Figure 10 – Bird baseline (Individual HRA species recorded in each season) • SIAA Figure 12 - Noise modelling contours • Stage 1 Screening Appendix F.1 - Evidence Plan • Stage 1 Screening Appendix F.2 - Natural England Comment Response Tracker
06/08/2020	Securing Mechanism Control Diagram (excerpt from presentation on the way in which landscape design and ecological mitigation measures are secured)
06/08/2020	NE comments provided on Draft Landscape and Visual ES Chapter
19/08/2020	Updated Code of Construction Practice Comments received from Natural England 01/09/2020
19/08/2020	Register of Environmental Actions and Commitments Comments received from Natural England 01/09/2020
24/08/2020	Draft Natural England SoCG
25/08/2020	HRA Document package: • Briefing paper on proposed consultation approach – HRA SoCG • HRA SoCG Tracker – Natural England
26/08/2020	Draft Design Principles and Cross Sections of Key Structures
26/08/2020	HRA Document package: • HRA SoCG Tracker Revision 1 – Natural England • HRA SoCG Workshop 1 Minutes
03/09/2020	HRA Document package:

Date	Summary
	• HRA SoCG Tracker Revision 2 – Natural England • HRA SoCG Workshop 2 Minutes
08/09/2020	HRA Document package: • LTC HRA SIAA Appendix B - Natural England Comment Response Tracker
10/09/2020	HRA Document package: • HRA SoCG Tracker Revision 3 – Natural England • HRA SoCG Workshop 3 Minutes (09/09/2020) • AQ Specialist Call Draft Agenda • Stage 1 Screening - Appendix H - LA105 NEA001 Comparison
18/09/2020	HRA Document package: • HRA SoCG Tracker Revision 4 – Natural England • HRA SoCG Workshop 4 Minutes (16/09/2020) • NE HRA AQ Consultation Meeting 25/09/2020 (HRA Workshop 5a) Presentation Slides (draft) • NE HRA Land Take Consultation Meeting 23/09/2020 Presentation Slides (draft)
24/09/2020	HRA Document package: • HRA SoCG Tracker Revision 5 – Natural England • HRA SoCG Workshop 5 Minutes (23/09/2020) and Presentation slides (final) • NE HRA AQ Consultation Meeting 25/09/2020 (HRA Workshop 5a) Presentation Slides (Final)
29/09/2020	HRA Document package: • Pre-DCO Submission - HRA Screening Report
01/10/2020	HRA Document package: • HRA SoCG Tracker Revision 6 – Natural England
06/10/2020	HRA Document package: • HRA SoCG Workshop 6 Minutes (30/09/2021) • AQ Specialist Meeting Minutes (HRA Workshop 5a)
13/10/2020	HRA Document package: • HRA SoCG Tracker Revision 7 – Natural England • HRA SoCG Workshop 7 Minutes (07/10/2021) • Pre-DCO Submission - HRA SIAA Report
20/10/2020	• EA Pre-Application Advice - North Portal - Meeting Minutes
29/10/2020	HRA Document package: • HRA SoCG Tracker Revision 8 – Natural England • NE HRA Land Take Disturbance Consultation Meeting 28/10/2020 Presentation Slides (HRA Workshop 8)
03/11/2020	HRA Document package:

Date	Summary
	• HRA SoCG Workshop 8 Minutes (28/10/2020) • NE HRA AQ Consultation Meeting 04/11/2020 (HRA Workshop 9) Presentation Slides • Briefing note on LTC Construction Barge Movements
10/11/2020	HRA Document package: • HRA SoCG Workshop 9 Minutes and Presentation Slides (04/11/2020) • HRA SoCG Tracker Revision 9 – Natural England
17/11/2020	HRA Document package: • HRA SoCG Workshop 10 Minutes and Presentation slides (11/11/2020) • HRA SoCG Tracker Revision 10 – Natural England • NE Area Manager Meeting Minutes (21/10/2020)
24/11/2020	• EA Pre-application Advice - North Portal / South Portal - Meeting Minutes (02/11/2020 and 03/11/2020)
01/12/2020	HRA Document package: • HRA SoCG Workshop 11 Minutes and Presentation slides (25/11/2020) • HRA SoCG Tracker Revision 11 – Natural England
08/12/2020	HRA Document package: • HRA SoCG Workshop 12 Minutes (02/12/2020) • NE HRA Consultation Meeting 09/12/2020 Presentation slides
15/12/2020	HRA Document package: • HRA SoCG Workshop 13 Minutes (09/12/2020) • NE HRA Consultation Meeting 16/12/2020 Presentation slides
19/01/2021	HRA Document package: • NE HRA Consultation Meeting 20/01/2021 (HRA Workshop 15) Presentation slides
28/01/2021	HRA Document package: • HRA Workshop 14 and 15 Minutes (16/12/2020 and 20/01/2021) • HRA SoCG Tracker Revision 12 – Natural England • Recreational Disturbance Technical Note
02/02/2021	HRA Document package: • NE HRA Consultation Meeting 03/02/2021 (HRA Workshop 16) Presentation slides
10/02/2021	HRA Document package: • HRA Workshop 16 Minutes (03/02/2021) • HRA SoCG Tracker Revision 13 – Natural England • NE HRA Consultation Meeting 11/02/2021 (HRA Workshop 17) Presentation slides
12/02/2021	HRA Document package: • Technical Note - Habitat Enhancement Areas
17/02/2021	HRA Document package:

Date	Summary
	• HRA Workshop 17 Minutes (11/02/2021) • HRA SoCG Tracker Revision 14 – Natural England • NE HRA Consultation Meeting 17/02/2021 (HRA Workshop 18) Presentation slides
20/02/2021	• Draft Outline Landscape Environmental Management Plan
23/02/2021	HRA Document package: • HRA Workshop 18 Minutes and Presentation Slides (17/02/2021) • Technical Note - Habitat Enhancement Areas (Revision 1)
09/03/2021	HRA Document package: • Draft Programme of milestones and call agendas • Technical Note - Dust measures • Technical Note - No LSE Lighting • Technical Note - Operational Noise & Visual Disturbance • HRA SoCG Tracker Revision 15 – Natural England • Environment Agency comments on Hydrogeological Risk Assessment
07/04/2021	HRA Document package: • HRA Workshop 19 Minutes (with Environment Agency 03/03/2021)
13/04/2021	HRA Document package: • HRA Workshop 20 Minutes (31/03/2021) • Revised Draft Programme of milestones & call agendas • Technical Note - Construction Noise and Mitigation • Technical Note - Ramsar Surface Water Ecology Baseline • HRA SoCG Tracker Revision 15 – Natural England
16/04/2021	HRA Document package: • Revised Draft Programme of milestones & call agendas
22/04/2021	HRA Document package: • Technical Note - Habitat Enhancement Areas (Revision 2) • Technical note - Iteration of FLL and SoCG update
27/04/2021	HRA Document package: • HRA Workshop 21 Minutes and Presentation slides (21/04/2021)
12/05/2021	HRA Document package: • HRA Workshop 22 Minutes and Presentation slides (05/05/2021) • Revised Draft Programme of milestones & call agendas • Revised Technical Note - Dust measures (Revision 1) • Revised Technical Note - No LSE Lighting (Revision 1) • Revised Technical Note - Ramsar Surface Water Ecology Baseline (Revision 1)
25/05/2021	HRA Document package: • HRA Workshop 23 Minutes and Presentation slides (19/05/2021)

Date	Summary
10/06/2021	HRA Document package: • HRA Workshop 24 Minutes and Presentation slides (02/06/2021)
15/06/2021	HRA Document package: • Updated Programme of milestones & call agendas
24/06/2021	HRA Document package: • HRA Workshop 25 Minutes and Presentation slides (16/06/2021)
08/07/2021	HRA Document package: • HRA Workshop 26 Minutes (30/06/2021)
30/07/2021	HRA Document package: • HRA Workshop 27 Minutes and Presentation slides (14/07/2021)

Appendix D Epping Forest Detailed Botanical Survey Results

PLACEHOLDER – Unchanged from DCO1.0 pre application consultation so not included here

Appendix E LA 115 Screening Matrices

PLACEHOLDER – TO BE PROVIDED ONCE REPORT FINALISED

Appendix F Planning Inspectorate Advice Note 10 Screening Matrices

PLACEHOLDER – TO BE PROVIDED ONCE REPORT FINALISED

Appendix G Planning Inspectorate Advice Note 10 Integrity matrices

PLACEHOLDER – TO BE PROVIDED ONCE REPORT FINALISED

Epping Forest SAC

Essex Estuaries SAC

Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) RAMSAR

Benfleet and Southend Marshes RAMSAR

Thames Estuary & Marshes RAMSAR

Benfleet and Southend Marshes SPA

Outer Thames Estuary SPA

Thames Estuary & Marshes SPA

Thames Estuary & Marshes RAMSAR

Medway Estuary & Marshes SPA

Medway Estuary & Marshes RAMSAR

North Downs Woodlands SAC

0 1 2 3 4 KM

Lower Thames Crossing OS

Legend

- Order Limits
- Area within 2km of the Order Limits
- RAMSAR Site
- Special Areas of Conservation
- Special Protection Area

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	29/06/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

Status: DRAFT

Original Size: A3

Revision: P02

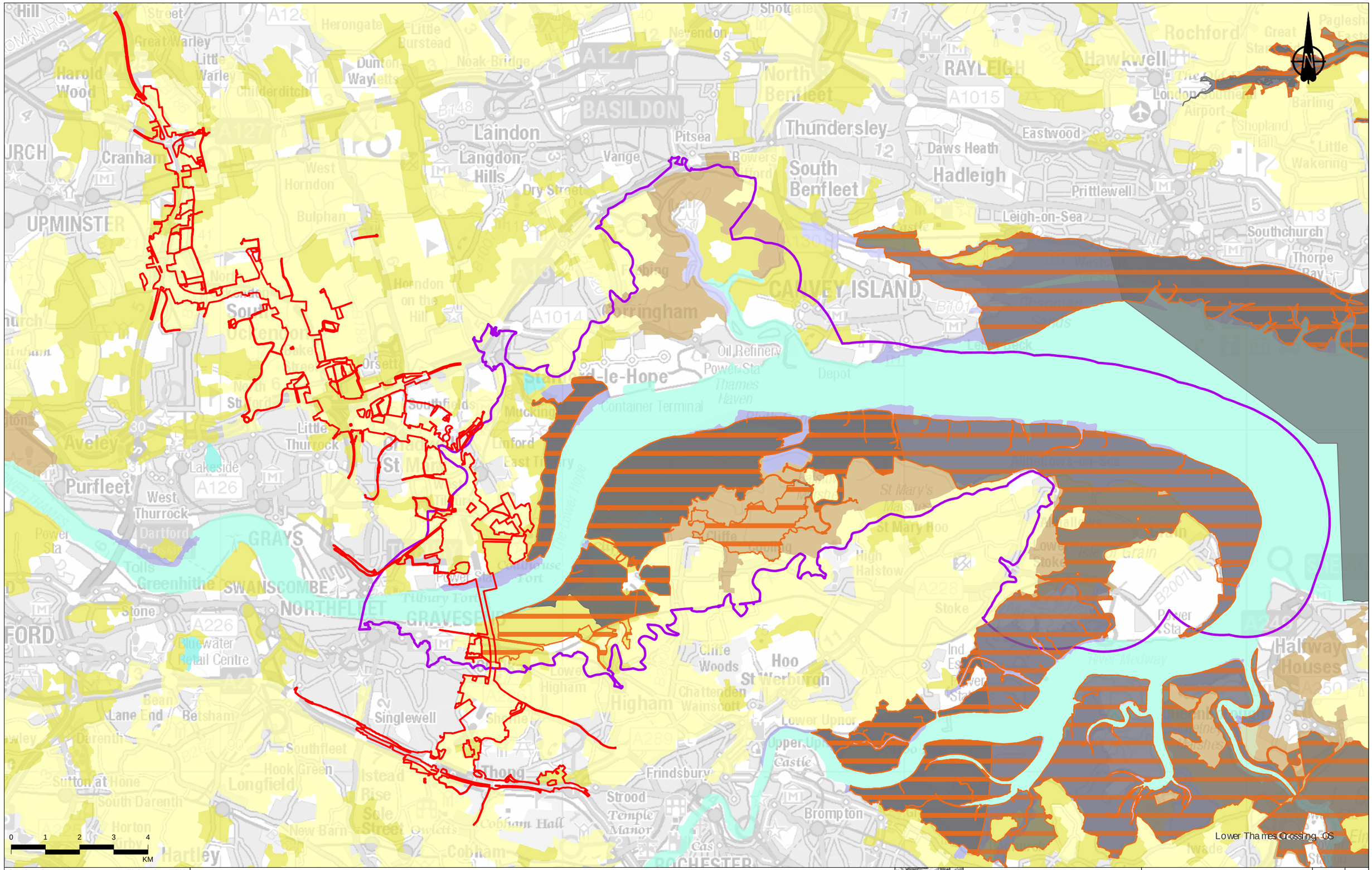
Application Document Number: TR010032/APP/6.5

Scale: 1:120,000

Drawing Title: Figure 1 - European Sites Located Within 2km Of The Project

Drawing Number

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 1 European sites located with 2km of the Project.aprx



Legend

- Order Limits
- Functionally Linked Land
- RAMSAR Site
- Special Protection Area

Potential Suitable Habitat
Corine Land Cover 2018

- 211: Non-irrigated arable land
- 231: Pastures
- 321: Natural grasslands
- 411: Inland marshes
- 421: Salt marshes
- 423: Intertidal flats
- 512: Water bodies
- 522: Estuaries
- 523: Sea and ocean

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Appr'd
P02	S8	29/06/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

Status: DRAFT
Original Size: A3
Revision: P02
Application Document Number: TR010032/APP/6.5
Scale: 1:100,000

Drawing Title: Figure 2 - Functionally linked land

Drawing Number:

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 2 Functionally linked land.aprx

Legend

Phase 1 Data

- Acid grassland
- Amenity grassland
- Arable
- Artifical mine
- Bare ground
- Broad-leaved parkland
- Broad-leaved woodland (plantation)
- Broad-leaved woodland (recently felled)
- Broad-leaved woodland (semi-natural)
- Buildings
- Calcareous grassland (semi-improved)
- Calcareous grassland (unimproved)
- Coastal grassland
- Coastal healthland
- Coastland - Intertidal (boulders/ rocks)
- Coastland - Intertidal (mud/ sand)
- Coastland - Intertidal (shingles/ cobbles)
- Coastland - Saltmarsh (Dense/ continuous)
- Coastland - Shingle above hightide mark
- Coniferous woodland (plantation)
- Culivated/disturbed land - Introduced Shrub
- Dense/continuous scrub
- Dry dwarf shrub heath
- Dry heath/acid grassland
- Ephemeral/short perennial land
- Fen basin mire
- Hardstanding
- Hedges and trees - Fence
- Improved grassland
- Other Habitat
- Marsh/marshy grassland
- Mixed woodland (plantation)
- Natural rock exposure
- Neutral grassland (semi-improved)
- Neutral grassland (unimproved)
- No access
- Poor semi-improved grassland
- Rock exposure and waste - Other
- Rock exposure and waste - Scree (Acidic/neutral)
- Rock exposure and waste - Scree (Basic)
- Running water
- Scattered scrub
- Standing Water
- Swamp
- Tall herb and fern - Bracken (continuous)
- Tall herb and fern - Upland species-rich ledges
- Tall ruderal herbs

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	04/08/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

Status: DRAFT

Original Size: A3

Revision: P02

Application Document Number: TR010032/APP/6.5

Scale:

Drawing Title: Phase 1 data legend sheet

Drawing Number:

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 3 Location of project elements in relation to European sites and functionally linked land.aprx

Highways construction works

Ecology Mitigation Areas

Construction compound 5

Construction access/haul road

Indicative dewatering drainage discharge pipeline

Construction compound 3b access

Construction compound 3b

Construction Compound 3 Drainage Discharge

Drainage Discharge Construction Access

Construction compound 3a

Construction Compound 3 Drainage Treatment

0 0.3 0.6 0.9 1.2 KM

Legend

- Order Limits
- Functionally Linked Land
- Thames Estuary & Marshes RAMSAR
- Thames Estuary & Marshes Special Protection Area

Areas of habitat loss within FLL

- No surface works
- Land take - temporary
- Land take - semi-permanent and permanent

Note: For phase 1 data symbology, please refer to the separate phase 1 legend sheet.

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	05/07/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

Status: DRAFT

Original Size: A3

Revision: P02

Application Document Number: TR010032/APP/6.5

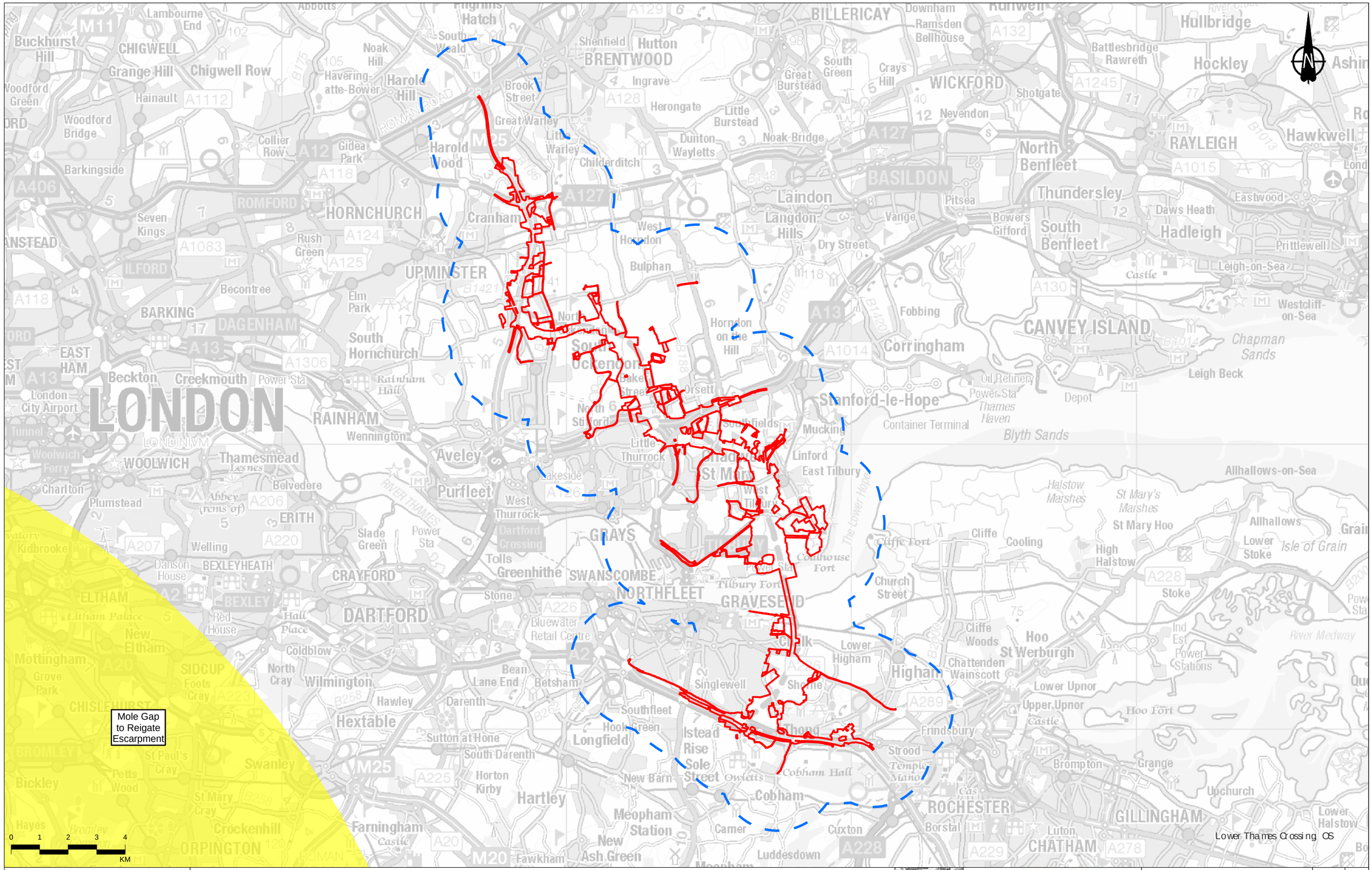
Scale: 1:30,000

Drawing Title: Figure 3 - Location of project elements in relation to European sites and functionally linked land

Drawing Number

Lower Thames Crossing OS

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 3 Location of project elements in relation to European sites and functionally linked land.aprx



Legend

- Area within 2km of the Order Limits
- Order Limits
- 30km buffer of Special Areas of Conservation where bats are one of the qualifying interests, in relation to the Project

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	05/07/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

Status	DRAFT
Original Size	A3
Revision	P02
Application Document Number	TR010032/APP/6.5
Scale	1:120,000

Drawing Title: Figure 4 - Area within 30km of European sites, where bats are one of the qualifying interests, in relation to the Project

Drawing Number

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 4 Area within 30km of European sites, where bats are one of the qualifying interests, in relation to the Project.aprx

Epping Forest SAC

Essex Estuaries SAC

Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) RAMSAR

Benfleet and Southend Marshes RAMSAR

Thames Estuary & Marshes RAMSAR

Benfleet and Southend Marshes SPA

Outer Thames Estuary SPA

Thames Estuary & Marshes SPA

Thames Estuary & Marshes RAMSAR

Medway Estuary & Marshes SPA

Medway Estuary & Marshes RAMSAR

North Downs Woodlands SAC

0 1 2 3 4 KM

Lower Thames Crossing OS

Legend

- Order Limits
- Area Within 2km Of The Order Limits
- RAMSAR Site
- Special Areas of Conservation
- Special Protection Area
- Watercourses
  - River Thames
  - Other Watercourses

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	05/07/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

Status: DRAFT

Original Size: A3

Revision: P02

Application Document Number: TR010032/APP/6.5

Scale: 1:120,000

Drawing Title: Figure 5 - Location of European sites up or downstream of watercourses crossed by the Project

Drawing Number

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 5 Location of European sites up or downstream of watercourses crossed by the Project..aprx

Legend

- Order Limits
- Thames Estuary & Marshes RAMSAR
- Thames Estuary & Marshes Special Protection Area

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	04/08/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

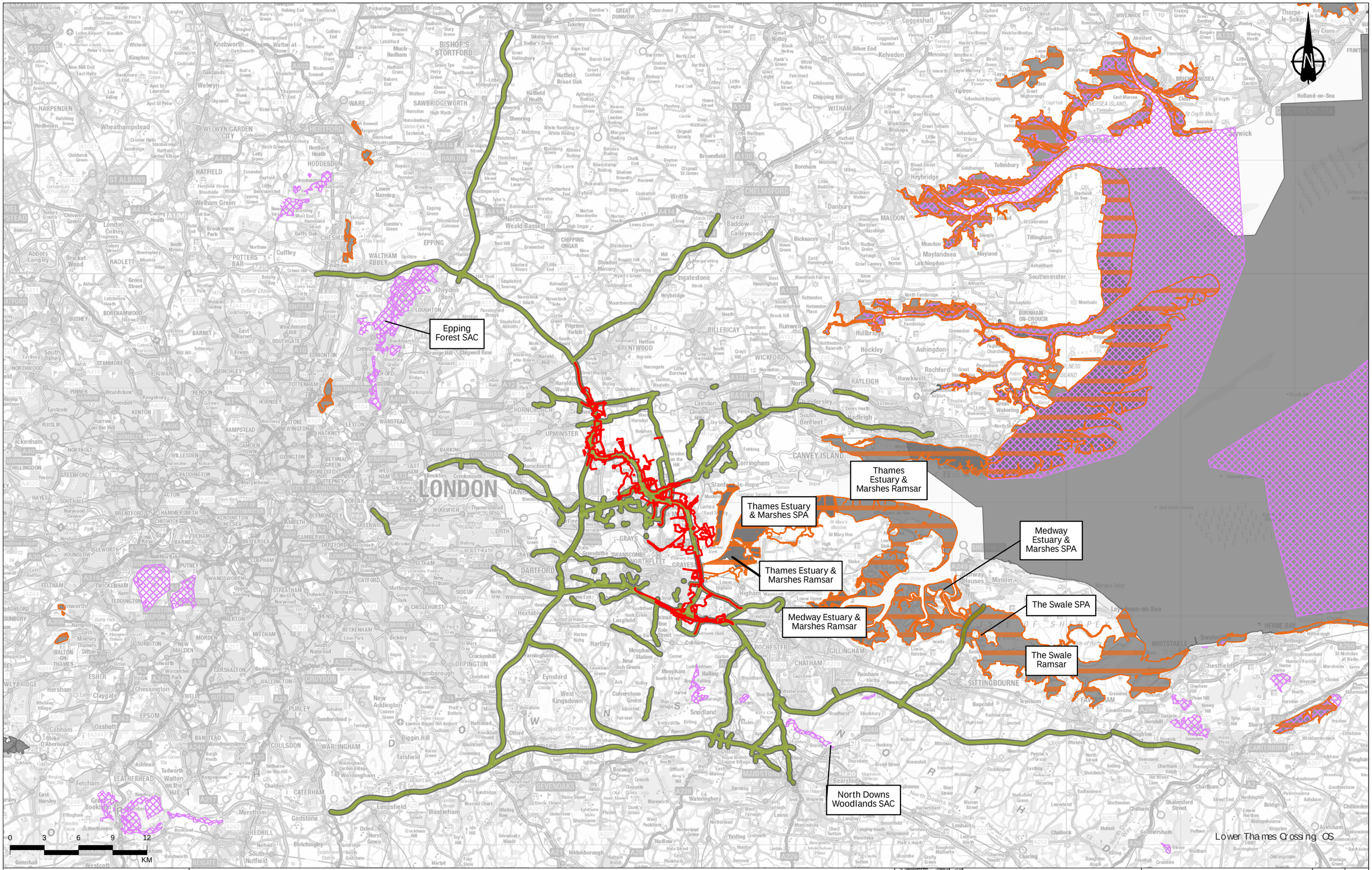
Status: DRAFT	Original Size: A3 / Revision: P02
Application Document Number: TR010032/APP/6.5	Scale: 1:50,000

Drawing Title

Figure 6 - Location of GWDTE and European sites in relation to the Project

Drawing Number

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 6 Location of GWDTE and European sites in relation to the Project.aprx



Legend

- Order Limits
- RAMSAR Site
- Special Areas of Conservation
- Special Protection Area
- Areas Within 200m of the Operational ARN

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	06/07/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

Status	DRAFT
Original Size	A3
Revision	P02
Application Document Number	TR010032/APP/6.5
Scale	1:300,000

Drawing Title: Figure 7 - European sites located within 200m of the affected road network (ARN) – Operation 2029

Drawing Number:

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 7 European sites located within 200m of the affected road network (ARN) – Operation 2029.aprx

Thames Estuary & Marshes Ramsar

Thames Estuary & Marshes SPA

Thames Estuary & Marshes Ramsar

0 2 4 6 8 KM

Legend

- Order Limits
- RAMSAR Site
- Special Areas of Conservation
- Special Protection Area
- Area Within 200m of the Construction ARN

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	03/08/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

Status: DRAFT	Original Size: A3	Revision: P02
Application Document Number: TR010032/APP/6.5	Scale: 1:195,000	

Drawing Title: Figure 8 - European sites located within 200m of the affected road network (ARN) – Construction

Drawing Number

Lower Thames Crossing OS

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 8 European sites located within 200m of the affected road network (ARN) - Construction .aprx

Epping Forest SAC

Essex Estuaries SAC

Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) RAMSAR

Benfleet and Southend Marshes RAMSAR

Thames Estuary & Marshes RAMSAR

Benfleet and Southend Marshes SPA

Outer Thames Estuary SPA

Thames Estuary & Marshes SPA

Thames Estuary & Marshes RAMSAR

Medway Estuary & Marshes SPA

Medway Estuary & Marshes RAMSAR

North Downs Woodlands SAC

Lower Thames Crossing OS

0 1 2 3 4 KM

Legend

- Order Limits
- Project Zone Of Influence
- RAMSAR
- Special Protection Area
- Special Areas of Conservation
- Sites of Special Scientific Interest
- SSSI Impact Risk Zones

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	07/07/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

Status: DRAFT

Original Size: A3

Revision: P02

Application Document Number: TR010032/APP/6.5

Scale: 1:120,000

Drawing Title: Figure 9 - Spatial relationship between the SSSI Impact Risk Zones and the Project

Drawing Number

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 9 Spatial relationship between the SSSI Impact Risk Zones and the Project.aprx

Bird Transect 21
Bird Transect 22
Transect1 Coles farm and Scrapheap
Tilbury Coalhouse Fort
Hangman's Wood
Transect 1 Cole Farm and scrap heap
Biggin Farm
East Tilbury Battery
East Tilbury Battery
Brett's Farm
Parsonage Farm
East Tilbury Marshes
Coalhouse Fort
Tilbury 1 Cole's Farm
NE2
NE
Transect 2 Inglebourne valley
East Tilbury Jetty at Goshems Farm
NW
Transect 4 Mott Farm
Transect 3 Bowaters Farm
Tilbury Fort
Transect 5 Tilbury Fort
Tilbury Power Station
SE
South Firing Range
SW
Shorne Marshes
Rochester Bridge
South - Chalk
Bird Transect 23
Filborough Marshes and firing range
Bird Transect 25
Bird Transect 24
Shorne Woods

0 0.35 0.7 1.05 1.4 KM

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	07/07/2021	DRAFT	AD	IP	RC

Legend

- Order Limits
- Functionally Linked Land
- Special Protection Area/Ramsar qualifying species record

Vantage Point Surveys - Twice per month April 2017 to March 2019 (inclusive)

- Nocturnal
- Intertidal

- Diurnal transect areas. Surveyed twice per month from April 2017 to March 2019 (inclusive)
- Nocturnal transect areas. Surveyed once per month from November 2017 to March 2018 and Nov 2018 to March 2019 (inclusive)

Client: highways england

Project: LOWER THAMES CROSSING

Status: DRAFT
Original Size: A3
Revision: P02
Application Document Number: TR010032/APP/6.5
Scale: 1:35,000

Drawing Title: Figure 10 - Locations of survey areas where SPA/Ramsar qualifying features recorded

Drawing Number:

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 10 Locations of survey areas where SPARamsar qualifying features recorded.aprx

Winter 2017/2018

Breeding 2017

Passage 2017

Winter 2018/2019

Breeding 2018

Passage 2018

0 0.5 1 1.5 2

KILOMETRES

Legend

- Order Limits
- Functionally Linked Land

Winter Season (Nov-Mar) record
Number:
- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- > 50

Breeding season (Apr-Jul) record
Number:
- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- > 50

Passage Season (Aug-Oct) record
Number:
- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- > 50

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	08/07/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

Status: DRAFT
Original Size: A3
Revision: P02
Application Document Number: TR010032/APP/6.5
Scale: 1:50,000

Drawing Title: Figure 11a - QF: Avocet Numbers recorded in each season
Page 1 of 10

Drawing Number

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 11 Numbers of qualifying features (QF) recorded in each season.aprx

Winter 2017/2018

Breeding 2017

Passage 2017

Winter 2018/2019

Breeding 2018

Passage 2018

0 0.5 1 1.5 2

KILOMETRES

Legend

- Order Limits
- Functionally Linked Land

Winter Season (Nov-Mar) record
Number:
- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- > 50

Breeding season (Apr-Jul) record
Number:
- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- > 50

Passage Season (Aug-Oct) record
Number:
- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- > 50

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	08/07/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

Status: DRAFT
Original Size: A3
Revision: P02
Application Document Number: TR010032/APP/6.5
Scale: 1:50,000

Drawing Title: Figure 11b - QF: Black-tailed godwit Numbers recorded in each season
Page 2 of 10

Drawing Number

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 11 Numbers of qualifying features (QF) recorded in each season.aprx

Winter 2017/2018

Breeding 2017

Passage 2017

Winter 2018/2019

Breeding 2018

Passage 2018

0 0.5 1 1.5 2

KILOMETRES

Legend

- Order Limits
- Functionally Linked Land

Winter Season (Nov-Mar) record

Number:

- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- > 50

Breeding season (Apr-Jul) record

Number:

- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- > 50

Passage Season (Aug-Oct) record

Number:

- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- > 50

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	08/07/2021	DRAFT	AD	IP	RC

Client: highways england

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Status: DRAFT

Original Size: A3

Revision: P02

Application Document Number: TR010032/APP/6.5

Scale: 1:50,000

Drawing Title: Figure 11c - QF: Dark-bellied brent goose Numbers recorded in each season
Page 3 of 10

Drawing Number:

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 11 Numbers of qualifying features (QF) recorded in each season.aprx

Winter 2017/2018

Breeding 2017

Passage 2017

Winter 2018/2019

Breeding 2018

Passage 2018

0 0.5 1 1.5 2

KILOMETRES

Legend

- Order Limits
- Functionally Linked Land

Winter Season (Nov-Mar) record
Number:
1 - 5
6 - 10
11 - 20
21 - 50
> 50

Breeding season (Apr-Jul) record
Number:
1 - 5
6 - 10
11 - 20
21 - 50
> 50

Passage Season (Aug-Oct) record
Number:
1 - 5
6 - 10
11 - 20
21 - 50
> 50

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	08/07/2021	DRAFT	AD	IP	RC

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Project: LOWER THAMES CROSSING

Status: DRAFT
Original Size: A3
Revision: P02
Application Document Number: TR010032/APP/6.5
Scale: 1:50,000

Drawing Title: Figure 11d - QF: Dunlin Numbers recorded in each season
Page 4 of 10

Drawing Number:

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 11 Numbers of qualifying features (QF) recorded in each season.aprx

Winter 2017/2018

Breeding 2017

Passage 2017

Winter 2018/2019

Breeding 2018

Passage 2018

0 0.5 1 1.5 2

KILOMETRES

Legend

- Order Limits
- Functionally Linked Land

Winter Season (Nov-Mar) record
Number:
1 - 5
6 - 10
11 - 20
21 - 50
> 50

Breeding season (Apr-Jul) record
Number:
1 - 5
6 - 10
11 - 20
21 - 50
> 50

Passage Season (Aug-Oct) record
Number:
1 - 5
6 - 10
11 - 20
21 - 50
> 50

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	08/07/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

Status: DRAFT
Original Size: A3
Revision: P02
Application Document Number: TR010032/APP/6.5
Scale: 1:50,000

Drawing Title: Figure 11e - QF: Grey plover Numbers recorded in each season
Page 5 of 10

Drawing Number:

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 11 Numbers of qualifying features (QF) recorded in each season.aprx

Winter 2017/2018

Breeding 2017

Passage 2017

Winter 2018/2019

Breeding 2018

Passage 2018

0 0.5 1 1.5 2
KILOMETRES

Legend

- Order Limits
- Functionally Linked Land

Winter Season (Nov-Mar) record
Number:
1 - 5
6 - 10
11 - 20
21 - 50
> 50

Breeding season (Apr-Jul) record
Number:
1 - 5
6 - 10
11 - 20
21 - 50
> 50

Passage Season (Aug-Oct) record
Number:
1 - 5
6 - 10
11 - 20
21 - 50
> 50

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S8	08/07/2021	DRAFT	AD	IP	RC

Client: highways england

Project: LOWER THAMES CROSSING

Status: DRAFT
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Scale: 1:50,000

Drawing Title: Figure 11f - QF: Knot Numbers recorded in each season Page 6 of 10

Drawing Number:

Z:\Environment\HRA\APRX and MXDs\DCO2\Figure 11 Numbers of qualifying features (QF) recorded in each season.aprx

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