

PLANNING ACT 2008  
INFRASTRUCTURE PLANNING  
(APPLICATIONS: PRESCRIBED FORMS AND PROCEDURE) REGULATIONS 2009  
REGULATION 5(2) (a)

## PROPOSED PORT TERMINAL AT FORMER TILBURY POWER STATION

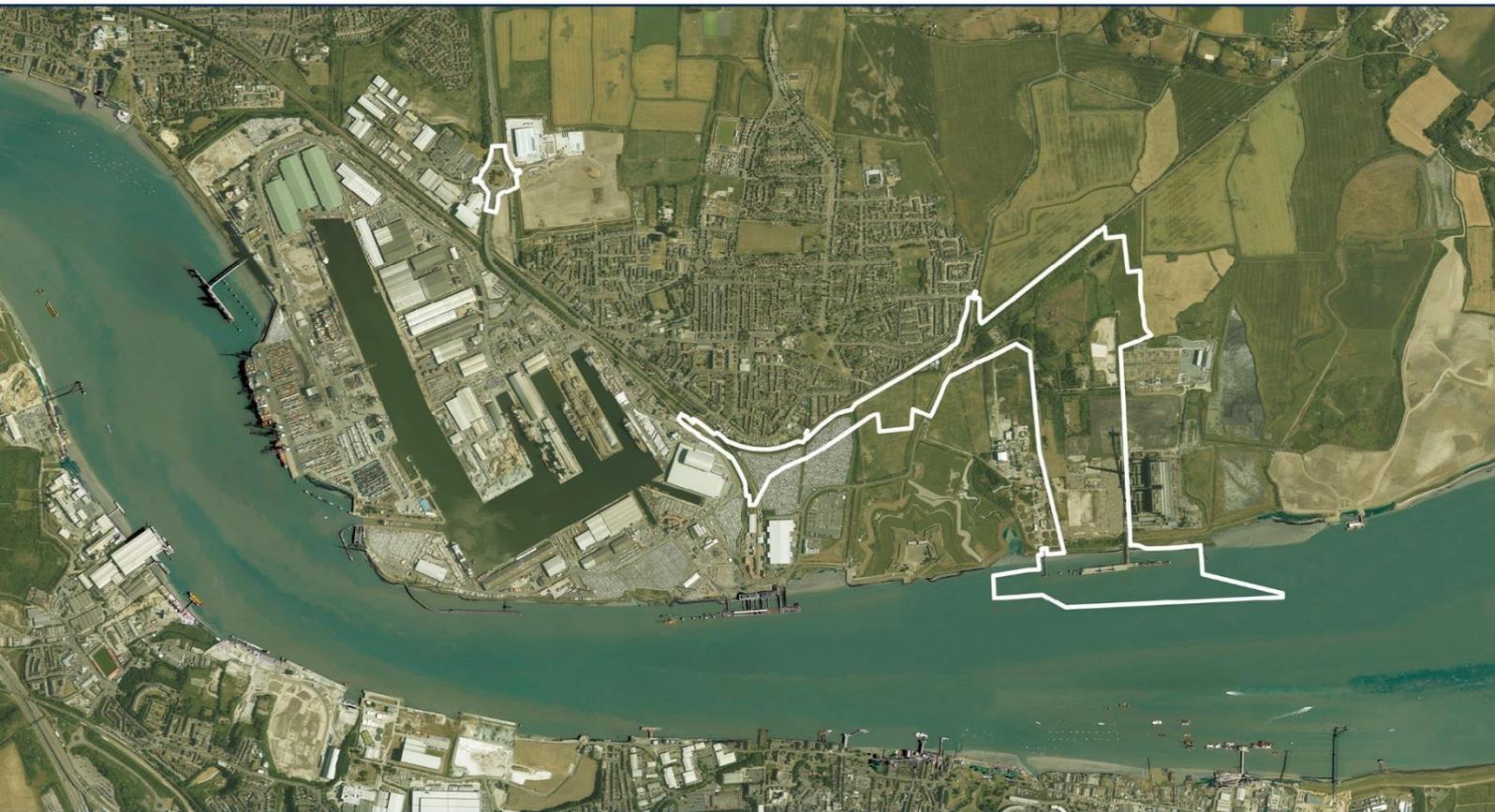
# TILBURY2

TR030003

VOLUME 6 PART B

## ES APPENDIX 10.O: HABITAT REGULATIONS ASSESSMENT (HRA) REPORT

DOCUMENT REF: 6.2 10.O



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## 1 INTRODUCTION

### 1.1 Status and Purpose of this Document

- 1.1.1 This document ('HRA report') aims to provide relevant technical information to enable competent authorities to discharge their functions under Regulations 7 (competent authorities) and 61 (requirement to carry out an appropriate assessment) of the Conservation of Habitats and Species Regulations 2010 (as amended) (The Habitats Regulations) in connection with the consenting process for the Tilbury2 project.
- 1.1.2 The Tilbury 2 project is a Nationally Significant Infrastructure Project (NSIP) and consequently the competent authority is the Secretary of State for Transport.
- 1.1.3 Under the provisions of the UK Habitats Regulations and the parent European Habitats Directive<sup>1</sup>, the Secretary of State is required to carry out an appropriate assessment if there are deemed to be 'Likely Significant Effects' (LSE) on a site or sites expressly protected under the terms of the Directive ('European Sites'), when considered alone or in conjunction with other projects and where those LSE arise from a plan or project not directly connected with or necessary to the management of that site or sites.
- 1.1.4 European Sites are Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) designated pursuant to the Birds and Habitats Directives respectively, but as a matter of UK policy<sup>2</sup> also extend to include sites designated pursuant to the 1971 Ramsar Convention on Wetlands of International Importance (Ramsar Sites).
- 1.1.5 This document describes how the potential for LSE on European Sites to arise has been assessed in accordance with prevailing guidance and how by means of the Stage 1 screening process (Stage 1 assessment), it has been concluded that there are no LSE arising for any European Sites. Evidence in support of that conclusion is presented in order to assist the competent authority.
- 1.1.6 This document has been prepared in accordance with procedural advice prepared by The Planning Inspectorate<sup>3</sup> in relation to the Planning Act 2008 process (as amended) and version 1.1 (February 2016) of Natural England's Operational Standard for HRA<sup>4</sup>. Other guidance has been drawn upon where relevant, and as cited and listed in the references.

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<sup>1</sup> Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (as codified) (the 'Habitats Directive')

<sup>2</sup> National Planning Policy Framework paragraph 118

<sup>3</sup> Advice Note 10: Habitats Regulations Assessment relevant to nationally significant infrastructure projects (version 7). The Planning Inspectorate. January 2016. Accessed October 2017.

<sup>4</sup> Natural England (2016) Habitats Regulations Assessment Operational Standard 29/2/2016. V1.1 downloaded 09/10/17

## 2 METHODOLOGY

### 2.1 Guidance and common standards followed

- 2.1.1 The assessment process followed the stepwise procedure set out in PINS advice note 10, whilst also drawing on Natural England's Operational Standards for HRA, EC Guidance and guidance for ecological impact assessment more generally (e.g.) as published by the European Commission and the Chartered Institute of Ecology and Environmental Management<sup>5 6 7 8</sup>.

### 2.2 Assessment process

- 2.2.1 The assessment process works sequentially through the following stages:

#### *Stage 1 (screening)*

- 2.2.2 This considers the scope for LSE to occur based on a broad scale risk analysis taking into account factors such as the spatial relationship between impact sources and designated sites (and functionally linked habitats and species), the magnitude of changes predicted in atmospheric, coastal/estuarine, freshwater and hydromorphological systems (drawing on outputs from other specialist studies) and whether there are physical or other relationships between source and receptor that could provide an impact vector. Stage 1 Screening for likely significant effects considers the project both alone and in-combination with other projects. Decommissioning is not considered in this case as there is no deemed end-life for the Tilbury2 development. If it can be confidently predicted that there are no likely significant effects, then the output of Stage 1 takes the form of a 'No Significant Effects Report' (NSER) and subsequent HRA stages are not required.

#### *Stage 2 (appropriate assessment)*

- 2.2.3 If Stage 1 identifies likely significant effects: an assessment of the implications of the project for the site(s)'s conservation objectives is carried out. Conservation objectives for European Sites are defined and published by Natural England. In this case the relevant document ("European Site Conservation Objectives for Thames Estuary and Marshes Special Protection Area Site Code: UK9012021") has not changed since 2014.
- 2.2.4 HRA Stages 3 and 4 are required if Stage 2 concludes that the project will adversely affect the integrity of the site(s), or when adverse effects on integrity cannot be ruled out.

#### *Stage 3: Assessment of alternative solutions*

- 2.2.5 Stage 3 requires consideration of alternatives, which may include siting the project in an alternative location or design changes to eliminate the source of LSE.

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<sup>5</sup> CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester.

<sup>6</sup> Natural England (2016) Habitats Regulations Assessment Operational Standard 29/2/2016. V1.1 downloaded 09/10/17

<sup>7</sup> CIEEM (2010) Guidelines for Ecological Impact Assessment in Britain and Ireland: Marine and Coastal. Chartered Institute of Ecology and Environmental Management, Winchester

<sup>8</sup> European Commission (2011) Guidance for the Implementation of the Birds and Habitats Directives in Estuaries and Coastal Zones (with particular attention to port development and dredging). Accessed October 2017 via [https://ec.europa.eu/transport/sites/transport/files/modes/maritime/.../guidance\\_doc.pdf](https://ec.europa.eu/transport/sites/transport/files/modes/maritime/.../guidance_doc.pdf)



*Stage 4: Assessment where no alternative solutions are possible and adverse impacts remain*

- 2.2.6 Stage 4 is engaged where alternative solutions to avoid LSE are not possible and is concerned with assessing whether the project is justified by 'Imperative Reasons of Overriding Public Interest' (IROPI) and, if so, what compensatory measures can be put in place in relation to the affected habitat.

### **3 DESCRIPTION OF THE PROJECT**

#### **3.1 Location and context**

3.1.1 A plan of the proposed Order Limits for the Tilbury 2 project is provided in Figure 4.1 of the Environmental Statement. The proposed Order Limits do not engage directly with any European Site or other statutory nature conservation designation. The relationship between the proposed Order Limits and relevant European Sites and SSSI is further shown at Figure 1 of this report. Figure 1 demonstrates that the nearest part of any European Site (Thames Estuary and Marshes SPA/Ramsar Site) is approximately 1.5km distant and to the south-east.

3.1.2 The land bound by the proposed Order limits comprises four areas, summarised as follows:

- the main site of the new port facility on land formerly forming part of the now decommissioned Tilbury Power Station ("the Tilbury2 site");
- sections of the adjoining tidal Thames required for the construction of expanded berthing capacity and associated dredging;
- an infrastructure corridor connecting the existing Port to the Tilbury 2 site and accommodating the routes of a new link road between Ferry Road and Fort Road and an adjoining rail spur ("the infrastructure corridor"); and
- a small, disjunct area of land around the roundabout to the north of the existing Port ("the ASDA roundabout") where small-scale highway improvements will be required.

#### **3.2 Need**

3.2.1 The need for the proposals in relation to the exhaustion of current capacity at the existing Port of Tilbury and the economic benefits of expansion both locally and nationally are set out in the Environmental Assessment (EA) at chapters 3 (Port of Tilbury – Existing and Future) and 5 (Description of the Proposals) and in the accompanying Outline Business Case submission document. Alternatives for the proposals as a whole and in terms of location are considered in EA chapter 6 and its appended Masterplanning Statement and Surface Access Options report.

3.2.2 In essence, it is argued that there is an overwhelming need for the proposals to avoid constraining the existing Port's ability to meet throughput increases and the needs of its tenants. Whilst it is difficult to forecast the behaviour of individual tenants if expansion cannot be achieved at Tilbury2, the Port of Tilbury London Limited (PoTLL) are strongly of the view that relocation to other ports, with a consequential damage to PoTLL's investment plans and economic contribution, is highly likely, with knock on effects on the local and regional economy. This is explored further in the Outline Business Case.

#### **3.3 Design Process**

3.3.1 The design of the project has been driven primarily by operational requirements to make best use of the available land. This has been to achieve the capacity objectives outlined above and to respond to the site constraints and opportunities in terms of existing marine and land-based infrastructure and the practical, spatial and operational demands of the primary uses proposed.

This process is explored further in the Masterplanning Statement and Surface Access Options report.

- 3.3.2 As set out in those documents, terrestrial and marine ecology considerations have been a key consideration at all stages of the design process, and the need to avoid generating off-site impacts that could transmit to European Sites downstream has been a significant driver in the design of marine infrastructure and in the adoption of restrictions imposed on project-related activities such as capital and maintenance dredging through the Development Consent Order (DCO), Deemed Marine Licence (DML), and the Construction Environmental Management Plan (CEMP).

### **3.4 Summary Project Description**

- 3.4.1 A full project description is contained within Chapter 5 of the ES. A brief summary is given below focussing on the elements of most relevance to the consideration of off-site effects with the potential to engage with the nearby European Site/s:

#### *Jetty/Marine Works*

- 3.4.2 The existing jetty formerly used for receipt of coal for the power station will be retained but will require modification and extension at both its upstream and downstream arms to increase berthing capacity. This will require in-channel works including piling. Capital and maintenance dredging will be required to create expanded berth pockets and to maintain the approach channel. Dredge pockets will be created and maintained for the life of the terminal around the improved terminal jetty. In relation to the downstream Construction Materials and Aggregates Terminal ("CMAT") jetty, the depth of pocket will be circa 15m and cater for the largest likely bulk aggregate vessels to visit the site in the future (c. 100,000 tonnes). A sheet pile wall will be installed to run along the northern edge of the dredge pocket. The roll on roll off (RoRo) berthing pocket (next to the western end of the existing jetty and around its westward extension) will require less dredging in order to create a depth of circa 7.88m. The immediately adjoining approaches to the berth pockets will also need dredging and are included within the indicative Order limits. The jetty will also need to be lit.

#### *Ro-Ro Terminal – landside facilities*

- 3.4.3 The southern part of the Tilbury2 site (land south of the existing Substation Road) will be developed to accommodate RoRo associated storage areas and access to the RoRo jetty over an area of approximately 20ha.

#### *Construction Materials and Aggregates Terminal – landside facilities*

- 3.4.4 The northern part of the Tilbury2 site (land north of Substation Road) will be developed to accommodate a CMAT, which will comprise a number of permanent uses and structures associated with the receipt and processing of marine aggregates via a conveyor connection to the expanded jetty.

#### *Processing Facilities*

- 3.4.5 This CMAT area is envisaged to include a mixing plant that will include the use of a mechanical mixer; moulding; pressure removal of water, and the robotised stacking of products once

completed. Manufactured products may also be cured in a heated area of the plant. A ready-mix concrete batching plant fed from the aggregate storage yard described above and an asphalt manufacturing plant is also envisaged.

#### *Highway and Rail Access Provision*

- 3.4.6 In order to fully utilise the new RoRo terminal and CMAT, a surface access strategy has been devised comprising new and improved road and rail links in the infrastructure corridor extending westwards from the Tilbury2 site (i.e. moving away from the nearest European Site) and connecting in to existing highway and rail networks at the eastern edge of the current Port.

### **3.5 Embedded Mitigation**

- 3.5.1 The application for a DCO and DML for the project is accompanied by an ES (Volume 6 of the application documents) which describes embedded mitigation to reduce the spatial influence of effects from noise and vibration (Chapter 17), dust and emissions (Chapter 18) and ground and surface water pollution (Chapters 15 and 16). Also accompanying the ES is a CEMP (document 6.9), Operational Management Plan (OMP) (document 6.10), a Lighting Strategy (ES Appendix 9.J) and a Drainage Strategy (ES Appendix 16.E). These collectively detail the mitigation measures that have been embedded within the design (such as the surface water drainage scheme for the Tilbury2 site and the Infrastructure Corridor) or committed to as a means to reduce effects local to the project site (for example planted landscape screening, noise attenuation fencing and cowling/shields on site lighting). Such embedded mitigation is taken into account in this HRA report. The DCO/DML, CEMP and OMP provide mechanisms for ensuring the delivery of these measures.

### **3.6 Consultation**

- 3.6.1 The pre-application procedures set out within the Planning Act 2008 (as amended) have been followed, as detailed within Chapter 1 of the ES and in the Consultation Report (CR) (document 5.1). PINS on behalf of the Secretary of State and relevant statutory bodies including Natural England, the Environment Agency, the Marine Management Organisation, the Port of London Authority and the relevant Local Planning Authorities have all been involved in and have contributed to the pre-application statutory (Section 42) consultation, but consultation and direct engagement has continued beyond that to include submission of drafts of relevant documents. In respect of the HRA process, this has included discussions with Natural England to set the scope of coverage of the HRA (in terms of the European Sites needing to be considered) and submission of advance drafts of this document for the purposes of seeking an agreed position on the likelihood or otherwise of significant effects on any European Site occurring.

## 4 RELEVANT EUROPEAN SITES

### 4.1 Models and assumptions used to define maximum zone of influence for effects arising from the project

4.1.1 The maximum zone of influence for air and water quality effects arising from the Tilbury 2 project has been defined by reference to the outputs of bespoke modelling studies conducted as part of the Environmental Impact Assessment, involving (*inter alia*) application of the following tools:

- Atmospheric Dispersion Modelling System (ADMS) 'ADMS-Roads' model (version 4.0). Cambridge Environmental Research Consultants (see ES Chapter 18)<sup>9</sup> to model land-based vehicular emissions generated by the project
- Atmospheric Dispersion Modelling System (ADMS) 'ADMS-5' model (industrial installations). Cambridge Environmental Research Consultants (see Appendix 6 of this HRA) to model emissions from shipping traffic in the operational phase.
- Hydrodynamic modelling tool TELEMAC-3D (ES Appendix 16.D section 2.1) to assist with modelling sediment dispersal and deposition plumes and related effects.

4.1.2 In respect of effects on cited fauna from lighting and disturbance from movement or human sources, the maximum zone of influence has been defined with the assistance of the following tool

- Waterbird Disturbance Mitigation Toolkit (Institute of Estuarine & Coastal Studies (IECS) University of Hull, 2013) (TIDE toolkit)<sup>10</sup>

4.1.3 Where such tools or the outputs from quantitative studies are not available, for example in the consideration of potential lighting effects on Ramsar-cited invertebrate or plant taxa in functionally linked habitats closer to the Tilbury 2 site that the designation, professional judgment has been applied taking subjective or objective account of factors such as intervening distance, rates of attenuation and dilution, prevailing tidal and atmospheric processes, and factors such as the existing substantially industrialised nature of the Thames estuary (influencing, amongst other things, individual species' habituation and sensitivity).

### 4.2 European Sites within range of potential impact sources

4.2.1 Based on the potential maximum range at which identified effects have the potential to be significant, taking account of the modelled outputs and assessments, the need to consider the potential for likely significant effects has been identified solely in respect of the Thames Estuary and Marshes SPA and the Thames Estuary and Marshes Ramsar Site.

4.2.2 The intention to limit Habitats Regulations Assessment to these two overlapping and largely coterminous designations was set out in scoping discussions and correspondence with statutory and non-statutory agencies at the outset of the project and referenced in the Preliminary Environmental Information report (PEIR) issued as part of the statutory section 42 pre-consultation process. In particular, paragraph 10.146 states:

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<sup>9</sup> See ES Chapter 18 e.g. para 18.121

<sup>10</sup> Accessed October 2017 from [http://www.tide-toolbox.eu/tidetools/waterbird\\_disturbance\\_mitigation\\_toolkit/](http://www.tide-toolbox.eu/tidetools/waterbird_disturbance_mitigation_toolkit/)

*“All other European nature conservation designations are located at least 9km from the Site, at which distance they are considered to be beyond the range of potential significant effects. No other designations have emerged through the scoping process, and therefore no other European nature conservation designations are given any further consideration in this PEIR”*

4.2.3 In responding to the statutory s.42 consultation, Natural England included the following statement in their letter of 28 July 2017 (Appendix 1):

*“Natural England acknowledges the list of sites presented in ‘Table 10.23 Statutory nature conservation designations within 5km of the Site’ and agrees the sites selected in the following paragraphs as being most likely to be impacted is appropriate.”*

4.2.4 In accordance with this agreed position with the Statutory Nature Conservation Body, the two European Sites considered in this assessment are the Thames Estuary and Marshes SPA and the Thames Estuary and Marshes Ramsar Site.

### **4.3 Qualifying Features – Thames Estuary and Marshes SPA**

4.3.1 The qualifying features for the Thames Estuary and Marshes SPA are attached at Appendix 2 and are as follows:

Wintering populations of European importance of the following Annex I species:

- Avocet *Recurvirostra avosetta*; and
- Hen harrier *Circus cyaneus*.

Regular use by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex I):

- Ringed plover *Charadrius hiaticula*;
- Grey plover *Pluvialis squatarola*;
- Dunlin *Calidris alpina alpina*;
- Knot *Calidris canutus islandica*;
- Black-tailed godwit *Limosa limosa islandica*; and
- Redshank *Tringa totanus totanus*.
- Over 20,000 waterfowl generally.

4.3.2 The European Site Conservation Objectives for the SPA are attached at Appendix 3 and are as follows:

- *“With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the ‘Qualifying Features’...), and subject to natural change;*
- *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."*

#### 4.4 Qualifying Features – Thames Estuary and Marshes Ramsar Site

4.4.1 Of the nine criteria for the selection of Wetlands of International Importance pursuant to the Convention, the Thames Estuary and Marshes Ramsar Site qualifies under Criterion 2 for supporting rare plants and invertebrates as follows:

4.4.2 The Ramsar Site supports the endangered plant species least lettuce *Lactuca saligna*; and at least 14 nationally scarce plants of wetland habitats (annual beard grass *Polypogon monspeliensis*, Borrer's saltmarsh-grass *Puccinellia fasciculata*, bulbous foxtail *Alopecurus bulbosus*, clustered clover *Trifolium glomeratum*, divided sedge *Carex divisa*, dwarf eelgrass *Zostera noltii*, golden samphire *Inula crithmoides*, narrow-leaved eelgrass *Zostera angustifolia*, one-flowered glasswort *Salicornia pusilla*, saltmarsh goosefoot *Chenopodium chenopodioides*, sea barley *Hordeum marinum*, sea clover *Trifolium squamosum*, slender hare's-ear *Bupleurum tenuissimum*, and stiff saltmarsh-grass *Puccinellia rupestris*).

4.4.3 The site supports the endangered species *Bagous longitarsis*; eleven vulnerable species (the groundbug *Henestaris halophilus*, a weevil *Bagous cylindrus*, a ground beetle *Polystichus connexus*, a crane fly *Erioptera bivittata*, a crane fly *Limnophila pictipennis*, a horse fly *Hybomitra expollicata*, a hoverfly *Lejops vittata*, a dancefly *Poecilobothrus ducalis*, a snail-killing fly *Pteromicra leucopeza*, a solitary wasp *Philanthus triangulum* and a damselfly *Lestes dryas*) and fifteen rare species (a ground beetle *Anisodactylus poeciloides*, the water beetles *Aulacochthebius exaratus*, *Berosus fulvus*, *Cercyon bifenestratus*, *Hydrochus elongatus*, *Hydrochus ignicollis*, *Ochthebius exaratus* and *Hydrophilus piceus*, a beetle *Malachius vulneratus*, a rove beetle *Philonthus punctus*, a fungus beetle *Telmatophilus brevicollis*, a fly *Campsicnemus magius*, a horsefly *Haematopota bigoti*, a soldier fly *Stratiomys longicornis* and a spider *Baryphyma duffeyi*.)

4.4.4 In addition, the site qualifies under Criterion 5 for supporting internationally important assemblages of waterfowl (5 year peak mean 1998/99-2002/03 of 45118 waterfowl) and under Criterion 6 for internationally important numbers of the following species:

- Ringed plover *Charadrius hiaticula*;
- Black-tailed godwit *Limosa limosa islandica*;
- Grey plover *Pluvialis squatarola*;
- Knot *Calidris canutus islandica*;
- Dunlin *Calidris alpina alpina*; and
- Redshank *Tringa totanus totanus*.

4.4.5 The Ramsar information sheet is attached at Appendix 4.

#### 4.5 Functionally linked features

4.5.1 In addition to populations of species occurring within the boundaries of the Thames Estuary and Marshes SPA and Ramsar Site, there is a need to consider 'functionally linked' populations occurring beyond the designation boundaries. The need to broaden impact assessments out to consider functionally linked features is an established principle in Habitats Regulations Assessment.

- 4.5.2 In this case, the main consideration is cited species making use of (predominantly intertidal) habitats for feeding that are closer to the Tilbury 2 site than the designated SPA/Ramsar boundaries, and thereby at higher risk of exposure to identified potentially significant impacts emanating from the project site. In respect of birds, the assumption can readily be made that such species will to a greater or lesser extent form part of or at least interchange with the nationally or internationally significant numbers that underpin the SPA/Ramsar designations and thence significant effects on them (for example from displacement) even outside the designated area could give rise to indirect significant effects within the designated sites, potentially up to and including threats to the continued sustainability of the key populations and thus site integrity.
- 4.5.3 In respect of populations of cited plant and invertebrate species relevant to the Ramsar Site but outwith the designation boundary and closer to the Tilbury 2 site, interrelationship with the Ramsar Site populations cannot be assumed so readily. However, the restricted distribution of such species and their specialist habitat requirements indicate that the health of populations outside of the designated site is very likely to have at least some degree of functional linkage to the health of the populations within it (for example in performing a role in genetic flow and exchange). These extra-boundary populations thus also fall to be considered in the HRA process.

## 5 POTENTIAL IMPACT SOURCES

### 5.1 Impacts with the potential to give rise to effects within the European Sites

5.1.1 The distance between the Tilbury2 site and the nearest part of the SPA/Ramsar (foreshore adjoining Eastcourt/Shorne Marshes on the opposite (southern) side of the Thames) is just under 1.5km. The nearest near-shore component (Mucking Flats) is just over 2.4km distant. Through application of the tools and judgments described in section 4.1, this obviates the potential for direct effects on the designated site, which are consequently scoped out, and substantially reduces the scope for indirect effects. In particular the attenuating effect of this intervening distance on potential impact sources such as disturbance caused by human movement and activity, noise and lighting on the Tilbury 2 site, is significant and allows the scope for such indirect effects to impact on receptors within the European Site boundaries to be ruled out.

5.1.2 Taking this into account, the following potential impact sources are considered to be of most relevance to the HRA process in respect of the Tilbury2 project:

#### *Air quality*

5.1.3 Emissions from road and non-road traffic and shipping in and around the Tilbury2 site will disperse towards the European Site by virtue of the prevailing westerly and south-westerly wind direction. Increased shipping traffic generated by the expanded port, once operational, may also bring emissions sources closer to the European Site via shipping lanes.

#### *Sediment circulation and deposition patterns*

5.1.4 The construction of new and/or expanded marine structures and associated capital and maintenance dredging has the potential to interfere with coastal and estuarine processes, including patterns of sediment circulation, accretion and deposition. Where such processes underpin the morphology, extent and condition of habitats within the European Site such as mudflat and saltmarsh, which are important for cited bird species and other taxa, there is the potential for any changes to give rise to a significant effect.

#### *Water and/or sediment quality*

5.1.5 The construction of new and/or expanded marine structures and associated capital and maintenance dredging has the potential to influence water quality within the Thames, both in terms of suspended sediment loads and through the risk of mobilising any contaminants currently bound in sediments. Redistribution of contaminants in this way could result in contamination affecting habitats within the European Site via sediment transport and re-deposition or could increase the bioavailability (e.g. to aquatic organisms) of contaminants, causing potential effects on cited interest features further up the food chain (biomagnification) or even via direct toxicity.

#### *Disturbance – shipping*

5.1.6 Increased shipping traffic generated by the expanded port, once operational, will generate additional movements along shipping lanes proximal to the European Site and could exacerbate any current disturbing effect that shipping traffic has on cited fauna such as birds.

*Disturbance - noise and lighting*

- 5.1.7 The attenuating effect of distance means that there is assessed to be no scope for significant disturbance effects from these sources to act directly on the European Site in respect of noise generation or lighting emissions from the site itself. There is assessed to be greater potential for noise and lighting associated with increased shipping traffic along shipping lanes proximal to the European Site to affect cited fauna such as birds.

**5.2 Impacts with the potential to give rise to effects on functionally linked features**

- 5.2.1 The marine elements of the Tilbury2 project site include representations of saltmarsh and mudflat that are a continuation of habitats present within and integral to the European Site. The potential for impacts on these to have implications for the European Site lies mainly in the scope for impacts on associated fauna and flora that represent an integral part and/or extension of the populations for which the European Site is designated. Principal amongst these are wading birds and waterfowl, where they use these habitats closer to the Tilbury2 site, but also the populations of cited insect and plant taxa which may form part of or an important outlier to local metapopulations that are important for reasons such as genetic exchange and/or providing a failsafe against localised extinctions.
- 5.2.2 Taking the above into account, the following potential impact sources are considered to be of most relevance to assessing whether LSE on the European Site are possible via effects on functionally linked habitats or species:

*Habitat loss*

- 5.2.3 Any loss of saltmarsh or intertidal mudflat habitat would denude the local extent within and around the European Site and may have implications for carrying capacity and/or pressure on the surviving examples within the European Site.

*Air quality*

- 5.2.4 Atmospheric pollution from road and non-road traffic and shipping in and around the Tilbury2 site could impinge on functionally linked habitat resources through deposition and interference with the nutrient balance of (e.g.) upper saltmarsh and coastal grazing marsh. Factors such as tidal wash are likely to militate against deposition on mudflats or regularly inundated habitat features.

*Sediment circulation and deposition patterns*

- 5.2.5 The construction of new and/or expanded marine structures and associated capital and maintenance dredging has the potential to interfere with coastal and estuarine processes, including patterns of sediment circulation, accretion and deposition close to the Tilbury2 site where it could affect the morphology, extent and condition of saltmarsh and mudflat habitats that are functionally linked to the European Site.

*Water and sediment quality*

- 5.2.6 The construction of new and/or expanded marine structures and associated capital and maintenance dredging has the potential to influence water quality local to the works, both in

terms of suspended sediment loads (albeit within a system characterised by high levels of suspended sediment) or more particularly through the risk of mobilising any contaminants currently bound in benthic sediments. Mobilisation and redistribution of contaminants in this way could result in contamination of intertidal habitats proximal to the Tilbury2 site or could increase the bioavailability (e.g. to aquatic organisms) of contaminants, causing potential effects on cited interest features further up the food chain (biomagnification) or even via direct toxicity.

*Disturbance - shipping*

- 5.2.7 Shipping activity concentrated around the jetty area may have a disturbing affect on the bird species that feed on nearby intertidal habitats, and where such species form part of the wider populations underpinning the European Site, there is a potential vector for indirect significant effects.

*Disturbance - noise and lighting*

- 5.2.8 Noise and lighting associated with the construction and operation of marine structures, and to a lesser extent the landward elements of the Tilbury2 site, may have a disturbing affect on bird species using nearby intertidal habitats, and where such species form part of the wider populations underpinning the European Site, there is a potential vector for indirect significant effects.

*Disturbance – visual/human activity*

- 5.2.9 Disturbance triggered by human presence and/or movement associated with the construction and operation of marine structures, and to a lesser extent the landward elements of the Tilbury2 site, may have a disturbing affect on bird species feeding on nearby intertidal habitats, and where such species form part of the wider populations underpinning the European Site, there is a potential vector for indirect significant effects.

**5.3 Cumulative impacts**

- 5.3.1 Table 2.2 of the Environmental Statement lists future consented or planned development projects that have been considered in the assessment of cumulative effects. The location of these relative to both the Tilbury2 site and the Thames Estuary and Marshes SPA/Ramsar is indicated on Figure 2.1 of the ES. Paragraphs 2.40 to 2.45 of the ES describe how these have been identified, and paragraphs 2.47-2.63 explain how certain other projects (for example the Lower Thames Crossing) have been excluded from consideration taking account of PINS guidance and because they are such a nascent stage.

- 5.3.2 The projects defined on Table 2.2 of the ES, when acting in concert with the Tilbury2 development, have the potential to give rise to additive or synergistic effects on the Thames Estuary environment, including the Thames Estuary and Marshes SPA/Ramsar Site. Additive or synergistic effects could arise from additional shipping movements (and related disturbance and air quality impacts), from individually low magnitude additive or synergistic effects on estuarine processes such as sediment circulation (e.g. arising from refurbishment of multiple marine structures and associated capital and maintenance dredging), with consequences for intertidal habitats within or functionally related to the European Site designations and related risks from mobilisation of polluted sediments.



#### **5.4 Impacts from decommissioning**

- 5.4.1 The Tilbury 2 project is for a permanent form of development and no decommissioning is envisaged. Potential impacts arising from decommissioning have not therefore been considered in this HRA report.

## **6 ASSESSMENT**

### **6.1 Stage 1 Screening Matrices**

- 6.1.1 Appendix 5 contains the completed Stage 1 screening matrices for the Thames Estuary and Marshes SPA and Ramsar Site, adopting the format set out in PINS Advice Note 10<sup>11</sup>
- 6.1.2 The disparate sources of potentially significant effects have been compressed into a number of broad categories in line with the approach recommended in Advice Note 10.

### **6.2 Conclusions of Stage 1 assessment**

- 6.2.1 The conclusions of the Stage 1 assessment are that there are no likely significant effects on the SPA or Ramsar Site arising as a consequence of the project, either independently, or considered cumulatively with effects arising from other known or planned projects. The reasons for this conclusion are summarised in section 7 overleaf.

### **6.3 Stage 2, 3 & 4 assessments**

- 6.3.1 As the potential for LSE has been screened out at Stage 1, there is no need to progress to Stages 2, 3 and 4 of the HRA process.

### **6.4 Further Consultation**

- 6.4.1 Natural England have responded to an initial draft of this HRA report and further consultation and discussion with them is continuing through the Statement of Common Ground process with the objective of reaching a position of agreement on the conclusions reached.

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<sup>11</sup> The Planning Inspectorate (January 2016): Advice Note 10: Habitats Regulations Assessment relevant to nationally significant infrastructure projects (version 7). Accessed October 2017.

## 7 OVERALL CONCLUSIONS

### 7.1 Potential for LSE via indirect effects manifesting within the European Site

- 7.1.1 The distance between the Tilbury2 site and the nearest part of the SPA/Ramsar (the designations being coterminous at that point) at Eastcourt/Shorne Marshes on the opposite (southern) side of the Thames is just under 1.5km. The nearest near-shore component (Mucking Flats) is just over 2.4km. These areas are, furthermore, the westernmost extremity of both the SPA and Ramsar Site, which cover 4,838.94 and 5,588.59 ha respectively extending eastward from these points up to 24km distant at Grain. The vast majority of both the SPA and Ramsar Site is therefore >3km removed from the Tilbury2 site. Such distances alone militate against LSE on qualifying bird species using the SPA/Ramsar Site from potential disturbance factors such as **human activity, lighting and noise**, whether arising during the construction or operational phases. Supporting evidence in respect of lighting is provided in the form of the Lux contour modelling provided in the Lighting Strategy (ES Appendix 9.J). The potential magnitude of change in noise generation as compared to the baseline position is assessed in ES Chapter 17 and the outputs of that assessment are considered in terms of implications for ecological receptors in Chapter 10. Peak or mean (i.e. 24hr) noise in excess of 55DB is not predicted to be experienced at distances in excess of 300m from the site for most construction or operational activities, with the exception of construction-phase jetty piling and dredging and pavement construction. The foremost of these could see noise levels of 63dB at 300m from source with the latter having the potential to slightly exceed the 55dB level at 300m (ES Chapter 17 Table 17.22). These data indicate that noise levels during construction would not be sufficient to elicit any behavioural responses in birds at the nearest point of the SPA/Ramsar Site. Reference to the Waterbird Disturbance Mitigation (TIDE) toolkit<sup>12</sup> supports the conclusion that human activity at this range is well beyond the range likely to elicit any behavioural responses in birds within the European Site.
- 7.1.2 Some increase in potential for LSE from disturbance during operation is associated with the predicted 11% uplift in shipping traffic generated by the operational port, as these increased vessel movements will occur along a broad (c.24km) interface with the SPA and Ramsar Site, albeit that the navigable channel is typically >200m from the SPA/Ramsar Site boundary. Increased port-related shipping movements along the Thames bring with them some scope for increased disturbance from noise, lighting and related visual disturbance caused by the movement of vessels *per se*. Because the majority of these vessels will be large, with a corresponding large draught, such potential impact sources will necessarily be along predictable mid-channel paths that are relatively remote (e.g. >200m) from intertidal habitats. These movements will, furthermore, be experienced by avian receptors against a backdrop of existing regular traffic of large, similarly distant vessels. They are therefore considered likely to represent an imperceptible increase in disturbance in the context of existing levels of habituation.
- 7.1.3 Based on the outputs of impact assessments reported on within and in the appendices to ES Chapters 11 (marine ecology) and 16 (water resources and flood risk), in particular the outputs from the hydrodynamic modelling study at appendix 16.D, and taking account of construction and operational restrictions contained within the CEMP and/or volunteered as part of the DML/DCO, there is assessed to be no scope for significant changes to baseline sediment circulation (erosion and deposition) regimes within the SPA/Ramsar Site boundary arising as a consequence of marine works and dredging, during either the construction or operational phase.

<sup>12</sup> Accessed October 2017 from [http://www.tide-toolbox.eu/tidetools/waterbird\\_disturbance\\_mitigation\\_toolkit/](http://www.tide-toolbox.eu/tidetools/waterbird_disturbance_mitigation_toolkit/)

- 7.1.4 Based on the outputs of impact assessments reported on within and in the appendices to ES Chapters 11 (marine ecology) and 16 (water resources and flood risk – including the Water Framework Directive Assessment at Appendix 16.B and the Hydrodynamic Modelling Study at Appendix 16.D), and taking account of construction and operational restrictions contained within the Construction Environmental Management Plan (CEMP) and/or volunteered through the Deemed Marine Licence/Development Consent Order, there is assessed to be no scope for significant changes to baseline sediment circulation (erosion and deposition) regimes within the SPA/Ramsar Site boundary arising as a consequence of marine works and dredging, during either the construction or operational phase. Of the two capital dredging scenarios assessed (namely backhoe dredge and disposal, and dispersal dredging by water injection (WID)), the latter has the potential to give rise to very minor, highly localised and temporary increases in sediment deposition within the intertidal areas of the SPA/Ramsar Site (ES Appendix 16.D). The favoured method of maintenance dredging is proposed to be by means of Water Injection Dredging (WID) limited to ebb tide periods outside of the months of June to August through conditions which would be imposed on the DML. The sediment plumes from all these dredging scenarios have been modelled and increases in subtidal deposition are predicted to be localised, and generally low in magnitude (<2mm) for each capital or maintenance dredging event (ES Appendix 16.D). The study concludes that the proposed reliance on WID for most dredging operations means that displaced sediments will mostly disperse and redeposit within the sub-tidal zone, with very limited potential for increases in deposition on the intertidal areas. The study further concludes that the variations experienced in the Thames sediment budget will be within the range of annual fluctuations in this part of the Thames (ES Appendix 16.D section 7.3.3). On the basis of such conclusions, significant effects on sediment circulation regimes within the downstream SPA/Ramsar Site are not predicted and no risk to the quality and availability of intertidal habitats for cited SPA or Ramsar Site species is predicted.
- 7.1.5 Localised elevated concentrations of PAHs including perylene, pyrene and fluoranthene and of metals including Arsenic, Chromium and Nickel have been found in samples of sediment around the existing Tilbury2 jetty and (in particular) the approach channel to it (ES Appendix 11.C). This is not unusual for Thames Estuary sediments. The contaminants of concern in this case generally have low solubility and where mobilised will mostly remain adsorbed onto sediment particles. This reduces the potential for contamination of the water column, but could pose a risk to sediment dwelling organisms where these substances are re-deposited at high concentrations. The risk to marine and estuarine biota is assessed in ES Chapter 11. Risk to higher trophic orders, including SPA and Ramsar Site cited fauna is mainly possible through these substances becoming directly bio-available in re-distributed sediments and or from biomagnification through the food chain, although the risks from biomagnification in the case of PAHs are ameliorated due to the greater capacity of higher organisms to metabolise PAHs. An assessment of the risks of significantly contaminated sediments around the Tilbury 2 jetty being redistributed onto intertidal habitats associated with the SPA and Ramsar Site is reported at ES Appendix 16.D, section 6, focusing on the PAH perylene. It assesses its risk to the marine environment and the likelihood of its dispersion based on its solubility between the sediments, water and biota. This assessment indicates that perylene mobilised during dredging operations has a very low risk of becoming available to SPA/Ramsar cited species, with in particular a very low risk of significant deposition onto intertidal areas both proximal to the Tilbury2 jetty and within the SPA/Ramsar Site further afield. Other contaminants adsorbed to sediments will follow a similar dispersion pathway and therefore the risk of significant effects from mobilisation of other PAHs and metals observed at elevated levels in the samples is assumed to be equivalent or less than for perylene. Notwithstanding this low risk, restrictions adopted through the DML/DCO for the project and/or

attached to future related consents will further obviate the scope for LSE, through the adoption of non-dispersive capital dredging methods (e.g. backhoe dredging) for areas of the approach channel that are confirmed (e.g. by existing or future further surveys) to be appreciably contaminated with PAHs or other contaminants. The disposal of arisings from this operation will be to an appropriate licensed contaminated sediment treatment site to be defined in line with the relevant consenting procedures. Such measures are assessed to obviate the scope for LSE on SPA/Ramsar Site features from mobilisation of contaminated sediments associated with dredging activities.

- 7.1.6 In respect of air quality, the main road and rail emissions sources from the project are >2km from the SPA/Ramsar: a distance which rules out LSE by reference to Defra guidance (ES Chapter 18). Emissions of NO<sub>x</sub> and SO<sub>2</sub> from the proposed 11% increase in vessel traffic on the Thames arising from the operation of Tilbury2 have been modelled against baseline (background) levels, as set out in Appendix 6 of this HRA report. The results indicate that increases in atmospheric levels and/or deposition loads of both NO<sub>x</sub> and SO<sub>2</sub> on habitats within the SPA/Ramsar Site boundary will be negligible (in both peak and mean scenarios resulting in all instances in increases of less than a tenth of 1% compared with baseline levels) and will not result in accepted critical loads for saltmarsh, mudflat or coastal grazing marsh habitat<sup>13</sup> being exceeded. The increments as seen in that report are so small that this assessment holds even when considered in combination with other projects. Consequently no LSE is predicted on the extent, stability or quality of habitats within the SPA and integral to the support of the avian features of the SPA and the avian, plant and invertebrate interest features of the Ramsar Site.

## 7.2 Potential for LSE via direct or indirect effects on ‘functionally linked’ habitats and species

- 7.2.1 Several of the bird species underpinning the European Site designations make use of intertidal habitats in closer proximity to the Tilbury2 site than the European Site itself. Most such use is for feeding by low numbers of individuals such as redshank and no significant high tide roosts were found within the Order limits or the wider study area indicated at ES figure 10.12. Nevertheless, these individuals will in most cases be part of the local wintering or passage population that forms the qualifying feature. In all cases, significantly less than 1% of the SPA/Ramsar Site population is involved in use of intertidal habitats within this envelope by SPA/Ramsar Site species in the baseline state (ES Chapter 10), and taking into account the type of use (e.g. no high tide roosting), and the likely spatial and temporal extent of potential disturbance, based on outputs from noise and vibration predictions (ES Chapter 17) and predicted Lux contours based on the Lighting Strategy (ES appendix 9.J), there is not assessed to be any scope for LSE on the SPA/Ramsar Site.
- 7.2.2 Taking account of construction and operational restrictions contained within the CEMP and/or volunteered as part of the DML/DCO, there is assessed to be no scope for significant changes to baseline sediment circulation (erosion and deposition) regimes on near-shore intertidal habitats within 1.6km of the new jetty. Deposition of sediments mobilised by backhoe and/or water injection dredging is predicted to give rise to additional deposition in excess of 1mm and up to 5mm in localised areas within this zone as compared with the baseline situation and depending on the tidal state during which such operations are carried out (ES Appendix 16.D). Such changes

<sup>13</sup> By reference to the Air Pollution Information System website <http://www.apis.ac.uk/> (accessed October 2017) and adopting the approach set out in Jones (*et al*) (2016) *A decision framework to attribute atmospheric nitrogen deposition as a threat to or cause of unfavourable habitat condition on protected sites*. JNCC report no 579 [accessed via <http://jncc.defra.gov.uk/page-6272> October 2017]

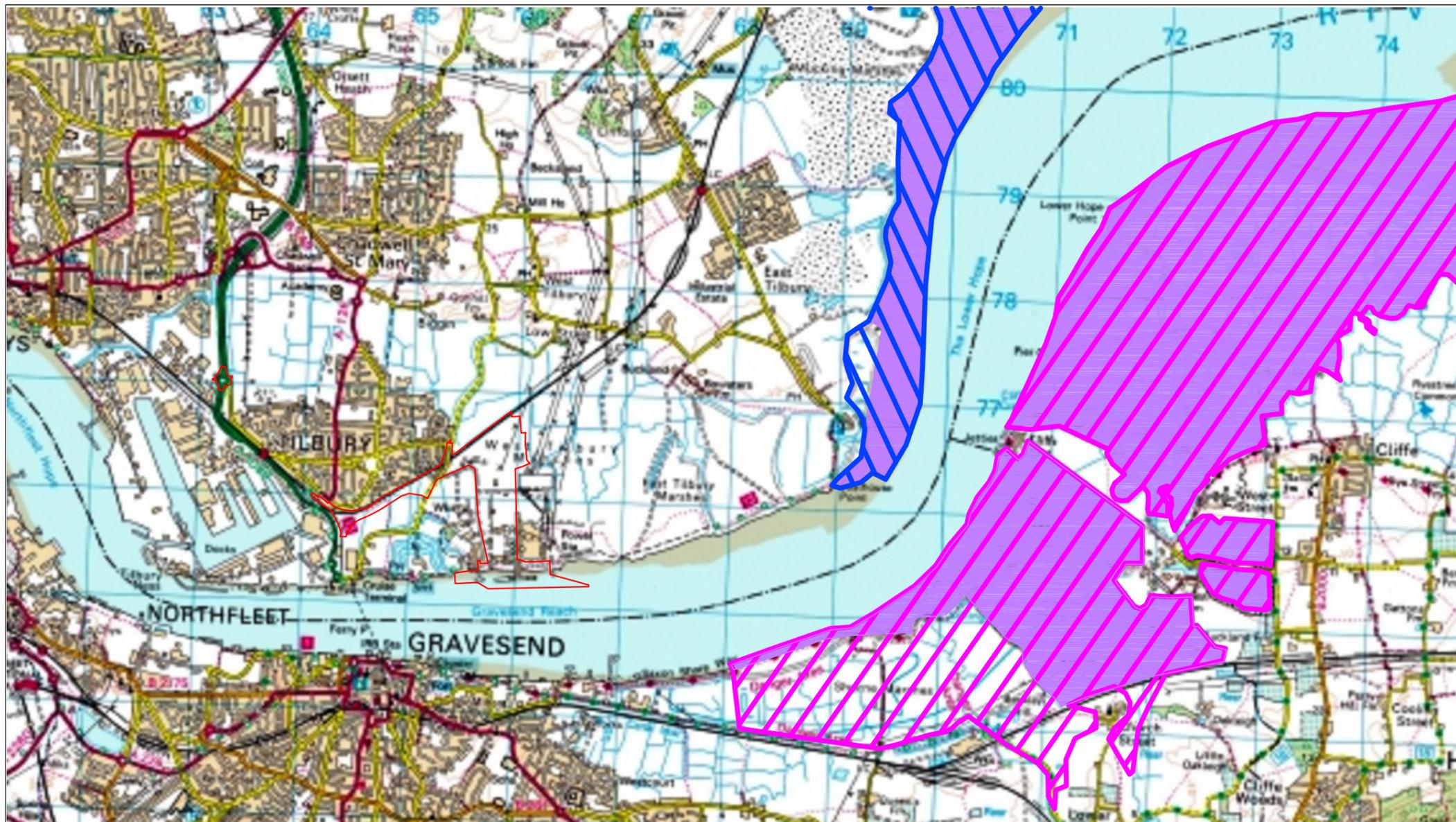
are unlikely to impinge on the extent, stability or quality of any saltmarsh habitats, but could affect intertidal mud habitats used by SPA interest features and therefore functionally-linked to the maintenance of the populations underpinning the European Site. In comparison with baseline conditions and the variability in sediment budgets within them, as discussed within ES Appendix 16.D, such effects are not likely to be significant in respect of the European Site.

- 7.2.3 Similarly, the risk to functionally linked habitats close to the Tilbury2 jetty from pollution from contaminants mobilised by construction or dredging works is constrained by restrictions adopted as part of the DML/DCO for the project and/or attached to future related consents, including the adoption of non-dispersive capital dredging methods (e.g. backhoe dredging) for areas of the approach channel that are confirmed (e.g. by existing or future further surveys) to be appreciably contaminated with PAHs or other contaminants. The disposal of arisings from this operation will be to an appropriate licensed contaminated sediment treatment site to be defined in line with the relevant consenting procedures. Such measures are assessed to obviate the scope for LSE on SPA/Ramsar Site features from mobilisation of contaminated sediments associated with dredging activities.
- 7.2.4 Increases in atmospheric levels and/or deposition loads of both NO<sub>x</sub> and SO<sub>2</sub> on intertidal habitats proximal to the Tilbury2 site and that have a significant supporting function to the SPA/Ramsar Site will be negligible, by comparison with existing elevated baseline levels (ES Chapter 18 and appendix 6 to this HRA). Emissions from operation of the port may give rise to significant increments above baseline NO<sub>x</sub> levels in close proximity to (e.g. <30m from) to the jetty, however in no instance is it predicted that critical loads of sensitive habitats will be exceeded and deposition effects may be obviated in any event due to the amelioration effects of tidal wash and/or absence of significant attendant SO<sub>2</sub>. Consequently no LSE is predicted on the extent, stability or quality of habitats outside of but functionally linked to the SPA and Ramsar Site and integral to the support of the avian features of the SPA and the avian, plant and invertebrate interest features of the Ramsar Site.
- 7.2.5 Lighting effects could give rise to physiological responses in potentially linked populations of Criterion 2 species in intertidal habitats close to the jetty, however of the fifteen nationally rare or scarce plant species cited in the Ramsar Information Sheet, only three have been recorded on the Tilbury2 site and only one of these (Golden Samphire) in intertidal habitats potentially at risk of lighting effects (further details in Chapter 10 of the ES). The location where this species grows will have been subject to light spill effects from past operational phases of the jetty (when the power station was active) and there is no evidence that this influenced the distribution or vigour of the colony. Of the twenty-seven Ramsar-cited invertebrate species, at least seven have previously been recorded within or in the immediate environs of the Tilbury2 site (ES Chapter 10). In respect of habitat loss, a combination of on-site and geographically relevant off-site compensation is proposed to ensure no net loss of Thames Estuary grazing marsh habitats and associated ditch systems of value to species such as *Lestes dryas*, *Stratiomys longicornis*, *Haematopota bigoti*, *Aulacochthebius exaratus* and *Anisodactylus poeciloides* occurs as a consequence of the project, as reported on in Chapter 10 of the ES. This should ensure no effect on the Ramsar populations by virtue of any functional linkage. For saltmarsh species such as *Malachius vulneratus*, the retention of coastal saltmarsh habitats and the low scope for any change to their supporting processes should ensure no significant effect from habitat loss, and such species are not assessed to be at risk of significant impacts from lighting, noise, dust and other emissions given their co-existence with the active power station and its operational jetty in the past.

### **7.3 Potential for LSE via cumulative effects**

7.3.1 While there is theoretically the potential for effects rendered non-significant for the reasons discussed above, to become significant when considered cumulatively with impacts arising from other known or planned projects, various factors militate against the possibility of these translating to LSE on the European Site. The primary factor is the low residual magnitude of change generated by the Tilbury2 project, once the embedded and additional mitigation measures described in the ES are taken into account. Where the residual change is more significant (e.g. the predicted 11% uplift in shipping movements generated by the project) various factors militate against the possibility of such change giving rise to LSE. For example, the requirements of navigational safety and the practical limitations of the river's morphology are assessed as likely to militate against large vessel traffic ever achieving a level where it poses a disturbance threat to bird use of intertidal habitats within or functionally linked to the European Site. This is in large part due to the requirement for larger vessels to remain within the maintained navigable channel in the central part of the river most remote (>200m) from such habitats. The potential for significant air quality deterioration arising from the cumulative effect of such uplift might be more significant were there no counterfactual improvements predicted (and being realised incipiently) from improvements in emissions standards, including specifically within the Thames Estuary (ES Chapter 18 and appendix 6 of this HRA). Cumulative (additive or synergistic) low magnitude effects on estuarine processes (including sediment circulation) that support intertidal habitats and related designations are also possible from refurbishment of marine structures and/or capital and maintenance dredging associated with other projects in other parts of the river. However the potential disruptive influence on such processes of the Tilbury2 project has been shown to be negligible and therefore significant cumulative effects are not likely regardless of the magnitude of effects arising elsewhere. Furthermore such projects would be subject to their own controls through their own marine licences and river works licences. Similarly, the adoption of measures to prevent significant mobilisation of polluted sediments leaves a negligible potential contribution to any cumulative effects arising from other marine works projects and dredging activities.

**FIGURE 1**



- ORDER LIMITS
- THAMES ESTUARY & MARSHES SPA/RAMSAR SITE
- SOUTH THAMES ESTUARY & MARSHES SSSI
- MUCKING FLATS & MARSHES SSSI



REV	DATE	DESCRIPTION
DRAWING TITLE		
SITE LOCATION RELATIVE TO EUROPEAN SITES		

SCALE	DRAWN	BC	<b>FIG. 1</b>
NOT TO SCALE			
DATE	CHECKED	DW	
SEPT 2017			



## **APPENDIX 1**

Date: 28 July 2017  
Our ref: 218441 Tilbury2 Port Expansion (Thurrock)  
Your ref:



Peter Ward,  
TILBURY2 Project, Port of Tilbury,  
Leslie Ford House, TILBURY,  
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T 0300 060 3900

Dear Mr Ward

**Consultation: Expansion of the Port of Tilbury – “Tilbury2”. Statutory Consultation on a Proposed Application for Development. Section 42 Planning Act 2008.  
Location: Former Tilbury Power Station, Thurrock**

Thank you for your consultation on the above dated the 16<sup>th</sup> June 2017 which was received by Natural England on the same date via email.

Natural England is a non-departmental public body. Our statutory purpose is to ensure that the natural environment is conserved, enhanced, and managed for the benefit of present and future generations, thereby contributing to sustainable development.

We understand that you are consulting us in line with paragraph 67 of the Planning Act 2008 “Guidance on pre-application consultation”, and that further consultation may be required in line with paragraph 85, particularly when the draft Environmental Statement has been prepared. We also appreciate that this consultation under S42 of the Planning Act 2008 also encompasses consultation on the preliminary environmental information, and that some overlap exists between these various requirements. Natural England welcomes both formal and informal pre application consultation and refers you to our annex C to the NID advice note 11.

Natural England has previously provided advice on this proposal through our Discretionary Advice Service (DAS) at a meeting on the 22<sup>nd</sup> March 2017 (our ref: 11835/209261) and through our response to the Environmental Impact Assessment Scoping Consultation dated the 25<sup>th</sup> April 2017 (our ref: 211894).

Natural England remains concerned that *“there is likely to be a net negative residual effect on the local and wider ecological resource during construction”* as stated in paragraph 10.292 of the Preliminary Environmental Information Report (PEIR) and that *“in an optimistic scenario” the aspiration is for “something close to a net neutral effect on local and regional biodiversity in perhaps ten or 15 years.”*

Paragraph 3.3.3 of National Planning Statement (NPS) for Ports requires that new development should *“preserve, protect and where possible improve marine and terrestrial biodiversity”* and *“provide high standards of protection for the natural environment.”* We advise that this paragraphs 10.292 and 10.293 should be seeking to achieve an aspiration of net environmental gain.

**Nationally and Internationally Designated Sites**

Natural England acknowledges the list of sites presented in *‘Table 10.23 Statutory nature conservation designations within 5km of the Site’* and agrees the sites selected in the following paragraphs as being most likely to impacted is appropriate.

It is noted in paragraph 10.7 that a *“shadow Habitats Regulation Assessment (HRA) document will*

be produced to accompany the Environmental Statement with sufficient information to enable the relevant competent authority/s to assess the likelihood of any potential effects on European Sites being significant.” HRA should be considered an iterative process which should be carried out at the earliest available opportunity so that its findings can be used to inform site design.

Natural England notes that further assessment is required regarding indirect impacts on Nationally and Internationally designated sites with full consideration of effects alone and ‘in combination’ with other plans and/or projects. We agree that this assessment will need to consider the impacts of net increases in shipping patterns and potential cumulatively significant changes to estuarine processes that support the condition of intertidal habitats. It should also consider impacts on mobile species especially given that the Thames Estuary and Marshes Special Protection Area (SPA) feature birds have been identified using the intertidal mudflats within the application site boundary and adjacent areas. Further to this we advise that a full survey season for over-wintering birds needs to include September through to the end March. We would expect to see the full overwintering bird report with the Environmental Statement so that it can be properly assessed.

### **Invertebrates**

Natural England was directly provided with the “Land Adjacent to Tilbury Power Station, Essex: Invertebrate Survey Report (November 2016)” on the 20<sup>th</sup> July 2017 and notes that it is still not available on the website for general public viewing.

The report confirms the findings of earlier reports; that the site is of high intrinsic importance to invertebrate ecology and forms an integral part of the “*wider area of interest that has become known as the East Thames Corridor, within which there is an outstanding community of invertebrates that is of profound national value.*” The number and diversity of rare invertebrate species is considerable and I refer to section 5.8 of the 2008 report, which states ‘*It is unequivocally clear that Tilbury Power Station supports an invertebrate assemblage that is outstandingly significant at a national (British Isles) level; almost no other site in Britain that has been afforded an equivalent level of appropriate survey supports such a high number of UK Biodiversity Action Plan species*’ The significance of the Thames Terrace Invertebrates is recognised within Natural England’s Thames Estuary and Marshes Focus Area.

Natural England notes from paragraph 10.281 and our previous DAS meeting that the applicant is keen to identify an offsite solution to compensate for the loss of these high value ecological areas. Whilst Natural England acknowledges that creative solutions may be necessary to achieve sustainable development solutions, we advise that it is important to follow the sequential processes of EIA and IEEEM principles to adequately assess the environmental assets and the significance of the impacts on these assets, considering alternatives, avoidance, mitigation and compensation for residual impacts. This would be consistent with paragraph 3.3.3 of the NPS for Ports, which states that new port infrastructure should preserve and protect biodiversity and provide high standards of environmental protection.

Paragraph 5.1.14 also advises that the decision-maker should give due consideration to local designations even if they should not be used in themselves to refuse development. Natural England is not yet satisfied of the need to destroy these significant environmental assets.

Details of mitigation measures and compensation sites are not yet available. We are aware that the applicant wishes to discuss these with us and will be engaging further in the near future.

### **Protected Species and biodiversity**

Planning Policy Statement 9 – ‘*Biodiversity and Geological Conservation*’ sets out the key principles of national planning policy. These include the principle that planning decisions should aim to maintain and enhance, restore or add to biodiversity and that opportunities for the incorporation of beneficial biodiversity within the design of development should be promoted. The companion ‘Guide to Good Practice’, published by the Government in 2006, reinforces these principles. It emphasises how “*The design, layout and landscaping of new developments offer enormous opportunities to add to, or enhance, biodiversity.*” It recognises that “*major new areas of biodiversity habitat alongside development*” can be provided. It also points out that “*Major development due to its scale and*

*demand on resources can have both the greatest impact on and provide the greatest benefits to biodiversity”.*

The terrestrial land within the site is shown to provide a mosaic of habitats supporting a number of rare and declining birds, including turtledove, nightingale and cetti's warbler and protected species including water vole and reptiles. In addition to this, the application site supports a significant number of nationally scarce or near threatened vascular plants, that collectively may be regarded as an outstanding vascular plant assemblage.

Natural England considers that the project should include all aspects of its mitigation, compensation and enhancement proposals for biodiversity, irrespective of the requirements of the international and national wildlife legislation which may also apply in this case. The site layout plans appear to show the development proceeding without having secured and integrated all counter-acting measures for habitat and species protection and lacking proposals for enhancement.

The area subject to development, even as a busy industrial port, can offer opportunities for conservation and enhancement which, together with land provided to offset the effects on habitats and species on the site, can help to maintain and improve green corridors, networks and habitat links to the wider environment. Substantial areas will need to be secured and incorporated into the master planning for the development site to offset the potential harm to wildlife species and habitats. Natural England advises that this development should be brought forward with all aspects of its proposals fully considered and thoroughly integrated, as part of the iterative processes of good design and environmental assessment.

Natural England also understands letters of no impediment will be sought for species licencing with regard to protected species. Our licencing team is aware and will engage further through our Discretionary Advice Service.

### **Protected Landscapes – North Kent Downs Area of Outstanding Natural Beauty (AONB)**

The proposed development is for a site approximately 4.6km from a nationally designated landscape namely North Kent Downs AONB. Natural England advises that the relevant AONB Conservation Board should be consulted. Their knowledge of the site and its wider landscape setting, together with the aims and objectives of the AONB's statutory management plan, will be a valuable contribution to the planning decision.

### **Marine Ecology**

Paragraph 11.2 advises that *“ongoing maintenance dredging will be required.”* Proposed methodology, quantity and frequency of maintenance should be provided so that impacts of this may be properly assessed. Regarding 11.3, where it is stated that *“the fate of dredging materials is yet to be determined,”* Natural England would encourage the beneficial re-use of sediments. The quantity of dredge material anticipated should also be provided.

Paragraph 11.5 – Natural England welcomes the proposed data collection and surveys for the marine environment which will provide evidence to support conclusions made. Natural England will be able to provide further comments once the Environmental Statement has been updated following the survey results.

Table 11.1: Marine and Coastal Access Act - Natural England welcomes the inclusion of the Thames Estuary recommended Marine Conservation Zone (rMCZ) and the separate Marine Conservation Zone (MCZ) assessment provided particularly the information on smelt as a migratory feature of the rMCZ. We note that the applicants have used information as provided in the Thames Estuary rMCZ factsheet available on the Wildlife Trust website. For your information the former Thames Estuary rMCZ has now been split into two separate sites; the first (Upper) stretches from Richmond Bridge to Battersea Bridge and the second (Lower) stretches from The Queen Elizabeth II Bridge to Columbia Wharf/Grays respectively.

The Upper Thames Estuary rMCZ is proposed as it is an important area for Smelt (*Osmerus eperlanus*). The boundary of the lower site, Swanscombe rMCZ, has been determined to fit more

closely around records of the tentacled lagoon-worm (*Alkmaria romijni*) for which there is currently considered to be a gap in the ecological network.

This information is in draft status only and forms part of our scientific advice on the sites that are under consideration for Tranche 3. Defra will make decisions regarding which sites and which features will go forward to a public consultation. These sites are not currently a material consideration, but the sites and features that are put forward to consultation will become a material consideration at that stage.

The Thames Estuary rMCZ was last consulted on in 2012/13

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/82726/mcz-annex-a3-121213.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82726/mcz-annex-a3-121213.pdf).

Please note that the last consultation does not necessarily reflect what will be put forward should the site go to public consultation as part of tranche 3. The features last consulted on are listed below:

Broad scale habitats -

- Intertidal sand and muddy sand
- Intertidal mixed sediment
- Subtidal coarse sediment
- Subtidal sand
- Subtidal mud

Habitat Features of Conservation Importance (FOCI) -

- Sheltered muddy gravels

Species FOCI (low mobility) -

- Tentacled lagoon worm (*Alkmaria romijni*). N.B. intertidal mud is a supporting habitat of this species.

Species FOCI (high mobility) -

- European eel (*Anguilla Anguilla*) NB- eel is no longer considered a suitable feature for designation within an MCZ
- Smelt (*Osmerus eperlanus*)

Paragraph 11.35 - Natural England welcomes the proposed survey work for tentacled lagoon to understand whether this protected species is present in the vicinity of the works. We advise that the applicants should demonstrate within the Environmental Statement that the impacts of the proposal are considered for tentacled lagoon worm under both aspects of legislation which protects this species.

Tentacled lagoon worm is a species listed under schedule 5 (9a) of the Wildlife and Countryside Act 1981 (as amended) and protection concerns the habitat of the species, any act that causes habitat disturbance would be considered an offence under this legislation.

The applicant must ensure to be compliant with the legislation when carrying out the proposed works. The Marine and Coastal Access Act (2009) concerns the population of the species and therefore the applicants must demonstrate that the conservation objectives for the population of the worm are not hindered by the proposal. We note that this has been provided within the MCZ assessment in Appendix 11A.

Paragraph 11.27 – Natural England welcomes the proposed additional benthic survey work which will provide evidence to support conclusions made. Natural England will be able to provide further comments once the Environmental Statement has been updated following the survey results.

Table 11.17 – Nustar Jetty. The dredge has been included within the table of cumulative impacts

however the jetty extension has not been included. (Marine Management Organisation application reference MLA/2017/00110).

**Hydrology, Air Quality, Noise and Vibration**

We would expect the Environmental Statement to consider the impacts of hydrological change, surface water runoff and contaminates on nearby designated sites, SPA and SSSI mobile species that utilise the site and/or surrounding area and on biodiversity retained on site. This should also be considered through the Habitats Regulations Assessment where appropriate.

If you have any queries relating to the advice in this letter please contact me on 020 802 61025

Yours sincerely,

Mr Jamie Melvin  
Planning Lead Adviser - West Anglia

## APPENDIX 2

JNCC is a statutory adviser to UK Government and devolved administrations



[Home](#) > [UK](#) > [UK Protected Sites](#) > [Special Protection Areas](#) > [SPA Reviews](#) > [Second Review](#) > SPA Review site accounts

## SPA description

(information as published 2001)

### Thames Estuary and Marshes



Country	England
Unitary Authority	Medway, Thurrock, Kent
SPA status	Classified 31/03/2000
Latitude	51 29 08 N
Longitude	00 35 47 E
SPA EU code	UK9012021
Area (ha)	4838.94
Component SSSI/ASSIs	Mucking Flats and Marshes South Thames Estuary and Marshes

The Thames Estuary and Marshes SPA is located on the south side of the Thames Estuary in southern England. The marshes extend for about 15 km along the south side of the estuary and also include intertidal areas on the north side of the estuary. To the south of the river, much of the area is brackish grazing marsh, although some of this has been converted to arable use. At Cliffe, there are flooded clay and chalk pits, some of which have been infilled with dredgings. Outside the sea wall, there is a small extent of saltmarsh and broad intertidal mud-flats. The estuary and adjacent grazing marsh areas support an important assemblage of wintering waterbirds including grebes, geese, ducks and waders. The site is also important in spring and autumn migration periods.

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#### Qualifying species

For individual species accounts visit the [Species Accounts section](#)

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This site qualifies under **Article 4.1** of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

**Over winter;**

Avocet *Recurvirostra avosetta*, 276 individuals representing at least 21.7% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)

Hen Harrier *Circus cyaneus*, 7 individuals representing at least 0.9% of the wintering population in Great Britain (5 year mean 93/4-97/8)

This site also qualifies under **Article 4.2** of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

**On passage;**

Ringed Plover *Charadrius hiaticula*, 559 individuals representing at least 1.1% of the Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6)

**Over winter;**

Ringed Plover *Charadrius hiaticula*, 541 individuals representing at least 1.1% of the wintering Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6)

**Assemblage qualification: A wetland of international importance.**

The area qualifies under **Article 4.2** of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl

Over winter, the area regularly supports 33,433 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: Redshank *Tringa totanus*, Black-tailed Godwit *Limosa limosa islandica*, Dunlin *Calidris alpina alpina*, Lapwing *Vanellus vanellus*, Grey Plover *Pluvialis squatarola*, Shoveler *Anas clypeata*, Pintail *Anas acuta*, Gadwall *Anas strepera*, Shelduck *Tadorna tadorna*, White-fronted Goose *Anser albifrons albifrons*, Little Grebe *Tachybaptus ruficollis*, Ringed Plover *Charadrius hiaticula*, Avocet *Recurvirostra avosetta*, Whimbrel *Numenius phaeopus*.

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**Note:**

*Many designated sites are on private land: the listing of a site in these pages does not imply any right of public access.*

Note that sites selected for waterbird species on the basis of their occurrence in the breeding, passage or winter periods also provide legal protection for these species when they occur at other times of the year.

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## **APPENDIX 3**



## European Site Conservation Objectives for Thames Estuary and Marshes Special Protection Area Site Code: UK9012021

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

**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.**

This document should be read in conjunction with the accompanying *Supplementary Advice* document, which provides more detailed advice and information to enable the application and achievement of the Objectives set out above.

### **Qualifying Features:**

- A082 *Circus cyaneus*; Hen harrier (Non-breeding)
  - A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
  - A137 *Charadrius hiaticula*; Ringed plover (Non-breeding)
  - A141 *Pluvialis squatarola*; Grey plover (Non-breeding)
  - A143 *Calidris canutus*; Red knot (Non-breeding)
  - A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
  - A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
  - A162 *Tringa totanus*; Common redshank (Non-breeding)
- Waterbird assemblage

## This is a European Marine Site

This SPA is a part of the Thames Estuary and Marshes European Marine Site (EMS). These Conservation Objectives should be used in conjunction with the Regulation 35 Conservation Advice document for the EMS. For further details about this please visit the Natural England website at: <http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx> or contact Natural England's enquiry service at [enquiries@naturalengland.org.uk](mailto:enquiries@naturalengland.org.uk) or by phone on 0845 600 3078.

## Explanatory Notes: European Site Conservation Objectives

These Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive. They must be considered when a competent authority is required to make a 'Habitats Regulations Assessment' including an Appropriate Assessment, under the relevant parts of this legislation.

These Conservation Objectives and the accompanying Supplementary Advice (where this is available) will also provide a framework to inform the management of the European Site under the provisions of Articles 4(1) and 4(2) of the Wild Birds Directive, and the prevention of deterioration of habitats and significant disturbance of its qualifying features required under Article 6(2) of the Habitats Directive.

These Conservation Objectives are set for each bird feature for a [Special Protection Area \(SPA\)](#). Where the objectives are met, the site will be considered to exhibit a high degree of integrity and to be contributing to achieving the aims of the Wild Birds Directive.

**Publication date:** 30 June 2014 (Version 2). This document updates and replaces an earlier version dated 29 May 2012 to reflect Natural England's Strategic Standard on European Site Conservation Objectives 2014. Previous references to additional features identified in the 2001 UK SPA Review have also been removed.

## **APPENDIX 4**

# Information Sheet on Ramsar Wetlands (RIS)

*Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8<sup>th</sup> Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9<sup>th</sup> Conference of the Contracting Parties (2005).*

## Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 7, 2nd edition, as amended by COP9 Resolution IX.1 Annex B). A 3rd edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.
3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

---

## 1. Name and address of the compiler of this form:

### Joint Nature Conservation Committee

Monkstone House

City Road

Peterborough

Cambridgeshire PE1 1JY

UK

Telephone/Fax: +44 (0)1733 – 562 626 / +44 (0)1733 – 555 948

Email: [RIS@JNCC.gov.uk](mailto:RIS@JNCC.gov.uk)

FOR OFFICE USE ONLY.

DD MM YY

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Designation date

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Site Reference Number

---

## 2. Date this sheet was completed/updated:

Designated: 31 March 2000

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## 3. Country:

UK (England)

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## 4. Name of the Ramsar site:

Thames Estuary and Marshes

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## 5. Designation of new Ramsar site or update of existing site:

**This RIS is for:** Updated information on an existing Ramsar site

---

## 6. For RIS updates only, changes to the site since its designation or earlier update:

### a) Site boundary and area:

\*\* Important note: If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

### b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

**7. Map of site included:**

Refer to Annex III of the *Explanatory Notes and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

**a) A map of the site, with clearly delineated boundaries, is included as:**

- i) **hard copy** (required for inclusion of site in the Ramsar List): *yes* ✓ -or- *no* ☐;
- ii) **an electronic format** (e.g. a JPEG or ArcView image) *Yes*
- iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** *yes* ✓ -or- *no* ☐;

**b) Describe briefly the type of boundary delineation applied:**

e.g. the boundary is the same as an existing protected area (nature reserve, national park etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The site boundary is the same as, or falls within, an existing protected area.

For precise boundary details, please refer to paper map provided at designation

**8. Geographical coordinates (latitude/longitude):**

51 29 08 N                      00 35 47 E

**9. General location:**

Include in which part of the country and which large administrative region(s), and the location of the nearest large town.

Nearest town/city: Gravesend

Contains part of the north coast of Kent and part of the southern coast of Essex, straddling the Thames estuary.

**Administrative region:** Essex; Kent; Medway; Thurrock

**10. Elevation** (average and/or max. & min.) (metres):    **11. Area** (hectares): 5588.59

Min.	-2
Max.	20
Mean	1

**12. General overview of the site:**

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

A complex of brackish, floodplain grazing marsh ditches, saline lagoons and intertidal saltmarsh and mudflat. These habitats together support internationally important numbers of wintering waterfowl. The saltmarsh and grazing marsh are of international importance for their diverse assemblages of wetland plants and invertebrates.

**13. Ramsar Criteria:**

Circle or underline each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11).

**2, 5, 6**

**14. Justification for the application of each Criterion listed in 13 above:**

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

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:**

45118 waterfowl (5 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 , <i>Charadrius hiaticula</i> , Europe/Northwest Africa	595 individuals, representing an average of 1.8% of the GB population (5 year peak mean 1998/9-2002/3)
--	--

Black-tailed godwit , <i>Limosa limosa islandica</i> , Iceland/W Europe	1640 individuals, representing an average of 4.6% of the population (5 year peak mean 1998/9-2002/3)
--	--

**Species with peak counts in winter:**

Grey plover , <i>Pluvialis squatarola</i> , E Atlantic/W Africa -wintering	1643 individuals, representing an average of 3.1% of the GB population (5 year peak mean 1998/9-2002/3)
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Red knot , <i>Calidris canutus islandica</i> , W & Southern Africa (wintering)	7279 individuals, representing an average of 1.6% of the population (5 year peak mean 1998/9-2002/3)
--	--

Dunlin , <i>Calidris alpina alpina</i> , W Siberia/W Europe	15171 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3)
--	---

Common redshank , <i>Tringa totanus totanus</i> ,	1178 individuals, representing an average of 1% of the GB population (5 year peak mean 1998/9-2002/3)
---	---

Contemporary data and information on waterbird trends at this site and their regional (sub-national) and national contexts can be found in the Wetland Bird Survey report, which is updated annually. See [www.bto.org/survey/webs/webs-alerts-index.htm](http://www.bto.org/survey/webs/webs-alerts-index.htm).

Details of bird species occurring at levels of National importance are given in Section 22

**15. Biogeography** (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

**a) biogeographic region:**

Atlantic

**b) biogeographic regionalisation scheme** (include reference citation):

Council Directive 92/43/EEC

**16. Physical features of the site:**

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Soil & geology	alluvium, mud, shingle
Geomorphology and landscape	coastal, floodplain, intertidal sediments (including sandflat/mudflat), estuary
Nutrient status	eutrophic
pH	no information
Salinity	brackish / mixosaline, fresh, saline / euhaline
Soil	no information
Water permanence	usually permanent, usually seasonal / intermittent
Summary of main climatic features	Annual averages (Greenwich, 1971–2000) ( <a href="http://www.metoffice.com/climate/uk/averages/19712000/sites/greenwich.html">www.metoffice.com/climate/uk/averages/19712000/sites/greenwich.html</a> ) Max. daily temperature: 14.8° C Min. daily temperature: 7.2° C Days of air frost: 29.1 Rainfall: 583.6 mm Hrs. of sunshine: 1461.0

**General description of the Physical Features:**

The marshes extend for about 15 km along the south side of the Thames estuary and also include intertidal areas on the north side of the estuary. To the south of the river, much of the area is brackish grazing marsh, although some of this has been converted to arable use. At Cliffe, there are flooded clay and chalk pits, some of which have been infilled with dredgings. Outside the sea-wall, there is a small extent of saltmarsh and broad intertidal mudflats.

**17. Physical features of the catchment area:**

Describe the surface area, general geology and geomorphological features, general soil types, general land use, and climate (including climate type).

The marshes extend for about 15 km along the south side of the Thames estuary and also include intertidal areas on the north side of the estuary. To the south of the river, much of the area is brackish grazing marsh, although some of this has been converted to arable use. At Cliffe, there are flooded clay and chalk pits, some of which have been infilled with dredgings. Outside the sea-wall, there is a small extent of saltmarsh and broad intertidal mudflats.

**18. Hydrological values:**

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

Shoreline stabilisation and dissipation of erosive forces, Sediment trapping, Flood water storage / desynchronisation of flood peaks, Maintenance of water quality (removal of nutrients)

**19. Wetland types:**

Marine/coastal wetland

Code	Name	% Area
G	Tidal flats	49.6
4	Seasonally flooded agricultural land	38.6
Q	Saline / brackish lakes: permanent	4.2
Ss	Saline / brackish marshes: seasonal / intermittent	3.2
Other	Other	1.6
H	Salt marshes	1.3
E	Sand / shingle shores (including dune systems)	0.8
O	Freshwater lakes: permanent	0.7

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**20. General ecological features:**

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

The intertidal flats are mostly fine, silty sediment, though in parts they are sandy. The saltmarsh shows a transition from pioneer communities containing *Zostera* to saltmarsh dominated by, for example, *Atriplex portulacoides*. The grazing marsh grassland is mesotrophic and generally species-poor. It does, however, contain scattered rarities, mostly annuals characteristic of bare ground. Where the grassland is seasonally inundated and the marshes are brackish the plant communities are intermediate between those of mesotrophic grassland and those of saltmarsh. The grazing marsh ditches contain a range of flora of brackish and fresh water. The aquatic flora is a mosaic of successional stages resulting from periodic clearance of drainage channels. The dominant emergent plants are *Phragmites communis* and *Bolboschoenus maritimus*. The saline lagoons have a diverse molluscan and crustacean fauna. Dominant plants in the lagoons include *Ulva* and *Chaetomorpha*.

Ecosystem services

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**21. Noteworthy flora:**

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Nationally important species occurring on the site:

Higher plants:

The site supports a population of the endangered least lettuce *Lactuca saligna*, and also supports several nationally scarce plants, including bulbous foxtail *Alopecurus bulbosus*, slender hare's-ear *Bupleurum tenuissimum*, divided sedge *Carex divisa*, saltmarsh goosefoot *Chenopodium chenopodioides*, sea barley *Hordeum marinum*, golden samphire *Inula crithmoides*, annual beard grass *Polypogon monspeliensis*, Borrer's saltmarsh-grass *Puccinellia fasciculata*, stiff saltmarsh-grass *P. rupestris*, one-flowered glasswort *Salicornia pusilla*, clustered clover *Trifolium glomeratum*, sea clover *T. squamosum*, narrow-leaved eelgrass *Zostera angustifolia* and dwarf eelgrass *Z. noltei*.

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**22. Noteworthy fauna:**

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

**Birds****Species currently occurring at levels of national importance:****Species with peak counts in spring/autumn:**

Little grebe , <i>Tachybaptus ruficollis ruficollis</i> , Europe to E Urals, NW Africa	251 individuals, representing an average of 3.2% of the GB population (5 year peak mean 1998/9- 2002/3)
Little egret , <i>Egretta garzetta</i> , West Mediterranean	54 individuals, representing an average of 3.2% of the GB population (5 year peak mean 1998/9- 2002/3)
Ruff , <i>Philomachus pugnax</i> , Europe/W Africa	23 individuals, representing an average of 3.2% of the GB population (5 year peak mean 1998/9- 2002/3)
Common greenshank , <i>Tringa nebularia</i> , Europe/W Africa	38 individuals, representing an average of 6.3% of the GB population (5 year peak mean 1998/9- 2002/3)

**Species with peak counts in winter:**

Common shelduck , <i>Tadorna tadorna</i> , NW Europe	1238 individuals, representing an average of 1.5% of the GB population (5 year peak mean 1998/9-2002/3)
Gadwall , <i>Anas strepera strepera</i> , NW Europe	359 individuals, representing an average of 2% of the GB population (5 year peak mean 1998/9-2002/3)
Northern shoveler , <i>Anas clypeata</i> , NW & C Europe	288 individuals, representing an average of 1.9% of the GB population (5 year peak mean 1998/9-2002/3)
Water rail , <i>Rallus aquaticus</i> , Europe	6 individuals, representing an average of 1.3% of the GB population (5 year peak mean 1998/9-2002/3)
Pied avocet , <i>Recurvirostra avosetta</i> , Europe/Northwest Africa	607 individuals, representing an average of 17.8% of the GB population (5 year peak mean 1998/9-2002/3)
Spotted redshank , <i>Tringa erythropus</i> , Europe/W Africa	6 individuals, representing an average of 4.4% of the GB population (5 year peak mean 1998/9-2002/3)

### Species Information

Nationally important species occurring on the site:

Invertebrates:

The endangered species *Bagous longitarsis* occurs on the site.

The following vulnerable species occur on the site: a groundbug *Henestaris halophilus*, a weevil *Bagous cylindrus*, a ground beetle *Polystichus connexus*, a crane fly *Erioptera bivittata*, a crane fly *Limnophila pictipennis*, a horse fly *Hybomitra expollicata*, a hoverfly *Lejops vittata*, a dancefly *Poecilobothrus ducalis*, a snail-killing fly *Pteromicra leucopeza*, a solitary wasp *Philanthus triangulum* and a damselfly *Lestes dryas*.

The following rare species occur on the site: a ground beetle *Anisodactylus poeciloides*, the water beetles *Aulacochthebius exaratus*, *Berosus fulvus*, *Cercyon bifenestratus*, *Hydrochus elongatus*, *H. ignicollis*, *Ochthebius exaratus* and *Hydrophilus piceus*, a beetle *Malachius vulneratus*, a rove beetle *Philonthus punctus*, a fungus beetle *Telmatophilus brevicollis*, a fly *Campsicnemus magius*, a horsefly *Haematopota bigoti*, a soldier fly *Stratiomys longicornis* and a spider *Baryphyma duffeyi*.

### 23. Social and cultural values:

Describe if the site has any general social and/or cultural values e.g. fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values.

- Aesthetic
- Archaeological/historical site
- Environmental education/ interpretation
- Fisheries production
- Livestock grazing
- Non-consumptive recreation
- Scientific research
- Sport fishing
- Sport hunting
- Tourism
- Transportation/navigation

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning? No

If Yes, describe this importance under one or more of the following categories:

- i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:
- ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:
- iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:
- iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

**24. Land tenure/ownership:**

Ownership category	On-site	Off-site
Non-governmental organisation (NGO)	+	+
Local authority, municipality etc.	+	+
Private	+	+
Public/communal	+	

**25. Current land (including water) use:**

Activity	On-site	Off-site
Nature conservation	+	+
Tourism	+	+
Recreation	+	+
Current scientific research	+	+
Fishing: commercial	+	
Fishing: recreational/sport	+	
Gathering of shellfish	+	
Bait collection	+	
Arable agriculture (unspecified)		+
Permanent arable agriculture		+
Livestock watering hole/pond	+	+
Grazing (unspecified)	+	+
Permanent pastoral agriculture	+	+
Hunting: recreational/sport	+	
Industrial water supply		+
Industry		+
Sewage treatment/disposal	+	+
Harbour/port	+	+
Flood control	+	
Transport route	+	+
Urban development		+
Military activities	+	

**26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:**

*Explanation of reporting category:*

1. *Those factors that are still operating, but it is unclear if they are under control, as there is a lag in showing the management or regulatory regime to be successful.*
2. *Those factors that are not currently being managed, or where the regulatory regime appears to have been ineffective so far.*

*NA = Not Applicable because no factors have been reported.*

Adverse Factor Category	Reporting Category	Description of the problem (Newly reported Factors only)	On-Site	Off-Site	Major Impact?
Dredging	1		+	+	+
Erosion	2		+		+
Eutrophication	2	Studies by the Environment Agency indicate that the waters in the Thames estuary are hyper-nitrified for nitrogen and phosphorus.	+	+	+
General disturbance from human activities	1		+		+

For category 2 factors only.

What measures have been taken / are planned / regulatory processes invoked, to mitigate the effect of these factors?

Erosion - The North Kent Coastal Habitat Management Plan (CHaMP) has been produced. The Environment Agency is producing a Flood Defence Strategy for the Thames (Thames 2100) and decisions on future flood risk management will need to take into account the effects on features within the designated sites.

Studies of sediment transport and hydrodynamics within Thames estuary. Investigation of beneficial use of dredgings for mudflat recharge and creation of compensatory habitat.

Eutrophication - Water quality and sources of nutrient inputs are subject to further investigation by the Environment Agency as part of the Agency's review of consents under the Habitats Regulations. Stage 3 of the Review of Consents (appropriate assessment) is scheduled for completion by March 2006, at which point any consented discharges having an adverse effect on site integrity will be identified.

Is the site subject to adverse ecological change? YES

**27. Conservation measures taken:**

List national category and legal status of protected areas, including boundary relationships with the Ramsar site; management practices; whether an officially approved management plan exists and whether it is being implemented.

Conservation measure	On-site	Off-site
Site/ Area of Special Scientific Interest (SSSI/ASSI)	+	
Special Protection Area (SPA)	+	

Land owned by a non-governmental organisation for nature conservation	+	+
Management agreement	+	
Site management statement/plan implemented	+	
Environmentally Sensitive Area (ESA)	+	+

**b) Describe any other current management practices:**

The management of Ramsar sites in the UK is determined by either a formal management plan or through other management planning processes, and is overseen by the relevant statutory conservation agency. Details of the precise management practises are given in these documents.

**28. Conservation measures proposed but not yet implemented:**

e.g. management plan in preparation; official proposal as a legally protected area, etc.

No information available

**29. Current scientific research and facilities:**

e.g. details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Numbers of migratory and wintering wildfowl and waders are monitored annually as part of the national Wetland Birds Survey (WeBS) organised by the British Trust for Ornithology, Wildfowl and Wetlands Trust, the Royal Society for the Protection of Birds and the Joint Nature Conservation Committee.

Numbers of breeding waders have been monitored through the BTO/RSPB/English Nature/Defra survey Breeding Waders of Wet Meadows (2002).

Botanical surveys of vegetation of sea wall embankments and grazing marsh ditches have been carried out.

The distribution and extent of saltmarsh habitat has been mapped - North Kent Marshes Saltmarsh Survey (2002) (Blair-Myres 2003)

The RSPB monitors various species groups on its reserves within the site

**30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:**

e.g. visitor centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

The RSPB manages a network of reserves within and adjacent to the site, which are promoted locally through existing community initiatives, and more widely through publications and via the internet.

The site forms part of proposals for a north Kent 'Regional Park', being promoted to balance development in Kent Thameside (part of the Thames Gateway growth area). The Management Guidance for the Thames Estuary aims to increase awareness of conservation and is promoted by the Thames Estuary Partnership. The Thames Estuary Partnership has also produced the Tidal Thames Habitat Action Plan to raise awareness of and address biodiversity issues.

**31. Current recreation and tourism:**

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

Yachting, angling, wildfowling, jet-skiing, water-skiing and birdwatching. Bird watching occurs throughout the year and wildfowling is restricted to the period September to February. The remaining activities occur year-round but are more prevalent in the summer months. Disturbance from these activities is a current issue but is being addressed through further research, negotiation and information dissemination.

**32. Jurisdiction:**

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept. of Agriculture/Dept. of Environment, etc.

Head, Natura 2000 and Ramsar Team, Department for Environment, Food and Rural Affairs, European Wildlife Division, Zone 1/07, Temple Quay House, 2 The Square, Temple Quay, Bristol, BS1 6EB

**33. Management authority:**

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Site Designations Manager, English Nature, Sites and Surveillance Team, Northminster House,  
Northminster Road, Peterborough, PE1 1UA, UK

**34. Bibliographical references:**

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

**Site-relevant references**

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Please return to: **Ramsar Secretariat, Rue Mauverney 28, CH-1196 Gland, Switzerland**  
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## **APPENDIX 5**

## **Appendix 5: Stage 1 Screening Matrices**

## Potential Effects

Potential effects upon the European site(s) \* which are considered within the submitted HRA report are provided in the table overleaf:

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\* As defined in Advice Note 10.

Effects considered within the screening matrices

Designation	Effects described in submission information	Presented in screening matrices as
Thames Estuary and Marshes SPA	<ul style="list-style-type: none"> <li>• <b>Disturbance (noise and lighting)</b> giving rise to displacement, other behavioural changes or physiological stress responses amongst cited bird species (within designation)</li> <li>• <b>Disturbance (human movement and activity)</b> giving rise to displacement, other behavioural changes or physiological stress responses amongst cited bird species (within designation)</li> <li>• <b>Disturbance (from shipping)</b> giving rise to displacement, other behavioural changes or physiological stress responses amongst cited bird species (within designation)</li> </ul>	<ul style="list-style-type: none"> <li>• Disturbance (within SPA)</li> </ul>
	<ul style="list-style-type: none"> <li>• <b>Disturbance (noise and lighting)</b> giving rise to displacement, other behavioural changes or physiological stress responses amongst cited bird species (functionally linked habitats outside designation)</li> <li>• <b>Disturbance (human movement and activity)</b> giving rise to displacement, other behavioural changes or physiological stress responses amongst cited bird species</li> </ul>	<ul style="list-style-type: none"> <li>• Disturbance (outside SPA)</li> </ul>

Designation	Effects described in submission information	Presented in screening matrices as
	<p>(functionally linked habitats outside designation)</p> <ul style="list-style-type: none"> <li>• <b>Disturbance (from shipping)</b> giving rise to displacement, other behavioural changes or physiological stress responses amongst cited bird species (functionally linked habitats outside designation)</li> </ul>	
	<ul style="list-style-type: none"> <li>• Damage to habitats used by cited bird species from changes to <b>sediment circulation or deposition patterns</b> (within designation)</li> <li>• Damage to habitats used by cited bird species from changes to <b>water and/or sediment quality</b>, with potential associated risk of bioaccumulation (within designation)</li> <li>• Damage to habitats used by cited bird species from changes in <b>air quality</b> (within designation)</li> </ul>	<ul style="list-style-type: none"> <li>• Habitat damage (within SPA)</li> </ul>
	<ul style="list-style-type: none"> <li>• Damage to or loss of habitats used by cited bird species from changes to <b>sediment circulation or deposition patterns</b> (functionally linked habitats outside designation boundary)</li> <li>• Damage to or loss of habitats used by cited bird species from changes to <b>water and/or sediment quality</b>,</li> </ul>	<ul style="list-style-type: none"> <li>• Habitat loss or damage (Functionally Linked Habitats – FLH - outside SPA)</li> </ul>

Designation	Effects described in submission information	Presented in screening matrices as
	<p>with potential associated risk of bioaccumulation (functionally linked habitats outside designation boundary)</p> <ul style="list-style-type: none"> <li>• Damage to or loss of habitats used by cited bird species from changes in <b>air quality</b> (functionally linked habitats outside designation boundary)</li> </ul>	
<p><b>Thames Estuary and Marshes Ramsar Site</b></p>	<ul style="list-style-type: none"> <li>• <b>Disturbance (noise and lighting)</b> giving rise to displacement, other behavioural changes or physiological stress responses amongst cited bird species (within designation)</li> <li>• <b>Disturbance (human movement and activity)</b> giving rise to displacement, other behavioural changes or physiological stress responses amongst cited bird species (within designation)</li> <li>• <b>Disturbance (from shipping)</b> giving rise to displacement, other behavioural changes or physiological stress responses amongst cited bird species (within designation)</li> </ul>	<ul style="list-style-type: none"> <li>• Disturbance (within Ramsar)</li> </ul>
	<ul style="list-style-type: none"> <li>• <b>Disturbance (noise and lighting)</b> giving rise to displacement, other behavioural changes or physiological stress responses amongst cited bird species (functionally linked habitats outside designation)</li> </ul>	<ul style="list-style-type: none"> <li>• Disturbance (outside Ramsar)</li> </ul>

Designation	Effects described in submission information	Presented in screening matrices as
	<ul style="list-style-type: none"> <li>• <b>Disturbance (human movement and activity)</b> giving rise to displacement, other behavioural changes or physiological stress responses amongst cited bird species (functionally linked habitats outside designation)</li> <li>• <b>Disturbance (from shipping)</b> giving rise to displacement, other behavioural changes or physiological stress responses amongst cited bird species (functionally linked habitats outside designation)</li> </ul>	
	<ul style="list-style-type: none"> <li>• Damage to habitats used by cited bird species from changes to <b>sediment circulation or deposition patterns</b> (within designation)</li> <li>• Damage to habitats used by cited bird species from changes to <b>water and/or sediment quality</b>, with potential associated risk of bioaccumulation (within designation)</li> <li>• Damage to habitats used by cited bird species from changes in <b>air quality</b> (within designation)</li> </ul>	<ul style="list-style-type: none"> <li>• Habitat damage (within Ramsar)</li> </ul>
	<ul style="list-style-type: none"> <li>• Damage to or loss of habitats used by cited bird species from changes to <b>sediment circulation or deposition</b></li> </ul>	<ul style="list-style-type: none"> <li>• Habitat loss or damage (FLH outside Ramsar)</li> </ul>

Designation	Effects described in submission information	Presented in screening matrices as
	<p><b>patterns</b> (functionally linked habitats outside designation boundary)</p> <ul style="list-style-type: none"> <li>• Damage to or loss of habitats used by cited bird species from changes to <b>water and/or sediment quality</b>, with potential associated risk of bioaccumulation (functionally linked habitats outside designation boundary)</li> <li>• Damage to or loss of habitats used by cited bird species from changes in <b>air quality</b> (functionally linked habitats outside designation boundary)</li> </ul>	
	<ul style="list-style-type: none"> <li>• Local (Ramsar and wider) population level impacts to Criterion 2 plant/invertebrate species from direct <b>habitat loss</b></li> <li>• Damage or loss of Criterion 2 plant/invertebrate species from habitat changes arising from changes in <b>air quality</b></li> <li>• Damage or loss of Criterion 2 plant/invertebrate species from habitat changes arising from changes in <b>sediment circulation and deposition patterns</b></li> <li>• Damage or loss of Criterion 2 plant/invertebrate species from changes in <b>water and sediment quality</b></li> </ul>	<ul style="list-style-type: none"> <li>• Damage or loss (non-bird Ramsar species)</li> </ul>

<b>Designation</b>	<b>Effects described in submission information</b>	<b>Presented in screening matrices as</b>
	<ul style="list-style-type: none"> <li>• Physiological stress or behavioural responses in Criterion 2 plant/invertebrate species caused by <b>lighting</b>.</li> </ul>	

## STAGE 1: SCREENING MATRICES

The European sites included within the screening assessment are:

**THAMES ESTUARY AND MARSHES SPA (REF: UK9012021) (Matrix 1)**

**THAMES ESTUARY AND MARSHES RAMSAR SITE (REF: UK11069) (Matrix 2)**

Evidence for, or against, likely significant effects on the European site(s) and its qualifying feature(s) is detailed within the footnotes that follow the screening matrices.

### **Matrix Key:**

✓ = Likely significant effect **cannot** be excluded

✗ = Likely significant effect **can** be excluded

C = construction

O = operation

D = decommissioning

### HRA Screening Matrix 1: Thames Estuary and Marshes SPA

Name of European site and designation: <i>Thames Estuary and Marshes SPA</i>															
EU Code: <i>UK9012021</i>															
Distance to NSIP: <i>c. 1.5km</i>															
European site features	Likely effects of NSIP														
Effect	1) Disturbance (within SPA)			2) Disturbance (outside SPA)			3) Habitat Damage (within SPA)			4) Damage to functionally linked habitats			In combination effects		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Stage of Development															
Article 4.1 qualifying feature: Avocet (winter)	<b>xa</b>	<b>xb</b>		<b>xc</b>	<b>xf</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xk</b>	<b>xk</b>	
Article 4.1 qualifying feature: Hen Harrier (winter)	<b>xa</b>	<b>xb</b>		<b>xd</b>	<b>xd</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xk</b>	<b>xk</b>	
Article 4.2 qualifying feature: Ringed Plover (passage)	<b>xa</b>	<b>xb</b>		<b>xc</b>	<b>xf</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xk</b>	<b>xk</b>	
Article 4.2 qualifying feature: Grey Plover (winter)	<b>xa</b>	<b>xb</b>		<b>xc</b>	<b>xf</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xk</b>	<b>xk</b>	
Article 4.2 qualifying feature: Knot (winter)	<b>xa</b>	<b>xb</b>		<b>xe</b>	<b>xf</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xk</b>	<b>xk</b>	

<i>Article 4.2 qualifying feature: Dunlin (winter)</i>	<b>xa</b>	<b>xb</b>		<b>xc</b>	<b>xf</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xk</b>	<b>xk</b>	
<i>Article 4.2 qualifying feature: Black-tailed Godwit (winter)</i>	<b>xa</b>	<b>xb</b>		<b>xc</b>	<b>xf</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xk</b>	<b>xk</b>	
<i>Article 4.2 qualifying feature: Redshank (winter)</i>	<b>xa</b>	<b>xb</b>		<b>xc</b>	<b>xf</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xk</b>	<b>xk</b>	
<i>Article 4.2 qualifying feature: Total waterfowl (winter)</i>	<b>xa</b>	<b>xb</b>		<b>xc</b>	<b>xf</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xk</b>	<b>xk</b>	

## HRA Screening Matrix 2: Thames Estuary and Marshes Ramsar Site

Name of European site and designation: <i>Thames Estuary and Marshes Ramsar Site</i>																		
Ramsar Code: <i>7UK141</i>																		
Distance to NSIP: <i>c. 1.5km</i>																		
Ramsar qualifying features	Likely effects of NSIP																	
	1) Disturbance (within Ramsar)			2) Disturbance (outside Ramsar)			3) Habitat Damage (within Ramsar)			4) Damage to functionally linked habitats			5) Damage or loss (non-bird species)			In combination effects		
Effect	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Stage of Development																		
Criterion 2 qualifying feature (nationally rare and scarce plant and invertebrate species)	<b>xi</b>	<b>xi</b>		<b>xi</b>	<b>xi</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xg</b>	<b>xg</b>		<b>xk</b>	<b>xk</b>	
Criterion 5 qualifying feature: Total waterfowl (winter)	<b>xa</b>	<b>xb</b>		<b>xc</b>	<b>xf</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xg</b>	<b>xg</b>		<b>xk</b>	<b>xk</b>	
Criterion 6 qualifying feature: Ringed Plover (passage)	<b>xa</b>	<b>xb</b>		<b>xc</b>	<b>xf</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xg</b>	<b>xg</b>		<b>xk</b>	<b>xk</b>	
Criterion 6 qualifying feature: Black Tailed Godwit (passage)	<b>xa</b>	<b>xb</b>		<b>xc</b>	<b>xf</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xg</b>	<b>xg</b>		<b>xk</b>	<b>xk</b>	
Criterion 6 qualifying feature: Grey Plover (winter)	<b>xa</b>	<b>xb</b>		<b>xc</b>	<b>xf</b>		<b>xg</b>	<b>xg</b>		<b>xh</b>	<b>xh</b>		<b>xg</b>	<b>xg</b>		<b>xk</b>	<b>xk</b>	

<i>Criterion 6 qualifying feature: Knot (winter)</i>	<b>x a</b>	<b>x b</b>		<b>x e</b>	<b>x f</b>		<b>x g</b>	<b>x g</b>		<b>x h</b>	<b>x h</b>		<b>x g</b>	<b>x g</b>		<b>x k</b>	<b>x k</b>	
<i>Criterion 6 qualifying feature: Dunlin (winter)</i>	<b>x a</b>	<b>x b</b>		<b>x c</b>	<b>x f</b>		<b>x g</b>	<b>x g</b>		<b>x h</b>	<b>x h</b>		<b>x g</b>	<b>x g</b>		<b>x k</b>	<b>x k</b>	
<i>Criterion 6 qualifying feature: Redshank (winter)</i>	<b>x a</b>	<b>x b</b>		<b>x c</b>	<b>x f</b>		<b>x g</b>	<b>x g</b>		<b>x h</b>	<b>x h</b>		<b>x g</b>	<b>x g</b>		<b>x k</b>	<b>x k</b>	

**Evidence supporting conclusions (note that the same supporting evidence may be referred to for both the SPA and Ramsar Site as their extents and boundaries are largely coterminous):**

- a. The distance between the Tilbury2 site and the nearest part of the SPA/Ramsar (foreshore adjoining Eastcourt/Shorne Marshes on the opposite (southern) side of the Thames) is just under 1.5km. The nearest near-shore component (Mucking Flats) is just over 2.4km. These areas are, furthermore, the westernmost extremity of both the SPA and Ramsar Site, which cover 4,838.94 and 5,588.59 ha respectively extending eastward from these points up to 24km distant at Grain. The vast majority of both the SPA and Ramsar Site is therefore >3km removed from the Tilbury2 site. Such distances alone militate against any LSE on qualifying bird species using the SPA/Ramsar Site from visual disturbance emanating from the construction site, or from lighting (on the basis of the information and lux modelling provided in ES Appendix 9.J). The potential magnitude of change in noise generation as compared to the baseline position is assessed in ES Chapter 17 and the outputs of that assessment are considered in terms of implications for ecological receptors in Chapter 10. Peak or mean (i.e. 24hr) noise in excess of 55dB is not predicted to be experienced at distances in excess of 300m from the site for most construction or operational activities, with the exception of construction-phase jetty piling and dredging and pavement construction. The foremost of these could see noise levels of 63dB at 300m from source with the latter having the potential to slightly exceed the 55dB level at 300m (ES Chapter 17 Table 17.22). These data indicate that noise levels during construction would not be sufficient to elicit any behavioural responses in birds at just under 1.5km (the nearest point of the SPA/Ramsar Site).
- b. In the operational phase, the mitigating effect of distance similarly rules out LSE on qualifying bird species within the SPA/Ramsar Site from lighting (based on the lighting design and predicted Lux contours reported in the Preliminary Lighting Strategy and Impact Assessment at Appendix 9.J of the ES) or visual disturbance emanating from the site. Noise levels generated within the site during operation are unlikely to exceed the peaks associated with construction-phase piling and can therefore also be ruled out as having the potential to give rise to a LSE on the SPA/Ramsar Site. Some increase in

potential for LSE from disturbance during operation is associated with the predicted 11% uplift in shipping traffic generated by the operational port, as these increased vessel movements will occur along a broad (c.24km) interface with the SPA and Ramsar Site, albeit that the navigable channel is typically >200m from the SPA/Ramsar Site boundary. Increased port-related shipping movements along the Thames bring with them some scope for increased disturbance from noise, lighting and related visual disturbance caused by the movement of vessels *per se*. Because the majority of vessels will be large, with a corresponding large draught, such potential impact sources will be along predictable mid-channel paths, relatively remote (e.g. >200m) from intertidal habitats and will be experienced by avian receptors against a backdrop of existing regular traffic of large, distant vessels. They are therefore considered likely to represent an imperceptible increase in disturbance in the context of existing levels of habituation.

- c. These Article 4.1 and 4.2 qualifying species (and Ramsar Criteria 5 and 6 species) all make use of intertidal habitats in closer proximity to the Tilbury2 site than the SPA/Ramsar Site itself, and the individual birds involved will in most cases be part of the local wintering or passage population that forms the qualifying feature. An appreciation of the numbers using intertidal habitats within and in proximity to the proposed DCO limits is provided by the baseline information reported on at ES Chapter 10 (in particular Table 10.41). In all cases, significantly less than 1% of the SPA/Ramsar Site population is involved. 300m is taken as a rational outer extent of impact envelope for significant construction-phase disturbance taking into account literature on response distances amongst the bird species concerned (e.g. Cutts, Phelps and Burdon 2009) and application of the TIDE toolkit ([http://www.tide-toolbox.eu/tidetools/waterbird\\_disturbance\\_mitigation\\_toolkit/](http://www.tide-toolbox.eu/tidetools/waterbird_disturbance_mitigation_toolkit/)) and outputs from the impact studies reported in the ES (in particular noise – Chapter 17). Due to the relatively low levels of use of intertidal habitats within this envelope by SPA/Ramsar Site species in the baseline state, even if significant temporary construction phase disturbance effects could occur on receptors within it, the result (up to and including temporary displacement) is assessed as not likely to translate to a significant effect on the SPA/Ramsar Site.
- d. Hen harrier is not likely to make any significant use of habitats that are potentially affected by construction phase disturbance effects (either within or outside the SPA), and the baseline surveys have not recorded any use of the Tilbury 2 site by this species more generally (ES Chapter 10).
- e. These species have not been recorded using functionally linked intertidal habitats within potential range of construction-phase disturbance effects, so while small-scale transient use of such areas cannot be discounted, there is assessed to be no scope for LSE.

- f. The scope for significant effects on populations of SPA and Ramsar Site qualifying bird species due to disturbance impacts on areas outside their respective boundaries is somewhat greater during the operational phase by virtue of the predicted 11% uplift in vessel traffic along the river. However the same factors militating against LSE apply when putting this uplift into context as discussed under (b) above and there are assessed to be no LSEs arising.
- g. Based on the outputs of impact assessments reported on within and in the appendices to ES Chapters 11 (marine ecology) and 16 (water resources and flood risk – including the Water Framework Directive Assessment at Appendix 16.B and the Hydrodynamic Modelling Study at Appendix 16.D), and taking account of construction and operational restrictions contained within the Construction Environmental Management Plan (CEMP) and/or volunteered through the Deemed Marine Licence/Development Consent Order, there is assessed to be no scope for significant changes to baseline sediment circulation (erosion and deposition) regimes within the SPA/Ramsar Site boundary arising as a consequence of marine works and dredging, during either the construction or operational phase. Of the two capital dredging scenarios assessed (namely backhoe dredge and disposal, and dispersal dredging by water injection (WID)), the latter has the potential to give rise to very minor, highly localised and temporary increases in sediment deposition within the intertidal areas of the SPA/Ramsar Site (ES Appendix 16.D). The favoured method of maintenance dredging is proposed to be by means of Water Injection Dredging (WID) limited to ebb tide periods outside of the months of June to August through conditions which would be imposed on the DML. The sediment plumes from all these dredging scenarios have been modelled and increases in subtidal deposition are predicted to be localised, and generally low in magnitude (<2mm) for each capital or maintenance dredging event (ES Appendix 16.D). The study concludes that the proposed reliance on WID for most dredging operations means that displaced sediments will mostly disperse and redeposit within the sub-tidal zone, with very limited potential for increases in deposition on the intertidal areas. The study further concludes that the variations experienced in the Thames sediment budget will be within the range of annual fluctuations in this part of the Thames (ES Appendix 16.D section 7.3.3). On the basis of such conclusions, significant effects on sediment circulation regimes within the downstream SPA/Ramsar Site are not predicted and no risk to the quality and availability of intertidal habitats for cited SPA or Ramsar Site species is predicted.

Localised elevated concentrations of PAHs including perylene, pyrene and fluoranthene and of metals including Arsenic, Chromium and Nickel have been found in samples of sediment around the existing Tilbury2 jetty and (in particular) the approach channel to it (ES Appendix 11.C). This is not unusual for Thames Estuary sediments. The contaminants of concern in this case generally have low solubility and where mobilised will mostly remain adsorbed onto sediment particles. This reduces the potential for contamination of the water column, but could pose a risk to sediment dwelling organisms where these substances are re-deposited at high concentrations. The risk to marine and estuarine biota is assessed in ES

Chapter 11. Risk to higher trophic orders, including SPA and Ramsar Site cited fauna is mainly possible through these substances becoming directly bio-available in re-distributed sediments and or from biomagnification through the food chain, although the risks from biomagnification in the case of PAHs are ameliorated due to the greater capacity of higher organisms to metabolise PAHs. An assessment of the risks of significantly contaminated sediments around the Tilbury 2 jetty being redistributed onto intertidal habitats associated with the SPA and Ramsar Site is reported at ES Appendix 16.D, section 6, focusing on the PAH perylene. It assesses its risk to the marine environment and the likelihood of its dispersion based on its solubility between the sediments, water and biota. This assessment indicates that perylene mobilised during dredging operations has a very low risk of becoming available to SPA/Ramsar cited species, with in particular a very low risk of significant deposition onto intertidal areas both proximal to the Tilbury2 jetty and within the SPA/Ramsar Site further afield. Other contaminants adsorbed to sediments will follow a similar dispersion pathway and therefore the risk of significant effects from mobilisation of other PAHs and metals observed at elevated levels in the samples is assumed to be equivalent or less than for perylene. Notwithstanding this low risk, restrictions adopted through the DML/DCO for the project and/or attached to future related consents will further obviate the scope for LSE, through the adoption of non-dispersive capital dredging methods (e.g. backhoe dredging) for areas of the approach channel that are confirmed (e.g. by existing or future further surveys) to be appreciably contaminated with PAHs or other contaminants. The disposal of arisings from this operation will be to an appropriate licensed contaminated sediment treatment site to be defined in line with the relevant consenting procedures. Such measures are assessed to obviate the scope for LSE on SPA/Ramsar Site features from mobilisation of contaminated sediments associated with dredging activities.

In respect of air quality, emissions of NO<sub>x</sub> and SO<sub>2</sub> from the proposed 11% increase in vessel traffic on the Thames arising from the operation of Tilbury2 have been modelled against baseline (background) levels, as set out in Appendix 6 of this HRA report. The results indicate that increases in atmospheric levels and/or deposition loads of both NO<sub>x</sub> and SO<sub>2</sub> on habitats within the SPA/Ramsar Site boundary will be negligible (in both peak and mean scenarios resulting in all instances in increases of less than a tenth of 1% compared with baseline levels) and will not result in accepted critical loads for saltmarsh, mudflat or coastal grazing marsh habitat being exceeded. The increments as seen in that report are so small that this assessment holds even when considered in combination with other projects. Consequently no LSE is predicted on the extent, stability or quality of habitats within the SPA and integral to the support of the avian features of the SPA and the avian, plant and invertebrate interest features of the Ramsar Site.

- h.** Based on the outputs of impact assessments reported on within and in the appendices to ES Chapters 11 (marine ecology) and 16 (water resources and flood risk – including the Water Framework Directive Assessment at Appendix 16.B), and taking account of construction and operational restrictions contained within the Construction Environmental Management

Plan (CEMP) and/or volunteered through the Deemed Marine Licence/Development Consent Order, there is assessed to be no scope for significant changes to baseline sediment circulation (erosion and deposition) regimes on near-shore intertidal habitats within 1.6km of the new jetty. Deposition of sediments mobilised by backhoe and/or water injection dredging is predicted to give rise to additional deposition in excess of 1mm and up to 5mm in localised areas within this zone as compared with the baseline situation and depending on the tidal state during which such operations are carried out. Such changes are unlikely to impinge on the extent, stability or quality of any saltmarsh habitats, but could affect intertidal mud habitats used by SPA interest features and therefore functionally-linked to the maintenance of the populations underpinning the European Site. In comparison with baseline conditions and the variability in sediment budgets within them, such effects are not likely to be significant in respect of the European Site.

Localised elevated concentrations of PAHs including perylene, pyrene and fluoranthene and of metals including Arsenic, Chromium and Nickel have been found in samples of sediment around the existing Tilbury2 jetty and (in particular) the approach channel to it (ES Appendix 11.C). This is not unusual for Thames Estuary sediments. The contaminants of concern in this case generally have low solubility and where mobilised will mostly remain adsorbed onto sediment particles. This reduces the potential for contamination of the water column, but could pose a risk to sediment dwelling organisms where these substances are re-deposited at high concentrations. The risk to marine and estuarine biota is assessed in ES Chapter 11. Risk to higher trophic orders, including SPA and Ramsar Site cited fauna using intertidal habitats closer to sediment disturbing activities (dredging or the construction of marine structures) is mainly possible through these substances becoming directly bio-available in re-distributed sediments and or from biomagnification through the food chain, although the risks from biomagnification in the case of PAHs are ameliorated due to the greater capacity of higher organisms to metabolise PAHs. An assessment of the risks of significantly contaminated sediments around the Tilbury 2 jetty being redistributed onto functionally linked intertidal habitats closer to the Tilbury 2 site is reported at ES Appendix 16.D, section 6, focusing on the PAH perylene. It assesses its risk to the marine environment and the likelihood of its dispersion based on its solubility between the sediments, water and biota. This assessment indicates that perylene mobilised during dredging operations has a very low risk of being deposited onto intertidal habitats at concentrations of concern. Other contaminants adsorbed to sediments will follow a similar dispersion pathway and therefore the risk of significant effects from mobilisation of other PAHs and metals observed at elevated levels in the samples is assumed to be equivalent or less than for perylene. Notwithstanding this low risk, restrictions adopted as part of the DML/DCO for the project and/or attached to future related consents will further obviate the scope for LSE, through the adoption of non-dispersive capital dredging methods (e.g. backhoe dredging) for areas of the approach channel that are confirmed (e.g. by existing or future further surveys) to be appreciably contaminated with PAHs or other contaminants. The disposal of arisings from this operation will be to an appropriate licensed contaminated sediment treatment site to be defined in line

with the relevant consenting procedures. Such measures are assessed to obviate the scope for LSE on SPA/Ramsar Site features from mobilisation of contaminated sediments associated with dredging activities.

In respect of air quality, increases in atmospheric levels and/or deposition loads of both NO<sub>x</sub> and SO<sub>2</sub> on intertidal habitats with a significant supporting function to the SPA/Ramsar Site are predicted to be negligible (ES Chapter 18). Emissions from operation of the port may give rise to significant increments above baseline NO<sub>x</sub> levels in close proximity to (e.g. <30m from) to the jetty, however in no instance is it predicted that critical loads of sensitive habitats will be exceeded and deposition effects may be obviated in any event due to the amelioration effects of tidal wash and/or absence of significant attendant SO<sub>2</sub>. Consequently no LSE is predicted on the extent, stability or quality of habitats outside of but functionally linked to the SPA and Ramsar Site and integral to the support of the avian features of the SPA and the avian, plant and invertebrate interest features of the Ramsar Site.

- i. Not applicable. For physiological effects on Ramsar Criterion 2 plant/invertebrate species from lighting, see under 5) Damage or loss (non-bird species).
- j. In both the construction and operational phases, the mitigating effect of distance rules out LSE on Criterion 2 invertebrate and plant species within the Ramsar Site from lighting (based on the lighting design and predicted Lux contours reported in ES appendix 9.J). Lighting effects could give rise to physiological responses in potentially linked populations of Criterion 2 species in intertidal habitats close to the jetty, however of the fifteen nationally rare or scarce plant species cited in the Ramsar Information Sheet, only three have been recorded on the Tilbury2 site and only one of these (Golden Samphire) in intertidal habitats potentially at risk of lighting effects (further details in Chapter 10 of the ES). The location where this species grows will have been subject to light spill effects from past operational phases of the jetty (when the power station was active) and there is no evidence that this influenced the distribution or vigour of the colony. Of the twenty-seven Ramsar-cited invertebrate species, at least seven have previously been recorded within or in the immediate environs of the Tilbury2 site (ES Chapter 10). In respect of habitat loss, a combination of on-site and geographically relevant off-site compensation is proposed to ensure no net loss of Thames Estuary grazing marsh habitats and associated ditch systems of value to species such as *Lestes dryas*, *Stratiomys longicornis*, *Haematopota bigoti*, *Aulacochthebius exaratus* and *Anisodactylus poeciloides* occurs as a consequence of the project, as reported on in Chapter 10 of the ES. This should ensure no effect on the Ramsar populations by virtue of any functional linkage For saltmarsh species such as *Malachius vulneratus*, the retention of coastal saltmarsh habitats and the low scope for any change to their supporting processes should ensure no significant effect from habitat loss, and such species are not assessed to be at risk of significant impacts

from lighting, noise, dust and other emissions given their co-existence with the operational power station and its jetty in the past.

- k. While there is potential for cumulative disturbance effects to arise during operation from increased shipping movements generated by Tilbury2 added to future increments from other known consented or planned projects (as set out in ES Chapter 20), for the reasons given at (b) above, these are predicted not to give rise to LSE on the basis of available data on such movements when considered cumulatively. Indeed, whilst a tipping point could theoretically be reached with unbridled future increase in river traffic, the requirements of navigational safety and the practical limitations of the river's morphology are assessed as likely to militate against large vessel traffic ever achieving a level where it poses a disturbance threat to bird use of intertidal habitats within or functionally linked to the European Site. This is in large part due to the requirement for larger vessels to remain within the maintained navigable channel in the central part of the river most remote from such habitats. The potential for significant air quality deterioration arising from the cumulative effect of such uplift might be more significant were there no counterfactual improvements predicted (and being realised incipiently) from improvements in emissions standards, including specifically within the Thames Estuary. Thus cumulative air quality effects are not considered likely to give rise to LSE in the context of this improving picture. Cumulative (additive or synergistic) low magnitude effects on estuarine processes (including sediment circulation) that support intertidal habitats and related designations are also possible from refurbishment of marine structures and/or capital and maintenance dredging associated with other projects. However the potential disruptive influence on such processes of the Tilbury2 project has been shown to be negligible and therefore significant cumulative effects are not likely regardless of the magnitude of effects arising elsewhere. Similarly, the adoption of measures to prevent significant mobilisation of polluted sediments leaves a negligible potential contribution to any cumulative effects arising from other marine works projects and dredging activities.

## APPENDIX 6



## **Air Quality Impacts on Designated Ecological Sites:**

**Tilbury 2 Dock, Thurrock**

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October 2017



Experts in air quality  
management & assessment

## Document Control

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### Document Status and Review Schedule

Report No.	Date	Status	Reviewed by
J2900A/3/F4	6 October 2017	Final	Dr Ben Marner (Technical Director)

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# 1 Introduction

- 1.1 This note presents the results of the assessment of potential air quality impacts on designated ecological sites associated with the proposed Tilbury 2 Dock at the Port of Tilbury. The emissions from additional ship movements generated by the proposed new dock could impact on designated sites adjacent to the Thames.
- 1.2 The pollutants of concern associated with shipping emissions are nitrogen oxides (NO<sub>x</sub>) and sulphur dioxide. Detailed modelling inputs are presented in Appendix A1.
- 1.3 Impacts from the additional vessel movements have been determined for a grid of receptor points covering nearby ecological receptors within the wider study area. These include the South Thames Estuary and Marshes Site of Special Scientific Interest (SSSI) and Mucking Flats and Marshes SSSI. These two designated sites are components of the larger Thames Estuary and Marshes Special Protection Area (SPA). Impacts on those areas of the SPA within the constituent SSSIs have been assessed.
- 1.4 The potential impacts from the proposed dock considered in this assessment are those associated with the additional shipping contributions to:
- annual mean NO<sub>x</sub> concentrations;
  - 24-hour mean NO<sub>x</sub> concentrations;
  - annual mean sulphur dioxide concentrations;
  - annual mean nitrogen deposition fluxes; and
  - annual mean acid deposition fluxes.
- 1.5 Contributions to levels of nitrogen and acid deposition have been combined with baseline deposition levels and compared against the Critical Loads applicable to the ecological sites listed above. Additionally, the contributions to the annual mean and maximum 24-hour mean NO<sub>x</sub> concentrations have been combined with baseline concentrations and compared against the annual mean and 24-hour mean Critical Levels (respectively 30 µg/m<sup>3</sup> and 75 µg/m<sup>3</sup>). The contribution to the annual mean sulphur dioxide concentrations, combined with baseline concentrations, has been compared against the annual mean Critical Level (20 µg/m<sup>3</sup>).
- 1.6 The Critical Loads and Critical Levels considered in this assessment for each ecological site assessed are presented in Table 1 and Table 2 below. Critical Loads are expressed as ranges. In Table 1, this range has been extended to include the maximum and minimum Critical Loads for any habitat within each site.

**Table 1: Vegetation and Ecosystem Critical Loads <sup>a</sup>**

Ecological Site	Designation	Critical Load (kg N/ha/yr) <sup>b</sup>	NMax Critical Load (keq/ha/yr)
Thames Estuary & Marshes	SPA	8 - 30	0.743 – 5.710
South Thames Estuary & Marshes	SSSI	8 - 30	0.733 – 5.710
Mucking Flats & Marshes	SSSI	8 - 30	4.558 – 5.710

<sup>a</sup> Critical Loads for nutrient nitrogen deposition and acid deposition taken from (APIS, 2017).

<sup>b</sup> A range of Critical Loads is presented to address the different ecological features present at each designated site. The lower end of the ranges corresponds to lower-bound of the Critical Load range for acid type coastal stable dune grasslands, and is not representative of the entirety of each designated site.

**Table 2: Vegetation and Ecosystem Critical Levels <sup>a</sup>**

Pollutant	Time Period	Critical Level
NO <sub>x</sub> (expressed as NO <sub>2</sub> )	Annual Mean <sup>a,b</sup>	30 µg/m <sup>3</sup>
	24-Hour Mean <sup>a,c</sup>	75 µg/m <sup>3</sup>
Sulphur Dioxide	Annual and Winter Mean <sup>a,b</sup>	20 µg/m <sup>3</sup>

<sup>a</sup> The Critical Levels are defined by the World Health Organisation (WHO, 2000).

<sup>b</sup> Away from major sources, this Critical Level is set as an objective (Defra, 2007) and a limit value (Directive 2008/50/EC of the European Parliament and of the Council, 2008).

<sup>c</sup> This critical level is not an objective and thus does not have the same legal standing.

1.7 Background nitrogen and acid deposition fluxes, and background NO<sub>x</sub> and SO<sub>2</sub> concentrations at the designated sites have been taken from the APIS website (APIS, 2017) and are presented in Table 3. Background nutrient nitrogen deposition rates potentially<sup>1</sup> exceed the Critical Load in all three designated sites. Background acid nitrogen deposition rates are potentially exceeding the Critical Load in the Thames Estuary and Marshes SPA and the South Thames Estuary and Marshes SSSI. All three sites have annual mean NO<sub>x</sub> concentrations in excess of the Critical Level, but there are no exceedances of the Critical Level for annual mean SO<sub>2</sub>.

<sup>1</sup> Assuming the lowest end of the Critical Load range applies.

**Table 3: Background Deposition Fluxes and Annual Mean Concentrations**

Ecological Site	Nutrient Nitrogen Deposition (kgN/ha/yr)	Acid Nitrogen Deposition (keq/ha/yr)	NO <sub>x</sub> Concentration (µg/m <sup>3</sup> )	SO <sub>2</sub> Concentration (µg/m <sup>3</sup> )
Thames Estuary & Marshes	9.5 – 16.0	0.66 – 1.20	18.3 – 35.3	0.3 – 1.1
South Thames Estuary & Marshes	5.2 – 14.8	0.35 – 1.08	17.1 – 35.3	0.3 – 1.1
Mucking Flats & Marshes	8.1 – 16.0	0.56 – 1.16	27.3 – 33.7	0.5 – 0.8

## 2 Impact Assessment

- 2.1 Air quality impacts on the three designated ecological sites, expressed as both the maximum and minimum additional shipping contribution (i.e. the maximum and minimum impacts anywhere within each modelled ecological site), are presented in Table 4, Table 5, Table 6, Table 7, Table 8 and Table 9 below. The additional shipping emissions would lead to extremely small changes in concentrations and deposition fluxes. The changes are so small that they would not change the concentrations and deposition fluxes when they are rounded to the level precision presented by APIS.

**Table 4: Predicted Maximum Pollutant Concentrations at Thames Estuary and Marshes SPA ( $\mu\text{g}/\text{m}^3$ )**

Pollutant/Averaging Period	Maximum Additional Shipping Contribution	Background Level	Total Background and Process Contribution <sup>a</sup>	% Change Relative to Background Level	% Change Relative to Critical Level/Load
Annual Mean NO <sub>x</sub> ( $\mu\text{g}/\text{m}^3$ )	0.00048	18.3 – 35.3	18.3 – 35.3	0.001 – 0.003	0.002
24-Hour Mean NO <sub>x</sub> ( $\mu\text{g}/\text{m}^3$ )	0.0076	N/A	N/A	N/A	0.01
Annual Mean Sulphur Dioxide ( $\mu\text{g}/\text{m}^3$ )	0.000017	0.3 - 1.1	0.3 – 1.1	0.002 – 0.006	0.00009
Annual Mean Nutrient Nitrogen Deposition Rate (kg-N/ha/yr)	0.000048	9.5 – 16.0	9.5 – 16.0	0.0003 – 0.0005	0.0002 – 0.0006
Annual Mean Acid Nitrogen Deposition Rate (keq/ha/yr)	0.0000055	0.66 – 1.20	0.66 – 1.20	0.0005 – 0.0008	0.0001 – 0.0007

<sup>a</sup> Adding the maximum shipping contribution to the range in background levels.

**Table 5: Predicted Minimum Pollutant Concentrations at Thames Estuary and Marshes SPA ( $\mu\text{g}/\text{m}^3$ )**

Pollutant/Averaging Period	Minimum Additional Shipping Contribution	Background Level	Total Background and Process Contribution <sup>a</sup>	% Change Relative to Background Level	% Change Relative to Critical Level/Load
Annual Mean NO <sub>x</sub> ( $\mu\text{g}/\text{m}^3$ )	0.00019	18.3 – 35.3	18.3 – 35.3	0.0005 – 0.001	0.0006
24-Hour Mean NO <sub>x</sub> ( $\mu\text{g}/\text{m}^3$ )	0.0014	N/A	N/A	N/A	0.002
Annual Mean Sulphur Dioxide ( $\mu\text{g}/\text{m}^3$ )	0.0000068	0.3-1.1	0.3 – 1.1	0.0006 – 0.002	0.00003
Annual Mean Nutrient Nitrogen Deposition Rate (kg-N/ha/yr)	0.000019	9.5 – 16.0	9.5 – 16.0	0.0001 – 0.0002	0.00006 – 0.0002
Annual Mean Acid Nitrogen Deposition Rate (keq/ha/yr)	0.0000022	0.66 – 1.20	0.66 – 1.20	0.0002 – 0.0003	0.00004 – 0.0003

<sup>a</sup> Adding the minimum shipping contribution to the range in background levels.

**Table 6: Predicted Maximum Pollutant Concentrations at South Thames Estuary and Marshes SSSI ( $\mu\text{g}/\text{m}^3$ )**

Pollutant/Averaging Period	Maximum Additional Shipping Contribution	Background Level	Total Background and Process Contribution <sup>a</sup>	Contribution as % of Background Level	% of Critical Level
Annual Mean Nitrogen Oxides ( $\mu\text{g}/\text{m}^3$ )	0.00048	17.1 – 35.3	17.1 – 35.3	0.001 – 0.003	0.002
24-Hour Mean Nitrogen Oxides ( $\mu\text{g}/\text{m}^3$ )	0.0076	N/A	N/A	N/A	0.01
Annual Mean Sulphur Dioxide ( $\mu\text{g}/\text{m}^3$ )	0.000017	0.3 – 1.1	0.3 – 1.1	0.002 – 0.006	0.00008
Annual Mean Nutrient Nitrogen Deposition Rate (kg-N/ha/yr)	0.000048	5.2 – 14.8	5.2 – 14.8	0.0003 – 0.0009	0.0002 – 0.0006
Annual Mean Acid Nitrogen Deposition Rate (keq/ha/yr)	0.0000055	0.35 – 1.08	0.35 – 1.08	0.0005 – 0.002	0.0001 – 0.0007

<sup>a</sup> Adding the maximum shipping contribution to the range in background levels.

**Table 7: Predicted Minimum Pollutant Concentrations at South Thames Estuary and Marshes SSSI ( $\mu\text{g}/\text{m}^3$ )**

Pollutant/Averaging Period	Minimum Additional Shipping Contribution	Background Level	Total Background and Process Contribution <sup>a</sup>	Contribution as % of Background Level	% of Critical Level
Annual Mean Nitrogen Oxides ( $\mu\text{g}/\text{m}^3$ )	0.00019	17.1 – 35.3	17.1 – 35.3	0.0005 – 0.001	0.0006
24-Hour Mean Nitrogen Oxides ( $\mu\text{g}/\text{m}^3$ )	0.0014	N/A	N/A	N/A	0.002
Annual Mean Sulphur Dioxide ( $\mu\text{g}/\text{m}^3$ )	0.0000068	0.3 – 1.1	0.3 – 1.1	0.0006 – 0.002	0.00003
Annual Mean Nutrient Nitrogen Deposition Rate (kg-N/ha/yr)	0.000019	5.2 – 14.8	5.2 – 14.8	0.0001 – 0.0004	0.00006 – 0.0002
Annual Mean Acid Nitrogen Deposition Rate (keq/ha/yr)	0.0000022	0.35 – 1.08	0.35 – 1.08	0.0002 – 0.0006	0.00004 – 0.0003

<sup>a</sup> Adding the minimum shipping contribution to the range in background levels.

**Table 8: Predicted Maximum Pollutant Concentrations at Mucking Flats and Marshes SSSI ( $\mu\text{g}/\text{m}^3$ )**

Pollutant/Averaging Period	Maximum Additional Shipping Contribution	Background Level	Total Background and Process Contribution <sup>a</sup>	Contribution as % of Background Level	% of Critical Level
Annual Mean Nitrogen Oxides ( $\mu\text{g}/\text{m}^3$ )	0.00038	27.3 – 33.7	27.3 – 33.7	0.001	0.001
24-Hour Mean Nitrogen Oxides ( $\mu\text{g}/\text{m}^3$ )	0.0041	N/A	N/A	N/A	0.005
Annual Mean Sulphur Dioxide ( $\mu\text{g}/\text{m}^3$ )	0.000013	0.5 – 0.8	0.5 – 0.8	0.002 – 0.003	0.00007
Annual Mean Nutrient Nitrogen Deposition Rate (kg-N/ha/yr)	0.000038	8.1 – 16.0	8.1 – 16.0	0.0002 – 0.0005	0.0001 – 0.0005
Annual Mean Acid Nitrogen Deposition Rate (keq/ha/yr)	0.0000043	0.56 – 1.16	0.56 – 1.16	0.0004 – 0.0008	0.00008 – 0.00009

<sup>a</sup> Adding the maximum shipping contribution to the range in background levels.

**Table 9: Predicted Minimum Pollutant Concentrations at Mucking Flats and Marshes SSSI ( $\mu\text{g}/\text{m}^3$ )**

Pollutant/Averaging Period	Minimum Additional Shipping Contribution	Background Level	Total Background and Process Contribution	Contribution as % of Background Level	% of Critical Level
Annual Mean Nitrogen Oxides ( $\mu\text{g}/\text{m}^3$ )	0.00033	27.3 – 33.7	27.3 – 33.7	0.001	0.001
24-Hour Mean Nitrogen Oxides ( $\mu\text{g}/\text{m}^3$ )	0.0027	N/A	N/A	N/A	0.004
Annual Mean Sulphur Dioxide ( $\mu\text{g}/\text{m}^3$ )	0.000012	0.5 – 0.8	0.5 – 0.8	0.001 – 0.002	0.00006
Annual Mean Nutrient Nitrogen Deposition Rate (kg-N/ha/yr)	0.000034	8.1 – 16.0	8.1 – 16.0	0.0002 – 0.0004	0.0001 – 0.0004
Annual Mean Acid Nitrogen Deposition Rate (keq/ha/yr)	0.0000038	0.56 – 1.16	0.56 – 1.16	0.0003 – 0.0007	0.00007 – 0.00008

<sup>a</sup> Adding the minimum shipping contribution to the range in background levels.

### 3 References

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## 4 Appendices

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## A1 Modelling Methodology

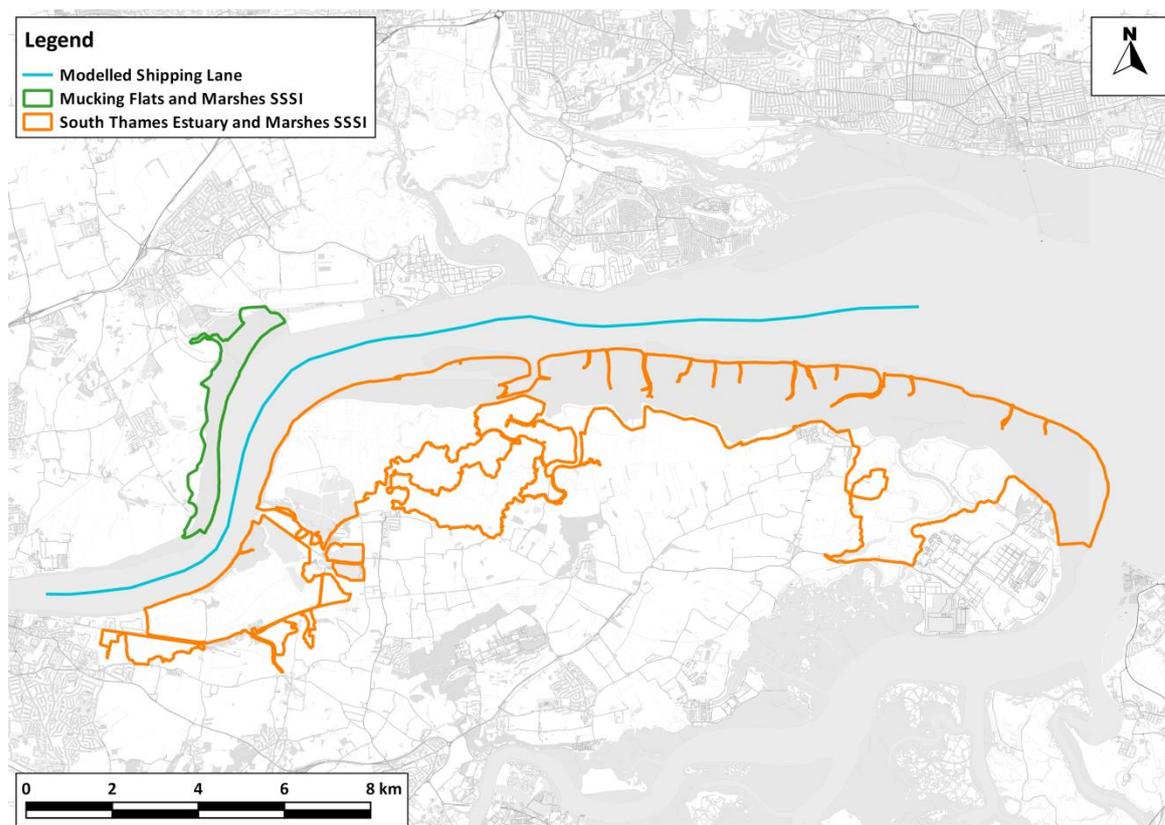
- A1.1 The impacts of emissions from the development-generated vessel movements have been predicted using the ADMS-5 dispersion model. ADMS-5 is a new generation model that incorporates a state-of-the-art understanding of the dispersion processes within the atmospheric boundary layer. The model has been run to predict the contribution of the proposed shipping emissions to annual mean concentrations of nitrogen oxides and sulphur dioxide, and the maximum 24-hour mean concentrations of nitrogen oxides.
- A1.2 Concentrations have been predicted across a nested Cartesian grid of receptors covering the entirety of the SSSIs, as well as the wider study area. Receptors have been spaced 200 m apart outside of the designated habitats and 100 m apart within the designated ecological site boundaries.
- A1.3 Hourly sequential meteorological data from Gravesend for 2013, 2014 and 2016 have been used in the model. The Gravesend meteorological station is deemed to be the nearest monitoring station representative of meteorological conditions in the vicinity of the proposed development site; both the development site and the Gravesend meteorological monitoring station are located at near-estuarine locations in the southeast of England where they will be influenced by the effects of estuarine meteorology.
- A1.4 Information on additional vessel movements and fleet composition associated with Tilbury 2 Dock has been provided by Port of Tilbury London Ltd. Specifications for the new development-generated vessels have been taken from technical datasheets for similar existing vessels, which have been identified by Port of Tilbury London Ltd. Vessel technical details are presented in Table A1.1 below. Using these details, nitrogen oxides and sulphur dioxide emissions rates have been calculated following the methodology established by Entec (2010). This approach assigns emissions factors to vessels based on engine speed and fuel type, and calculates an emission rate according to engine power and distance travelled. The total emission rates for all vessels included in this assessment are presented in Table A1.2. Table A1.2 also defines other model inputs used in the assessment. Exhaust temperature and efflux velocity have been taken from a report by CONservation of Clean Air and Water in Europe (CONCAWE, 1994). Source height has been determined from vessel technical drawings. Figure A1.1 shows the shipping lane included within the model and defines the study area.

**Table A1.1: Vessel Specifications**

Parameter	Value
<b>CMAT Aggregates Vessels – e.g. JS AMAZON</b>	
Annual Vessel Movements	40
Main Engine	Doonan MAN B&W 5S60ME-C8-TII
Main Engine Rotations Per Minute	91
Main Engine Power (kW)	8,300
Main Engine Fuel	MGO
Auxiliary Engine	3 x CME-MAN, 5L23/30H
Auxiliary Engine Rotations Per Minute	720
Auxiliary Engine Power (kW)	615
Auxiliary Engine Fuel	MGO
Vessel Average Speed (kph)	19.6
<b>RoRo Vessels – e.g. M/V Bore Sea</b>	
Annual Vessel Movements	1,452
Main Engine	Wärtsilä 12V46F-CR
Main Engine Rotations Per Minute	600
Main Engine Power (kW)	12,000
Main Engine Fuel	MGO
Auxiliary Engine	2 x Caterpillar 3508B
Auxiliary Engine Rotations Per Minute	1,500
Auxiliary Engine Power (kW)	1,270
Auxiliary Engine Fuel	MDO
Vessel Average Speed (kph)	27.0

**Table A1.2: Model Inputs**

Parameter	Value
Total Nitrogen Oxides Emission Rate (g/m/s)	0.00019
Total Sulphur Dioxide Emission Rate (g/m/s)	0.0000069
Exhaust Temperature (°C)	280
Efflux Velocity (m/s)	30
Source Height (m)	40.5



**Figure A1.1: Modelled Shipping Lane and SSSI boundaries**

## Deposition Rates

A1.5 Deposition has not been included within the dispersion model because the principal depositing component of concern is nitrogen dioxide and this is calculated from nitrogen oxides outside of the model. Instead, deposition has been calculated from the predicted ambient concentrations using the deposition velocities set out in Table A1.3. Deposition velocities refer to a height above ground, typically 1 or 2 m, although in practice the precise height makes little difference and here they have been applied to concentrations predicted at a height of 1.5 m above ground. The velocities are applied simply by multiplying a concentration ( $\mu\text{g}/\text{m}^3$ ) by the velocity (m/s) to predict a deposition flux ( $\mu\text{g}/\text{m}^2/\text{s}$ ). Subsequent calculations required to present the data as kg/ha/yr of nitrogen or sulphur and as keq/ha/yr for acidity follow basic chemical and mathematical rules<sup>2</sup>.

<sup>2</sup> For example, 1 kg N/ha/yr = 0.071 keq/ha/yr

**Table A1.3: Deposition Velocities Used in This Assessment**

Pollutant	Deposition Velocity (m/s)	Reference
Nitrogen Dioxide	0.0015 m/s (Grassland)	AQTAG06 (Environment Agency, 2011)
Sulphur Dioxide	0.012 m/s (Grassland)	AQTAG06 (Environment Agency, 2011)

A1.6 Wet deposition has been discounted. Wet deposition of the emitted pollutants this close to the emission source will be restricted to wash-out, or below cloud scavenging. For this to occur, rain droplets must come into contact with the gas molecules before they hit the ground. Falling raindrops displace the air around them, effectively pushing gasses away. The low solubility of nitrogen dioxide means that any scavenging of this gas will be a negligible factor. While wash-out of sulphur dioxide might be more significant, the very low sulphur oxide emission rates mean that discounting wet deposition is highly unlikely to affect the outcomes of the assessment.

## A2 Professional Experience

### **Prof. Duncan Laxen, BSc (Hons) MSc PhD MIEEnvSc FIAQM**

Prof Laxen is the Managing Director of Air Quality Consultants, a company which he founded in 1993. He has over forty years' experience in environmental sciences and has been a member of Defra's Air Quality Expert Group and the Department of Health's Committee on the Medical Effects of Air Pollution. He has been involved in major studies of air quality, including nitrogen dioxide, lead, dust, acid rain, PM<sub>10</sub>, PM<sub>2.5</sub> and ozone and was responsible for setting up the UK's urban air quality monitoring network. Prof Laxen has been responsible for appraisals of all local authorities' air quality Review & Assessment reports and for providing guidance and support to local authorities carrying out their local air quality management duties. He has carried out air quality assessments for power stations; road schemes; ports; airports; railways; mineral and landfill sites; and residential/commercial developments. He has also been involved in numerous investigations into industrial emissions; ambient air quality; indoor air quality; nuisance dust and transport emissions. Prof Laxen has prepared specialist reviews on air quality topics and contributed to the development of air quality management in the UK. He has been an expert witness at numerous Public Inquiries, published over 70 scientific papers and given numerous presentations at conferences. He is a Fellow of the Institute of Air Quality Management.

### **Dr Ben Marner, BSc (Hons) PhD CSci MIEEnvSc MIAQM**

Dr Marner is a Technical Director with AQC and has seventeen years' experience in the field of air quality. He has been responsible for air quality and greenhouse gas assessments of road schemes, rail schemes, airports, power stations, waste incinerators, commercial developments and residential developments in the UK and abroad. He has been an expert witness at several public inquiries, where he has presented evidence on health-related air quality impacts, the impacts of air quality on sensitive ecosystems, and greenhouse gas impacts. He has extensive experience of using detailed dispersion models, as well as contributing to the development of modelling best practices. Dr Marner has arranged and overseen air quality monitoring surveys, as well as contributing to Defra guidance on harmonising monitoring methods. He has been responsible for air quality review and assessments on behalf of numerous local authorities. He has also developed methods to predict nitrogen deposition fluxes on behalf of the Environment Agency, provided support and advice to the UK Government's air quality review and assessment helpdesk, Transport Scotland, Transport for London, and numerous local authorities. He is a Member of the Institute of Air Quality Management and a Chartered Scientist.

### **Penny Wilson, BSc (Hons) CSci MIEnvSc MIAQM**

Ms Wilson is an Associate Director with AQC, with more than seventeen years' relevant experience in the field of air quality. She has been responsible for air quality assessments of a wide range of development projects, covering retail, housing, roads, ports, railways and airports. She has also prepared air quality review and assessment reports and air quality action plans for local authorities and appraised local authority assessments and air quality grant applications on behalf of the UK governments. Ms Wilson has arranged air quality and dust monitoring programmes and carried out dust and odour assessments. She has provided expert witness services for planning appeals and is Member of the Institute of Air Quality Management and a Chartered Scientist.

### **Marko Ristic-Smith, BA (Hons) MSc DIC AMIEnvSc AMIAQM**

Mr Ristic-Smith is an Assistant Consultant with AQC, having joined the company in September 2016. He is gaining experience of air quality assessments for a range of developments using air quality monitoring and modelling techniques. Prior to joining AQC he completed his MSc in Environmental Technology, with his thesis examining the air quality and health impacts of transport policy scenarios in London. He is an Associate Member of the Institute of Air Quality Management.

Full CVs are available at [www.aqconsultants.co.uk](http://www.aqconsultants.co.uk).