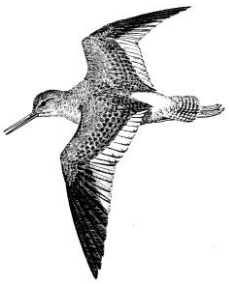
ENGLISH NATURE

THAMES ESTUARY

European marine site

English Nature's advice given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994



Issued 25 May 2001

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English Nature's advice for Thames Estuary European marine site given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994

Preface

This document provides English Nature's advice to other relevant authorities as to (a) the conservation objectives and (b) any operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species for the Thames Estuary European marine site. This advice is being prepared to fulfil our obligations under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994.

The **Thames Estuary and Marshes** Special Protection Area is a European marine site. European marine sites are defined in the Conservation (Natural Habitats &c.) Regulations 1994 as any part of a European site covered (continuously or intermittently) by tidal waters or any part of the sea in or adjacent to Great Britain up to the seaward limit of territorial waters. European sites include Special Areas of Conservation (designated under the Habitats Directive, which support certain natural habitats and species of European importance), and Special Protection Areas (designated under the Birds Directive, which support significant numbers of internationally important wild birds). In many instances these designations may coincide and our advice is being prepared to cover both the SAC and SPA interests where this occurs.

This 'Regulation 33 package' is designed to help relevant and competent authorities, who have responsibilities to implement the Habitats Directive, to:

- understand the international nature conservation importance of the site, underlying physical processes and the ecological requirements of the habitats and species involved;
- advise relevant authorities as to the conservation objectives for the site and operations which may cause deterioration or disturbance
- set the standards against which the condition of the site's interest features can be determined and undertake compliance monitoring to establish whether they are in favourable condition; and
- develop, if deemed necessary, a management scheme to ensure that the features of the site are maintained.

In addition, the Regulation 33 package will provide a basis to inform the scope and nature of 'appropriate assessment' required in relation to plans and projects (Regulations 48 & 50 and by English Nature under Regulation 20). English Nature will keep this advice under review and may update it every six years or sooner, depending on the changing circumstances of the European marine site. In addition, we will provide more detailed advice to competent and relevant authorities to assess the implications of any given plan or project under the Regulations, where appropriate, at the time a plan or project is being considered. If as a result of the UK SPA Network Review (led by JNCC) interest features are added to this European marine site or the site boundaries change, English Nature will amend this advice, as appropriate.

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English Nature
25 May 2001

Issued 25 May 2001

English Nature's advice for Thames Estuary European marine site given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994

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1. Introduction

1.1 Natura 2000

The European Union Habitats[1] and Birds[2] Directives are international obligations which set out a number of actions to be taken for nature conservation. The Habitats Directive aims to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements, and sets out measures to maintain or restore, natural habitats and species of European Union interest at favourable conservation status[3]. The Birds Directive protects all wild birds and their habitats within the European Union, and there are special measures for migratory birds and those that are considered rare or vulnerable.

The Habitats and Birds Directives include requirements for the designation of conservation areas. In the case of the Habitats Directive these are Special Areas of Conservation (SACs) which support certain natural habitats or species, and in the Birds Directive, Special Protection Areas (SPAs) which support wild birds of European Union interest. These sites will form a network of conservation areas across the EU to be known as "Natura 2000". Where SACs or SPAs consist of areas continuously or intermittently covered by tidal waters or any part of the sea in or adjacent to Great Britain up to the limit of territorial waters, they are referred to as European marine sites.

Further guidance on European marine sites is contained in the Department of the Environment Transport and Regions/Welsh Office document: *European marine sites in England & Wales: A guide to the Conservation (Natural Habitats &c.) Regulations 1994 and to the preparation and application of management schemes.*

1.2 English Nature's role

The Conservation (Natural Habitats &c.) Regulations 1994 translate the Habitats Directive into law in Great Britain. It gives English Nature a statutory responsibility to advise relevant authorities as to the conservation objectives for European marine sites in England and to advise relevant authorities as to any operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species for which the sites have been designated. This information will be a key component of any of the management schemes which may be developed for these sites.

This document is English Nature's advice for the Thames Estuary European marine site issued in fulfilment of Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994 (the 'Regulation 33 package'). Copies of key references quoted in this document are held at the English Nature local office, in Kent.

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1 Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora

2 Council Directive 79/409/EEC on the conservation of wild birds

3 A habitat or species is defined as being at favourable conservation status when its natural range and the areas it covers within that range are stable or increasing and the specific structure and functions which are necessary for its long term maintenance exist and are likely to continue to exist for the foreseeable future.

In addition to providing such advice, the Regulation 33 package informs on the scope and nature of 'appropriate assessment' which the Directive requires to be undertaken for plans and projects (Regulations 48 & 50 and by English Nature under Regulation 20). English Nature may also provide more detailed advice to competent and relevant authorities to assess the implications of any such plans or projects.

1.3 The role of relevant authorities

The Conservation (Natural Habitats &c.) Regulations 1994 require all competent authorities to exercise their functions so as to secure compliance with the Habitats Directive. This European marine site does not have a significant subtidal component, and is managed through existing SSSI mechanisms under the Wildlife and Countryside Act 1981, as amended 1985. However, relevant authorities may, if deemed necessary, draw up a management scheme under Regulation 34 for the European marine site component of the Thames Estuary and Marshes SPA. If such a management scheme is developed, it will provide the framework through which relevant authorities exercise their functions so as to secure compliance with the Habitats Directive and must be based on the advice in this package. Irrespective of this decision, relevant authorities must, within their areas of jurisdiction, have regard to both direct and indirect effects on an interest feature of the site as well as cumulative effects. This may include consideration of features and issues outside the boundary of the European marine site and above the highest astronomical tide.

Relevant authorities should ensure that all plans for the area integrate with any management scheme for the European marine site. Such plans may include shoreline management plans, CHaMPs (Coastal Habitat Management Plans), local Environment Agency plans, SSSI management plans, local BAP plans and sustainable development strategies for estuaries. This must occur to ensure that there is only a single management scheme through which all relevant authorities exercise their duties under the Conservation (Natural Habitats &c.) Regulations 1994.

Relevant authorities also need to have regard to changing circumstances of the SPA and may therefore need to modify the way in which they exercise their functions so as to maintain the favourable condition of interest features concerned in the long term. There is no requirement for relevant authorities to take any actions outside their statutory functions.

Under certain circumstances, where another relevant authority is unable to act for legal reasons, or where there is no other relevant authority, English Nature is empowered to use its bylaw-making powers for Marine Nature Reserves (MNR) for use in European marine sites.

1.4 Activity outside the control of relevant authorities

Nothing within this Regulation 33 package will require relevant authorities to undertake any actions or ameliorate changes in the condition of interest features if it is shown that the changes result wholly from natural causes[4]. This also applies if the changes, although causing deterioration or disturbance to the interest features, are the result of human or natural events outside their control. Having issued Regulation 33 advice for European marine sites, English Nature will work with relevant authorities and others to agree, within a defined time frame, a protocol for evaluating all observed changes to baselines and to develop an understanding of natural change and provide further guidance as appropriate and possible.

1.5 Responsibilities under other conservation designations

[4] Determination of what constitutes natural change will be based on the best available information and scientific opinion at the time.

In addition to its SPA status, parts of Thames Estuary are also designated and subject to agreements under other conservation legislation (e.g. SSSIs notified under the Wildlife and Countryside Act 1981 as amended 1985). The obligations of relevant authorities and other organisations under such designations are not affected by the advice contained in this document.

1.6 Role of conservation objectives

Section 4 of this document sets out the conservation objectives for the Thames Estuary European marine site. They are the starting point from which management schemes and monitoring programmes may be developed as they provide the basis for determining what is currently causing or may cause a significant effect, and for informing on the scope of appropriate assessments of plans or projects. The conservation objectives set out what needs to be achieved and thus deliver the aims of the Habitats Directive.

1.7 Role of advice on operations

The advice on operations set out in Section 6 provides the basis for discussion about the nature and extent of the operations taking place within or close to the site and which may have an impact on its interest features. It is given on the basis of the working assumption that sites were in favourable condition at the time they were identified. In the 2000-2006 reporting period an assessment of the condition of the site will be made to support this assumption, and ensure that favourable condition is being maintained. The advice should also be used to identify the extent to which existing measures of control, management and use are, or can be made, consistent with the conservation objectives and thereby focus the attention of relevant authorities and surveillance to areas that may need management measures.

This operations advice may need to be supplemented through further discussions with any management and advisory groups for the European marine site.

2. Qualifying species within the SPA under the EU Birds Directive

The boundary of the Thames Estuary and Marshes Special Protection Area (SPA) is shown in Figure 1.

Thames Estuary and Marshes SPA qualifies under Article 4.1 of the EU Birds Directive by supporting:

- Internationally important populations of regularly occurring Annex 1 species.

It also qualifies under Article 4.2 of the EU Birds Directive in that it supports:

- Internationally important populations of regularly occurring migratory species; and
- An internationally important assemblage of waterfowl.

The Thames Estuary and Marshes was classified as an SPA on 31 March 2000 and it is that citation on which this advice is based. The Thames Estuary and Marshes was also listed on 31 March 2000 as a Ramsar site under the Ramsar convention for its internationally important wetland status.

3. Interest features of the European marine site

The Thames Estuary and Marshes SPA includes both marine areas (ie. land covered continuously or intermittently by tidal waters) and land which is not subject to tidal influence. The marine part of the SPA is termed a European marine site. The extent of the Thames Estuary European marine site is illustrated in Figure 2. The seaward boundary of the European marine site is concurrent with that of the SPA. The landward boundary of the European marine site is the upper boundary of the SPA, or where that extends above land covered continuously or intermittently by tidal waters it is at the limit of the marine habitats.

Where SPA qualifying species occur within the European marine site they are referred to as interest features. Sub-features (habitats) have also been identified to highlight the ecologically important components of the European marine site for each interest feature. The interest features and sub-features for the Thames Estuary European marine site are described below and the sub-features are mapped at Figure 2 to show their distribution and extent.

3.1 Background and context

A major aim of the Birds Directive is to take special measures to conserve the habitats of qualifying birds in order to ensure their survival and reproduction within the European Union. A key mechanism in achieving this is the classification by Member States of the most suitable sites as SPAs.

English Nature's conservation objectives at a site level focus on maintaining the condition of the habitats used by the qualifying species. Habitat condition will be delivered through appropriate site management including the avoidance of damaging disturbance. In reporting on Favourable Conservation Status, account will need to be taken both of habitat condition and the status of the birds on the SPA.

Accordingly, English Nature will use annual counts, in the context of five year peak means for qualifying species, together with available information on population and distribution trends, to assess whether an SPA is continuing to make an appropriate contribution to the Favourable Conservation Status of the species. Count information will be assessed in combination with information on habitat condition, at the appropriate time within the reporting cycle, in order to report to the European Commission.

English Nature's advice focuses on the qualifying species for which the SPA was originally classified despite the fact that numbers and species composition may have changed on this site since that time. Such population and species composition changes are being documented through the UK SPA Network Review, led by JNCC, which will provide advice to Ministers on any changes required in SPA citations. Depending on the review and decisions from DETR, English Nature may reissue this advice.

In addition to focusing on avoiding deterioration to the habitats of the qualifying species, the Habitats Directive also requires that actions are taken to avoid significant disturbance to the species for which the site was designated. Such disturbance may include alterations in population trends and/or distribution patterns. Avoiding disturbance to species requirements is mentioned in the favourable condition table underpinning the conservation objectives for the SPA. In this context, five year peak mean information on populations will be used as the basis for assessing whether disturbance is damaging.

Attention is, however, also directed to the inclusion of disturbance in the advice on operations provided in section 6. Where disturbance is highlighted in such advice, relevant authorities need to avoid damaging disturbance to qualifying species when exercising their functions under the Directive.

3.2 Reductions in organic inputs

Under the Urban Waste Water Treatment (UWWT) Directive all coastal discharges above a certain volume must have secondary treatment installed by the end of 2000. Secondary treatment of sewage will significantly reduce organic loading and to a lesser extent reduce concentrations of dissolved nutrients. The effects of these reductions on coastal features and the birds they support are difficult to predict. On the one hand, it might be expected that there would be a redistribution of feeding birds or a reduction in the overall capacity of a coastal area to support bird populations. On the other hand, where bird populations are currently adversely affected by eutrophication, cleaner discharges may contribute to improving site condition.

English Nature supports the cleaning up of coastal discharges. On balance, the overall ecological benefits of cleaner discharges are likely, in general, to outweigh any subsequent local decline in bird numbers, although there is presently insufficient knowledge to accurately predict the effects in general or for individual SPA sites. Consequently, English Nature, with input from the Countryside Council for Wales and the Environment Agency, is commissioning a related research project to study the relationship between birds and organic nutrient levels, the overall effects on the ecosystem and thereby the effects of the clean-up programme under the UWWT and Bathing Water Directives.

Under the Habitats Regulations, if significant effects are likely from such activities, the competent authority (in this case the Environment Agency) will be required to undertake an appropriate assessment to determine whether there is an adverse effect on site integrity.

3.3 General description

In recognition that bird populations may change as a reflection of national or international trends or events, this advice on the bird interests of the European marine site focuses on the condition of the habitats necessary to support the bird populations. Sub-features are identified which describe the key habitats within the European marine site necessary to support the birds that qualify within the SPA. Detailed information and targets for habitat condition are listed in the favourable condition table in Section 5. Bird usage of the site varies seasonally, with different areas being favoured over others at certain times of the year. However, annual counts for qualifying species will be used by English Nature, in the context of five year peak means, together with available information on UK population and distribution trends, to assess whether this SPA is continuing to make an appropriate contribution to the Favourable Conservation Status of the species across Europe.

Bird communities are highly mobile and exhibit patterns of activity related to tidal water movements and many other factors. Different bird species exploit different parts of a marine area and different prey species. Changes in the habitat may therefore affect them differently. The important bird populations at this site require a functional estuary system which is capable of supporting intertidal habitats suitable for feeding and roosting. The most important factors related to this are:

- Current extent and distribution of suitable feeding and roosting habitat (e.g. mudflats, saltmarsh);
- Sufficient prey availability (e.g. small fish, crustaceans and worms);
- Levels of disturbance which are not detrimental to maintaining favourable conservation status for the species concerned; and
- Water quality necessary to maintain intertidal plant and animal communities;

The Thames Estuary European marine site encompasses the extensive mudflats and small areas of saltmarsh on the south bank of the Thames between Shorne Marshes and Grain, together with Mucking Flats on the north shore.

The squeeze of coastal habitats between rising seas and built sea defences is a concern in the Thames, as elsewhere around the coast. Between 1921 and 1983, tidal records indicate that sea levels in the Thames increased by approximately 4mm per year (IECS 1993). In the period from 1973 to 1988, 18.4% of the saltmarsh on the south bank of the Thames was lost to tidal erosion (Burd, 1992). Saltmarshes are not extensive in the Thames estuary, and are largely restricted to embayments (e.g. at Higham) and creeks (e.g. Yantlet Creek). In contrast, mudflats are extensive within the estuary, with over 2,250 ha on the south bank and *c*. 260 ha at Mucking. The mudflats within the estuary appear to have kept pace with sea level rise in recent decades (IECS, 1993). Between 1940 and 1988, the mudflats on the southern bank increased their area by 125 ha, a rate of 2.6 ha yr^{-1}. Most of this increase occurred through accretion at the low tide mark. At Mucking, the mudflats have extended slightly southwards since 1940, but the northern part of the flats have experienced a shoreward shift in MLW over the same period.

3.4 Internationally important populations of the regularly occurring Annex 1 species

The species listed in Annex 1 of the Birds Directive are the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution. Species listed on Annex 1 are in danger of extinction, rare or vulnerable. Annex 1 species that regularly occur at levels over 1% of the national population meet the SPA qualifying criteria. The Thames Estuary and Marshes SPA supports internationally important populations of avocet *Recurvirostra avosetta* and hen harrier *Circus cyaneus*, species listed on Annex 1 that meet the qualifying criteria.

This advice refers specifically to those species that regularly use the parts of the SPA lying within the boundary of the European marine site. In this context, only avocet occur in nationally important numbers within the European marine site. Avocet also utilise flooded mineral workings and areas of grazing marsh within the SPA but above the point of highest astronomical tide and therefore outside the European marine site boundary, particularly when displaced from the mudflats at high tide. The internationally important wintering population of hen harrier is dependent on the grazing marsh habitats within the SPA, but also outside the European marine site. Relevant authorities therefore need to have regard to adjacent European interests (i.e. those occurring above the highest astronomical tide), as they might be affected by activities taking place within, or adjacent to the European marine site. Objectives to maintain this aspect of bird interest in favourable condition are found within English Nature's conservation objectives for the relevant SSSIs within the SPA boundary and will be dealt with through procedures outlined in the Conservation (Natural Habitats &c.) Regulations 1994.

Other, non-qualifying, Annex 1 species that regularly occur on the European marine site include common tern *Sterna hirundo*, Bewick's swan *Cygnus columbianus bewickii*, golden plover *Pluvialis apricaria*, and ruff *Philomachus pugnax*.

3.4.1 Key sub-features

Intertidal mudflats
Mudflats are extensive within the estuary, with over 2,250 ha on the south bank of the Thames and *c*.260ha at Mucking. The mudflats are a rich source of invertebrates (shell fish and worms) and provide feeding grounds for wintering avocet. The mudflats at Higham and Mucking are particularly important for this species.

Intertidal saltmarsh
Saltmarshes are not extensive in the Thames Estuary European marine site, but nevertheless provide important high tide roost sites for birds, particularly at Higham. The vegetation varies because the plants at each level within its vertical profile are adapted to their particular degree of tidal exposure. Also in parts the vegetation varies because of grazing by domestic livestock. Where there is shallow water within the saltings they are also provide suitable habitat for feeding birds.

3.5 Internationally important assemblage of waterfowl including internationally important populations of regularly occurring migratory bird species

The internationally important assemblage of waterfowl and the internationally important populations of regularly occurring migratory species are separate qualifying features (see Section 2). They are considered together here to avoid unnecessary repetition.

Britain's wildfowl belong to the north-west European population and the waders to the East Atlantic flyway population. Migratory species of these biogeographic populations that regularly occur at levels of 1% or more of the total biogeographical population meet the SPA criteria and qualify in their own right. The Thames Estuary is also one of the most important estuaries in the UK for wintering waterfowl, and in addition to its internationally important populations, the Thames Estuary qualifies for its wintering waterfowl assemblage, regularly supporting over 20,000 birds (Cranswick *et al.,* 1999). The wintering waterfowl assemblage includes all the internationally important regularly occurring migratory or Annex 1 wintering species as well as species present in nationally important numbers or species whose populations exceed 2000 individuals.

The Thames Estuary supports internationally important numbers of regularly occurring migratory ringed plover *Charadrius hiaticula*, grey plover *Pluvialis squatarola*, dunlin *Calidris alpina alpina*, knot *C. canutus islandica*, black-tailed godwit *Limosa limosa* and redshank *Tringa totanus totanus*. Nationally important populations include shelduck *Tadorna tadorna*, teal *Anas crecca* and pintail *A. acuta*.

All of the above populations and assemblages are dependent on the European marine site. However, many of these species also use the grazing marsh and flooded mineral workings which lie outside the European marine site, for example as high tide roosts. Other species which contribute to the internationally important waterfowl assemblage within the Thames Estuary and Marshes SPA, such as gadwall *Anas strepera*, shoveler *Anas clypeata*, tufted duck *Aythya fuligula* and pochard *Aythya ferina* are largely dependent on the habitats outside the European marine site. Relevant authorities therefore need to have regard to adjacent European interests (i.e. those occurring above the highest astronomical tide), as they might be affected by activities taking place within, or adjacent to the European marine site. Objectives to maintain this aspect of bird interest in favourable condition are found within English Nature's conservation objectives for the relevant SSSIs within the SPA boundary and will be dealt with through procedures outlined in the Conservation (Natural Habitats &c.) Regulations 1994.

During severe winter weather the Thames Estuary assumes even greater national and international importance as waterfowl are attracted by the mild conditions and the abundant food resource.

3.5.1 Key sub-features

Intertidal mudflats
Mudflats are a rich source of invertebrates and provide the main feeding ground for wintering species such as dunlin, knot and black-tailed godwit, which occur in internationally important numbers, and other waterfowl species which contribute to the total size of the waterfowl assemblage.

The mudflats do in addition support some plant life, including eel grass (although very limited in extent) and algae. These too can be valuable as food for wildfowl, especially when inland feeding sites are frozen. Mudflats also provide important roosting areas for the internationally important assemblage of waterfowl and its qualifying species.

Intertidal saltmarsh

Saltmarshes are not extensive in the Thames Estuary European marine site, but nevertheless provide important feeding and roosting areas for the internationally important assemblage of waterfowl and its qualifying species. Upper saltmarsh in particular makes ideal highwater roost sites. The vegetation varies because the plants at each level within its vertical profile are adapted to their particular degree of tidal exposure. Also in parts the vegetation varies because of grazing by domestic livestock. Where the vegetation is kept short by grazing livestock, the waterfowl species which are themselves grazers, including teal, can feed. Where there is shallow water within the saltings it is especially suitable for feeding waders and dabbling duck.

Intertidal shingle

There are small areas of intertidal shingle and cobble beach on the south bank of the Thames near Allhallows and at Yantlet. These areas provide important roost sites for waders displaced from the mudflats at high tide.

4. Conservation objectives for SPA interest features

Under Regulation 33(2)(a) of the Conservation (Natural Habitats &c.) Regulations 1994, English Nature has a duty to advise other relevant authorities as to the conservation objectives for the European site. The conservation objectives for the Thames Estuary European marine site interest features are provided below and should be read in the context of other advice given in this package, particularly:

- the attached map showing the extent of the sub-features;
- summary information on the interest of each of the features; and
- the favourable condition table, providing information on how to recognise favourable condition for the feature, which will act as a basis for the development of a monitoring programme.

4.1 The conservation objective for the internationally important population of the regularly occurring Annex 1 bird species

Subject to natural change, maintain in favourable condition[5] the habitats for the **internationally important population of the regularly occurring Annex 1 bird species**, under the Birds Directive, in particular:

- **Intertidal mudflats**
- **Intertidal saltmarsh**

Numbers of birds using these habitats are given in Table 1

4.2 The conservation objective for the internationally important populations of regularly occurring migratory bird species

Subject to natural change, maintain in favourable condition[5]5 the habitats for the **internationally important populations of regularly occurring migratory bird species**, under the Birds Directive, in particular:

- **Intertidal mudflats**
- **Saltmarsh**
- **Intertidal shingle**

Numbers of bird species using these habitats are given in Table 1

4.3 The conservation objective for the internationally important assemblage of waterfowl

Subject to natural change, maintain in favourable condition[5] the habitats for the **internationally important assemblage of waterfowl**, under the Birds Directive, in particular:

- **Intertidal mudflats**
- **Saltmarsh**
- **Intertidal shingle**

Numbers of bird species using these habitats are given in Table 1

Note: These SPA conservation objectives focus on habitat condition in recognition that bird populations

5 For a detailed definition of how to recognise favourable condition see attached table 2 (Section 5)

may change as a reflection of national or international trends or events. Annual counts for qualifying species will be used by English Nature, in the context of five year peak means, together with available information on UK population and distribution trends, to assess whether this SPA is continuing to make an appropriate contribution to the Favourable Conservation Status of the species across Europe.

Table 1 Information on populations of bird species qualifying under the Birds Directive using the Thames Estuary European marine site at the time the SPA was classified.

Internationally important populations of regularly occurring Annex 1 species.

Species	Population (5 yr peak mean 1993/94 - 1997/98)*	
Avocet (*Recurvirostra avosetta*)	283 birds	28.3 % Great Britain

Internationally important populations of regularly occurring migratory bird species.[6]

Species	Population (5 yr peak mean 1993/94 - 1997/98)*	
Ringed Plover (*Charadrius hiaticula*)	1,324 birds	2.6% Europe /North Africa
Grey Plover (*Pluvialis squatarola*)	2,593 birds	1.7% Eastern Atlantic
Dunlin (*Calidris alpina alpina*)	29,646 birds	2.1% Northern Siberia/Europe/West Africa
Knot (*Calidris canutus islandica*)	4,848 birds	1.4% North West Europe
Black-tailed Godwit (*Limosa limosa*)	1,699 birds	2.4% Iceland
Redshank (*Tringa totanus totanus*)	3,251 birds	2.2% Eastern Atlantic

An internationally important assemblage of waterfowl.

Importance	Population (5 yr peak mean 1993/94 - 1997/98)*
Thames Estuary supports large populations of wintering waterfowl.	75,019 individual birds _

This figure includes the internationally important populations of regularly occurring migratory bird species listed above, as well as the nationally important populations of regularly occurring migratory bird species listed in the table below.

Nationally important bird populations within internationally important assemblages of water fowl.

Species
Shelduck *Tadorna tadorna*
Teal *Anas crecca*
Pintail *Anas acuta*

* SPA citation 31 March 2000 held on Register of European marine sites for Great Britain.

6. Thames Estuary is regularly used by 1% or more of the biogeographical population of a regularly occurring species (other than those listed on annex 1) in any season (Cranswick *et al.*, 1995).

5. Favourable condition table

The favourable condition table is supplied as an integral part of English Nature's Regulation 33 advice package. It is intended to supplement the conservation objectives only in relation to management of activities and requirements on monitoring the condition of the site and its features. The table **does not by itself** provide a comprehensive basis on which to assess plans and projects as required under Regulations 20 and 48-50, but it does provide a basis to inform the scope and nature of any 'appropriate assessment' that may be needed. It should be noted that appropriate assessments are, by contrast, a separate activity to condition monitoring requiring consideration of issues specific to individual plans or projects. English Nature will provide more detailed advice to competent and relevant authorities to assess the implications of any given plan or project under the Regulations, where appropriate, at the time a plan or project is being considered.

The favourable condition table is the principle source of information that English Nature will use to assess the condition of an interest feature and as such comprises indicators of condition. On many terrestrial European sites, we know sufficient about the preferred or target condition of qualifying habitats to be able to define measures and associated targets for all attributes to be assessed in condition monitoring. Assessments as to whether individual interest features are in favourable condition will be made against these targets. In European marine sites we know less about habitat condition and find it difficult to specify favourable condition. Individual sites within a single marine habitat category are also all very different, further hampering the identification of generic indicators of condition. Accordingly, in the absence of such information, condition of interest features in European marine sites will be assessed against targets based on the existing conditions, which may need to be established through baseline surveys in many cases.

The assumption that existing interest features on European marine sites are in favourable condition will be tested in the 2000 - 2006 reporting period and the results subsequently fed back into our advice and site management. Where there is more than one year's observations on the condition of marine habitats, all available information will need to be used to set the site within long-term trends in order to form a view on favourable condition. Where it may become clear that certain attributes are a cause for concern, and if detailed studies prove this correct, restorative management actions will need to be taken to return the interest feature from unfavourable to favourable condition. It is the intention of English Nature to provide quantification of targets in the favourable condition table during the 2000 - 2006 reporting period.

This advice also provides the basis for discussions with management and advisory groups, and as such the attributes and associated measures and targets may be modified over time. The aim is to produce a single agreed set of attributes that will then be monitored in order to report on the condition of features. Monitoring of the attributes may be of fairly coarse methodology, underpinned by more rigorous methods on specific areas within the site. To meet UK agreed common standards, English Nature will be committed to reporting on each of the attributes subsequently listed in the final version of the table, although the information to be used may be collected by other organisations through agreements.

The table will be an important, but not the only, driver of the site monitoring programme. Other data, such as results from compliance monitoring and appropriate assessments, will also have an important role in assessing condition. The monitoring programme will be developed as part of the management scheme process through discussion with the relevant authorities and other interested parties. English Nature will be responsible for collating the information required to assess condition and will form a judgement on the condition of each feature within the site, taking into account all available information and using the favourable condition table as a guide.

Box 1	**Glossary of terms used in the favourable condition table**
Interest feature	The habitat or species for which the site has been selected.
Sub-feature	An ecologically important sub-division of the interest feature.
Attribute	Selected characteristic of an interest feature/sub-feature which provides an indication of the condition of the feature to which it applies.
Measure	What will be measured in terms of the units of measurement, arithmetic nature and frequency at which the measurement is taken. This measure will be attained using a range of methods from broad scale to more specific across the site.
Target	This defines the desired condition of an attribute, taking into account fluctuations due to natural change. Changes that are significantly different from the target will serve as a trigger mechanism through which some further investigation or remedial action is taken.
Comments	The rationale for selection of the attribute.

Note: The internationally important assemblage of waterfowl and the internationally important populations of regularly occurring migratory species are separate qualifying features (Section 2). They are considered together in the favourable condition table to avoid unnecessary repetition.

Table 2 Favourable Condition Table for Thames Estuary European marine site

Numbers of bird species using these habitats are given in Table 1

NB - Many of the attributes will be able to be monitored at the same time or during the same survey. The frequency of sampling for many attributes may need to be greater during the first reporting cycle in order to characterise the site and establish the baseline.

Feature	Sub-feature	Attribute	Measure	Target	Comment
Internationally important populations of regularly occurring Annex 1 bird species (avocet)	All sub-features	Disturbance in feeding and roosting areas	Reduction or displacement of wintering birds, measured periodically (frequency to be determined).	No significant reduction in numbers or displacement of wintering birds attributable to disturbance, subject to natural change.	Significant disturbance attributable to human activities can result in reduced food intake and/or increased energy expenditure. Five year peak mean information on populations will be used as the basis for assessing whether disturbance is damaging.
		Absence of obstructions to view lines	Openness of terrain unrestricted by obstructions, measured periodically (frequency to be determined).	No increase in obstructions to existing bird view lines, subject to natural change.	Avocet ideally require unrestricted views >200m to allow early detection of predators when feeding and roosting.
	Intertidal mudflats	Extent and distribution of habitat	Area (ha), measured once per reporting cycle.	No decrease in extent from an established baseline[7], subject to natural change.	Intertidal sediments and their communities provide both habitat and feeding areas for the Annex 1 bird populations.
		Food availability	Diversity and abundance of fish and intertidal invertebrates including e.g. *Gammarus, Corophium*, flies, beetles, *Nereis, Hydrobia, Cardium*, gobies. Measured periodically, frequency to be determined.	Diversity and abundance of prey species should not deviate significantly from an established baseline[7], subject to natural change.	Marine insects, crustaceans, molluscs, worms and fish are important prey for avocet.
	Saltmarsh	Extent and distribution of	Area (ha), measured once per reporting cycle.	No decrease in extent from an established baseline[7],	Saltmarsh provides roosting areas, and shallow water within saltings may be used for feeding.

Feature	Sub-feature	Attribute	Measure	Target	Comment
		habitat		subject to natural change.	
Internationally important populations of regularly occurring Annex 1 bird species (avocet)	Saltmarsh	Vegetation characteristics	Open, short vegetation or bare ground predominating (roosting), measured periodically (frequency to be determined).	Vegetation height throughout areas used for roosting should not deviate significantly from an established baseline[7], subject to natural change.	Vegetation of <10cm is required throughout areas used by roosting avocet.
Internationally important assemblage including internationally and nationally important populations of migratory species	All sub-features	Disturbance in feeding and roosting areas.	Reduction or displacement of wintering birds, measured periodically (frequency to be determined).	No significant reduction in numbers or displacement of wintering birds attributable to disturbance, subject to natural change.	Significant disturbance attributable to human activities can result in reduced food intake and / or increased energy expenditure. Five year peak mean information on populations will be used as the basis for assessing whether disturbance is damaging.
		Absence of obstructions to viewlines	Openness of terrain unrestricted by obstructions, measured periodically (frequency to be determined).	No increase in obstructions to existing viewlines, subject to natural change.	Some waders require unrestricted views >200m to allow early detection of predators when feeding and roosting.
	Intertidal mudflats	Extent and distribution of habitat	Area (ha), measured once per reporting cycle.	No decrease in extent from an established baseline[7], subject to natural change.	Intertidal mudflats and their communities provide both roosting and feeding areas for the migratory species of birds.
		Food availability	Diversity and abundance of intertidal invertebrates. Measured periodically (frequency to be determined).	Diversity and abundance of prey species should not deviate significantly from an established baseline[7], subject to natural change.	Marine insects, crustaceans, molluscs and worms are important food sources for the migratory species of birds: *Gammarus* and *Pisidium* for ringed plover. *Nereis*, *Arenicola* and *Notomastus* for grey plover. *Nereis*, *Macoma*, *Hydrobia*, *Crangon* and *Carcinus* for dunlin. *Macoma*, *Mytilus/Cerastoderma* spat and *Hydrobia* for knot. *Macoma*, *Cardium* and *Nereis* for black-tailed godwit. *Hydrobia*, *Macoma*, *Corophium* and *Nereis* for redshank. *Nereis*, *Corophium* and *Hydrobia* for shelduck. *Hydrobia* for teal and pintail.
	Saltmarsh	Extent and distribution of	Area (ha), measured once	No decrease in extent from an established baseline[7],	Waterfowl feed and roost within the saltmarsh areas of

Feature	Sub-feature	Attribute	Measure	Target	Comment
		habitat	per reporting cycle.	subject to natural change.	the Thames Estuary European marine site.
Internationally important assemblage including internationally and nationally important populations of migratory species	Saltmarsh	Food availability	Presence and abundance of soft leaved and seed bearing plants. Measured periodically (frequency to be determined).	Presence and abundance of food species should not deviate significantly from an established baseline[7], subject to natural change.	*Salicornia* and *Atriplex* are important for teal.
		Vegetation characteristics	Open, short vegetation or bare ground predominating (roosting), measured periodically (frequency to be determined).	Vegetation height throughout areas used for roosting should not deviate significantly from an established baseline[7], subject to natural change.	Vegetation of <10cm is required throughout areas used by roosting waders.
	Intertidal shingle/cobble beach	Extent and distribution of habitat	Area (ha), measured once per reporting cycle.	No decrease in extent from an established baseline[7], subject to natural change.	Areas of intertidal shingle/cobble beach provide high tide roosts for the migratory species of waterfowl which use the Thames Estuary European marine site.

[7] Baseline will be established during the first reporting cycle

NB. Extreme events (such as storms reducing or increasing salinities, exceptionally cold winters or warm summers) also need to be recorded as they may be critical in influencing ecological issues in the Thames Estuary and may well be missed by routine monitoring.

6. Advice on operations

English Nature has a duty under Regulation 33(2)(b) of the Conservation (Natural Habitats &c.) Regulations 1994 to advise other relevant authorities as to any operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species, for which the site has been designated. Information on how English Nature has developed this advice is given in section 6.2, and on how it may be reviewed and updated in the future, in Section 6.4.

The advice is provided in summary form in Table 3 and Section 6.5 and with more detail in Table 4 and 5 and Section 6.8, including advice in relation to specific interest features and their sub-features.

6.1 Purpose of advice

The aim of this advice is to enable all relevant authorities to direct and prioritise their work on the management of activities that pose the greatest potential threat to the favourable condition of interest features on the Thames Estuary European marine site. The advice is linked to the conservation objectives for interest features and will help provide the basis for detailed discussions within the management group to formulate and agree a management scheme to agreed timescales for the site. The advice given here will inform on, but is without prejudice to, any advice given under Regulation 48 or Regulation 50 on operations that qualify as plans or projects within the meaning of Article 6 of the Habitats Directive.

6.2 Methods for assessment

To develop this advice on operations English Nature has used a three step process involving:

- an assessment of the **sensitivity** of the interest features or their component sub-features to operations;
- an assessment of the **exposure** of each interest feature or their component sub-features to operations; and
- a final assessment of **current vulnerability** of interest features or their component sub-features to operations.

This three step process builds up a level of information necessary to manage activities in and around the European marine site in an effective manner. Through a consistent approach, this process enables English Nature to both explain the reasoning behind our advice and identify to competent and relevant authorities those operations which pose the most current threats to the favourable condition of the interest features on the European marine site.

All the scores of relative sensitivity, exposure and vulnerability are derived using best available scientific information and informed scientific interpretation and judgement. The process uses sufficiently coarse categorisation to minimise uncertainty in information, reflecting the current state of our knowledge and understanding of the marine environment. Information has been gathered from a range of sources including reports such as ABP Research (1999).

6.2.1 Sensitivity assessment

The sensitivity assessment used is an assessment of the relative sensitivity of the interest features or the component sub-features of the Thames Estuary European marine site to the effects of broad categories of human activities. In relation to this assessment, sensitivity has been defined as the intolerance of a habitat,

community or individual (or individual colony) of a species to damage, or death, from an external factor (Hiscock, 1996). The sensitivity has been assessed in relation to the use of habitats by birds. As an example, wintering birds are highly sensitive to loss of their roosting or feeding grounds.

The sensitivity assessments of the interest features or their component sub-features of the Thames Estuary European marine site are based upon a series of scientific review documents. These include reports produced for the UK Marine SAC LIFE project (Davison & Hughes 1998; Elliott *et al* 1998), the Countryside Council for Wales Science Report (Holt *et al*, 1995) and the Marine Habitats Reviews (Jones *et al*, 2000).

The sensitivity assessments are based on current information but may develop with improvements in scientific knowledge and understanding. In particular, English Nature and Scottish Natural Heritage have commissioned the Marine Biological Association of the UK, through its Marine *Life* Information Network (MarLIN) to provide detailed sensitivity information to underpin this advice, over the next three years, and available to all over the World Wide Web (www.marlin.ac.uk).

6.2.2 Exposure assessment

This has been undertaken for the Thames Estuary European marine site by assessing the relative exposure of the interest features or their component sub-features to the effects of broad categories of human activities currently occurring on the site. The exposure has been assessed in relation to the use of habitats by birds. As an example, wintering birds' feeding and roosting grounds may be considered highly exposed to toxic contamination from synthetic compounds due to the locations and intensity of discharges into an area. Assessments have been informed by discussions with relevant authorities and other stakeholders, and by information included in other relevant sources, e.g. *Management Guidance for the Thames Estuary*.

6.2.3 Vulnerability assessment

The third step in the process is to determine the vulnerability of interest features or their component sub-features to operations. This is an integration of sensitivity and exposure. Only if a feature is both sensitive and exposed to a human activity will it be considered vulnerable. In this context therefore, 'vulnerability' has been defined as the exposure of a habitat, community or individual (or individual colony) of a species to an external factor to which it is sensitive (Hiscock, 1996). The process of deriving and scoring relative vulnerability is provided in Appendix I.

6.3 Format of advice

The advice is provided within six broad categories of operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species. This approach therefore:

- enables links to be made between human activities and the ecological requirements of the habitats or species, as required under Article 6 of the Habitats Directive;
- provides a consistent framework to enable relevant authorities in England to assess the effects of activities and identify priorities for management within their areas of responsibility; and
- is appropriately robust to take into account the development of novel activities or operations which may cause deterioration or disturbance to the interest features of the site and should have sufficient stability to need only infrequent review and updating by English Nature.

Sensitivity and vulnerability have been assessed in relation to the use of habitats by birds.

These broad categories provide a clear framework against which relevant authorities can assess activities under their responsibility. The more detailed information in Table 4 and 5 provides relevant authorities with a context against which to consider an assessment of 'significant effect' or any plans or projects which may affect the site and a basis to inform on the scope and nature of appropriate assessments required in relation to plans and projects. It is important to note that this advice is only a starting point for assessing impacts. It does not remove the need for the relevant authorities to consult English Nature formally over individual plans and projects where required to do so under the Regulations.

6.4 Update and review of advice

Information as to the operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species, for which the site has been designated, is provided in light of what English Nature knows about current activities and patterns of usage at the Thames Estuary European marine site. English Nature expects that the information on current activities and patterns of usage (which was used to derive table 4) will be supplemented as part of the process of developing the management of the site, and through further discussion with the relevant authorities. The option of zoning this information may be appropriate. As such, it is important that future consideration of this advice by relevant authorities and others takes account of changes in the usage patterns that have occurred at the site, over the intervening period, since the advice was issued. In contrast, the information provided in this advice on the sensitivity of interest features or sub-features (Table 5) is relatively stable and will only change as a result of an improvement in our scientific knowledge, which will be a relatively long term process. Advice for sites will be kept under review and may be periodically updated through discussion with relevant authorities and others to reflect significant changes in our understanding of sensitivity together with the potential effects of plans and projects on the marine environment.

6.5 Summary of advice on operations

6.5.1 Internationally important populations of regularly occurring Annex 1 species

In pursuit of the conservation objective for habitats supporting internationally important populations of regularly occurring Annex 1 species (Section 4.1), the relevant and competent authorities for the Thames Estuary European marine site are advised to manage human activities within their remit such that they do not result in significant deterioration or significant disturbance to habitats or species for which the site has been selected, through any of the following:

- Physical loss resulting from removal
- Physical damage from abrasion
- Noise or visual disturbance
- Increased synthetic and/or non-synthetic toxic contamination
- Non-toxic contamination through changes in nutrient and/or organic loading
- Biological disturbance through the introduction of non-native species or the selective extraction of species

6.5.2 Internationally important assemblage of waterfowl and internationally important populations of regularly occurring migratory species

In pursuit of the conservation objective for habitats supporting the internationally important populations of regularly occurring migratory species (Section 4.2) and habitats supporting the internationally important assemblage of waterfowl (Section 4.3), the relevant and competent authorities for the Thames Estuary European marine site are advised to manage human activities within their remit such that they do not result

in deterioration or significant disturbance to habitats or species for which the site has been selected, through any of the following:

- Physical loss resulting from removal
- Physical damage from abrasion or selective extraction
- Noise or visual disturbance
- Increased synthetic and/or non-synthetic toxic contamination
- Non-toxic contamination through changes in nutrient and/or organic loading
- Biological disturbance through the introduction of non-native species or the selective extraction of species

6.6 Plans and Projects

Under Regulation 48(1), an appropriate assessment must be undertaken in respect of any plan or project which:

a. either alone or in combination with other plans or projects is likely to have a ***significant effect*** on a European Site; and
b. is not directly connected with or necessary to the management of the site for nature conservation.

This legal requirement applies to all European sites. Regulation 48 is also applied, as a matter of Government policy, to potential SPAs and listed Ramsar sites.

English Nature's 'Habitats regulations guidance note 1: The Appropriate Assessment (Regulation 48)', is at Appendix II for further information.

Tables 3, 4 and 5 provide relevant authorities with a guide against which to initiate an assessment of the 'significance' of any plans or projects (and ongoing operations or activities) proposed for the site although this will only be the starting point for assessing impacts and does not remove the need for relevant authorities to formally consult English Nature over individual plans and projects where required under the Regulations.

6.7 Review of consents

Regulation 50 of the Conservation (Natural Habitats, &c.) Regulations 1994 requires a competent authority to undertake a review of any existing consent or permission to which Regulation 48(1) would apply if were being reconsidered as of the date on which the site became a European site. Where a review is required under these provisions it must be carried out as soon as reasonably practicable. This will have implications for discharge and other consents, which will need to be reviewed in light of these objectives and may mean that lower targets for background levels of contaminants etc. will need to be set.

Table 3 Summary of operations which may cause deterioration or disturbance to the Thames Estuary European marine site interest features at current levels of use[8]

The advice below is not a list of prohibitions but rather a checklist for operations for discussion with the relevant authorities, which may need to be subject to some form of management measure(s) or further measures where actions are already in force. Examples of activities under relevant authority jurisdiction are also provided. Operations marked with a √ indicate those features that are considered to be highly or moderately vulnerable to the effects of the operations.

Standard list of categories of operation which may cause deterioration or disturbance	Internationally important populations of regularly occurring Annex 1 birds		Internationally important populations of regularly occurring migratory species and internationally important assemblage of waterfowl (>20 000 birds)		
	Intertidal mudflats	Saltmarsh	Intertidal mudflats	Saltmarsh	Intertidal shingle
Physical loss					
Removal (e.g. by coastal development, reprofiling)	√	√	√	√	√
Smothering (e.g. by artificial structures, disposal of dredge spoil)					
Physical damage					
Siltation (e.g. run-off, channel dredging, outfalls)					
Abrasion (e.g. boating, anchoring, trampling)		√		√	√
Selective extraction (e.g. aggregate dredging)					√
Non-physical disturbance					
Noise (e.g. boat activity)	√	√	√	√	√
Visual (e.g. recreational activity)	√	√	√	√	√
Toxic contamination					
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs)	√	√	√	√	

Standard list of categories of operation which may cause deterioration or disturbance	Internationally important populations of regularly occurring Annex 1 birds		Internationally important populations of regularly occurring migratory species and internationally important assemblage of waterfowl (>20 000 birds)		
	Intertidal mudflats	Saltmarsh	Intertidal mudflats	Saltmarsh	Intertidal shingle
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	√	√	√	√	
Introduction of radionuclides					
Non-toxic contamination					
Changes in nutrient loading (e.g. agricultural run-off, outfalls)	√		√		
Changes in organic loading (e.g. mariculture, outfalls)	√		√		
Changes in thermal regime (e.g. power stations)					
Changes in turbidity (e.g. dredging)					
Changes in salinity (e.g. water abstraction, outfalls)					
Biological disturbance					
Introduction of microbial pathogens					
Introduction & translocation of non-native species	√		√		
Selective extraction of species (e.g. bait digging, shellfish harvesting)	√	√	√	√	

[8] This advice has been developed using best available scientific information and informed scientific interpretation and judgement (as at October 2000). This process has used a coarse grading of relative sensitivity, exposure and vulnerability of each interest feature to different categories of operation based on the current state of our knowledge and understanding of the marine environment. This is shown in the sensitivity and vulnerability matrices at Table 5. The advice is indicative only, and is given to guide relevant authorities and others on particular operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species for which the site has been designated. The advice, therefore, is not a list of prohibitions but rather a check list for operations which may need to be subject to some form of management measure(s) or further measures where actions are already in force.
The precise impact of any category of operation occurring on the site will be dependant upon the nature, scale, location and timing of events. More detailed advice is available from English Nature to assist relevant authorities in

assessing actual impacts and cumulative effects. Assessment of this information should be undertaken in the development of management of the site through wider consultation.
In accordance with Government policy guidance, the advice on operations is feature and site specific, and provided in the light of current activities and patterns of usage at the site as at October 2000. As such, it is important that future consideration of this advice by relevant authorities, and others, takes account of changes in usage patterns that have occurred at the site over the intervening period. Advice for sites will be kept under review and may be periodically updated through discussions with relevant authorities, and others, to reflect significant changes in our understanding of sensitivity together with the potential effects of plans or projects on the marine environment. The provision of the statutory advice given here, on operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species, for which the site has been designated, under Regulation 33(2), is provided without prejudice to specific advice given under Regulation 48(3) or Regulation 50 on individual operations that qualify as plans or projects within the meaning of Article 6 of the Habitats Directive.

6.8 Interest feature and sub-feature specific advice on operations

This section provides information to help relate general advice to each of the specific interest features of the Thames Estuary European marine site.

This advice relates to the vulnerability of the interest features and sub-features of the Thames Estuary European marine site as summarised in Table 3 and set out in more detail in Table 5. An explanation of the sensitivity of the interest features or sub-features follows with an explanation of their exposure and therefore their vulnerability to damage or disturbance from the listed categories of operations. This enables links between the categories of operation and the ecological requirements of the European marine site's interest features, as set out in Section 3, to be made.

6.8.1 Internationally important populations of regularly occurring Annex 1 species, internationally important populations of regularly occurring migratory species and internationally important assemblage of waterfowl

Physical loss

The physical loss of areas of intertidal habitats may be caused directly through change of land use or indirectly as a consequence of changes to sedimentation processes (e.g. coastal defences) as well as via the effects of smothering by artificial structures (e.g. jetties) or the disposal of dredging spoil. Activities or developments resulting in physical loss of the intertidal sub-features are likely to reduce the availability of food and roosting habitat and thus be detrimental to the favourable condition of the SPA interest features including all qualifying Annex 1 and migratory species. The sensitivity of this habitat to physical loss by removal is high and the vulnerability is also high. The sensitivity of this habitat to physical loss by smothering is moderate and only of low vulnerability.

The majority of the Thames Estuary European marine site is bordered by undeveloped coast, and the area of intertidal mudflats on the south bank of the Thames has actually increased since 1940 (IECS, 1993). This increase may be the result of changes in the profile of the estuary following land claim and development on the northern bank of the Thames, outside the European marine site (IECS, 1993). Further development within the estuary (e.g. expansion of the port facilities at

Shellhaven) and any need for additional dredging in the subtidal channel could affect patterns of erosion and accretion within the European marine site. Some models of sea level rise also predict a significant shortfall in sediment availability within the estuary over the next 50 years (IECS, 1993). Further studies, such as the North Kent Coast Coastal Process Study proposed by the Environment Agency, will improve understanding of sediment movement within the estuary.

A significant proportion of the maintenance dredging within the subtidal channel is carried out by means of water injection or agitation, but some dredging does involve the extraction of material for beneficial use or disposal. Unless required for other projects, dredging spoil is currently disposed of onshore at Rainham and at Cliffe. The exposure of the intertidal sub-features to smothering is therefore categorised as low. Demand for disposal sites may increase if further capital and/or maintenance dredging is required as part of the Shellhaven development.

During recent decades, most loss of saltmarsh within the Thames Estuary European marine site has been the result of coastal squeeze, caused by rising sea levels and the shoreward constraints of sea defence embankments (Burd, 1992). If current rates of saltmarsh loss continue, the majority of the remaining saltmarsh resource may be lost by the middle of this century. The habitat is therefore considered to have a high vulnerability to physical loss.

Physical damage

Siltation

Prey items of birds feeding on intertidal mudflats live on the surface of the mud or within the sediment. Siltation is unlikely to affect availability of prey species as burrowing worms and shellfish would tend migrate upwards through deposited silts. However, filter-feeding shellfish may be stressed by increased siltation and this may affect prey availability to waterfowl. The sensitivity of the habitat to damage by siltation is rated as low.

A significant proportion of the maintenance dredging within the subtidal channel is by means of water injection or agitation dredging. Siltation can occur as a result of these dredging operations, the plume from which may cover a large area. The suspended sediment regime of the Thames estuary involves processes of deposition and re-entrainment with each tidal cycle (HR Wallingford, 1978), and natural sediment flux within the estuary is large compared to that associated with current dredging activity. Exposure to damage by siltation is therefore only rated as low to moderate and the habitats and qualifying species of the Thames European marine site are not currently vulnerable to physical damage through siltation.
The role of dredging in the complex process of sediment flux within the estuary is of importance in that continued disturbance of the channel geometry may result in changes to this natural process of sediment exchange. Increased demand for capital and/or maintenance dredging in association with developments elsewhere in the Thames may therefore influence sediment exchange and local siltation. Further studies, such as the North Kent Coast Coastal Process Study proposed by the Environment Agency, will improve understanding of sediment movement within the estuary.

Abrasion

Saltmarsh losses within the estuary are largely attributed to the process of coastal squeeze (Burd, 1992), with the marsh being eroded at the seaward edge but constrained by embankments to shoreward. The exposed saltmarshes along the Thames estuary are susceptible to wave attack and erosion during the high water period of the tide. Sea level rise accentuates this process, with the saltmarsh being in contact with the water for longer periods, and with the deeper water leading to increased wave energy.

The Thames is a major shipping channel, with the Port of London handling approximately 54.2 million tonnes of trade in 1999. There are in addition large numbers of recreational boat users in the estuary. Abrasion caused by the wash from ships and boats may be contributing to the loss of saltmarsh habitats within parts of the estuary. The habitat is therefore thought to have a high exposure and high vulnerability to abrasion.

Intertidal mudflats are also exposed to abrasion by boat wash, but the evidence of continued accretion on the seaward edge of the flats since 1940 suggests that this is not currently a constraint on the extent of this habitat within the European marine site.

The small areas of intertidal shingle are only covered by the highest tides and therefore have a low exposure to abrasion from boat wash. However, the physical structure of the habitat is easily damaged and the sensitivity is therefore high, resulting in an overall assessment of moderate vulnerability.

Selective extraction

Selective extraction of minerals would be damaging to all habitats within the European marine site. The process itself may result in further problems associated with disturbance and siltation/smothering, or affect patterns of accretion and erosion within the estuary. Dredging is not considered as "selective extraction". Current exposure is thought to be low for all sub-features. The roost sites provided by areas of intertidal shingle are easily damaged by extraction, however, and their sensitivity is therefore high, resulting in an overall assessment of moderate vulnerability for this sub-feature.

Non-physical disturbance

All bird species using the site are highly sensitive to disturbance, particularly during severe weather. Disturbance can have the effect of displacing birds, thus reducing their feeding efficiency while increasing their energy requirements. This factor is a particular concern during prolonged periods of cold weather. Disturbance may be caused by sudden movements of objects and increases in noise over or adjacent to feeding and roosting areas. Sensitivity to noise and visual disturbance is high for all sub-features.

Much of the site is accessible to the public, most of the sea wall being a public right of way. Whilst large parts of the site are remote from urban conurbations and therefore little used, there are zones of high public activity, particularly during the spring and summer. Parts of the site are also easily accessible from the water and used by yachts and other watercraft. Currently recreational disturbance is not thought to be a major problem within the site, but exposure may be high in specific areas. Exposure to visual disturbance is moderate for saltmarsh because it is restricted to areas adjacent to public footpaths and is exposed throughout most states of the tide. Similarly, exposure is moderate for intertidal shingle, the majority of which is adjacent to the settlement of Allhallows-on-Sea. Both saltmarsh and intertidal shingle are therefore given a high vulnerability rating for visual disturbance.

The Thames is a major route for shipping, with regular movement of ships and boats in the deep water channel (outside the European marine site). Birds may become habituated to the visual presence of ships in the channel, but sudden movements or noises on these vessels or the presence of fast-moving craft may disturb birds feeding at the water's edge. The degree of disturbance will be dependent on the state of the tide and hence the distance of ships from the mudflat margins. Intertidal mudflats are therefore subject to a medium level of noise disturbance, but exposure is thought to be low for saltmarsh and intertidal

shingle.

Toxic contamination

Industrial and domestic effluent discharges contain contaminants which build up in the food chain and may have toxic effects on birds and their prey. These contaminant include heavy metals such as copper, zinc, mercury and cadmium, and synthetic organic compounds such as dieldrin, TBT and PCBs (poly-chlorinated biphenyls). These may have lethal and sub-lethal effects on marine invertebrates predated by birds. Specialist feeders can be affected by the loss of a prey species, whilst generalist feeders could benefit from an abundance of opportunistic prey species. This may, however, result in a reduced diversity of species in the bird assemblage and may affect internationally important populations. Sub-lethal effects on food sources reduce the fitness of individual prey species by affecting reproduction, physiology and general health. Initially this may result in an increased abundance of food as invertebrate prey behaviour may be altered, making them more available to feeding birds, but ultimately the prey populations would start to decline. Birds feeding on contaminated food sources are directly at risk from substances with the potential to accumulate within the food chain. Mudflats and saltmarsh are therefore moderately sensitive to toxic contamination. Intertidal shingle, which is used for roosting rather than feeding, is less sensitive to the effects of contamination.

Sewage discharge points are a potential source of toxic contaminants which may affect limited areas. Toxic contaminants in the marine environment are, however, often the result of diffuse sources and so the precise source can be difficult to identify. Historically, of the large estuaries in England, the Thames has had one of the highest concentrations of these substances. By the 1950s, the combined effects of inadequately treated sewage and industrial discharges, thermal pollution from power stations and the increasing use of non-biological detergents meant that the estuary had declined to a worse state than at any time in its history (TEP, 1999). Water quality has improved dramatically during the last 30 years as a result of stricter regulation and investment in treatment infrastructure. The Thames is now acclaimed as a river "returned from the dead", supporting a diverse ecosystem including 118 species of fish.
However, pollution still poses a threat to fish and other aquatic life. Monitoring in 1997 found that levels of TBT in the waters of the estuary exceeded the environmental quality standards set to protect wildlife (TEP, 1999). Dredging or other remobilisation of contaminants trapped in sediments could lead to increased exposure to hydrocarbons and heavy metals.

Large oil spills over intertidal mudflats can cause large scale deterioration of invertebrate communities and this would have a significant impact on an important food source for wintering waterfowl. Acute oil spills over saltmarsh would render this food source unpalatable, and birds alighting to feed or roost would become oiled and contaminated.

Mudflats and saltmarsh have moderate to high exposure ratings for toxic contamination by synthetic and non-synthetic compounds due to their proximity to industrial areas, including the large oil refineries and storage depots on the north bank of the Thames, upstream inputs, and the risk of oil spills from shipping. The areas of intertidal shingle have been given a lower exposure rating, since they are only exposed to water-borne contamination during the highest tides.

Non-toxic contamination

Changes in nutrient and organic loading

Organic or nutrient enrichment can reduce the availability of food for birds by increasing growth of algal mats on the intertidal area. Algal blooms can reduce the surrounding water quality by causing the removal of oxygen as the bloom decomposes or occasionally by the release of toxins. Such a deterioration in water quality can impact on marine communities and cause a reduction in food availability. Algal blooms can also cause a reduction in water clarity, thereby reducing the visibility of prey items for birds feeding at the water's edge.

Organically enriched sediments benefit invertebrate prey species that can tolerate low oxygen levels. Though there may be an abundance of marine worms (oligochaetes), which thrive in these conditions, there are usually few other species present. While it may appear that birds benefit under these circumstances because large numbers visit such areas to feed, it is likely to indicate opportunism by a limited number of bird species, and is unlikely to benefit the estuary bird populations as a whole. In the absence of such organically enriched areas, birds are likely to be more widespread on the intertidal flats.

The catchment for the Thames estuary includes large areas of arable land and major urban conurbations. The site is therefore exposed to nutrient and organic enrichment from upstream inputs, e.g. fertilizer run-off, sewage treatment works and industrial facilities. Exposure is greater for mudflats than for saltmarsh or shingle, due to the longer periods of submersion. Vulnerability to nutrient and organic enrichment is therefore rated as moderate or high for mudflats, but low for the other sub-features. However, eutrophication has not been perceived as a significant problem within the estuary. The natural conditions which exist in the estuary, such as strong tidal flows, salinity variations and high turbidity, are thought to preclude any significant algal blooms (TEP, 1999).

Changes in thermal regime
Feeding around thermal discharges could increase if some prey populations have increased in response to the heated water or are more available due to changes in behaviour triggered by the increase in temperature. For example, some burrowing marine animals have been reported to leave their burrows and lie on the surface of the sediment in response to higher temperatures (Cole *et al*., 1999).

There are currently several power stations within the estuary, e.g. at Tilbury and at Grain, and other cooling water discharges occur upstream from the European marine site. Since 1989, discharges of cooling water have been subject to a condition whereby when river temperatures exceed 21.5^{o}C power stations have to switch to alternative cooling methods. The natural conditions which exist in the estuary, such as strong tidal flows, are thought to localise the effects of these discharges and exposure for all sub-features is rated as low, with no vulnerability.

Changes in turbidity
Most prey communities are adapted to turbid conditions and increases from man-induced sources are likely to be tolerated. The exceptions include filter-feeding shellfish inhabiting the foreshore and shallow waters, which may lose condition if turbidity levels increase above background levels clogging feeding or respiratory structures.

Exposure to changes in turbidity is thought to be low because the estuary is constantly turbid. Vulnerability is therefore low for all sub-features within the European marine site.

Changes in salinity
The estuary is subject to natural salinity variations, dependent on the state of the tide and fluvial flow in the Thames. Localised changes in salinity may also occur in the vicinity of freshwater outfalls, dependent on flows. Vulnerability is currently low although the influence of these changes on invertebrate populations and the feeding behaviour of waterfowl needs further investigation.

Biological disturbance
Introduction of microbial pathogens
Microbial pathogens may enter the estuary through sewage discharges or by introduction of organisms brought in by shipping. As pathogens are species specific, specialist feeders such as knot, which feed on shellfish, could be affected if an epidemic disease severely depleted a particular food source.

Introduction of non-native species

An introduced species may affect the availability of prey items to birds either through predation of favoured prey or by out-competing them for food, leading to losses of the prey population. Mudflats have a moderate sensitivity to the introduction of non-native species, whilst saltmarsh is thought to be less sensitive. Intertidal shingle, used as roosting habitat, is not thought to be sensitive.

The Thames is a major shipping channel, with the Port of London handling approximately 54.2 million tonnes of trade in 1999. Non-native and potentially invasive species may be accidentally introduced in ship's ballast water, e.g. Chinese Mitten Crabs, which are a concern in the Thames upstream from the European marine site, as they have been found burrowing in the estuary's soft sea defences. Exposure to the introduction of non-native species is therefore thought to be medium for intertidal mudflats, but low for saltmarsh and shingle due to their restricted distribution within the site. Evaluation of sensitivity and exposure therefore suggests that only mudflats are moderately vulnerable to the effects of introduced non-native species, at current levels of exposure.

Selective extraction of species

Bird populations may be affected if they are in competition with humans in exploiting a food species. Over exploitation of shellfish stocks could have a serious impact on birds such as knot. Fisheries can also impact on bird populations, or their prey, as a result of disturbance, smothering, siltation or physical damage to intertidal habitats; these activities have been considered in the preceding sections. Both mudflats and saltmarsh have moderate sensitivity to the effects of selective extraction of species.

The Greater Thames Estuary supports the largest cockle fishery in the UK, with the area of Maplin Sands being particularly important. Commercial cockle harvesting occurs between Grain and Allhallows, but the current level of activity within the European marine site is thought to be low. Other fisheries in the estuary include a gill net fishery for bass and mullet, which encompasses the south side of the Thames between Grain and Cliffe, and a commercial trawl fishery for sole, sprat, herring, cod, whiting, eel and smelt in the subtidal channel. Some fyke netting for eels occurs across Blythe Sands.

Non-commercial bait digging can also impact on prey populations, but the impacts are localised and the current level of activity is thought to be low. Wildfowling occurs on and around the edge of the estuary, including one of the main areas of saltmarsh at Yantlet Creek.

The cumulative exposure to commercial fisheries, non-commercial bait digging and wildfowling has been rated as medium for intertidal mudflats and saltmarsh within the European marine site. As a consequence, mudflats and saltmarsh are given moderate vulnerability ratings. The areas of intertidal shingle are thought to have low exposure, and hence low vulnerability, to these activities.

Table 4 Assessment of the relative exposure of interest features and sub-features of Thames Estuary European marine site to different categories of operations based on current level of activities (as at October 2000)

Key: High= High exposure Med =Medium exposure Low= Low exposure None= No exposure

Standard list of categories of operation which may cause deterioration or disturbance	Internationally important populations of regularly occurring Annex 1 birds		Internationally important populations of regularly occurring migratory species and internationally important assemblage of waterfowl (>20 000 birds)		
	Intertidal mudflats	Saltmarsh	Intertidal mudflats	Saltmarsh	Intertidal shingle
Physical loss					
Removal (e.g. by coastal development, reprofiling)	Med	Med	Med	Med	Med
Smothering (e.g. by artificial structures, disposal of dredge spoil)	Low	Low	Low	Low	Low
Physical damage					
Siltation (e.g. run-off, channel dredging, outfalls)	Med	Low	Med	Low	Low
Abrasion (e.g. boating, anchoring, trampling)	Med	High	Med	High	Low
Selective extraction (e.g. aggregate dredging)	Low	Low	Low	Low	Low
Non-physical disturbance					
Noise (e.g. boat activity)	Med	Low	Med	Low	Low
Visual (e.g. recreational activity)	Low	Med	Low	Med	Med
Toxic contamination					
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs)	High	Med	High	Med	Low
Introduction of non-synthetic compounds (e.g. heavy metals,					

Standard list of categories of operation which may cause deterioration or disturbance	Internationally important populations of regularly occurring Annex 1 birds		Internationally important populations of regularly occurring migratory species and internationally important assemblage of waterfowl (>20 000 birds)		
	Intertidal mudflats	Saltmarsh	Intertidal mudflats	Saltmarsh	Intertidal shingle
hydrocarbons)	Med	Med	Med	Med	Low
Introduction of radionuclides	Low	Low	Low	Low	Low
Non-toxic contamination					
Changes in nutrient loading (e.g. agricultural run-off, outfalls)	High	Med	High	Med	Low
Changes in organic loading (e.g. mariculture, outfalls)	Med	Med	Med	Med	Low
Changes in thermal regime (e.g. power stations)	Low	Low	Low	Low	Low
Changes in turbidity (e.g. dredging)	Low	Low	Low	Low	Low
Changes in salinity (e.g. water abstraction, outfalls)	Med	Low	Med	Low	Low
Biological disturbance					
Introduction of microbial pathogens	Med	Low	Med	Low	Low
Introduction & translocation of non-native species	Med	Low	Med	Low	Low
Selective extraction of species (e.g. bait digging, shellfish harvesting)	Med	Med	Med	Med	Low

Table 5 Assessment of the relative vulnerability of interest features and sub-features of Thames Estuary European marine site to different categories of operations.
Categories of operations to which the features or sub-features of the site are highly or moderately vulnerable are indicated by shading. Table also incorporates relative sensitivity scores used in part to derive vulnerability.[9]

Key

	High vulnerability	••••	High sensitivity
	Moderate vulnerability	•••	Moderate sensitivity
		••	Low sensitivity
		•	No detectable sensitivity

Standard list of categories of operation which may cause deterioration or disturbance	**Internationally important populations of regularly occurring Annex 1 birds**		**Internationally important populations of regularly occurring migratory species and internationally important assemblage of waterfowl (>20 000 birds)**		
	Intertidal mudflats	**Saltmarsh**	**Intertidal mudflats**	**Saltmarsh**	**Intertidal shingle**
Physical loss					
Removal (e.g. by coastal development, reprofiling)	••••	••••	••••	••••	••••
Smothering (e.g. by artificial structures, disposal of dredge spoil)	•••	•••	•••	•••	•••
Physical damage					
Siltation (e.g. run-off, channel dredging, outfalls)	••	••	••	••	••
Abrasion (e.g. boating, anchoring, trampling)	••	•••	••	•••	••••
Selective extraction (e.g. aggregate dredging)	•••	••	•••	••	••••
Non-physical disturbance					
Noise (e.g. boat activity)	••••	••••	••••	••••	••••
Visual (e.g. recreational activity)	••••	••••	••••	••••	••••

Standard list of categories of operation which may cause deterioration or disturbance	Internationally important populations of regularly occurring Annex 1 birds		Internationally important populations of regularly occurring migratory species and internationally important assemblage of waterfowl (>20 000 birds)		
	Intertidal mudflats	Saltmarsh	Intertidal mudflats	Saltmarsh	Intertidal shingle
Toxic contamination					
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs)	•••	•••	•••	•••	•
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	•••	•••	•••	•••	••
Introduction of radionuclides	••	••	••	••	••
Non-toxic contamination					
Changes in nutrient loading (e.g. agricultural run-off, outfalls)	•••	••	•••	••	•
Changes in organic loading (e.g. mariculture, outfalls)	•••	••	•••	••	•
Changes in thermal regime (e.g. power stations)	•	•	•	•	•
Changes in turbidity (e.g. dredging)	••	••	••	••	•
Changes in salinity (e.g. water abstraction, outfalls)	••	••	••	••	•
Biological disturbance					
Introduction of microbial pathogens	••	••	••	••	•
Introduction & translocation of non-native species	•••	••	•••	•••	•
Selective extraction of species (e.g. bait digging, shellfish harvesting)	•••	•••	•••	•••	•

[9] English Nature's advice on operations is derived from an assessment combining relative sensitivity of the features or sub-features with information on human usage of the site (as at October 2000), to identify relative vulnerability to categories of operations. In accordance with Government policy guidance this advice is provided in the light of current activities and patterns of usage at the site. It is important therefore that future consideration of this advice by relevant authorities, and others, takes account of changes in the usage patterns at the site. In contract the sensitivity of interest features, or sub-features, is relatively stable with alterations reflecting improvement in our scientific knowledge and understanding. To this end, information on sensitivity has been included in this table to assist the management and advisory groups with the future management of the site.

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8. Glossary

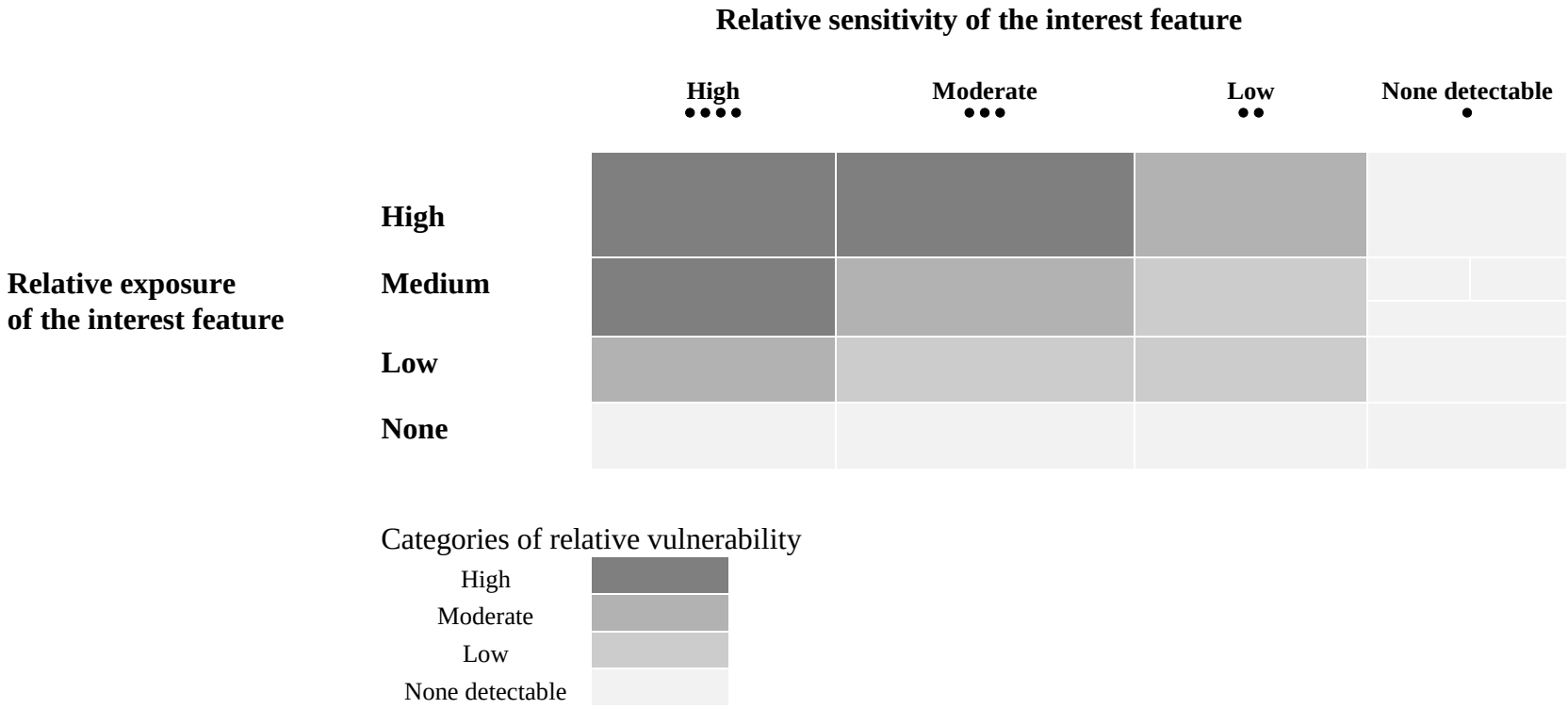
Advisory Group	The body of the representatives from local interests, user groups and conservation groups, formed to advise the management group
Annex 1 Bird species	The species listed in Annex 1 of the Birds Directive are the subject of special conservation measures concerning their habitat. These measures ensure the survival and reproduction of the birds in their area of distribution. Species listed on Annex 1 are in danger of extinction, rare or vulnerable
Annex I habitat type(s)	A natural habitat(s) listed in Annex I of the Habitats Directive for which Special Areas of Conservation can be selected.
Annex II species	A species listed in Annex II of the Habitats Directive for which Special Areas of Conservation can be selected.
Annex V	The listing, in the Habitats Directive, of the animal and plant species whose taking in the wild and exploitation may be subject to management measures.
Assemblage	A collection of plants and/or animals characteristically associated with a particular environment.
Attribute	Characteristic of an interest feature/sub-feature which provides an indication of the condition of the feature or sub-feature to which it applies.
BAP	Biodiversity Action Plan.
Benthos	Those organisms attached to, or living on, in or near, the seabed, including that part which is exposed by tides.
Biotope	The physical habitat with its biological community; a term which refers to the combination of physical environment and its distinctive assemblage of conspicuous species.
Biodiversity	The total variety of life on earth. This includes diversity within species, between species and ecosystems.
Characteristic	Special to, or especially abundant in, a particular situation or biotope. Characteristic species should be immediately conspicuous and easily identified.
Circalittoral	The rocky subtidal zone below that which is dominated by algae (animal dominated subtidal zone).
Community	A group or organisms occurring in a particular environment, presumably interacting with each other and with the environment, and identifiable by means of ecological survey from other groups.
Competent authority	Any Minister, government department, public or statutory undertaker, public body or person holding a public office that exercises legislative powers.
Conservation objective	A statement of the nature conservation aspirations for a site, expressed in terms of the favourable condition that we wish to see the species and/or

	habitats for which the site has been selected to attain. Conservation objectives for European marine sites relate to the aims of the Habitats Directive.
Eulittoral	The main part of the intertidal zone characterised by limpets, barnacles, mussels, fucoid algae and with red algae often abundant on the lower part.
Epifauna	Benthic animals living on the seabed.
European marine site	A European site which consists of, or in so far as it consists of, areas covered intermittently or continuously by seawater.
European Site	A classified SPA, designated SAC, site of Community importance (a site selected as a candidate SAC, adopted by the European Commission but not yet designated), a candidate SAC (in England only) or a site hosting a priority species in respect of which Article 5 of the Habitats directive applies.
Favourable conservation status	A range of conditions for a natural habitat or species at which the sum of the influences acting upon that habitat or species are not adversely affecting its distribution, abundance, structure or function throughout the EC in the long term. The condition in which the habitat or species is capable of sustaining itself on a long-term basis.
Favourable condition	A range of conditions for a natural habitat or species at which the sum of the influences acting upon that habitat or species are not adversely affecting its distribution, abundance, structure or function within an individual Natura 2000 site in the long term. The condition in which the habitat or species is capable of sustaining itself on a long-term basis.
Habitat	The place in which a plant or animal lives.
Habitats Directive	The abbreviated term of *Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora*. It is the aim of this Directive to promote the conservation of certain habitats and species within the European Union.
Infauna	Benthic animals which live within the sediment.
Infralittoral	The subtidal zone in which upward facing rocks are dominated by erect algae, typically kelps.
Interest feature	A natural or semi-natural feature for which a European site has been selected. This includes any Habitats Directive Annex I habitat, or any Annex II species and any population of a bird species for which an SPA has been designated under the Birds Directive.
Maintain	The action required for an interest feature when it is considered to be in favourable condition.
Management group	The body of relevant authorities formed to manage the European marine site.
Management scheme	The framework established by the relevant authorities at a European marine site under which their functions are exercised to secure, in relation to that site, compliance with the requirements of the Habitats Directive.

Nationally scarce/rare	For marine purposes, these are regarded as species of limited national occurrence.
Natura 2000	The European network of protected sites established under the Birds Directive and the Habitats Directive.
Notable species	A species that is considered to be notable due to its importance as an indicator, and may also be of nature conservation importance, and which is unlikely to be a 'characteristic species'.
Operations which may cause deterioration or disturbance	Any activity or operation taking place within, adjacent to, or remote from a European marine site that has the potential to cause deterioration to the natural habitats for which the site was designated, or disturbance to the species and its habitats for which the site was designated.
Plan or project	Any proposed development that is within a relevant authority's function to control, or over which a competent authority has a statutory function to decide on applications for consents, authorisations, licences or permissions.
Peak mean counts (5 yr)	Thames Estuary is broken down into count sectors. Over the winter months WeBs volunteers count all the birds which are visible within each sector. The yearly figures for each species in Thames Estuary are then averaged over a five year period to give the 5 yr peak mean count.
Relevant authority	The specific competent authority which has powers or functions which have, or could have, an impact on the marine environment, or adjacent to, a European marine site.
Restore	The action required for an interest feature when it is not considered to be in a favourable condition.
Sensitivity	The intolerance of a habitat, community or individual species to damage from an external force.
Sub-feature	An ecologically important sub-division of an interest feature.
Vulnerability	The exposure of a habitat, community or individual of a species to an external factor to which it is sensitive.
WeBS	Wetland Bird Survey: a collaborative national surveillance scheme of the UK's waterfowl based on counts undertaken once per month outside of the breeding season.

Appendix I Matrix of relative vulnerability

The relative vulnerability of an interest feature or sub-feature is determined by combining the relative sensitivity and exposure assessments according to the table below.



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Appendix II English Nature's Habitats Regulations Guidance Note 1: The Appropriate Assessment (Regulation 48)

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Appendix III List of Relevant Authorities

Government Office for the South East
Government Office Eastern Region
Government Office for London
Castle Point District Council
Essex County Council
Gravesham Borough Council
Kent County Council
Medway Council
Southend-on-Sea Borough Council
Thurrock Council
English Nature
Environment Agency
Southern Water plc
Thames Water plc
Medway Ports
Port of London Authority
Kent and Essex Sea Fisheries Committee

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