



THE PLANNING ACT 2008

THE INFRASTRUCTURE PLANNING (ENVIRONMENTAL  
PROCEDURE RULES) 2010

ABLE MARINE ENERGY PARK ORDER APPLICATION

Written Representations of Natural England

Applications by Able Humber Ports Limited for:

The construction and operation of a new quay, called the Able Marine Energy Park, and associated development on the south bank of the River Humber.

Site at Immingham, North Lincolnshire

Infrastructure Planning Commission ref: TR030001

29 June 2012

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## **1. The purpose of this statement**

- 1.1. These Written Representations are submitted in pursuance of rule 10(1) of the Infrastructure Planning (Examination Procedure) Rules 2010 in relation to an application under the Planning Act 2008 for a Development Consent Order (“DCO”) for the construction and operation of a new quay, called the Able Marine Energy Park, on the south bank of the River Humber and associated development submitted by Able Humber Ports Limited (“the Applicant”) to the Secretary of State. The new quay, together with onshore facilities, will be used for the manufacture of offshore wind turbines.
- 1.2. Natural England provided a summary of its principal concerns in its Relevant Representations, submitted to the Planning Inspectorate on 2 April 2012. Natural England’s written representations address these concerns, in view of the common ground discussions that have taken place with the Applicant to date, in more detail, and are structured as follows:
  - a) The status and functions of Natural England (Section 2 below)
  - b) The legislative framework (Section 3 below)
  - c) The statutory nature conservation and landscape designations and interests in the area of the proposed project (Section 4 below)
  - d) The Humber Estuary and the impacts upon it arising out of the proposed development (Section 5 below)
  - e) The impacts of the proposed development (Section 6 below)
  - f) Background to Natural England’s assessment of the issues (Section 7 below)
  - g) An analysis of the issues identified by Natural England together with additional comments on other issues and the draft DCO (Section 8 below)
- 1.3 By Annex D to its letter of 31 May 2012 the Examining Authority has asked the parties, including Natural England a number of first written questions. The answers to those questions are contained within these Written Representations. For ease of reference a table directing the reader to the parts of these representations where the answers are provided is at Annex C. These Written Representations have been compiled drawing upon the expert advice of Natural England’s senior coastal geomorphology specialist, Siobhan Browne, and Natural England’s senior ornithologist in its Land Use function, Richard Saunders.
- 1.4 As detailed below, significant information is still awaited from the Applicant in respect of the proposed development. These Written Representations therefore represent a provisional response on a number of issues, especially the important issue of compensation.

## 2. Status and Functions of Natural England

2.1 Natural England is a statutory body established under the Natural Environment and Rural Communities Act 2006 (the “NERC Act”). Natural England is the statutory advisor to Government on nature conservation in England and promotes the conservation of England’s wildlife and natural features. It is financed by the Department for Environment, Food and Rural Affairs (“Defra”) but is a Non-Departmental Public Body, which forms its own views based on the best scientific evidence available.

2.2 Natural England works for people, places and nature, to enhance biodiversity, landscapes and wildlife in rural, urban, coastal and marine areas; promoting access, recreation and public well-being, and contributing to the way natural resources are managed so that they can be enjoyed now and by future generations.

2.3 Section 2 of the NERC Act provides that Natural England’s statutory general purpose is:

*“... to ensure that the natural environment is conserved, enhanced and managed for the benefit of present and future generations, thereby contributing to sustainable development.”*

Section 2(2) states that Natural England’s general purpose includes –

- promoting nature conservation and protecting biodiversity;
- conserving and enhancing the landscape;
- securing the provision and improvement of facilities for the study, understanding and enjoyment of the natural environment;
- promoting access to the countryside and open spaces and encouraging open-air recreation; and
- contributing, in other ways, to social and economic well-being through management of the natural environment.

2.4 Natural England is also a statutory consultee in respect of (amongst other things) plans and projects subject to the requirements of the various Environmental Impact Assessment Regulations in England, proposals likely to damage any of the flora, fauna or geological or physiographical features for which a Site of Special Scientific Interest (“SSSI”) has been designated, and plans or projects likely to have a significant effect on any EU site. EU sites include Special Protection Areas (“SPAs”) and Special Areas of Conservation (“SACs”) or sites listed under the 1971 Convention on Wetlands of International Importance (“Ramsar sites”). In addition, Natural England exercises additional duties with regards to SSSIs under the Wildlife and Countryside Act 1981(as amended) and in relation to Natura 2000 sites under the Habitats Regulations.



### 3. Legislative Framework

#### EU sites: Special Protection Areas and Special Areas of Conservation

- 3.1 Council Directive 2009/147/EEC on the conservation of wild birds (the “Birds Directive”) requires Member States to take the requisite measures to maintain the population of species of wild birds at a level which corresponds, in particular, to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements. With this objective in mind, Article 4 of the Birds Directive requires the classification of areas as SPAs, for individual species listed on Annex I of the Directive and/or for regularly occurring migratory species. These requirements previously existed in Council Directive 79/409/EEC on the conservation of wild birds.
- 3.2 Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the “Habitats Directive”) aims to contribute towards ensuring biodiversity through the conservation of natural habitats and of wild fauna and flora. Measures taken pursuant to the Directive shall be designed to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of community interest. Member States, in consultation with the European Commission, must select and designate areas for protection as SACs. Together with SPAs, these sites make up the Natura 2000 ecological network.
- 3.3 SACs and SPAs are subject to the protection required by Article 6(2), 6(3) and 6(4) of the Habitats Directive.<sup>1</sup> Article 6(2) requires Member States to take appropriate steps to avoid in these areas the deterioration of natural habitats and the disturbance of the species for which the areas have been designated, in so far as such disturbance could be significant in relation to the objectives of the Directive. Articles 6(3) and (4) require that any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect on it, either individually or in combination with other plans or projects must be subject to an appropriate assessment of its implications for the site in view of the site’s conservation objectives. In the light of such an assessment, such plans or projects may only be agreed, save in the circumstances provided for in Article 6(4), after ascertaining that they will not adversely affect the integrity of the site. Article 6(4) provides that despite a negative assessment of the implications for the site a plan or project may nonetheless proceed where there are no alternatives to it and imperative reasons of overriding public interest why it must proceed. Where a plan or project proceeds on this basis, compensatory measures must be put in place to ensure the overall coherence of the Natura 2000 network.
- 3.4 SACs and SPAs are protected as EU sites in England by the Habitats Regulations which transpose the relevant parts of the Habitats Directive into domestic law.
- 3.5 This case involves the Humber Estuary SAC and the Humber Estuary SPA. The citations, dates of the SAC’s designation and the SPA’s classification, and boundary maps are included within Annexes A and B.
- 3.6 In determining these applications, the Secretary of State will be acting as a competent authority for the purposes of regulations 61, 62 and 66 of the Habitats Regulations. These regulations describe a sequence of steps to be taken by the competent authority in respect of a EU site (including the SAC and SPA of relevance with regards these applications) for the purposes of the Habitats Regulations, when

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<sup>1</sup> SACs are subject to these Articles by direct reference; SPAs are subject to these Articles by reason of Article 7 of the Habitats Directive.

deciding whether to authorise a project. Those steps are:

- Step 1 Under regulation 61(1)(b), consider whether the project is directly connected with or necessary to the management of the site? If not—
- Step 2 Under regulation 61(1)(a) consider whether the project is likely to have a significant effect on the site, either alone or in combination with other plans or projects. If such an effect cannot be excluded --
- Step 3 Under regulation 61(1), make an appropriate assessment of the implications for the site in view of its current conservation objectives. In so doing, it is mandatory under regulation 61(3) to consult Natural England and have regard to its representations, and optional under regulation 61(4) to take the opinion of the general public. Regulation 61(2) empowers the competent authority to require the Applicant to provide information for the purposes of the appropriate assessment, or to enable the authority to determine whether such an assessment is required.
- Step 4 Pursuant to regulation 61(5) and (6), consider whether the project will adversely affect the integrity of the site, having regard to the manner in which it is proposed to be carried out, and any conditions or restrictions subject to which that authorisation might be given (the “Integrity Test”).
- Step 5 In accordance with regulation 61(5), but subject to regulation 62, reject the project, unless it is ascertained that the project will not adversely affect the integrity of the site.
- Step 6 If the project fails the Integrity Test in respect of the site, consider, in accordance with regulation 62(1), whether one is satisfied that there is no alternative solution; if not so satisfied, reject the project; but if so satisfied, proceed to steps 7 and 8.
- Step 7 Consider, in accordance with regulation 62(1), but subject to Step 6, whether one is satisfied that the project must be carried out for imperative reasons of overriding public interest.
- Step 8 Consider in accordance with regulation 66 whether one can secure that compensatory measures are taken which would be necessary to secure that the overall coherence of Natura 2000 is protected.

### **Ramsar sites**

- 3.7 In relation to its international obligations under the 1971 Convention on Wetlands of International Importance, the Government designates Ramsar sites in accordance with the criteria set out in the Convention, in recognition of the international importance of these sites as a wetland wildlife habitat.
- 3.8 In accordance with *Government Circular: Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System* (ODPM 06/2005),<sup>2</sup>

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<sup>2</sup> Please note that the National Planning Policy Framework (“NPPF”) does not affect the status of Circular 06/2005, which continues to apply.

and the *National Planning Policy Framework* (2012)<sup>3</sup> Ramsar sites are subject to the same procedures described in the preceding section (in relation to EU sites). This is a matter of UK Government Policy, in order to assist the Government in fully meeting its obligations under the Ramsar Convention.

- 3.9 This case involves the Humber Estuary Ramsar site. The citation, date of classification, and boundary map are included within Annexes A and B.

### **Sites of Special Scientific Interest**

- 3.10 Section 28G of the 1981 Act places legal obligations on certain authorities in relation to Sites of Special Scientific Interest (SSSIs). These authorities are known as “section 28G authorities”. The Secretary of State expects that all section 28G authorities will take full account of their responsibilities under this duty whenever their actions may affect SSSIs. The legislation provides that section 28G authorities include a Minister of the Crown,<sup>4</sup> Government department, a local authority, and any other public body of any description.

- 3.11 An authority to whom section 28G of the 1981 Act applies has a duty in exercising its functions so far as their exercise is likely to affect the flora, fauna or geological or physiographical features by reason of which a SSSI is of special interest to:

*‘take reasonable steps, consistent with the proper exercise of the authority’s functions, to further the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which the site is of special scientific interest.’*

- 3.12 The SSSIs of relevance with regards this application are the Humber Estuary SSSI and the North Killingholme Haven Pits SSSI. The conservation objectives and notification map for these SSSIs are included within Annexes A and B.

- 3.13 This section 28G duty applies to Natural England and the Secretary of State for purposes of these applications. It should be noted that this duty also applies to various local authorities in their role as local planning authority.

- 3.14 In addition, where the permission of a section 28G authority is needed before proposed operations may be carried out, the section 28G authority must, in accordance with section 28I(5) of the 1981 Act, take any advice received from Natural England into account:

- (a) in deciding whether or not to permit the proposed operations; and
- (b) if it does decide to do so, in deciding what (if any) conditions are to be attached to the permission.

- 3.15 As the Applicant requires planning permission from the Secretary of State in order to proceed with its proposals, and as the Secretary of State is a section 28G authority in this matter, the duties under section 28I(5) apply to the Secretary of State as well.<sup>5</sup>

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3 See paragraph 118.

4 Within the meaning of the Ministers of the Crown Act 1975.

5 Natural England accepts that the notice requirements of section 28I (2) to (4) have been satisfied for the purposes of the Secretary of State’s determination of the planning applications at issue here.

## European Protected Species

- 3.16 Species listed under Annex IV(a) to the Habitats Directive (and which are also listed in Schedule 2 of the Habitats Regulations by reason of the transposition of the Habitats Directive), are referred to as “European Protected Species”. A case in 2011<sup>6</sup> confirmed Natural England’s key role with respect to protected species licensing, and the weight that should be placed on its advice in this regard. Furthermore, under regulation 9(5) of the Habitats Regulations, a competent authority, in exercising any of its functions, must have regard to the requirements of the Habitats Directive so far as they may be affected by the exercise of those functions. Therefore it is also the case that a local planning authority, and by inference any determining authority (such as the Secretary of State in this case), should also ensure that Article 16(1) of the Habitats Directive is properly applied when considering planning applications which have an effect on European Protected Species. Article 16(1) includes consideration as to whether:
- there are no satisfactory alternatives;
  - there are imperative reasons of overriding public interest (including socio-economic reasons); and
  - that the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.
- 3.17 The European Protected Species of relevance to this application are great crested newts and several species of bat.

## Nationally Protected Species

- 3.18 As stated in ODPM Circular 06/2005 on *Biodiversity and Geological Conservation – statutory obligations and their impact within the planning system*, Part I of the 1981 Act sets out the protection that is afforded to all wild birds, and certain wild animals and plants. Section 25 places a duty on all local authorities to do what they consider expedient to bring the provisions of the 1981 Act relating to protected species to the attention of the public and particularly school children. Local authorities are also empowered to institute proceedings against any person committing an offence under Part I of the 1981 Act within their area. Furthermore, under section 16 of the 1981 Act, licences may be issued, providing certain conditions are met, derogating from the protection afforded to species for listed reasons, such as public health and safety. However, there is no provision for licences to be granted for the purposes of development.
- 3.19 The nationally protected species of relevance to this application are water voles and badgers.
- 3.20 Badgers and their setts are also protected under the Protection of Badgers Act 1992, which makes it illegal to kill, injure or take badgers or to interfere with a badger sett. There is, however, provision within the legislation to permit activities affecting badgers or their setts where there is suitable justification and the problem cannot be resolved by alternative means. Natural England administers licence applications in respect of badgers under the Protection of Badgers Act 1992.

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<sup>6</sup> *Morge v Hampshire County Council* [2011] UKSC 2

## Conservation of Biodiversity

- 3.21 Section 40(1) of the NERC Act places a duty on public authorities (including, for the purposes of determining these applications, the Secretary of State) with respect to the conservation of biological diversity, as follows:

*'Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity.'*

- 3.22 Many of the species within the designated sites citations (which are provided in Annex B) are also species listed in UK Biodiversity Action Plan.<sup>7</sup>

### European Commission guidance and national policy

- 3.23 It should be noted that guidance and national policy documents are available which can assist when competent authorities when they are considering the legal steps set out above in respect of EU sites and SSSIs. These documents include the following:

#### European Commission guidance on EU sites

- *Managing Natura 2000 Sites* (2000)
- *Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological Guidance on the provisions of Article 6(3) and (4) of the Habitats Directive* (2001)
- *Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC* (2007)
- *The implementation of the Birds and Habitats Directives in estuaries and coastal zones* (2011).

#### UK policy on EU sites and SSSIs

- *Government Circular: Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System* (ODPM 06/2005)
  - *National Planning Policy Framework* (2012) (particularly paragraphs 118 and 119).
- 3.24 Natural England's approach to assessing issues such as 'integrity',<sup>8</sup> 'coherence',<sup>9</sup> 'deterioration',<sup>10</sup> and 'disturbance'<sup>11</sup> are informed by the guidance provided in these documents (see further below).

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7 The UK Biodiversity Action Plan published in 1994 was the United Kingdom Government's response to signing the Convention on Biological Diversity at the 1992 Rio Earth Summit. It set out a series of species for which work was needed to halt the loss of biodiversity. These are commonly referred to as BAP species.

8 See, for example, section 4.6.3 of the *Managing Natura 2000* guidance.

9 See, for example, section 1.4.2 of *Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC*.

10 See, for example, section 3.3 to 3.6 of the *Managing Natura 2000* guidance.

11 Ibid.

#### 4. The Statutory Nature Conservation Designations and Interests in the Area of the Proposed Project

- 4.1. The following is a brief summary of the interest features of the relevant designated areas of concern in this matter.<sup>12</sup> Designation citations and maps are included in Annexes A and B.

##### International Designations

##### Special Protection Area

- 4.2. The Humber Estuary was first classified by the UK Government as an SPA under the provisions of the Birds Directive on 28 July 1994 as the Humber Flats, Marshes and Coast (Phase 1) SPA. The extended and renamed Humber Estuary SPA was classified on 31 August 2007.
- 4.3. The SPA covers 37,630.24ha in the unitary authorities/ counties of City of Kingston-upon-Hull, East Riding of Yorkshire, Lincolnshire, North East Lincolnshire and North Lincolnshire.
- 4.4. The SPA is classified under Article 4.1 of the Birds Directive as it is used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I in any season:
- Avocet *Recurvirostra avosetta* – wintering
  - Bittern *Botaurus stellaris* – wintering
  - Hen harrier *Circus cyaneus* – wintering
  - Golden plover *Pluvialis apricaria* – wintering
  - Bar-tailed godwit *Limosa lapponica* – wintering
  - Ruff *Philomachus pugnax*- passage
  - Bittern *Botaurus stellaris*- breeding
  - Marsh harrier *Circus aeruginosus* – breeding
  - Avocet *Recurvirostra avosetta* – breeding
  - Little tern *Sterna albifrons* - breeding
- 4.5. The site is classified under Article 4.2 of the Birds Directive as it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I) in any season:
- Shelduck *Tadorna tadorna* – wintering
  - Knot *Calidris canutus* – wintering
  - Dunlin *Calidris alpina* – wintering
  - Black-tailed godwit *Limosa limosa* – wintering
  - Redshank *Tringa totanus* – wintering
  - Knot *Calidris canutus* - passage
  - Dunlin *Calidris alpina* - passage
  - Black-tailed godwit *Limosa limosa* - passage
  - Redshank *Tringa totanus* - passage

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<sup>12</sup> Ramsar sites are listed, SPAs are classified, SSSIs are notified and SACs are designated under their relevant legislation. In order to simplify the text the term designation has been used to encompass these terms.

- 4.6. The site is classified under Article 4.2 of the Birds Directive as it is used regularly by over 20,000 waterbirds:
- Assemblage of waterbirds in any season (this includes all waterbirds except non-native or introduced species)
- 4.7. The conservation objectives in respect of the SPA are provided in Annex B.
- 4.8. The terrestrial site of the proposed development is immediately adjacent to the SPA. The marine works including the new quay structure and proposed dredging are totally within the SPA.

### **Special Area of Conservation**

- 4.9. The Humber Estuary SAC was designated by the Secretary of State for Environment, Food and Rural Affairs under the Habitats Directive on 10 December 2009.
- 4.10. The SAC covers 36,657.15ha in the unitary authorities/ counties of City of Kingston-upon-Hull, East Riding of Yorkshire, Lincolnshire, North East Lincolnshire and North Lincolnshire.
- 4.11. The site is designated under Article 4(4) of the Habitats Directive as it hosts the following habitats listed in Annex I:
- Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
  - Coastal lagoons\*
  - Dunes with *Hippophae rhamnoides*
  - Embryonic shifting dunes
  - Estuaries
  - Mudflats and sandflats not covered by seawater at low tide
  - Fixed dunes with herbaceous vegetation ('grey dunes')\*
  - *Salicornia* and other annuals colonising mud and sand
  - Sandbanks which are slightly covered by sea water all the time
  - Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')

(The habitats marked with an asterisk are Annex I priority habitats.)

- 4.12. The site is designated under Article 4(4) of the Habitats Directive as it hosts the following species listed in Annex II:
- Sea Lamprey (*Petromyzon marinus*)
  - River lamprey (*Lampetra fluviatilis*)
  - Grey seal *Halichoerus grypus*
- 4.13. The conservation objectives in respect of the SAC are provided in Annex B.
- 4.14. The terrestrial site of the proposed development is immediately adjacent to the SAC. The marine works including the new quay structure and proposed dredging are totally within the SAC.
- 4.15. Natural England's position with regards impacts on marine ecology generally as a result of the development are set out in below.

## Ramsar sites

- 4.16. The Humber Estuary was first designated by the UK Government as a Ramsar site under the Convention on Wetlands of International Importance on 28 July 1994 as the Humber Flats, Marshes and Coast (Phase 1) Ramsar site. The extended and renamed Humber Estuary Ramsar site was designated on 31 August 2007.
- 4.17. The Ramsar site covers 37,987.80ha in the unitary authorities/ counties of City of Kingston-upon-Hull, East Riding of Yorkshire, Lincolnshire, North East Lincolnshire and North Lincolnshire
- 4.18. The site is listed for the following criteria:

- **Criterion 1:** The site contains a representative, rare, or unique example of natural or near-natural wetland types found within the appropriate biogeographic region:

The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.

- **Criterion 3:** The site supports populations of animal species important for maintaining the biological diversity of a particular biogeographic region:

The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. The dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the Ramsar site are the most north-easterly breeding site in Great Britain of the natterjack toad *Bufo calamita*.

- **Criterion 5:** The site regularly supports 20,000 or more waterbirds:

In the non-breeding season, the area regularly supports 153,934 individual waterbirds (5 year peak mean 1996/97 – 2000/01).

- **Criterion 6:** The site regularly supports 1% of the individuals in a population of one species or subspecies of waterbird in any season:

- Shelduck *Tadorna tadorna* – wintering
- Golden plover *Pluvialis apricaria* - wintering
- Knot *Calidris canutus* – wintering
- Dunlin *Calidris alpina* – wintering
- Black-tailed godwit *Limosa limosa* – wintering
- Bar-tailed godwit *Limosa lapponica* – wintering
- Redshank *Tringa totanus* – wintering
- Golden plover *Pluvialis apricaria* - passage
- Knot *Calidris canutus* – passage
- Dunlin *Calidris alpina* – passage
- Black-tailed godwit *Limosa limosa* – passage
- Redshank *Tringa totanus* - passage

- **Criterion 8:** The site qualifies because it is a migration path on which fish



stocks, either within the wetland or elsewhere, depend:

The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.

- 4.19. More detailed information in relation to the Ramsar designation is provided in the reports of Natural England's respective experts, previously identified at paragraphs 4.8 and 4.14 above, and contained at Annexes C and D.
- 4.20. The terrestrial site of the proposed development is immediately adjacent to the Ramsar site. The marine works including the new quay structure and proposed dredging are totally within the Ramsar site.

## National Designations

### Sites of Special Scientific Interest

- 4.21. The Humber Estuary was previously notified as seven biological and geological SSSIs covering the intertidal and terrestrial periphery of the estuary. The Humber Estuary SSSI was notified on 3 February 2004 and includes all seven of these SSSIs and also enlarges the area notified to include the entire estuary and the associated features of interest. This extends from the limit of saline intrusion on the rivers Ouse and Trent to the mouth of the estuary, as well as some terrestrial areas that support some of the estuarine features. The enlarged area also includes the geomorphological interest at Spurn. A whole estuary approach to this notification allows for the dynamic intertidal and subtidal areas to change naturally and remain within the site boundary.
- 4.22. The site is designated for the following features:
  - **Estuary:** The Humber Estuary is a large macro-tidal coastal plain estuary with high suspended sediment loads, which feed a dynamic and rapidly changing system of accreting and eroding intertidal and subtidal mudflats, sandflats, saltmarsh and reedbeds.
  - **Saline lagoons:** Within the Humber Estuary SSSI there are good examples of four of the five physiographic types of saline lagoon.
  - **Sand dunes:** The sand dunes within the Humber Estuary are features of the outer estuary on both the north and south banks particularly on Spurn and along the Lincolnshire coast south of Cleethorpes. Examples of both strandline, foredune, mobile, semi-fixed dunes, fixed dunes and dune grassland occur on both banks of the estuary and along the coast.
  - **Standing waters:** The most extensive area of standing waters on the Humber occurs at Barton and Barrow. The complex of disused clay pits vary in size and salinity, and are a mosaic of open waters. Similar pits occur at other locations on the estuary, such as at Faxfleet and Haverfield Pits.
  - **Geology and geomorphology:** Approximately one kilometre of the cliff and foreshore at South Ferriby, on the southern shore of the Humber provides exposures of Pleistocene sediments resting upon chalk. Spurn is an

outstanding example of a dynamic spit system, very unusual, if not unique in Europe, in that the massive supply of sediment resulting from the erosion of the Holderness coast to the north has enabled it to extend across the mouth of a macro-tidal estuary.

- **Wintering and passage waterfowl species:** The estuary regularly supports 22 species of wintering waterfowl in nationally important numbers. In addition, nine species of passage waders regularly occur in nationally important numbers on the Humber Estuary.
  - **Breeding bird assemblage of lowland open waters and their margins:** The Humber Estuary supports a breeding bird assemblage of lowland open waters and their margins.
  - **Grey seals:** The Humber Estuary supports one of the largest grey seal breeding colonies in England with a high rate of pup production compared to other UK sites.
  - **River lamprey and sea lamprey:** The Humber Estuary acts as an important migration route for both river lamprey and sea lamprey between coastal waters and their spawning areas.
  - **Vascular plant assemblage:** The site supports an important vascular plant assemblage, including at least ten nationally scarce species. These are characteristic of coastal and wetland habitats.
  - **Invertebrate assemblage:** Assemblages of terrestrial and aquatic invertebrates are well represented across the Humber Estuary and its hinterlands. These include many scarce and threatened species across a range of taxa, especially the Coleoptera and Lepidoptera.
- 4.23. North Killingholme Haven Pits was notified as a SSSI on 15 January 1996. The main reason for notification is due to their importance as large saline lagoons with an exceptionally rich fauna.
- 4.24. The site is designated for the following features:
- **Saline coastal lagoons:** The site comprises three pits of differing size and salinity, both factors which contribute to its national and local importance. There have been nine species of specialist lagoon species recorded from the pits, which is exceptionally high given their latitude.
  - ***Scirpus maritimus* swamp:** The lagoons are fringed with sea club rush which provides valuable feeding and breeding grounds for a range of summer migrants such as reed and sedge warblers.
  - ***Crataegus monogyna* - *Hedera helix* scrub:** The site is fringed in places with thick hawthorn scrub which provides important bird habitat.
  - **Aggregations of non-breeding birds:** The lagoons support nationally important numbers of black-tailed godwit *Limosa limosa islandica*, which have visited the site in increasing numbers since the late 1980s.

- ***Phragmites australis* swamp and reedbeds:** The lagoons are fringed with common reed which provides valuable feeding and breeding grounds for a range of summer migrants such as reed and sedge warblers.

- **Population of Schedule 5 tentacled Lagoon-worm *Alkmaria romijni*:**  
These are found in just four sites in Great Britain.

4.25. The terrestrial site of the proposed development is immediately adjacent to both of these SSSIs. The marine works including the new quay structure and the proposed dredging are entirely within the Humber Estuary SSSI.

## **5. The Humber Estuary and the impacts upon it arising out of the proposed development**

### **The Humber Estuary**

- 5.1. The Humber Estuary is a large estuary on the East coast and is one of the largest estuaries in the UK. The estuary is over 30,550ha and 14km at its widest point and it is the largest macro-tidal coastal plain estuary on the British North Sea, draining around 20% of the total land surface of England. The estuary encompasses the outflow from the rivers Trent, Ouse and Hull and provides the largest single output of fresh water from Britain into the North Sea.
- 5.2. The Estuary is approximately 144.7km long and at its mouth is 7.5km wide.<sup>13</sup> The tidal range of the estuary is approximately 7.4m which is the second largest in the UK. The areas of the estuary covered by designations are detailed in Annexes A and B.
- 5.3. The bed of the estuary is mostly sandy with some patches of gravel and glacial till, grading into silty clay in the intertidal areas. The exception is the outer part of the south bank where the higher energy environment and greater marine sediment component results in the intertidal area being predominantly sandy.

### **Geomorphological process**

- 5.4. The Humber Estuary is extremely turbid and sediment transport is particularly important within the estuary. The estuary has a high suspended sediment load. Sediment enters the system from the North Sea, the Holderness coastline and from the rivers which feed into the estuary. The majority of suspended sediment is from the sea, with over 1,500 tonnes carried in per tide, compared to an average of 320 tonnes from riverine sources (Environment Agency, 1998<sup>14</sup>). It has been estimated that up to 1.26 million tonnes of sediment may be present in the water column, with around 170 tonnes deposited in the estuary on each tide, and 150 tonnes exported to the sea (Environment Agency, 1998).
- 5.5. The sediments provide essential material to make and maintain the intertidal habitats of the estuary. The estuary system is dynamic with accreting and eroding intertidal and subtidal habitats. Accretion will occur in areas of lower energy where sediment is able to settle, erosion will occur in areas of higher energy. The physical processes operating in the estuary are vital for the habitats found within the estuary. Without the processes operating in the estuary there would be no development of intertidal habitats.
- 5.6. The erosion and accretion of sediments is a feature of much of the estuary, as is the changing position of the main channel upstream of the bridge. General channel morphology however is subject to regular spring-neap and winter-summer erosion-deposition cycles.
- 5.7. The natural processes acting on the estuary are very powerful, but the coastline (without human influence) can adapt in response to these forces as a dynamic system. On the Humber, much of the dynamic nature of the estuary is constrained

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13 Figures taken from The Humber Estuary Coastal processes and conservation document written by the Institute of Estuarine and Coastal studies at the University of Hull in 1994 for English Nature.

14 ENVIRONMENT AGENCY, 1998. *Strategic studies, shoreline management plan, geomorphology review. The Humber estuary tidal defence strategy*. Environment Agency.

by sea defences along almost its entire length, with these structures restricting the development of intertidal mudflats and saltmarsh (Allen *et al.*, 2003).<sup>15</sup>

- 5.8. The Humber Estuary is complex and dynamic and is still not fully understood, with the influence of the changes in freshwater fluxes on the remainder of the system unclear. In addition there are numerous cyclical patterns of erosion and deposition within the estuary, the control and interaction of which are unclear. The influence of the lunar nodal cycle on the cycles that currently exist within the system is also unclear.
- 5.9. The Environment Agency undertook various geomorphological and hydrodynamic studies to underpin the submission of the Humber Flood Risk Management Strategy to Defra in 2007. This work improved the understanding of the complexity of the Humber system.
- 5.10. Natural England is aware of the dynamic qualities of the Humber Estuary and this was reflected in the Regulation 33 advice which stated:

*“The natural processes acting on the estuary are immensely powerful, but the coastline (without human influence) can adapt in response to these forces as a dynamic system. On the Humber, much of the dynamic nature of the estuary is constrained by sea defences along almost its entire length, with these structures restricting the development of intertidal mudflats and saltmarsh (Allen et al., 2003). Possibly the most dynamic section of the estuary is the inner reach between the Humber Bridge and Trent Falls where there are frequent channel migrations around Read’s Island. Recent research has revealed a number of mechanisms responsible for channel movement in this area, including fresh water discharge and tidal regime. There are also dynamic interactions between the various bank systems in the inner and middle estuary releasing sediment which form mud and sand bars that create semi-permanent islands. There are also channel movements in the outer estuary.”*

- 5.11. Whilst assessing the application documentation Natural England has considered the dynamic qualities of the estuary and has assessed the proposals while considering this natural variability.
- 5.12. There has been a major change in the Environment Agency’s understanding of habitat losses within the Humber Estuary since the Flood Risk Management Study was published in 2008. The greatest concentration of losses is within the middle and outer southern part of the estuary. At present the Environment Agency is undertaking work to look at how much of this change is natural change and how much is influenced by anthropogenic processes. The Environment Agency’s understanding of the current rates of loss per sector within the estuary are summarised in Table 1.

Table 5.1. A summary of nodal trend as reported in the CHaMP, showing the 95% prediction error bands within the estuary. The large difference in the Inner estuary is reflective of the poor predictive capability of the regression equation.

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<sup>15</sup> ALLEN, J., BOYES, S., BURDON, D., CUTTS, N., HEMINGWAY, K., JARVIS, S., JENNINGS, K.,MANDER, L.,MURBY, P., PROCTOR, N., THOMSON S. &WARREN, R. 2003. *Humber Data Review* English Nature Research Report

Estuary Section	Statistical trend	Loss/ gain between 2000-2056 (ha)
Inner	+5.9 ha yr <sup>-1</sup> ± 4.7 ha yr <sup>-1</sup>	330
Middle	-9.1 ha yr <sup>-1</sup> ± 2.8 ha yr <sup>-1</sup>	-510
Outer North	+1.1 ha yr <sup>-1</sup> ± 1.3 ha yr <sup>-1</sup>	62
Outer South	-3.0 ha yr <sup>-1</sup> ± 1.4 ha yr <sup>-1</sup>	-168
Whole Estuary	-5.1 ha yr <sup>-1</sup> ± 5.8 ha yr <sup>-1</sup>	-286

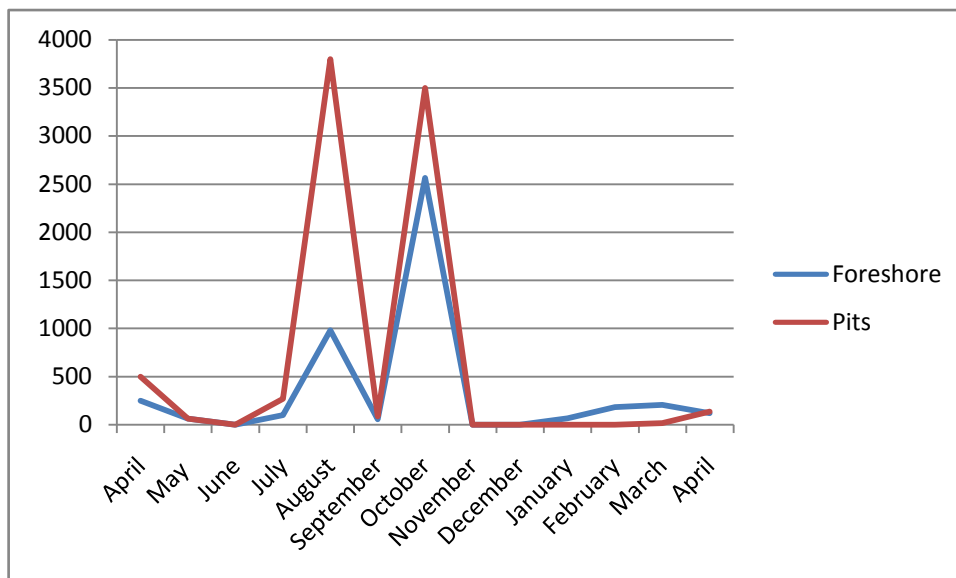
- 5.13. The Environment Agency has commissioned a piece of work looking into how further natural change might affect the sites in the future. This work is still in progress and is unlikely to be complete until late July/early August 2012.

### **Bird numbers**

#### **Killingholme Marshes foreshore**

- 5.14. The area of mudflat on the Killingholme Marshes foreshore is one of the most important areas on the entire Humber Estuary. It is utilised as feeding habitat by thousands of SPA/Ramsar waterbirds. The shadow HRA identifies those waterbird species for which it is not possible to rule out an adverse effect due to the loss of intertidal mudflat habitat as: shelduck; lapwing; ringed plover; dunlin; black-tailed godwit; bar-tailed godwit; redshank; and curlew. The densities of all eight affected SPA bird species are far in excess of that expected from uniform occupancy across the Humber Estuary, even when making the assumption birds are concentrated into just a single habitat type.
- 5.15. Black-tailed godwit is the key species that utilises this area of mudflat for foraging and a peak count of 2,566 birds has been recorded. Black-tailed godwit densities are so high at this location that, despite its limited size, the peak numbers of birds recorded exceeds the threshold for international importance. As such, this one area of mudflat meets qualifying criteria for SPA status in its own right and its potential loss should be viewed in these terms.
- 5.16. These figures demonstrate exceptional ecological functionality (i.e. its ability to attract and support foraging birds), however from whatever perspective they are viewed, the importance of Killingholme to SPA birds is irrefutable.
- 5.17. Another important feature of Killingholme Marshes foreshore is its proximity to roosting sites at North Killingholme Haven Pits SSSI. The proximity between a secure roost site and a foraging area with high prey availability are important attributes in order to support an internationally important passage population of black-tailed godwits. It is surprising that within its shadow Habitats Regulations Assessment, the Applicants comments that “the correlation between the numbers of blacktailed godwits at NKHP and Killingholme Marshes foreshore is poor” (paragraph 6.3.36).
- 5.18. The dates and timings of the survey visits relied upon are not provided, so it is not possible to determine whether or not surveys were undertaken simultaneously. Nevertheless, far from demonstrating poor correlation, the peak monthly counts obtained from the Through the Tide Counts presented in Graph 1 clearly shows there is good correlation in black-tailed godwit use between the two sites.

Graph 5.1: Correlation between black-tailed godwit numbers at Killingholme Marshes foreshore and Killingholme Haven and Pits



### Black-tailed godwit, redshank and curlew

- 5.19. Three key species that are likely to be affected by the proposed development are black-tailed godwit, redshank and curlew. The table below shows national population changes for curlew, black-tailed godwit and curlew based on WeBS data. The SPA was classified in 2007. The period of change shown is between 2006/07 and 2009/10 (the latter being the most recently published WeBS report).

Species	WeBS 2006/7	WeBS 2009/10	% change
Curlew	83,259	84,531	1.5%
Black-tailed godwit	29,406	34,977	18.9%
Redshank	74,833	84,151	12.5%

- 5.20. The small increase in the period shown for curlew does not reflect the steady decline in the European breeding population over the longer term: the UK breeding population declined by 41% between 1995 and 2009 (BTO Breeding Birds Survey). Agricultural intensification and nest predation are the likely causes.
- 5.21. The increase in the wintering population of black-tailed godwit (*islandica*) mirrors the increase in the Icelandic breeding population. The population in Iceland has expanded through a combination of rising temperatures and expansion of agricultural land increasing the extent of breeding habitat.
- 5.22. There are three races of redshank that occur in the UK. *Brittanica* (that breeds in the UK) and *robusta* (that breeds in Iceland) form the bulk of the UK's wintering population with smaller numbers of *totanus* (that breeds in continental Europe) occurring in autumn. None of these races can be distinguished in the field. The shorter term increase in wintering birds does not reflect the long term declines in breeding birds across Europe. Likely causes are agricultural intensification, loss of

saltmarsh and inappropriate grassland management.



## 6. The Impacts of the proposed development

- 6.1. These Written Representations focus on the loss of habitat as a result of the proposed development. The development will result in the loss of habitat from the Humber Estuary which will result in the loss of SAC, SPA, Ramsar and SSSI designated habitat.
- 6.2. The losses will be both direct from the footprint of the quay and indirect due to changes in hydrodynamics, additional losses associated with bird disturbance will also impact the designated sites and the species they support.
- 6.3. The direct loss will affect both subtidal habitat (which is a subfeature of the estuary feature) and intertidal mudflat. 13.5ha of subtidal habitat and 31.5ha of intertidal mudflat will be lost as result of direct loss due to quay development (i.e. the footprint of the proposed quay).
- 6.4. There will also be indirect impacts on estuary habitats from the development. These indirect impacts are losses or changes to habitat resulting from changes in sediment distribution caused by the presence of the new quay. The modelling produced by the Applicant suggests that accretion will result in the creation of 12.3ha of saltmarsh, comprising 10.3ha in areas which are currently intertidal mudflats and approximately 2ha in areas which are currently subtidal. In addition 7.88ha of mudflat will result in areas that are currently subtidal. The Applicant has therefore identified within their Habitats Regulation Assessment Report that overall from these figures there will be a 2.47ha loss of mudflat as this mudflat will change to saltmarsh as a result of the development being in place. The Applicant has identified the other changes as changes to features (i.e. change from mudflat to saltmarsh) rather than a loss. As these represent changes rather than losses they have stated that these do not require compensation.
- 6.5. In addition to these indirect losses to habitats caused by changes in sediment distribution there will also be a functional loss of an additional 6ha of mudflat during construction and operation of the quay. This will result in disturbance to SPA and Ramsar waterbirds.
- 6.6. As stated in the Applicant's Habitats Regulation Assessment Report this therefore means that overall there will be a loss of approximately 34ha of mudflat from the SAC, with this loss being 40ha (39.97ha) for the SPA (due to the additional 6ha as a result of the disturbance issues mentioned in paragraph 23) and 13.5ha of estuary habitat (which is the loss of subtidal habitat) from the SAC. Tables 2 and 3 taken from the Applicant's Habitats Regulation Assessment Report which details these losses.

**Table 6.1:** Direct and Indirect effects (ha) on Estuary Habitat of the Humber Estuary SAC due to AMEP- Table 5.5 of the Habitat Regulations Assessment Report

	Saltmarsh	Intertidal Mudflat	Sub-tidal (estuary)
Direct Loss	0	-31.5	-13.5
Indirect Loss / Gain	12.3	-10.35	-9.83
		7.88	

Total Area	12.3	-33.97	-13.5*
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**Table 6.2:** Direct and Indirect effects (ha) on Estuary Habitat of the Humber Estuary SPA due to AMEP- Table 5.6 of the Habitat Regulations Assessment Report

	Saltmarsh	Intertidal Mudflat	Sub-tidal (estuary)
Direct Loss	0	-31.5	-13.5
Indirect Loss / Gain	12.3	-10.35	-9.83
		7.88	
Temporary functional loss	N/A	-6	N/A
Total Area	12.3	-39.97	-13.5*
*Refer to Table 5.5.			

- 6.7. In addition to these losses the Environment Agency (EA) has commissioned a report to assess the long term changes in the estuary as a result of the development<sup>16</sup>. The EA commissioned this report due to a perceived disagreement about whether or not the south bank scheme (AMEP) will have detrimental effects on estuarine functioning and result in further indirect losses to intertidal habitat over the long term. The EA is responsible for meeting coastal squeeze<sup>17</sup> losses and were concerned that further long term losses not attributed to this planned development would require the EA to carry out further compensation for losses to coastal squeeze. The report was commissioned to determine whether there would be long term impacts as a result of the development and quantify any such impacts. The results from this report highlight that there could be up to an additional 10 hectare loss of intertidal habitat from the estuary as a result of the development being in place over the long term (this loss would take place over a 100 year time scale). This loss is an estuary wide loss and cannot be pinpointed to a particular area of the estuary. Therefore it is not possible to determine the ecological function of this loss, only that it is intertidal habitat that will be lost.
- 6.8. The Applicant has detailed plans for creating a compensation site on the North Bank of the Humber Estuary to compensate for these losses (this is discussed in more detail in later sections), within the plans for the compensation site there will be an additional 2ha loss of saltmarsh from the designated site as a result of creating the breach for the realignment site.
- 6.9. The loss of intertidal mudflat is the most significant impact of the proposal. The design of the proposed development requires a quay to be built on an area of intertidal mudflat on the southern bank of the Humber Estuary, adjacent to an area known as Killingholme Marshes. The construction of the proposed quay will lead to (at least) the loss from the Killingholme Marshes foreshore of 31.5ha from direct impacts, a 6ha functional loss owing to disturbance and a further 2.47 ha loss of mudflat which is predicted to convert to saltmarsh as a result of the development.

**Table 6.3:** Loss of mudflat as described within Table 5.6 of the Habitat Regulations

16 Wang, Z. and Jeuken, M. Unpublished. Confidential report to Phillip Winn at the Environment Agency: Review EIA documents GPH and AMEP. Deltares.

17 Coastal Squeeze is defined by the Environment Agency as 'the process by which coastal habitats and natural features are progressively lost or drowned, caught between coastal defences and rising sea levels'

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Direct loss	-31.5 ha
Indirect loss / gain	-2.47 (7.88 – 10.35) ha
Functional loss	-6 ha
<b>Total</b>	<b>-39.97 ha</b>

- 6.10. It is understood that the Applicant has conducted further work, since the application date. It goes without saying that the final assessment of habitat loss should be based upon the most up-to-date figures, including the EA's report.

### Impacts on birds

- 6.11. A number of different data sources demonstrate significant usage of Killingholme Foreshore marshes by waterbirds. The Applicant accepts that there will be an adverse effects for eight of these bird species and the waterfowl assemblage<sup>18</sup>, on the basis of significant displacement, this is described at section 6.3.37 of the HRA report. Natural England agrees with the Applicant's assessment as contained within its HRA report that there will be "significant displacement of birds with no certainty that the displaced birds can be accommodated elsewhere, and hence could be lost from the Humber Estuary population."
- 6.12. The majority of birds present utilise the proposed development site, and the area that will remain undeveloped is unlikely to continue to attract the minority of birds that do not currently utilise the development site.
- 6.13. The table below sets out the percentage of birds that will be disturbed as a percentage of the SPA population.

Table 6.4: Bird species present on Killingholme Marshes Foreshore in significant numbers

Species	Peak count	Percentage of SPA population
Shelduck	109	2.2%
Ringed plover	210	10%
Lapwing	87519	4.7%
Dunlin	1,029	4.8%
Black-tailed godwit	2,566	66%
Bar-tailed godwit	123	2.1 %
Curlew	158	3.6%
Redshank	540	9.9%

- 6.14. Able have calculated that the proposed scheme will displace up to 2.7% of the overall wetland assemblage and have therefore concluded that this will represent an adverse effect on site integrity. It is important to note that this is an under-estimate. The peak waterbird assemblage is calculated by summing the individual species maxima during the season, irrespective of the month in which they occurred (outside

<sup>18</sup> The total number of birds contributing towards the SPA assemblage has been calculated incorrectly. Peak numbers for each species have not been added. It is likely this is a mathematical error and would be relatively straightforward to resolve.

<sup>19</sup> 875 = low tide count maximum. 291 = TTTC maximum count for Lapwing.

the breeding season). Although when calculating a species population present across a number of sites it is not possible to sum maximum counts taken on different dates (as movement between sites could involve double-counting), counts of separate species taken within the same year are independent and can therefore be added to provide a maximum site total. The species maxima were recorded by the TTTCs over a single year (with the exception of Lapwing for which the low tide maxima was the highest count but has been substituted for the TTTC count for this purpose), providing a total of 5,026 birds. This correct figure for the assemblage is 1,476 birds greater, or a significant increase of 42% above the figure provided by Able. The actual peak represents 3.7%, and not 2.5%, of the WeBS 5 year peak mean as shown in Table 6.2 below.

Table 6.5: Contribution of waterbirds present on Killingholme Marshes Foreshore to the assemblage

Source	Count	Percentage of SPA population
Able count	3,550	2.5%
Actual sum of species maxima	5,026	3.7%

- 6.15. Able has highlighted within the HRA assessment report that the loss of 31.5 ha of intertidal mudflat equates to just 0.33% of this habitat type within the European Site. Using the higher loss figure of 39.97 ha to take into account indirect and functional loss, and using an overall area of 9,382.46 ha for littoral sediment i.e. mudflats and sandflats (estimated using Ordnance Survey Landline intertidal and Mastermap as provided within the HRA assessment report), this provides a revised figure of 0.43%.
- 6.16. There is sufficient bird count data provided by the Through The Tide Counts (TTTCs), Low Tide Counts, WeBS core counts to assess the likely impacts of the proposed development. Whilst it would be useful to know specific additional details (such as dates of survey, time of survey and presence of any disturbing activities at the time of survey), this is just a presentational issue. There is not a need to conduct further bird counts.
- 6.17. Bittern were not recorded in the WeBS data for the SPA over the last five years or from the TTTC surveys in 2010-11. Natural England considers that this is a robust basis to exclude the species from the HRA. In short, there is no risk that bittern habitat will be directly affected or that the level of indirect disturbance to bittern would be sufficient to justify including them in the HRA.
- 6.18. Owing to the small classified population of Ruff at the site, the occasional presence of a single bird could give the impression that Ruff are present as a significant proportion of the SPA population (using a 1% threshold to determine significance). Only a single bird has been recorded, which Natural England does not consider to be a sufficiently large sample to determine representative use. Therefore Natural England agrees that although the numbers of Ruff were represented at 1.6% this is insufficient to determine that there would be a significant effect on that species.

### Conclusion of impacts

- 6.19. The impact of the proposal on habitat is therefore very significant in the context of the integrity of the EU sites.

## 7. Background to Natural England's assessment of the issues

- 7.1. Since submitting its Relevant Representations on 2 April 2012, Natural England has continued to meet with the Applicant, the Environment Agency and the Marine Management Organisation every two weeks. The purpose of these meetings has been to discuss with the Applicant the issues raised by the three agencies and to seek agreement on their resolution.

### Outstanding information

- 7.2. Natural England's assessment is largely based upon information submitted by the Applicant as well as information held by Natural England itself or provided by other statutory authorities such as the Environment Agency and the Marine Management Organisation. In this regard Natural England reiterates the importance of information in good time if it is to be able properly to advise the Examining Authority on the nature conservation implications of the proposal for which DCO is sought.
- 7.3. In a letter of 29 May 2012 Natural England sought clarification about when a number of outstanding reports and other information would be provided. The letter referred to the Applicant's draft list of outstanding information prepared for the Preliminary Meeting on 24 May 2012. In particular it emphasised the need for further information to be provided in relation to the proposed compensatory measures at Cherry Cobb Sands. The table below updates the Applicant's list and highlights where information is still outstanding.

Table 7.1: Outstanding information/reports

Report Title	Provider	Date Due to Able	Formally Issued	Status*
Badger Bait-Marking Survey	P. Lewns	22/05/2012	29/05/2012	Received by NE
EX. NOTE: Sensitive Months for Birds Using Intertidal	ERM	24/05/2012	31/05/2012	<b>Not received</b>
EX. NOTE: Maintenance Dredge Variability	HRW	25/05/2012	01/06/2012	<b>Not received</b>
HR Wallingford Long-Term Morphological Change to N of Quay	HRW	25/05/2012	01/06/2012	<b>Not received</b>
HR Wallingford Long-Term Morphological Change to S of Quay	HRW	25/05/2012	01/06/2012	<b>Not received</b>
EX. NOTE: Bats	ERM	29/05/2012	05/06/2012	Received by NE
GCN Licence Application	AE	29/05/2012	05/06/2012	Received by NE
EX. NOTE: Operational Buffer	Able	29/05/2012	05/06/2012	<b>Not received</b>
EX. NOTE: Site Habitat Loss Tabulation	Able	29/05/2012	05/06/2012	Received by NE

Description of Works within DML	Able	01/06/2012	08/06/2012	Received by NE
EX. NOTE: Quantum of Habitat Compensation	Able	01/06/2012	08/06/2012	<b>Not received</b>
Supplement to Annex 8.1	JBA	08/06/2012	15/06/2012	<b>Not received</b>
EX. NOTE: Impacts of Construction on NKHP	ERM	12/06/2012	19/06/2012	<b>Not received</b>
EX. NOTE: Pumping Station	ERM	12/06/2012	19/06/2012	<b>Not received</b>
Additional Landscape Masterplan	ERM	15/06/2012	22/06/2012	<b>Not received</b>
Corrigenda to Flood Risk Assessment	JBA	15/06/2012	22/06/2012	Information for the Environment Agency
EX. NOTE: Beneficial Use of Dredge Arisings	Able	15/06/2012	22/06/2012	<b>Not received</b>
EX. NOTE: Dredging/Disposal on Aquatic Ecology & Sub-Tidal Losses	ERM	15/06/2012	22/06/2012	<b>Not received</b>
EX. NOTE: Further assessment of Breeding Bird Survey	Able	15/06/2012	22/06/2012	Received
EX. NOTE: Re-use of In-Situ Material at CCS	Able	15/06/2012	22/06/2012	Information for the Environment Agency
Supplementary In-Combination Assessment	ERM/JBA	15/06/2012	22/06/2012	<b>Not received</b>
Biotope Report	Able	N/A	N/A	Received
EX. NOTE: Mitigation for Compensation	Able	N/A	N/A	Received
EX. NOTE: N Bank Flood Defence Crest Height	B&V	N/A	N/A	Received

\*Status as of 28 June 2012

7.4. In addition to these documents. Natural England also requested the following information from the Applicant:

- Design details of the compensation site.

Status: **not yet received**. Note: the Applicant has stated that this will be issued at the end of June 2012. There have been discussions with the Applicant about the results of modelling two different designs but we have not received a report on these designs or the final design details for the compensation site.

- Detailed design of the proposed wet grassland creation at Old Little Humber Farm (“OLHF”).

Status: **not yet received**. Note: Natural England has provided comments on a draft design for OLHF which was provided in the form of notes rather than a formal report, with a pack of drawings, and with biomass data presented in a separate email. We await the final design details.

- An explanatory note on the impacts of dredging on the berthing pocket, the turning circle and the approach channel.

Status: **partially received**. Note: there have been discussions with the Applicant on this matter and an explanatory note on the berthing pocket was received on 27 June 2012.

- Agreement of mitigation for lamprey and grey seals.

Status: **not yet received**. Note: The Environment Agency has provided a joint response on behalf of Natural England and the Marine Management Organisation to outline piling mitigation. A response is awaited.

### **Discussion of mitigation and design alternatives**

- 7.5. The details of the proposal are set out in the Application documents.
- 7.6. As far as discussion of design alternatives is concerned, in its response to the preliminary environmental information report, Natural England queried why it was necessary for the proposed quay to be a solid structure, given that a more conventional jetty structure would result in a much reduced habitat loss to the designated site. Natural England was informed by the Applicant that due to the weights that the quay would be required to support a jetty structure would not be feasible. Other than this, Natural England has not been involved in any discussion of design alternatives with the Applicant.
- 7.7. As far as mitigation strategies are concerned, in the first instance the need for mitigation was determined by assessing the data and information provided by the Applicant’s Environmental Statement and determining the nature and scale of impacts on the species and habitats of the EU sites. A similar process was undertaken for impacts affecting the two SSSIs and wider biodiversity impacts. Natural England has attended ecology meetings with the Applicant and its consultants since September 2010. At these meetings the potential impacts of the proposed development were considered and also whether these impacts required mitigation. As a result of these and subsequent discussions mitigation for some impacts has been proposed.
- 7.8. There has not been a single comprehensive and coordinated strategy of mitigation measures, though Natural England has been able to work with the Applicant to determine mitigation that is fit for purpose, deliverable and can be guaranteed. Further mitigation may be necessary in light of further information that is yet to be provided.
- 7.9. Area A is the proposed mitigation for the loss of terrestrial feeding and roosting habitat utilised by significant numbers of curlew, a SPA and Ramsar waterbird

species. It will consist of a core area that is sufficient to support the birds displaced by the development; the core will be surrounded by a buffer to ensure that birds utilising the core area are not disturbed during construction and/ or operation of the new port. Area A will be 47.8ha and will be optimally managed as wet grassland habitat.

- 7.10. Area B is the land proposed as mitigation for the loss of habitat and displacement of great crested newts. Area B is located 1.13km to the north west of the existing 3 ponds which support great crested newts. Six new ponds will be created at the receptor site with surrounding terrestrial habitat designed to meet the requirements of the newts, including species-rich meadow grassland, logpiles and a purpose built newt hibernacula.
- 7.11. However, it was clear from an early stage that mitigation would not be available for the impacts of the proposed solid quay structure, which will result in the direct loss of designated site habitat. In addition, there will be an area to the south of the new quay that will be affected by both construction and operational disturbance. As discussed below, compensatory measures will be required for these impacts.

### **Discussion of compensatory measures**

- 7.12. Compensatory measures are always assessed on a case by case basis, Natural England does not make stipulations, but assesses all realistic proposals that are made. In this case Natural England advised that compensation should be provided in the first instance in the same area of estuary as the impact for which it is compensating, that is the middle estuary. This is because it is generally considered optimal for compensation to be proximate to the area it is compensating. However it is important to stress that this is not the only possible location for compensatory measures. In other words it is desirable to locate the compensation within the middle estuary but not essential.
- 7.13. At the time of the Immingham Ro-Ro development, when two inter-tidal compensation sites of circa 50 ha were provided outside the middle estuary (ten years ago), categorisation of the estuary into inner, middle and outer zones was not a prominent factor when considering the compensation sites for Immingham Outer Harbour development.
- 7.14. Chowder Ness was considered suitable because though it is technically just outside the middle estuary, it is close to the boundary. To some degree the dividing line of the inner and middle estuary has been drawn at the bridge for convenience sake and is not an absolute in ecological terms. It was considered an advantage that the habitat at Chowder Ness would be provided as a larger block of habitat and would be away from the industrial environment of Hull Docks. There was confidence that the species affected at Quay 2005 and IOH would use a realignment site at Chowder Ness.
- 7.15. Welwick was considered suitable because the area was known to support the species which would be affected at the two development sites. Welwick saltmarsh, adjacent to the realignment site, was known as an important high tide roost for wading birds in this part of the estuary. It was considered advantageous to locate a realignment close to this roost, thereby adding more 'value' to an area already known to be important. Also the Welwick site was within a part of the local Sunk Island area which had been most recently reclaimed from the estuary. It was considered logical that a shoreline which had until relatively recently been a functioning part of the



estuary would be a sensible place to set back flood defences.

### **Natural England's assessment of the EU sites and their conservation objectives**

- 7.16. Natural England regularly assesses the condition of SSSI units that underpin all EU sites. It assesses those features for which the site was designated and determines whether they are in satisfactory condition. The most recent condition assessment for the Humber Estuary SSSI, dated 1 May 2012, states that 97.8% of the site is in favourable or unfavourable recovering condition.
- 7.17. Other assessments have also been undertaken of site condition. Natural England was commissioned by Defra in 2010 to undertake a strategic review of the risks from all ongoing activities within European Marine Sites ("EMS"), in order to identify future management required to ensure site features are maintained or restored to favourable condition. The Humber Estuary EMS covers the marine areas of the Humber Estuary SAC, SPA and Ramsar site. A report card has been produced for each site which identifies the level of risk from specific ongoing activities. For those activities identified as high risk, Natural England worked with the relevant bodies to agree a preferred option to remedy the issue, together with a timescale for delivery. The high risk activities identified on the Humber Estuary were the dissolved oxygen sag which affects the estuary feature and the sea lamprey, and eel net fisheries causing by-catch of river lamprey. Actions to remedy these issues were agreed with the Environment Agency. These identified risks are not of direct relevance to the Applicant's proposal.
- 7.18. An assessment of the vulnerability of interest features and their component sub-features was carried out in 2003 in *English Nature's advice given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994* (provided at Annex B). No overall site vulnerability assessment is undertaken. Vulnerability is described as "an integration of sensitivity and exposure" so that only if a feature is both sensitive and exposed to human activities will it be considered vulnerable. The vulnerability of individual features is reflected in the assessments of site condition referred to above.
- 7.19. As of May 2012 Natural England has published new conservation objectives for the SPA and the SAC. These are provided in Annex B. These are the legal conservation objectives that are relevant for the assessment of the EU sites. However, these are 'high-level' objectives which set out general parameters against which plans and projects should be assessed. The favourable condition tables in the Humber Estuary SSSI document dated December 2009 give site specific targets and measures that inform Natural England's monitoring programme and enable it to make judgements on the condition of designated sites. These tables should also be utilised to support a Habitats Regulations Assessment as they provide the necessary level of detail to ensure its conclusions are robust and all potential impacts on each interest feature have been properly assessed.
- 7.20. The new 'high level' conservation objectives, the December 2009 SSSI document, including its favourable condition tables, and the Regulation 33 advice for the European Marine Site are all broadly consistent with the January 2011 EU Commission guidance document *Guidelines on the Implementation of the Birds and Habitats Directives in Estuaries and Coastal Zones*, despite the fact that some of those documents pre-date the guidance.
- 7.21. In the condition tables for the 2009 SSSI document condition is measured against a

target of 'no reduction in extent'. This also is broadly consistent with EU guidance, for example European Commission Guidance on Article 6(4) refers to the objective of 'no net losses' to the overall coherence of the Natura 2000 network (section 1.5.5). However, in a dynamic coastal or estuary environment the dynamic nature of that environment is taken into account in determining the significance of impacts and in making other determinations.

- 7.22. Paragraphs 65 and 66 of the *March 2012 Habitats Review* (Applying a consistent approach to conservation objectives) state that "Natural England, working with JNCC, will publish by the end of June 2012 its new approach to increasing the information available on conservation objectives including the features on the sites". It is not expected that this work will have any implications for the current proposal as whilst a description of the new approach will be published at the end of June, the site conservation advice (the Regulation 33 package referred to above) will not be reviewed until after March 2013. The aim of this work is to provide greater clarity for developers and to better inform Habitats Regulations Assessments at an early stage.
- 7.23. While Natural England's knowledge and understanding of European Marine Sites and the potential risks to them have improved since the first Regulation 33 packages were published, the conservation objectives in the Regulation 33 package for the Humber Estuary are fairly robust and it is not expected that this work will change the existing objectives substantially.

#### **Summary paragraph on conservation objectives**

- 7.24. In summary, the conservation objectives that the competent authority should refer to are those that are dated May 2012 as these are the over-arching objectives that cover all areas of the Humber Estuary designated site. Further detail should be taken from the favourable condition tables in the Humber Estuary SSSI document dated December 2009 and Regulation 33 advice for the European marine site as necessary to enable a robust Habitats Regulations Assessment to be undertaken.

#### **Natural England's approach to the assessment of integrity**

- 7.25. A central concept when assessing the potential impacts of a plan or project on an EU site is the integrity of that site. Preserving the integrity of EU sites is in large part the purpose of the Article 6 of the Habitats Directive. In the *Waddenzee* case<sup>20</sup> the European Court of Justice (ECJ) said that:

*"It is therefore apparent that the plan or project in question may be granted authorisation only on the condition that the competent national authorities are convinced that it will not adversely affect the integrity of the site concerned.*

*So, where doubt remains as to the absence of adverse effects on the integrity of the site linked to the plan or project being considered, the competent authority will have to refuse authorisation."*

- 7.26. To assist competent authorities when assessing the issue of integrity guidance is provided in the European Commission's document *Managing Natura 2000 Sites* (2000). Section 4.6.3 defines the "integrity of the site" as

*"... the coherence of the site's ecological structure and function, across its*

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<sup>20</sup> Case C-127/02 *Landelijke Vereniging tot Behoud van de Waddenzee v. Staatssecretaris van Landbouw Natuurbeheer en Visserij* [2004] ECR I-7405 at [56]-[57].

*whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified.*<sup>21</sup>

The competent authority must, therefore, be mindful of the ecological structure and function of an EU site when considering various man-made impacts upon it.

7.27. The assessment of integrity must focus upon a site's conservation objectives.<sup>22</sup> Furthermore in the *Waddenzee* case, the Advocate General indicated<sup>23</sup> that harm to integrity included deterioration and significant disruption of natural habitats and species for which the EU site has been designated, as defined in Article 6(2) of the Habitats Directive.

7.28. There is little determinative judicial authority on the definition of "integrity". However in English Nature Research Report 704, David Tyldesley and Associates (provided at Annex D) assessed a number of cases in relation to the assessment of the spatial scale of impacts. The report states

*"Bearing in mind the precautionary principle embedded in the legislation, applied consistently by Secretaries of State and endorsed in court judgments, habitat loss of very small scale, including losses in the order of 0.1% or less of a site, can clearly be regarded as an adverse effect on the integrity of a designated site".*

7.29. The report continues "[w]hilst it is concluded that very small scale losses can be decisive in important decisions about project proposals, there must be a point at which an effect may be considered *de minimis*". Therefore, 'no net loss' should not be an absolute criterion applied to all proposed development, it is dependent on the extent and ecological function of the habitat that will be lost. If the conservation objectives are not affected, a loss of habitat may not harm the integrity of an EU site. There is no minimum threshold, assessments should be made on a case-by-case basis. If significant areas of ecologically functioning habitat will be lost from within the designated site boundary, then (provided that the tests of 'no alternative solutions' and 'imperative reasons of overriding public interest' are passed) these losses will require compensation.

### **Natural England's approach to the assessment of coherence**

7.30. The aim of compensatory measures is to ensure that the overall ecological coherence of the Natura 2000 Network is maintained. Article 10 of the Habitats Directive refers to "ecological coherence" in terms of

*"Such features ... which, by virtue of their linear and continuous structure (such as rivers with their banks or their function as stepping stones (such as ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species."*

7.31. Detailed guidance on coherence is provided by the European Commission in its *Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC*. It is unnecessary to set out at length passages from that document within these Written Representations, however it may be noted that section 1.4.2 recommends the following approach in relation to SACs and SPAs respectively:

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<sup>21</sup> This definition is drawn from UK PPG 9 (October 1994).

<sup>22</sup> See Regulation 61 of the Habitats Regulations, see also paragraph 4.6.3 of Managing Natura 2000.

<sup>23</sup> At [117] of her opinion.

*“With regard to a plan or project, the compensatory measures defined to protect the overall coherence of Natura 2000 network will have to address the criteria mentioned above. This would mean that compensation should refer to the site's conservation objectives and to the habitats and species negatively affected in comparable proportions in terms of number and status. At the same time the role played by the site concerned in relation to the biogeographical distribution has to be replaced adequately.*

*At this stage it would be useful to recall that under the Habitats Directive the selection of a site for the Natura 2000 Network rests on:*

- the taking into account of the habitat(s) and species in proportions (surface areas, populations) described in the standard data form;*
- the inclusion of the site in a biogeographical region within which it is located;*
- the selection criteria established by the ‘Habitats’ Committee and used by the European Topic Centre on Biological Diversity to advise the Commission to retain a site on the Community list.*

*Competent authorities should be looking at these criteria when designing the compensatory measures for a project, and should ensure that they provide the properties and functions comparable to those which had justified the selection of the original site.*

*The ‘Birds’ Directive does not provide for bio-geographical regions, or selection at Community level. However by analogy, it could be considered that the overall coherence of the network is ensured if:*

- compensation fulfils the same purposes that motivated the site's designation in accordance with Article 4(1) and 4(2) of the Birds Directive;*
- compensation fulfils the same function along the same migration path;*
- the compensation site(s) are accessible with certainty by the birds usually occurring on the site affected by the project.”*

- 7.32. It is expected that an area providing compensation will be incorporated into the designated site boundary of the EU site (or separately designated) so as to ensure that the overall coherence of the Natura 2000 network.

## 8. Issues

### Introduction

- 8.1. Natural England identified five main issues in its Relevant Representations, the most important of which related to the provision of compensation at Cherry Cobb Sands. In addition, it identified a number of subsidiary issues on which further evidence or other work was required. These were further issues which had not been resolved satisfactorily as part of the pre-application process.
- 8.2. Natural England's view has been that there is no reason in principle why obstacles to the project could not be overcome; however serious concerns have now been raised about the adequacy of the compensation proposed. Natural England's satisfaction in relation to the other issues is subject to being provided with further information and details on those matters.
- 8.3. In some areas, the Applicant has provided the further information or assurances necessary and issues have been resolved. However, in other areas, issues remain.
- 8.4. Natural England wishes to again make it clear that it is concerned about the late provision of information by the Applicant in this case. It is of importance that it receives the information requested, and is allowed to reflect properly upon it, as it goes to the heart of Natural England's concerns about the proposal, particularly in respect of the compensation package. The Applicant's failure to provide the information which Natural England, and the other Defra agencies have requested, in a timely fashion inevitably hampers Natural England's ability to fully advise the Examining Authority in these representations. This matter was raised at the preliminary meeting on 24 May 2012. The hopeful expectation is that fully worked up information will be provided so that Natural England will be in a position to respond in its comments and submissions in July and through the Statements of Common Ground in July and August. These Written Representations therefore represent a provisional response on a number of issues, especially the important issue of compensation. Natural England urges the Applicant to work with it as closely and openly as possible so that it can best assist the Examining Authority further on in the process.
- 8.5. The most important of the main issues is the adequacy of compensatory measures at Cherry Cobb Sands. The other four main issues relate to specific aspects of particular concern. There also remain a number of issues where Natural England identified that:
  - Further evidence or assessment was required;
  - Further work on the mitigation and compensation proposals was required; and
  - Are issues to be dealt with under DCO requirements.

The issues will be presented in the same order as they were in the Relevant Representations, and it will be indicated where appropriate that the issues have been resolved.

### **The main outstanding issue: proposed compensation site at Cherry Cobb Sands**

## **Summary of Natural England's position**

- 8.6. The Applicant originally proposed a 100ha managed realignment site at Cherry Cobb Sands on the north bank of the Humber, opposite the development site. It was understood that this would provide a ratio of 2:1 compensation for the loss of mudflat, together with above 1:1 compensation for the loss of designated estuary features of the SAC. Given the fact that the compensatory habitat would not be available at the time that the existing habitat would be lost, the Applicant has proposed providing a 38ha wet grassland site at Old Little Humber Farm whilst the managed realignment site at Cherry Cobb Sands develops benthic interest.
- 8.7. Natural England's position on this proposal was that in principle there was a sufficient degree of confidence that the proposed amount of compensation would be sufficient, although Natural England noted residual doubts relating to the modelling work both for the site (see para.1.18.1 of the Relevant Representations).
- 8.8. However, recent communications with the Applicant and its consultants, Black and Veatch, have indicated that it may not be possible to provide a compensatory ratio of 2:1 (mudflat habitat creation to mudflat loss) at Cherry Cobb Sands. It appears that the managed realignment site will rapidly accrete and is likely to become saltmarsh habitat more quickly and at a higher rate than previously anticipated.
- 8.9. Black and Veatch have said that they will carry out further work to investigate these concerns, such as redesigning the managed realignment site, and that this information will be provided in a written report at the end of June 2012. However, as their interim work predicts that it will be difficult to achieve a ratio of 1:1 in the short to medium term, they have stated that redesigning the proposed managed realignment site is unlikely to provide a substantially greater amount of mudflat habitat. At the time of writing these Written Representations, Natural England has not yet received this further information. However, on the basis of the information that Natural England has so far received, there are serious doubts on the ability of Cherry Cobb Sands to deliver adequate and effective compensation for the loss of the mudflat at Killingholme Marshes.<sup>24</sup> This is discussed in more detail below.
- 8.10. Natural England's position is that in order to comply with the requirements of the Habitats Regulations, equivalent functional ecological habitat must be provided as compensation both for the loss to the protected features (estuary habitat and intertidal mudflats) but also for the impacts on birds, especially the black-tailed godwit. Currently, there is considerable uncertainty not only over the detailed design, but over what exactly is proposed as compensation by the Applicant. This makes it impossible for Natural England to give any firm advice on the adequacy of the compensatory measures in these Written Representations. Nor is it possible to conclude that the compensatory measures proposed will maintain the coherence of the Natura 2000 network as required under Regulation 66 of the Habitats Regulations. It is a matter of concern that the proposed compensation has not been finalised at this late stage. Natural England will work with the Applicant as far as possible to assist in assessing its proposal and considering compensation options.

## **Assessment of compensation at Cherry Cobb Sands**

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<sup>24</sup> Natural England is not concerned in particular about the fact that the baseline data used for the modelling is from 2008, it remains to be seen what data will be used for further iterations. It is assumed that the most recent data available is used.

- 8.11. As noted above Natural England is unable at this stage to give a firm indication as to the proposed compensation at Cherry Cobb Sands. However, in order to assist the Examining Authority in considering this matter it would be helpful to set out some of the main areas of concern that Natural England currently has on the information before it.

*Extent of compensation*

- 8.12. Natural England's advice in this case is that it will be necessary to provide a compensatory ratio of at least 2:1. This is not a standard requirement, there is no generic compensation ratio that would apply to all species and habitat types. It may be noted that the European Commission guidance on Article 6(4) notes that "[t]here is wide acknowledgement that ratios should be generally well above 1:1" (section 1.5.4).
- 8.13. In this case, the ratio of 2:1 was proposed by the Applicant, but it is considered that the need for a 2:1 ratio is underpinned both by common sense and a good understanding of the specific ecological conditions involved. This is based in particular on two interrelated factors: the ecological quality of the area that will be lost and the uncertainty of being able to establish equivalent habitat at Cherry Cobb Sands.
- 8.14. A 2:1 ratio is likely to be sufficient to meet the requirements of seven of the eight SPA species displaced (shelduck, ringed plover, dunlin, lapwing, bar-tailed godwit, curlew and redshank), albeit an element of uncertainty remains. For black-tailed godwits, however, it remains possible that 2:1 may not prove to be sufficient, which means that a strict monitoring programme will be required in addition.
- 8.15. Given the anticipated accretion of the habitat to saltmarsh, it is now doubted that Cherry Cobb Sands will be able to provide a ratio of 2:1, or even 1:1, within a timeframe that is reasonably comparable to the habitat lost. This makes it unlikely that Cherry Cobb Sands is capable of providing compensation that will ensure the coherence of the Natura 2000 network. Natural England will seek to work with the Applicant to provide any further advice as further proposals emerge. It should be noted that the requirement for 2:1 compensation is separate from Natural England's concerns about mudflat turning into saltmarsh.

*Effectiveness of compensation*

- 8.16. One of the key functional aspects for the compensation is to maintain feeding opportunities for black-tailed godwits. However, once the design is selected that maximises creation of mudflat with the minimum succession to saltmarsh, the diversity and abundance of invertebrates (and consequently both the species and numbers of birds that will colonise) largely depends on the prevailing environmental conditions at the site selected. It is not possible to undertake specific habitat management prescriptions that would ensure that the mudflat selected would mirror the mudflat lost and the birds it supports

*Timing of compensation*

- 8.17. There are two factors to have regard to in respect of the timing of compensation. First, compensation should be available to birds for the same period of time as the area of lost habitat would have otherwise been present. In other words, the compensation should be like for like on a temporal basis, taking into account natural change.

- 8.18. Secondly, compensation should be available at the time that the habitat compensated for is lost. As Cherry Cobb Sands will not be mudflat for a number of years after the Killingholme Marshes foreshore is destroyed, the Applicant offered to provide a 38ha wet grassland site at Old Little Humber Farm whilst the managed realignment site develops benthic interest.<sup>25</sup>
- 8.19. Limited details have been provided by the Applicant about Old Little Humber Farm, however a recent meeting has cast significant doubt over whether Old Little Humber Farm would be able to fulfil this function. In particular, for black-tailed godwits, an ideal compensatory area would consist of an island within an area of permanent standing water. However, the proposed site is dry and is criss-crossed by underground pipes. It is likely that it would require very substantial engineering works to raise water levels in order that it could be sustainably flooded to create suitable habitat for black-tailed godwits and other waterbirds. Natural England will continue to discuss this issue with the Applicant, however on the information currently available it seems likely that the creation of wet-grassland at Old Little Humber Farm will not be capable of supporting displaced birds at the time of predicted mudflat loss.

#### **Experience from other managed realignment sites**

- 8.20. Chowder Ness was breached in 2006 and was created by Associated British Ports as compensation habitat, along with Welwick. The monitoring work undertaken in 2011 indicates that it is unlikely the habitat creation targets for Chowder Ness will be met as a greater area than predicted has accreted to saltmarsh. However, the rate of saltmarsh spread has now apparently begun to slow. Of the realignment sites on the Humber, Chowder Ness has typically shown the slowest rate of accretion. This may be due to its location in the estuary where less saltmarsh is typically found, the complete removal of the fronting flood bank, and its location within the tidal frame; the edge of the site is very close to mean low water neaps when compared to other realignment sites on the Humber. Whilst the site may not meet its targets for intertidal mudflat creation, it is comfortably exceeding its bird targets, i.e. there are significantly more birds, of the relevant species, utilising the compensation sites than will be displaced by the developments.
- 8.21. Paull Holme Strays is a 80ha realignment site provided by the Environment Agency largely as compensation for coastal squeeze arising from the ongoing implementation of the Humber Flood Risk Management Strategy. It also provides compensation for some small areas of direct loss attributable to specific Environment Agency flood defence works. The qualitative targets are to provide mudflat and saltmarsh typical of the middle estuary. There has been an aspirational target for the site to provide 45ha of mudflat and 35ha of saltmarsh. Specific compensation objectives were not provided for this site as the majority of Paull Holme Strays is required to provide non-specific intertidal habitat to replace the gradual loss of intertidal habitat lost across the estuary to coastal squeeze over a period of decades.
- 8.22. At present, none of the realignment sites on the Humber Estuary have reached the

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<sup>25</sup> It is proposed that Old Little Humber Farm remain in place until monitoring could demonstrate that Cherry Cobb Sands maintained the coherence of the SPA network. On this basis, it could potentially remain in perpetuity as the additional functionality it could provide for birds, both in terms of roosting and foraging, could be essential to maintaining coherence of the Natura 2000 network. Therefore, Natural England has considered the provision of this area of wet-grassland as part of the overall compensation package (and not a temporary measure) in combination with the managed realignment site.



end of their initial ten year management and monitoring programmes. They are dynamic sites and continue to change. They are overseen by a management and monitoring group. As the sites are developing and more monitoring data is becoming available, the group is debating the particular issue of saltmarsh spread at the expense of intertidal mudflats. It is therefore too soon to draw firm conclusions from the experience at Chowder Ness or Paull Holme Strays.

- 8.23. There are two other limitations on what can be learned from Chowder Ness and Paull Holme Strays in this case. First, in a dynamic estuary environment the modelling for each site must be judged independently. Secondly, neither the Paull Holme Strays or Chowder Ness realignment schemes were required to compensate for a habitat of the same quality as that at the Killingholme Marshes foreshore, in particular in relation to black-tailed godwits. While black-tailed godwits are present at Paull Holme Strays in low numbers, they do not feed there (Institute of Estuarine and Coastal Studies).

#### **Need to consider other options**

- 8.24. Natural England understands from recent meetings (June 2012) with the Applicant and its consultants, Black and Veatch, that Black and Veatch are now concerned that it may not be possible to create a compensation ratio of 2:1 mudflat habitat creation to mudflat loss on the north bank of the Humber Estuary. Rather, it appears that the managed realignment site will rapidly accrete and is likely to create greater areas of saltmarsh habitat than previously anticipated. This means that a 2:1 ratio for mudflats may not be achieved and that over time the ratio may decline to less than 1:1. Black and Veatch have said that they will carry out further work to investigate these concerns, such as redesigning the managed realignment site, and that this information will be provided in a written report at the end of June 2012. However, as the current work predicts that it will be difficult to achieve a ratio of 1:1 in the short to medium term, they have stated that redesigning the proposed managed realignment site is unlikely to provide a substantially greater amount of mudflat habitat. Natural England will advise the Examining Authority on the conclusions of this additional work in due course, after we receive the written report of this work.
- 8.25. More recently we have discussed with the Applicant that it would be advisable to explore alternative options for the provision of compensatory habitat. Ideally, we would have understood the limitations of the Cherry Cobb Sands proposal much earlier (as well as explored alternative options earlier). Despite this late stage in the application process we are urging the Applicant to explore in as much detail as possible alternative options for the provision of compensatory habitat. In order to provide meaningful and helpful advice on these options there is a need for Natural England and the Examining Authority to have sight of supporting evidence for the technical feasibility and habitat deliverability of any proposed scheme as well as an assessment of the impacts of the scheme itself and in-combination with other projects.
- 8.26. One alternative option recently proposed in outline form only (email from the Applicant to Natural England dated 14 June 2012) was the creation of mudflat within the estuary by the installation of a number of groynes. In effect, this proposal aims to mitigate for the loss of intertidal mudflat habitat by seeking to provide new intertidal mudflat habitat within the designated site boundary. Although Natural England has not ruled out the 'within estuary option' Natural England has advised that in the absence of detailed information Natural England has significant reservations about the proposal in terms of the deliverability of the required amount and quality of habitat and potential adverse impacts on the designated site.

- 8.27. Natural England is urging the Applicant to explore other options which in Natural England's view would offer more realistic possibilities for the delivery of the required compensation without affecting additional areas of the designated site. These other options are based on various combinations of managed realignment and wet grassland habitats and include a proposal to exchange the proposed location for managed realignment mudflats at Cherry Cobb Sands on the north bank with the planned provision of wet grassland (from another compensation scheme of the Applicant) on the south bank. Natural England is urging the Applicant to consider all alternative options as it is Natural England's view that these options may offer greater levels of certainty than the proposals so far canvassed. Natural England recommends that the Applicant produces a clear position on these options as soon as possible and invite the Panel to take an interest in them.

#### **Need for monitoring**

- 8.28. In any event, whatever compensation is provided Natural England considers that monitoring will be necessary in light of the uncertainties around habitat creation in estuaries and modeling (paragraph 1.19.1 of Natural England's Relevant Representations).

#### **Other main issues identified in Natural England's Relevant Representations**

##### **Disturbance to Humber Estuary SPA/ Ramsar waterbirds (paragraph 1.18.2)**

- 8.29. It is Natural England's position that the piling operations required during the construction of the Marine Energy Park are likely to result in disturbance to SPA and Ramsar waterbird species.
- 8.30. As stated in Natural England's Relevant Representations, the application documentation states that Natural England has confirmed that no seasonal restrictions on piling are required. This is not however the case. Natural England wrote to the Applicant on 22 December 2011 advising that seasonal restrictions on piling activities would be required if severe weather occurred during February or March in order to prevent the impact of the piling operations on birds and avoid an adverse effect on the site integrity of the SPA and Ramsar site. This remains the position. Natural England has proposed some specific details for a requirement and anticipates that this matter can be resolved with the Applicant through the Statement of Common Ground.
- 8.31. The Applicant has calculated that there will a 6ha functional loss of habitat owing to disturbance. It is assumed that this area has been calculated by mapping the area contained within a buffer surrounding the development. The size of the buffer will be determined by the disturbance distance selected. The 275m distance selected in the shadow Habitats Regulations Assessment Report (paragraph 6.3.8) is reasonable. This is a distance that applies to all bird species and although some birds will be disturbed at greater distances, for other species the distance will be lesser. It would nevertheless be useful to confirm with the Applicant that 275m was indeed the distance used to determine a functional loss of 6ha.

##### **Designated site habitat loss; lack of proposed compensation for the SAC and Ramsar site (paragraph 1.18.3)**

- 8.32. The shadow Habitats Regulations Assessment prepared on behalf of the Applicant states that the berthing pocket will be over-dredged to the natural bedrock and then

backfilled to -11m with stone aggregate. The impact of this work, including, for example, the loss of approximately 7.7ha of subtidal estuary mud habitat, is not assessed either in the shadow Habitats Regulations Assessment or in the Environmental Statement. Natural England advises that this impact should be assessed by the Examining Authority as part of its Habitats Regulations Assessment. Sufficient information will be required to allow this to be done.

- 8.33. Without in any way pre-judging the outcome of this assessment, Natural England advises that if the information provided on dredging determines that this activity will lead to a permanent loss of estuary habitat, then this will be an impact that results in an adverse effect on the integrity of the SAC and Ramsar site. If relevant, this impact should be taken into account in the assessment of necessary compensatory habitat.
- 8.34. Since Natural England submitted its relevant representation it has requested further information relating to this matter from the Applicant. Further to this there was a recent meeting between Natural England and the Applicant's consultants during week of 11 June 2012. During this meeting the issue was discussed and information relating to dredging was again requested, but only partially received. Natural England hopes that the Applicant provides this information shortly so that it can advise the Examining Authority appropriately in its Comments on the Written Representations that are due on 27 July 2012.

#### **Mitigation for great crested newts (Area B) (paragraph 1.18.4)**

- 8.35. It is understood from surveys carried out by the Applicant and provided in the Environmental Statement that the proposed development includes an area occupied by three ponds that currently support a medium sized breeding population of great crested newts. This area, including the ponds and supporting terrestrial newt habitat, will be destroyed as part of the development proposals.
- 8.36. While great crested newt is not a designated feature of the Humber Estuary SAC, this species is a European protected species by virtue of being listed in Annex IV(a) of the Habitats Directive.
- 8.37. Inclusion on Annex IV(a) ("European protected species") means that member states are required to put in place a system of strict protection as outlined in Article 12, and this is done through inclusion on Schedule 2 of the Habitat Regulations. Regulation 41 makes it an offence to:
- deliberately capture or kill a great crested newt;
  - deliberately disturb a great crested newt;
  - deliberately take or destroy the eggs of a great crested newt;
  - damage or destroy a breeding site or resting place of a great crested newt.

The legislation applies to all life stages of great crested newts.

- 8.38. Under Article 16 of the Habitats Directive there are three tests which must be applied by planning authorities when considering planning applications that will deliberately kill or unacceptably disturb (etc) a European protected species. These tests are: (i) that there is no satisfactory alternative to the proposal, (ii) that the proposal is not detrimental to the maintenance of the population of the protected species at a

favourable conservation status in its natural range and (iii) that the proposal is justified for a certain reason, including an imperative reason of overriding public interest.

- 8.39. These tests have been transposed into English law by regulation 53 of the Habitats Regulations. Under the Habitats Regulations the 'relevant licensing body' may grant a licence in respect of a European protected species if these tests are met. In England, the relevant licensing body is Natural England.
- 8.40. The Applicant submitted a draft European protected species licence (a mitigation licence) application to Natural England on 16 February 2012. Natural England's Regulation team assessed the draft licence application and concluded that it failed to meet the three licensing tests (see para 3.16 above).
- 8.41. Natural England advised the Applicant (in its letter dated 4 April 2012) that it was not possible to issue a 'letter of comfort' at that stage and provided details of the further information required to address the issues of concern. A copy of Natural England's response and the determination report is enclosed at Annex G which sets out the detail of the further information required. This letter also explains the process in more detail regarding what will happen if a 'letter of comfort' is issued and the Applicant then wishes to formally apply for the licence following receipt of the DCO.
- 8.42. In summary, the main issues of concern are as follows:
- In the context of meeting the favourable conservation status test, Natural England has advised the Applicant that:
    - additional information is required on the 2010 survey and impact assessment;
    - that there is a need for a habitat management and maintenance plan; and
    - a legally binding agreement is necessary to secure the long term security of the receptor site (Area B) and adjoining woodland, in order to ensure that the habitats are managed and maintained in the future. The receptor site (location for the creation of six new ponds) as proposed does not in itself provide sufficient terrestrial habitat for the newts, hence the importance of including the adjoining woodland.
- 8.43. Natural England has also advised that additional supporting evidence must also be provided to inform the other two licensing tests.
- 8.44. Since the application was first submitted, Natural England has been working with the Applicant to help ensure that their draft licence application meets Natural England's protected species licensing requirements.
- 8.45. A revised draft licence application was received by Natural England on 12 June 2012 and is currently being reassessed by our Regulation team (Natural England aims to issue a decision within 30 days of receipt of the application).
- 8.46. Provided sufficient information has been provided by the Applicant in response to Natural England's request for further information, and there have been no changes to the application then Natural England will be in a position to issue a 'letter of comfort'. If a 'comfort letter' is issued by Natural England, it will indicate that there is no impediment to issuing a mitigation licence should the Development Consent Order be

granted, (when the licence application would be formally submitted).

### **Biodiversity mitigation; breeding birds (paragraph 1.18.5)**

- 8.47. In its Relevant Representations, Natural England raised a concern that the significance of the impact of the proposal on biodiversity was not fully represented in the main chapters of the Environmental Statement, as breeding bird survey data had been omitted. In particular, the correct figure for red and amber listed breeding bird territories is 271, rather than the 116 reported in the Environmental Statement. With regard to the duty under section 40 of the NERC Act to have regard to the conservation of biodiversity, Natural England advised that sufficient opportunities to mitigate the impacts on breeding birds should be provided.
- 8.48. Natural England has now received an updated report on breeding birds from the Applicant and is satisfied that the baseline data is now accurate. However Natural England does not believe that the impacts of the development are accurately predicted in a number of cases. Natural England has therefore advised the Applicant to provide further information to determine whether impacts on some species of breeding bird can be mitigated through the provision of onsite habitat creation and enhancement. This information is awaited.

### **Other issues identified in Natural England's Relevant Representations**

#### **Overview of the remaining issues**

- 8.49. In addition to the main issues identified by Natural England above, there are a number of other issues which Natural England advised should be addressed by the Applicant and the Examining Authority as part of the application process in order to ensure that the project is acceptable from a nature conservation perspective. These issues were set out in the appendices to Natural England's Relevant Representations. As noted at paragraph 1.20 of the Relevant Representations, they fall into three overlapping categories:
- Issues on which further evidence or assessment work is required.
  - Issues where further work on mitigation and compensation proposals is required.
  - Issues that should be dealt with under the DCO requirements.
- 8.50. In addition to these issues, Natural England has considered the Examining Authority's request that a general review be made of the shadow Habitats Regulations Assessment. The outstanding issues are set out in more detail below. These are primarily issues on which further information is required in order to allow the Examining Authority properly to consider the application or where further commitments and/or detail are required in relation to the mitigation and compensation proposals, to provide a sufficient degree of confidence as to their efficacy.

#### **Resolved issues**

- 8.51. Since Natural England submitted its Relevant Representations it has been in discussions with the Applicant, and further information has been provided. Accordingly Natural England and the Applicant have reached agreement on some of the issues set out in paragraph 1.20. The issues on which agreement has been

reached, together with any relevant comments, are set out in the table below.

Table 8.1: Issues resolved between Natural England and the Applicant

Ref. in NE RRs	Description of issue	Comment
<i>Appendix 1: Issues on which further evidence or assessment work is required</i>		
Para.2.1	Disturbance to birds on the intertidal habitat	<b>Agreed</b> – the area will be lost during construction and operation and will therefore require compensation.
Para.2.6	Estuary biotope (habitats and species) characterisation	Supplementary interpretation has been reported by the Institute of Estuarine and Coastal Studies in ' <i>Biotopes of the Intertidal and Subtidal Sediments around the AMEP site, in the Humber Estuary</i> ', dated 27 April 2012.
Para.2.8.3	Hydrodynamic impacts of the Compensation Site	Discussions have taken place with regards this matter and some further information is required to confirm that this has been adequately assessed.
Para.2.9	Effects of projects and sea level rise	<b>Agreed</b> – following further clarification provided in correspondence.
Para.2.11	Loss of terrestrial habitat utilised by SPA/ Ramsar waterbirds	<b>Agreed</b> The Applicant has provided an additional report on this issue. Natural England has agreed that this loss of terrestrial habitat does not require mitigation.
Para.2.13.1	Bats, south bank development site (SSSI)	<b>Partially agreed</b> - Further explanation has been provided as part of a review of the information to clarify that the trees to be lost are unlikely to provide suitable roosting habitat for bats. However until the detailed landscape masterplan has been provided it is not possible to determine whether the proposed mitigation is sufficient.
Para.2.13.2	Badgers, Cherry Cobb Sands (SSSI)	An additional badger survey and accompanying report has been provided by the Applicant's consultants. The consultant will decide whether a licence is required from Natural England. Natural England will assist the Applicant with a licence application should one be made.
Para.2.15	North bank compensation site – trees as foraging and roosting habitat for bats (SSSI)	<b>Agreed</b> – the Applicant has now demonstrated that the trees are not suitable habitat for roosting bats.

Ref. in NE RRs	Description of issue	Comment
Para.2.17	Old Little Humber Farm	<b>Agreed</b> – it has been agreed that landscaping strips will be provided at Cherry Cobbs Sands.
<i>Appendix 2: Issues where further work on the mitigation and compensation proposals is required, and the contents of the proposed Ecological Management and Monitoring Plans</i>		
3.2	Loss of SSSI soak dykes	It is agreed that soak dykes will be included within the compensation site
3.3	Habitat improvements at North Killingholme Pits SSSI	It is agreed that Natural England will provide a skeleton Ecological Management and Monitoring Plan, based upon this the Applicant has agreed in principle to carry out some improvement works.
3.4	Mitigation measures for the little ringed plover	It is agreed that mitigation will be provided alongside the works at North Killingholme Haven Pits.
3.8	Concerns over Mitigation Area A	The mitigation proposals will be amended to take account of Natural England's concerns. Natural England is waiting for the supplementary landscape plans in order to confirm the adequacy of the proposals. However these are likely to be agreed. Natural England is producing a skeleton Ecological Management and Monitoring Plan that will cover this.
<i>Appendix 3: Issues that should be dealt with under the DCO requirements</i>		
Para.4.2	Need for maximum light levels and measures to avoid light overpill.	Agreed for inclusion in the DCO.
Para.4.4	Footpath diversion to avoid impacts on waterbirds	Agreed for inclusion in the DCO.
Para.4.5	200m operational buffer around North Killingholme Haven Pits SSSI	Agreed for inclusion in the DCO.

### Statement to inform Habitats Regulations Assessment

- 8.52. In its Rule 8 letter the Examining Authority asked Natural England, the Environment Agency, the Marine Management Organisation, and the Applicant to complete, correct and update the attached screening matrix and appropriate assessment matrix.
- 8.53. Natural England, the Environment Agency, the Marine Management Organisation, and the Applicant have agreed the information provided at Annex H. This consists of an updated Table 1, summary of likely impacts. The parties are also suggesting reformatting Tables 2 to 7 in the form suggested in Annex H. If the Examining Authority are content with this approach we would be happy to continue to complete the tables during Examination Process and in light of further environmental information received.

## **Outstanding issues**

- 8.54. Unfortunately there are still a number of matters that Natural England has not been able to agree with the Applicant since it submitted its Relevant Representations. These issues are set out below, together with any relevant comments and how we believe the issue can be resolved. Natural England hopes that the Applicant provides this information shortly so that it can advise the Examining Authority appropriately in its Comments on the Written Representations that are due on 27 July 2012.

### **Issues on which further evidence or assessment work is required:**

#### **Designated site habitat loss (paragraph 2.2)**

- 8.55. There are a number of elements of the project that will lead to direct or indirect loss of designated site habitat. These include the proposed new quay, berthing structure, the breach for the managed realignment site and associated erosion. However, there are other aspects of the project in relation to which it is not clear whether there would be habitat loss, namely the proposed rock armouring, and the pumping station including temporary coffer dam and associated drainage channel with stone mattressing. Natural England was provided with EX 11.23 on 1 June 2012; however this does not provide any detail of the predicted indirect losses and gains. It also does not take account of the Deltares work commissioned by the Environment Agency. We are aware that Able Humber Ports Ltd have compiled a comprehensive spreadsheet detailing this information, but we are yet to receive it.

#### **Construction and operational disturbance (paragraph 2.3)**

- 8.56. Natural England has advised that there has not been proper consideration of construction and operational disturbance arising from the project on designated site birds utilising the remaining SSSI, SPA and Ramsar intertidal habitat and North Killingholme Haven Pits. We understand the Applicant will provide an explanatory note on construction and operational disturbance, but we are yet to receive it.

#### **In-combination impacts (paragraph 2.4)**

- 8.57. Natural England has advised that the in-combination section in the Applicant's shadow Habitats Regulations Assessment Report does not address the complete set of plans and projects and their associated impacts that may combine with the Marine Energy Park and affect the Humber Estuary. Natural England is therefore waiting for a supplementary in-combination assessment report before it is able to draw conclusions on the cumulative and in-combination impacts of the scheme on the Humber Estuary SPA/SAC/Ramsar site. Natural England has provided additional information to the Applicant including suggesting further contact local planning authorities, the Marine Management Organisation, and the Planning Inspectorate to confirm the full list of consented or proposed projects and plans affecting the EU and Ramsar sites. Natural England understands that the Applicant will provide a revised in-combination assessment, but it has yet to receive it.

#### **Shadow HRA (paragraph 2.5)**

- 8.58. Natural England has advised that the Applicant's shadow Habitats Regulations Assessment Report prepared on behalf of the Applicant does not adequately assess all the implications of those impacts that could lead to an adverse effect on the integrity of the Humber Estuary SAC, SPA and Ramsar sites. The Examining Authority could not therefore simply adopt the shadow Habitats Regulations



Assessment Report without undertaking further consideration of these implications. Natural England is working closely with the Applicant, the Environment Agency and the Marine Management Organisation to populate the tables provided by the Examining Authority at Annex D2 of the Rule 8 letter to ensure that all the potential impacts of the development are properly assessed. We understand that any further work that is required on the Habitats Regulations Assessment will be formalised through the Statement of Common Ground due for submission in August.

### **Dredging (paragraph 2.7)**

- 8.59. Natural England advises that dredging may have a significant impact on the Humber Estuary designated sites. Dredging will affect subtidal habitats and associated benthos, leading to increased suspended sediment concentrations, and may smother benthic communities in the disposal areas. These impacts should be assessed in an appropriate assessment covering the proposed capital dredge, maintenance dredge, plough dredging and dredge disposal. We understand that the Applicant will provide an explanatory note on the impacts of dredging on aquatic ecology, but we are yet to receive it.

### **Hydrodynamic and sedimentary regime: morphological assessment upstream of the quay (paragraph 2.8.1)**

- 8.60. The application document submitted states that “[a]t the location of ADCP2, which is just upstream from the proposed quay location, during the rising tide there is a modest increase in speed here due to the scheme of 2.5%.” This increase in speed is also seen in figures 1 and 2. The increase in speed is a problem as it may lead to erosion of the designated site. If erosion were to occur it would potentially cause a reduction in extent of the designated habitat. Natural England was concerned about this as this potential impact on the designated site has not been assessed by the Applicant.
- 8.61. Natural England has been informed in discussions with the Applicant that modelling using the new quay design (which is set further landwards than the original plans) suggests that the change in quay design has stopped this increase in speed which will stop any erosion in this area and would therefore stop any erosion of the designated sites.
- 8.62. Natural England has not had sight of the most up to date modelling reports and so cannot confirm whether the new quay design has stopped erosion in this area. Until it has had the opportunity to consider this new information Natural England is unable to rule out the possibility of significant impacts on the Humber estuary SAC, SPA, Ramsar site and SSSI.

### **Hydrodynamic and sedimentary regime: Wave height, wider estuary impacts (paragraph 2.8.2)**

- 8.63. Diagrams presented within the ES application documents illustrated the impact of the development on wave heights. However the diagrams only showed very localised images of the impacts such that it was not possible to assess how changes in wave heights may be felt in the wider estuary. This issue is important because changes in wave heights may result in changes to erosion and accretion patterns within the estuary which would impact on intertidal habitats.
- 8.64. Natural England has been informed in discussions with the Applicant that the reports created by the Applicant in order to facilitate discussion on the new modelling using

the new quay design will incorporate estuary wide images of changes to wave heights.

- 8.65. Natural England has not had sight of the most up to date modelling reports and so cannot confirm whether these images have been included. Until it has had the opportunity to consider this new information Natural England is unable to rule out the possibility of significant effects on the Humber Estuary SAC, SPA, Ramsar and SSSI. These impacts will need to be considered in the appropriate assessment undertaken by the Secretary of State, acting as competent authority.

#### **Compensation at Cherry Cobb Sands (paragraph 2.10)**

- 8.66. Black and Veatch's letter dated 2 November 2011 (provided at Annex E) states that further modelling work will be carried out to predict ground levels and hence mudflat development within the managed realignment site for the first 10 years. This work is not included in the application documentation. It should be provided to demonstrate the extent of intertidal mudflat habitat that will be created by the managed realignment site and maintained in the long term. This is important because the success of the managed realignment site will demonstrate whether, and if so how, the compensatory measures will ensure the overall coherence of Natura 2000 is protected. As stated above, Black and Veatch are still undertaking this work and Natural England are yet to receive it.

#### **Landscape Masterplan (paragraph 2.16)**

- 8.67. This plan indicates that there is potential within the development site for ecological mitigation to be provided, which is welcomed. However, the submitted landscape plan has insufficient detail to assess whether the suggested mitigation will be adequate and effective. Broad descriptions have been applied to Mitigation Areas A and B with some of the mitigation features listed. Natural England advises that the Examining Authority should require more detailed plans including planting plans in order to assess whether impacts on species and habitats have been mitigated sufficiently. Natural England is waiting for the supplementary Landscape Plans in order to assess the adequacy of the proposed mitigation.

#### **Thermal Plume**

- 8.68. A new matter that has not been raised before relates to the thermal plume. Natural England has previously provided the Applicant with its view regarding the relocation of the Centrica and E.ON outfalls to the north of the proposed quay and associated thermal plume issues. As part of that view we expressed concern regarding any options to co-locate the outfalls. In a recent meeting on the 13 June 2012 the Applicant stated that co-location is now being considered. Natural England understands that there is a supplementary report regarding the potential impact from this new proposal. To date this material has not been received.

**Issues where further work on the mitigation and compensation proposals is required, and the contents of the proposed Ecological Management and Monitoring Plans:**

#### **Ecological Management and Monitoring Plans (paragraph 3.1)**

- 8.69. The Applicant has agreed to work with Natural England and the Humber Industry and Nature Conservation Association to complete three Ecological Management and Monitoring Plans - terrestrial, marine and for the compensation site. These plans

need to be worked-up to a sufficient level of detail to give a sufficient degree of confidence as to the adequacy and efficacy of the proposed measures, and be secured by requirements on the DCO, before consent is granted. Natural England is still working on these plans and will be able to send them through to the Applicant in the next few weeks.

#### **Old Little Humber Farm (paragraph 3.1.2)**

- 8.70. The Applicant has stated it will create an area of wet grassland at Old Little Humber Farm to provide feeding habitat for SPA/Ramsar waterbirds whilst the managed realignment site develops benthic invertebrates; it is therefore important that this habitat is created in advance. Flightlines between Old Little Humber Farm and the Humber Estuary should be secured and it is understood that the Applicant are progressing this. We understand that the Applicant will provide further information on the secured flightlines and on the detailed design of Old Little Humber Farm, but we are yet to receive it. This issue is in addition to the concerns raised above.

#### **Marine piling (paragraph 3.1.3)**

- 8.71. Lamprey are a designated feature of the Humber Estuary SAC and Ramsar site. The evidence regarding the potential impacts of underwater piling noise on lamprey is unclear, as a result of which it is not possible to be certain that they will not be adversely affected by the marine construction works. Natural England, the Environment Agency and the Marine Management Organisation have provided details of requirements to the Applicant on 19 June 2012 and are awaiting a response.

#### **Bats (paragraph 3.5)**

- 8.72. Sufficient survey work has not been undertaken to determine whether bats utilise the development site. If further survey work shows that foraging/commuting routes of bats would be affected by the project, mitigation for the resultant impact should be included in the terrestrial Ecological Management and Monitoring Plan. Natural England has now agreed the survey work that has been undertaken, but it is waiting for the supplementary Landscape Plans in order to assess the adequacy of the proposed mitigation.

#### **Water voles (paragraph 3.6)**

- 8.73. More detailed mitigation proposals are required to ensure that this species is adequately protected. For example, details of new habitat to be created including ditch profiles, planting plans and proposed habitat maintenance works. Natural England is waiting for the supplementary Landscape Plans in order to assess the adequacy of the proposed mitigation.

#### **Badgers (paragraph 3.7)**

- 8.74. No mitigation is proposed for the loss of foraging habitat utilised by badgers on the south bank despite this being recommended in the badger survey report. Natural England received additional information regarding Burkinshaws Covert on 27 June 2012; however we have not had time to review it.

#### **Issues that should be dealt with under the DCO requirements**

#### **Operational buffer (paragraph 4.1)**

- 8.75. An operational buffer is proposed along one side of the mitigation area (Area A). Further information on exactly what will be permitted in this area should be provided by the Applicant and included in the DCO requirements to ensure that construction and operational noise and visual disturbance do not affect the success of the mitigation area. We understand that the Applicant will provide an explanatory note covering the operational buffer, but we are yet to receive it.

### **Grey seals (paragraph 4.3)**

- 8.76. Grey seals are a designated feature of the Humber Estuary SAC and Ramsar site. The Applicant has agreed to a soft-start technique to mitigate the impact of underwater piling noise. This is a necessary limitation and should be included in the DCO requirements so as to secure its implementation. Natural England, the Environment Agency and the Marine Management Organisation have provided details of requirements to the Applicant on 19 June 2012 and are awaiting a response.

### **Matters not raised in Natural England's Relevant Representations**

- 8.77. In addition to the issues identified above, the Examining Authority has asked a number of questions relating to issues that have not been raised, or specifically raised, by Natural England. These are addressed below.

### **Impacts from air pollution on the EU sites**

- 8.78. Natural England has considered the impact of air pollution from traffic on the EU sites. However, all of the specific points raised by Natural England have either been addressed by the Applicant or, as in the case of foundry emissions, are no longer relevant. It is fair to say that the graphical presentation of the air pollution impacts in the Environmental Statement lacks clarity: in particular, the site boundary and the locations of designated sites are not marked in the relevant figure or shown elsewhere in the air quality chapter. However, despite this lack of clarity, Natural England has no concerns in relation to air quality impacts of the proposal on nearby designated sites.

### **Impacts on sea and river lamprey**

- 8.79. As noted above, both sea and river lamprey are protected features of the SAC. Natural England has been working closely with the Environment Agency and the Marine Management Organisation to draw up proposed conditions that will safeguard relevant marine receptors, including grey seal, salmon and sea and river lamprey. The Environment Agency provided a response to the Applicant on 19 June 2012 on behalf of all three agencies (see letter at Annex F).
- 8.80. The favourable condition table for the Humber Estuary SSSI states that “[e]levated levels of suspended solids can clog the respiratory structures of fish. The target of 25mg L-1 is based on the EC Freshwater Fish Directive”. This is therefore a generic target. Natural England is aware that the Humber Estuary has high suspended sediment loads, stated as 5-14g L-1 in chapter 9 of the Applicant's Environmental Statement. It is therefore acknowledged that this condition objective should be amended to take account of site specific conditions.
- 8.81. Accordingly, it is Natural England's advice that if appropriate mitigation measures are put in place, the proposal will not be detrimental to achieving favourable conservation

status of lamprey and there will be no requirement for compensatory measures.

### **North Killingholme Haven Pits**

- 8.82. Natural England has advised that there has not been proper consideration of construction and operational disturbance arising from the project on designated site birds utilising the remaining SSSI, SPA and Ramsar intertidal habitat and North Killingholme Haven Pits. We understand the Applicant will provide an explanatory note on construction and operational disturbance, but we are yet to receive it. Once we have received this information we will be able to advise whether any mitigation is required.

## 9. Natural England's comments on the draft DCO

- 9.1 Natural England has already commented in appendices 3 and 4 of its Relevant Representations on those issues which it advises should be dealt with under the DCO requirements, together with its initial comments on the draft DCO. These have yet to be agreed between Applicant and Natural England. Natural England reiterates those comments again in these written representations. These are as follows:

### Appendix 3: Issues that should be dealt with under the DCO requirements

#### Habitats Regulations

- **Operational buffer:** An operational buffer is proposed along one side of the mitigation area (Area A). Further information on exactly what will be permitted in this area should be provided by the Applicant and included in the DCO requirements to ensure that construction and operational noise and visual disturbance do not affect the success of the mitigation area.
- **Lighting:** Artificial lighting can affect birds' usage of the SPA and Ramsar site and Natural England advises that maximum light levels and measures to avoid light overspill should be included in the DCO requirements in order to avoid such impacts.
- **Grey seals:** Grey seals are a designated feature of the Humber Estuary SAC and Ramsar site. The Applicant has agreed to a soft-start technique to mitigate the impact of underwater piling noise. This is a necessary limitation and should be included in the DCO requirements so as to secure its implementation.
- **Footpath diversion:** Natural England welcomes the Applicant's proposed footpath diversion to the landward toe of the new flood defences as this will minimise disturbance to SPA/ Ramsar waterbirds which are anticipated will utilise the managed realignment site. The proposed footpath diversion should be secured in the DCO requirements.

#### North Killingholme Haven Pits SSSI

- The land adjacent to North Killingholme Haven Pits is already developed and the relevant planning permission includes safeguards for the designated site, such as a 200m buffer. Natural England welcomes the suggestion by the Applicant to include a requirement in the DCO to retain these safeguards.

### Appendix 4: Initial comments on the draft DCO

#### Schedule 11 Requirements

#### Ecological mitigation

- This section should refer to the Ecological Management and Monitoring Plan (plans for the terrestrial development site, the compensation site, and the marine environment). These plans should be approved by the Local Planning Authority or the Marine Management Organisation (as appropriate) in consultation with Natural England.

### **European Protected Species**

- This provision currently only applies to bats and great crested newts for this development (on the south bank site based on existing survey results). Natural England advise that this requirement should closely follow the wording of the Model Provision, so that 'no development at all' should be begun if European Protected Species are present until a scheme of protection and mitigation measures has been submitted and approved by Natural England.

### **Nationally Protected Species**

- Mitigation plans should be included in the Ecological Management and Monitoring Plans. This should include mitigation for badgers, water voles and breeding birds. European Protected Species are specifically referred to in the DCO. As the Ecological Management and Monitoring Plans should include badgers, water voles and breeding birds, nationally protected species should also be referred to in the DCO.
- Natural England notes that there is no reference in the Development Consent Order to the creation of the compensatory habitat site at Cherry Cobb Sands. Natural England would expect to see proper reference to compensation within the DCO and as an **additional requirement** so it is clear how the necessary measures to provide the compensation would be secured together with a requirement to complete the compensatory measures by a particular point.

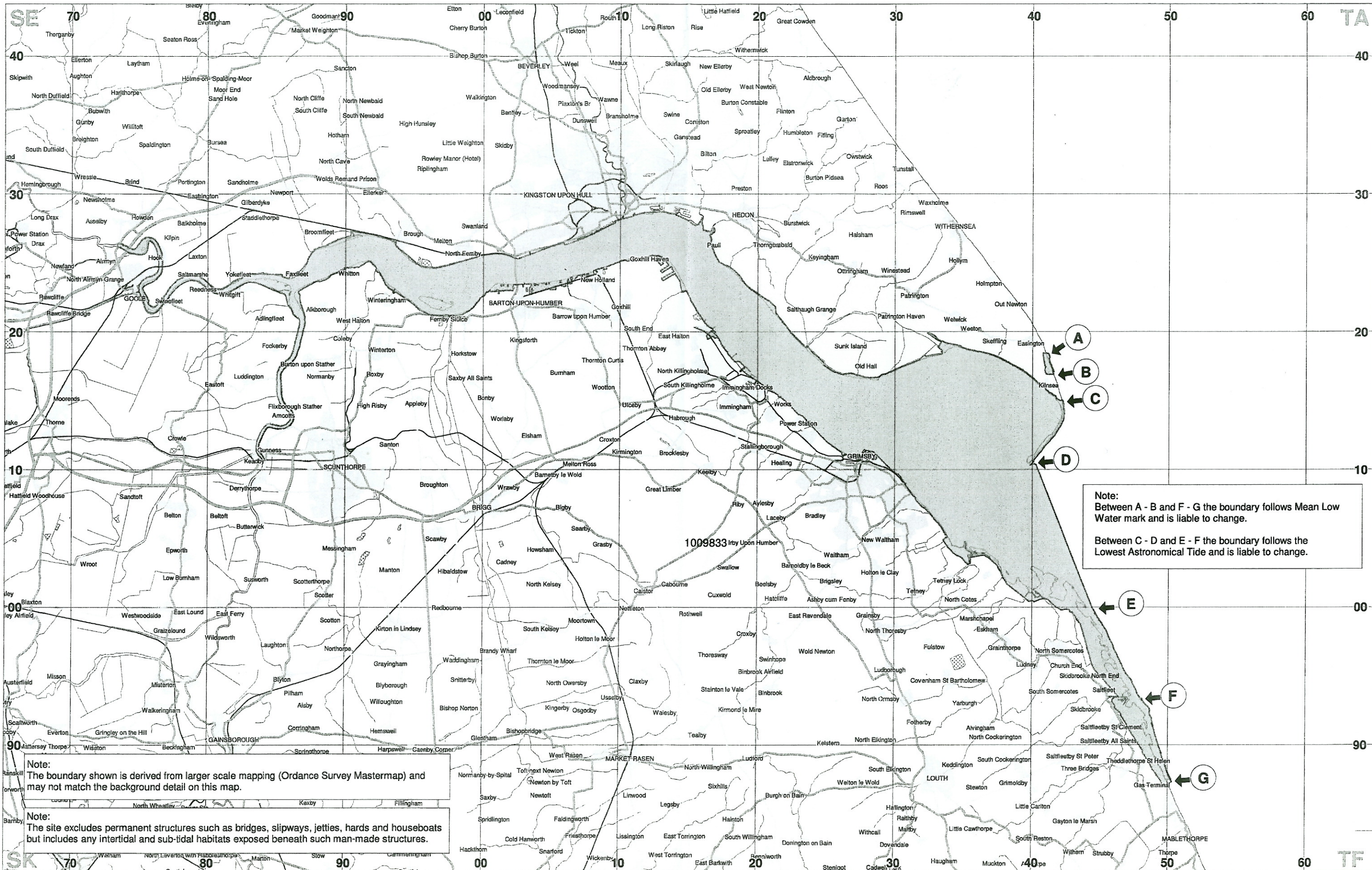
## **10. Resolution of remaining issues**

- 10.1. A Statement of Common Ground between Natural England and the Applicant on issues covered in the Environmental Statement is timetabled to be submitted on 27 July 2012. The deadline for receipt by the Examining Authority of the Statement of Common Ground on Habitats Regulations Assessment issues is 24 August 2012.
- 10.2. Natural England intends to continue discussions with the Applicant to seek to resolve matters as far as possible through the Statements of Common Ground.
- 10.3. Failing satisfactory agreement with the Applicant, Natural England will advise the Examining Authority on those issues which will require their consideration as part of the Examination Process.

Natural England

June 2012





Note:  
Between A - B and F - G the boundary follows Mean Low Water mark and is liable to change.  
Between C - D and E - F the boundary follows the Lowest Astronomical Tide and is liable to change.

Note:  
The boundary shown is derived from larger scale mapping (Ordnance Survey Mastermap) and may not match the background detail on this map.

Note:  
The site excludes permanent structures such as bridges, slipways, jetties, hards and houseboats but includes any intertidal and sub-tidal habitats exposed beneath such man-made structures.

**Ramsar Site**  
**Humber Estuary**  
CITY OF KINGSTON UPON HULL, EAST RIDING OF YORKSHIRE,  
LINCOLNSHIRE, NORTH EAST LINCOLNSHIRE, NORTH LINCOLNSHIRE

 Ramsar Site  
37987.80 Hectares

Ramsar Site Code:  
UK11031  
Version Number:  
2  
Longitude:  
00 03 25 E  
Latitude:  
53 32 59 N  
Projection:  
British National Grid  
Area of Ramsar:  
37987.80 Hectares

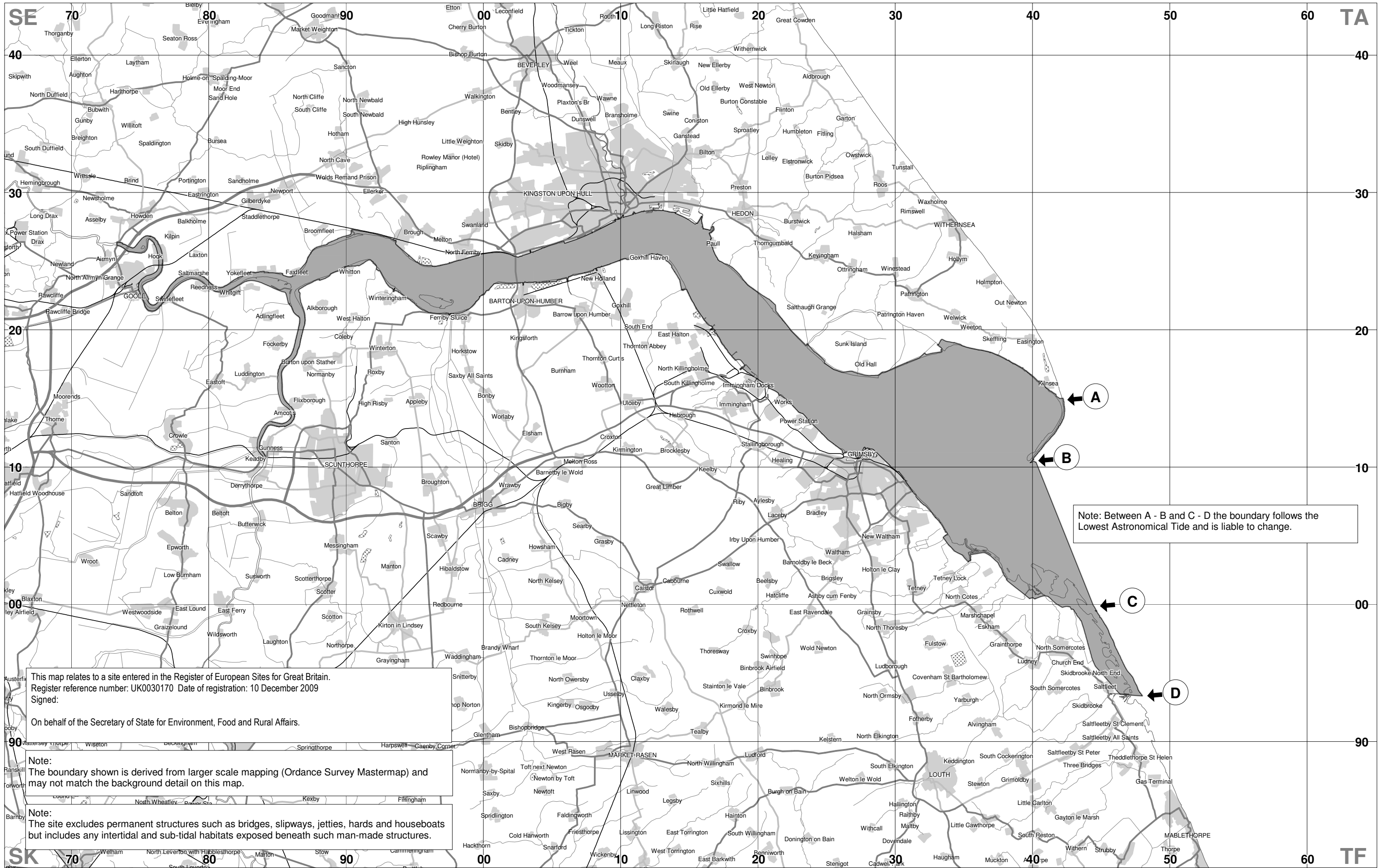
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Version:  
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10/06/2007  
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233

Scale 1:250000 at A3  
Map 1 of 1

Wetland of International Importance, Ramsar Convention  
Designated by the Secretary of State for Environment,  
Food and Rural Affairs. Date: 31 August 2007  
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This map relates to a site entered in the Register of European Sites for Great Britain.  
 Register reference number: UK0030170 Date of registration: 10 December 2009  
 Signed:

On behalf of the Secretary of State for Environment, Food and Rural Affairs.

**Note:**  
 The boundary shown is derived from larger scale mapping (Ordnance Survey Mastermap) and may not match the background detail on this map.

**Note:**  
 The site excludes permanent structures such as bridges, slipways, jetties, hards and houseboats but includes any intertidal and sub-tidal habitats exposed beneath such man-made structures.

**Special Area of Conservation**  
**Humber Estuary**  
 CITY OF KINGSTON UPON HULL, EAST RIDING OF YORKSHIRE,  
 LINCOLNSHIRE, NORTH EAST LINCOLNSHIRE, NORTH LINCOLNSHIRE

Special Area of Conservation  
 36657.15 Hectares

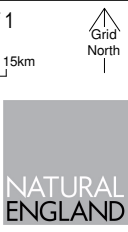
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 Area of SAC: 36657.15 Hectares

Scale 1:250000 at A3  
 Map 1 of 1

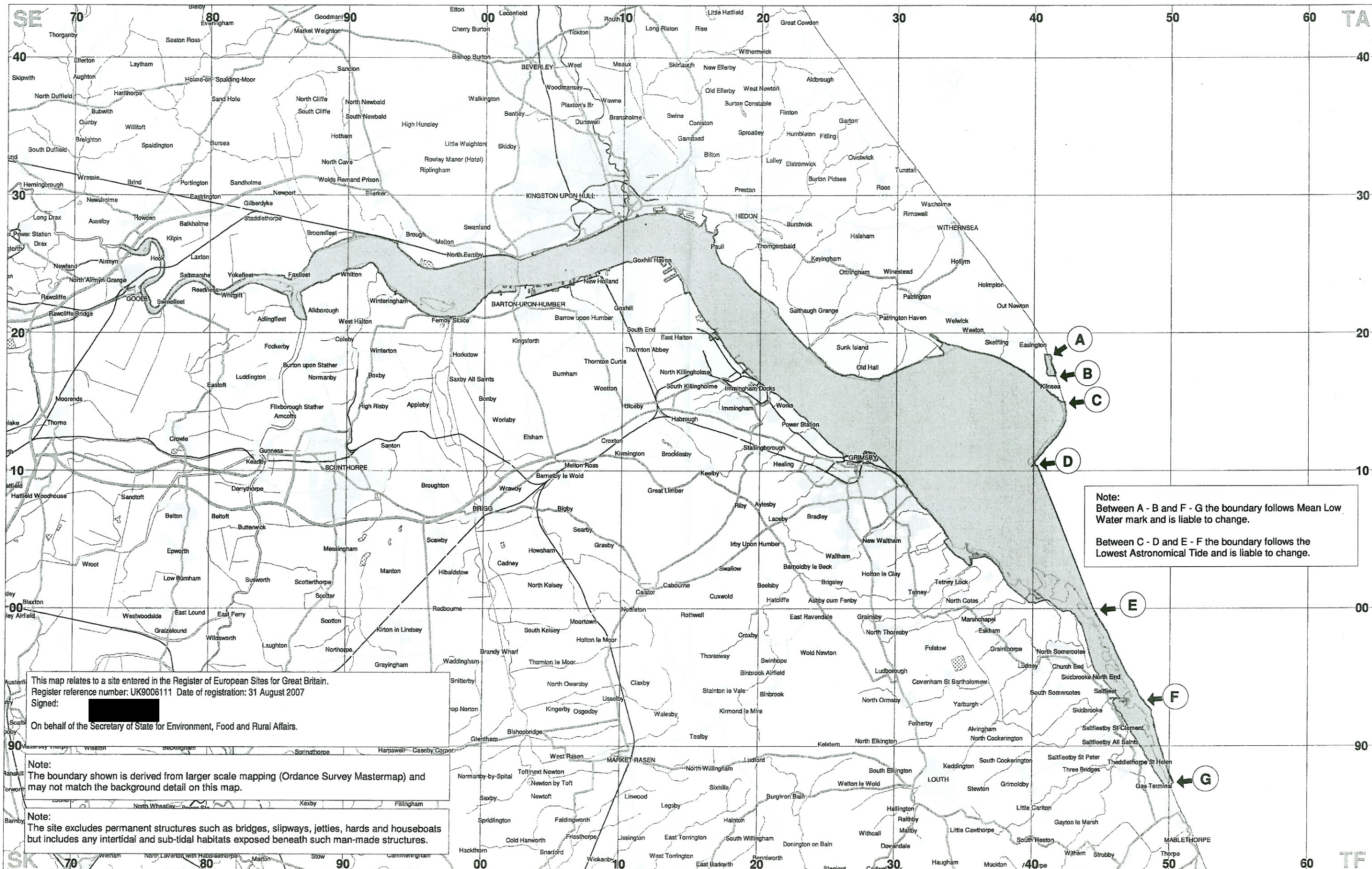
0 5 10 15km  
 0 5 10 12500yd.

Special Area of Conservation Directive 92/43/EEC  
 Designated by the Secretary of State for Environment,  
 Food and Rural Affairs. Date: 10 December 2009

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This map relates to a site entered in the Register of European Sites for Great Britain.  
 Register reference number: UK9006111 Date of registration: 31 August 2007  
 Signed: [Redacted]  
 On behalf of the Secretary of State for Environment, Food and Rural Affairs.

Note:  
 The boundary shown is derived from larger scale mapping (Ordnance Survey Mastermap) and may not match the background detail on this map.

Note:  
 The site excludes permanent structures such as bridges, slipways, jetties, hards and houseboats but includes any intertidal and sub-tidal habitats exposed beneath such man-made structures.

Note:  
 Between A - B and F - G the boundary follows Mean Low Water mark and is liable to change.  
 Between C - D and E - F the boundary follows the Lowest Astronomical Tide and is liable to change.

**Special Protection Area**  
**Humber Estuary**  
 CITY OF KINGSTON UPON HULL, EAST RIDING OF YORKSHIRE,  
 LINCOLNSHIRE, NORTH EAST LINCOLNSHIRE, NORTH LINCOLNSHIRE

Special Protection Area  
 37630.24 Hectares

EU Site Code: UK9006111  
 Theme ID: 1009833  
 Version Number: 2  
 Grid Ref: TA363178  
 Longitude: 0:03:25E  
 Latitude: 53:32:59N  
 Projection: British National Grid  
 Area of SPA: 37630.24 Hectares

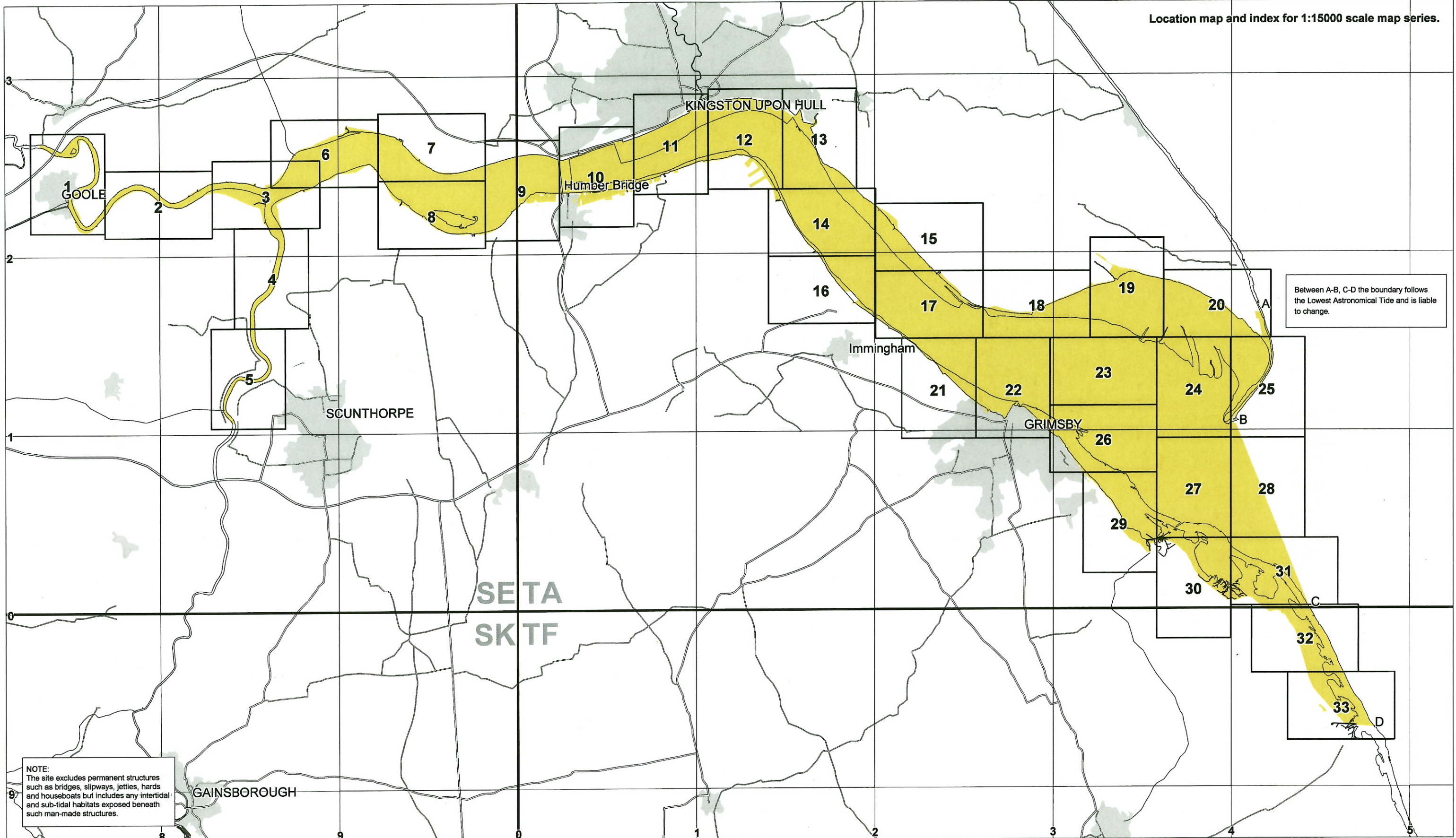
Scale 1:250000 at A3  
 Map 1 of 1  
 Grid North

0 5 10 15km  
 0 5 10 12500yd.

Special Protection Area Directive 79/409/EEC  
 Classified by the Secretary of State for Environment,  
 Food and Rural Affairs. Date: 31 August 2007  
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**NATURAL ENGLAND**





Between A-B, C-D the boundary follows the Lowest Astronomical Tide and is liable to change.

NOTE:  
The site excludes permanent structures such as bridges, slipways, jetties, hards and houseboats but includes any intertidal and sub-tidal habitats exposed beneath such man-made structures.

Site of Special Scientific Interest  
**Humber Estuary**

Site of Special Scientific Interest  
37000.59 Hectares  
Date Notified: 3 Feb 2004

City of Kingston upon Hull, East Riding of Yorkshire,  
North Lincolnshire, Lincolnshire, North East Lincolnshire

Scale 1:200000  
Map 1 of 1  
0 4 8 12km  
0 10000 20000 30000ft.  
Grid North

Theme ID: 1009830  
Grid Ref: TA134270  
Version: 20040903  
Plotted: 01/10/2004  
Ref: 1009830  
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Nature Conservancy Council for England

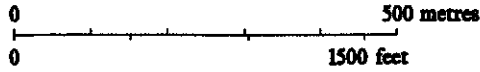
Site of Special Scientific Interest

# North Killingholme Haven Pits Humberside

Site boundary (centre of line): ——— Hectares: 20.61

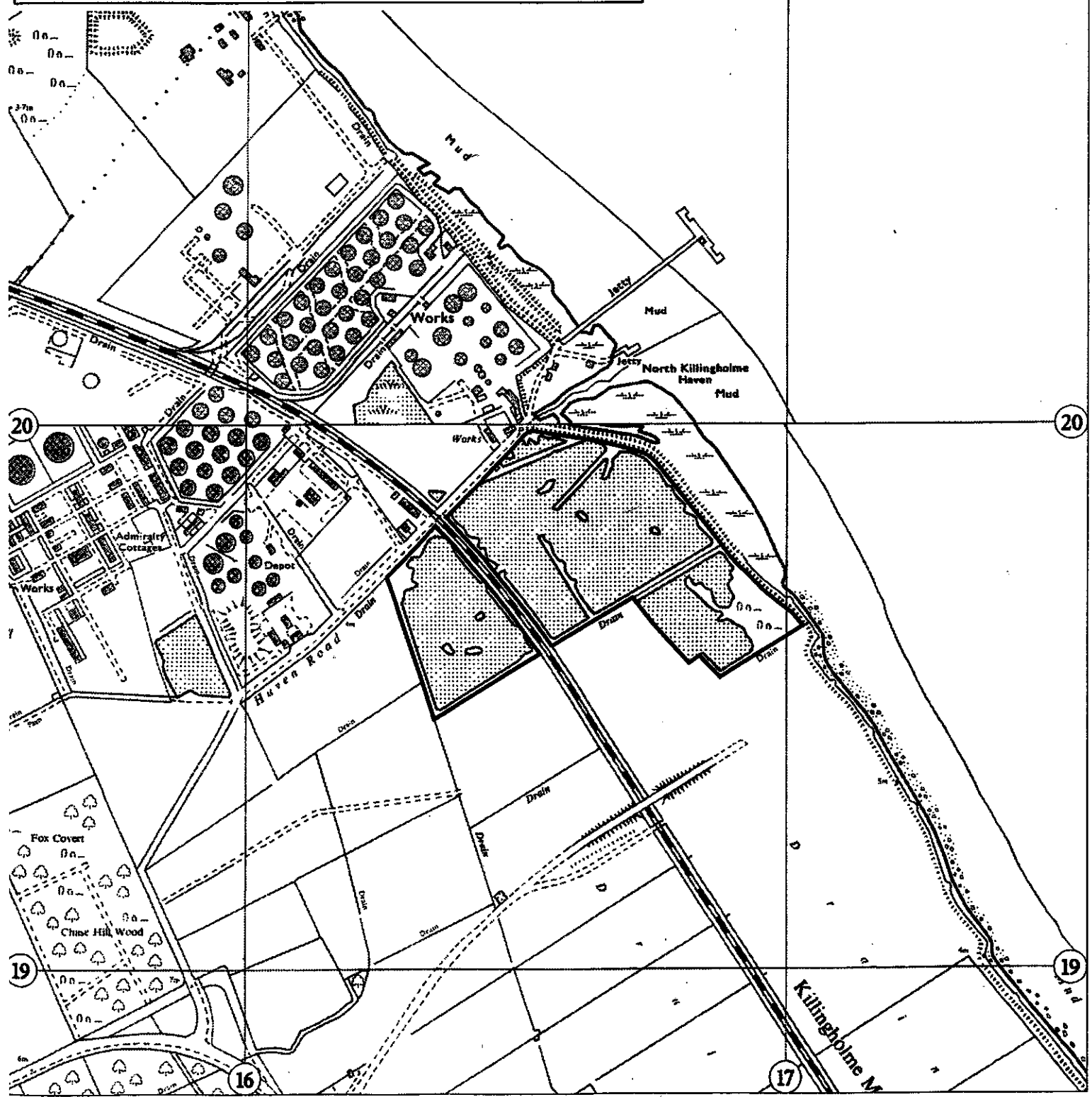
Date notified: 15/1/96 *Confirmed - 24/6/96*

Scale 1:10000



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Prepared by Geographic Information Unit, English Nature 26 Oct 1995 © English Nature 1995



# Conservation objectives and definitions of favourable condition for designated features of interest



These Conservation Objectives relate to all designated features on the SSSI, whether designated as SSSI, SPA, SAC or Ramsar features.

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Name of Site of Special Scientific Interest (SSSI)	
Humber Estuary	
Names of designated international sites	
Special Area for Conservation (SAC)	Humber Estuary
Special Protection Area (SPA)	Humber Estuary
Ramsar	Humber Estuary
Relationship between site designations	
The Humber Estuary SSSI is a component SSSI of the wider SPA/Ramsar designation of the Humber Estuary. The other component SSSI's of the Humber Estuary SPA/Ramsar site are North Killingholm Haven Pits SSSI, The Lagoons SSSI and Saltfleetby-Theddlethorpe Dunes SSSI.	

Version control information		
Status of this Version (Draft, Consultation Draft, Final)	Draft	
Prepared by	Fiona Berry, Sophie Bourel, Joanna Redhead, Emma Hawthorne, Tim Page	
Date of this version	December 2009	
Date of generic guidance on favourable condition used	CSM guidance for: birds (2004); reptiles and amphibians (2004); vascular plants (2004); sand dunes (2004); saltmarsh (2004); standing waters (2005); inshore sublittoral sediments (2004); littoral sediments (2004); estuaries (2004); lagoons (2004); marine mammals (2005); CSM provisional guidance for invertebrates (2008); CSM for earth science sites (2004); Conservation objectives and monitoring Geological guidance (2006).	
Other notes/version history		
Quality assurance information		
Checked by	Name	Date
	Signature	



## **Conservation Objectives and definitions of Favourable Condition: notes for users**

### **Conservation Objectives**

SSSIs are notified because of specific biological or geological features. Conservation Objectives define the desired state for each site in terms of the features for which they have been designated. When these features are being managed in a way which maintains their nature conservation value, then they are said to be in 'favourable condition'. It is a Government target that 95% of the total area of SSSIs should be in favourable condition by 2010.

### **Definitions of Favourable Condition**

The Conservation Objectives are accompanied by one or more habitat extent and quality definitions for the special interest features at this site. These are subject to periodic reassessment and may be updated to reflect new information or knowledge; they will be used by Natural England and other relevant authorities to determine if a site is in favourable condition. The standards for favourable condition have been developed and are applied throughout the UK.

### **Use under the Habitats Regulations**

The Conservation Objectives and definitions of favourable condition for features on the SSSI may inform the scope and nature of any 'appropriate assessment' under the Habitats Regulations. An appropriate assessment will also require consideration of issues specific to the individual plan or project. The habitat quality definitions do not by themselves provide a comprehensive basis on which to assess plans and projects as required under Regulations 20-21, 24, 48-50 and 54 - 85. The scope and content of an appropriate assessment will depend upon the location, size and significance of the proposed project. Natural England will advise on a case by case basis.

Following an appropriate assessment, competent authorities are required to ascertain the effect on the integrity of the site. The integrity of the site is defined in paragraph 20 of ODPM Circular 06/2005 (DEFRA Circular 01/2005) as the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified. The determination of favourable condition is separate from the judgement of effect upon integrity. For example, there may be a time-lag between a plan or project being initiated and a consequent adverse effect upon integrity becoming manifest in the condition assessment. In such cases, a plan or project may have an adverse effect upon integrity even though the site remains in favourable condition.

The formal Conservation Objectives for European Sites under the Habitats Regulations are in accordance with paragraph 17 of ODPM Circular 06/2005 (DEFRA Circular 01/2005), the reasons for which the European Site was classified or designated. The entry on the Register of European Sites gives the reasons for which a European Site was classified or designated.

### **Explanatory text for Tables 2 and 3**

Tables 2, 2a and 3 set out the measures of condition which we will use to provide evidence to support our assessment of whether features are in favourable condition. They are derived from a set of generic guidance on favourable condition prepared by Natural England specialists, and have been tailored by local staff to reflect the particular characteristics and site-specific circumstances of individual sites. Quality Assurance has ensured that such site-specific tailoring remains within a nationally consistent set of standards. The tables include an audit trail to provide a summary of the reasoning behind any site-specific targets etc. In some cases the requirements of features or designations may conflict; the detailed basis for any reconciliation of conflicts on this site may be recorded elsewhere.



## Conservation Objectives

The Conservation Objectives for this site are, subject to natural change, to maintain the following habitats and geological features in favourable condition (\*), with particular reference to any dependent component special interest features (habitats, vegetation types, species, species assemblages etc.) for which the land is designated (SSSI, SAC, SPA, Ramsar) as individually listed in Table 1.

### **Habitat Types represented (Biodiversity Action Plan categories)**

- Estuary
- Inshore sublittoral sediment
- Littoral rock
- Inshore littoral rock
- Littoral sediment (mudflat, sandflat and saltmarsh)
- Saline Lagoons
- Sand dunes
- Standing open water and canals

### **Geological features (Geological Site Types)**

- EC – Coastal Cliffs and foreshore
- IA - Active processes geomorphology

### **Species features**

- Breeding bird assemblage
- Passage and wintering waterfowl species
- Grey seal
- River lamprey
- Sea lamprey
- Vascular plants assemblages
- Invertebrate assemblages

(\*) or restored to favourable condition if features are judged to be unfavourable.

Standards for favourable condition are defined with particular reference to the specific designated features listed in Table 1, and are based on a selected set of attributes for features which most economically define favourable condition as set out in Table 2, Table 2a and Table 3:

**Table 1 Individual designated interest feature**

BAP Broad Habitat type / Geological Site Type	Specific designated features	Explanatory description of the feature for clarification	SSSI designated interest features	SAC designated interest features	SPA bird populations dependency on specific habitats			Ramsar criteria applicable to specific habitats			
					Annex 1 species	Migratory species	Waterfowl assemblage	1a Wetland characteristics	2a Hosting rare species &c	3a 20000 waterfowl	3c 1% of population
Estuary	Estuary	<p>The Humber Estuary is the largest macro tidal coastal plain estuary on the east coast of Britain.</p> <p>The estuary has a high suspended sediment load, which feeds a dynamic and rapidly changing system of accreting and eroding intertidal and subtidal habitats, including saltmarsh, intertidal mudflats and sandflats and subtidal sediment communities.</p> <p>The estuarine system supports a high ornithological interest including nationally important numbers of 22 species of wintering wildfowl, nine species of passage birds and a nationally important breeding bird assemblage.</p> <p>There are records of over 80 species of fish in the estuary, including both sea and river lamprey. A grey seal colony can be found on the south bank at Donna Nook.</p> <p><u>Estuary sub-features are;</u></p> <ul style="list-style-type: none"> <li>- Saltmarsh communities</li> <li>- Intertidal mudflats and sandflats communities</li> <li>- Subtidal sediment communities</li> </ul> <p>Source: Reg 33 Interim Advice (2003)</p>	*	*	(*)	(*)	(*)	*	(*)	(*)	(*)
Littoral sediment	Coastal saltmarsh	The composition of the Humber's saltmarshes is unusual compared to other UK estuaries. Over 50% of	*	*	(*)	(*)	(*)		(*)	(*)	(*)

	<p>communities</p> <p>This feature includes all saltmarshes and their associated transition habitats.</p> <p>The SAC features of Atlantic salt meadows and <i>Salicornia</i> and other annuals colonising mud and sand have been incorporated.</p>	<p>the marsh is dominated by common reed (<i>Phragmites australis</i>) and sea clubrush (<i>Scirpus maritimus</i>), especially in the inner estuary. Typical pioneer marsh and low, mid and upper marsh communities are relatively scarce.</p> <p><i>Salicornia</i> and other colonising annuals (pioneer saltmarsh) are primarily found in the outer estuary. <u>Salicornia sub-features:</u> <i>Annual Salicornia community;</i> SM8 is the most extensive NVC community and can form a mosaic with SM13 and SM6. <i>Suaeda maritima saltmarsh community;</i> NVC community, SM9. Relatively uncommon.</p> <p>The Atlantic salt meadows of the Humber are predominantly ungrazed and support a range of communities dominated by sea purslane with frequent sea aster and sea lavender. <u>Atlantic salt meadows sub-features:</u> <i>Low-mid marsh communities</i> NVC communities; SM10 – SM14 <i>Mid-upper marsh communities</i> NVC communities; SM 15 – SM16 <i>Transitional communities</i> NVC communities; SM24, SM28, MG11<sup>++</sup>, S4, S21, S26,</p> <p>S4, S21 and S26 “swamp” community types are incorporated within the saltmarsh feature, rather than being a separate feature. Tidal reedbeds form an intrinsic part of the back-marsh area of the saltmarsh and are an important transition into freshwater reedbed habitats and supports breeding bittern, marsh harrier, bearded tit, wintering bird populations, invertebrates, fish and small mammals.</p> <p>Source: Reg 33 Interim Advice (2003)</p>									
Littoral sediment	Mudflats and sandflats not covered by seawater at low	The Humber’s intertidal flats represent 4.5% of the total British resource. The habitats range from gravels and sands to muddy sands and mud which reflects the varying degrees of exposure to waves, currents and	*	*	(*)	(*)	(*)		(*)	(*)	(*)

	<p>tide.</p> <p>Wave exposed sandy shores; Moderately exposed sandy shores; sheltered muddy shores</p>	<p>inflowing rivers.</p> <p><u>Intertidal flats sub-features</u> <i>Intertidal gravel and sand communities</i> Feature of the outer estuary, supporting high numbers of polychaete worms. <i>Intertidal muddy can communities;</i> In more sheltered parts of the estuary, particularly Cleethorpes to Donna Nook. <i>Intertidal mud communities;</i> Form in the most sheltered areas, usually where silt derived from rivers is deposited <i>Eelgrass bed communities;</i> Nationally rare, important habitat for fish. Declined around the Humber, still present at Spurn Bight and Grimsby area</p> <p>Source: Reg 33 Interim Advice (2003)</p>									
Inshore sublittoral sediment	<p>Sandbanks which are slightly covered by sea water all the time</p>	<p>The sub-tidal environment of the Humber is highly dynamic and varies according to the composition of bottom sediments, salinity, sediment load, turbidity, dissolved oxygen and anthropogenic factors such as water quality and dredging.</p> <p><u>Sub-tidal sandbanks sub-features:</u> <i>Sub-tidal gravel and sands;</i> Patchily distributed throughout estuary <i>Sub-tidal muddy sands;</i> Predominantly in the middle and outer estuary</p> <p>Source: Reg 33 Interim Advice (2003)</p>	*	*							
Saline Lagoons	<p>Coastal lagoons</p>	<p>The Humber region is particularly important for lagoons that have developed where there were formerly saltmarshes behind dune-capped barrier islands.</p> <p>Good example of four of the five physiographic types of saline lagoon: Isolated (Humberstone Fitties) Percolation (Northcoates) Silled (Northcoates) Sluiced low salinity (Blacktoft Sands)</p>	*	*	(*)	(*)	(*)		(*)	(*)	(*)

Sand dunes		Sand dunes are found on the outer estuary, on both banks, particularly at Spurn and south of Cleethorpes. The estuary supports a diverse range of dune habitats, including foredune, mobile, semi-fixed, fixed and dune grassland (NVC communities SD2, SD4-10; SD15a, SD17-18).	*						(*)		
	Fixed dunes with herbaceous vegetation (grey dunes)	Species rich dune grassland with vegetation dependant on grazing, dune stability and the amount of lime in the sand. Key sites – Spurn Peninsula, North Lincolnshire coast NVC communities; SD7 – SD8		*							
	Dunes with <i>Hippophae rhamnoides</i>	Native sea buckthorn scrub occurs on both sides of the estuary. The estuary is considered to support a significant presence as the total extent in the UK is considered < 1000Ha. Key sites – Cleethorpes, Spurn Peninsula NVC community; SD18		*							
	Embryonic shifting dunes	Low dunes that develop along the upper shore above the high tide line. The estuary is considered to support a significant presence as the total extent in the UK is considered < 1000Ha. Key sites, Spurn Peninsula, Easington Lagoons, North Somercotes NVC community; SD4		*							
	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)	Actively building or growing dunes with sand binding marram, found in areas receiving large quantities of blown sand. Key sites, Spurn Peninsula NVC community; SD5 – SD6		*							
Standing open water and canals	Complex of open water habitats with transitions from freshwater to brackish. The most extensive area is at Barton and Barrow (others at Faxfleet and Haverfield Pits). The complex of disused clay pits vary in size and salinity, and are a mosaic of open waters, reeds, grassland and scrub. The pits support important breeding birds and provide roosting and feeding areas for waterfowl. Two pools support specialist lagoonal species: the	*		(*)	(*)	(*)		(*)	(*)	(*)	

		tentacle lagoon worm <i>Alkmaria romijni</i> and the isopod <i>Lekanesphaera hookeri</i> .  Barton Blow Wells support byrozoan UK BAP species <i>Lophopus crystallinus</i> (recorded from only 4 UK sites in last 30 yrs)									
Mammals	<i>Halichoerus grypus</i> (Grey seal)	Donna Nook is 2 <sup>nd</sup> largest grey seal breeding colony in England with a high rate of pup production compared to other UK sites. Approximately 1.5% UK population, 18% English population, is found at Donna Nook (data from 2001).  Source: Humber Estuary SSSI – Supporting information – issued by English Nature’s Humber to Pennines Team on 3 February 2004	*	*					*		
Fish	River Lamprey <i>Lampetra fluviatilis</i>	The Humber Estuary is the migration route for river lamprey between freshwater catchments to coastal waters and vice versa. The estuary provides the only route to and from the River Derwent, which is recognised at a European and national level as an important spawning river.	*	*					*		
Fish	Sea Lamprey <i>Petromyzon marinus</i>	The Humber Estuary is the migration route for sea lamprey between freshwater catchments to coastal waters and vice versa. The estuary provides the only route to and from the River Derwent, which is recognised at a European and national level as an important spawning river.	*	*					*		
Birds	Aggregations of non-breeding birds: Wintering and passage waterfowl species	Nationally important numbers of 22 wintering waterfowl: Bittern, shelduck*, wigeon, teal, pochard, scaup, goldeneye, avocet, ringed plover, golden plover*, grey plover, lapwing*, dunlin*, black-tail godwit*, curlew, dark-bellied brent goose, oystercatcher, knot*, bar-tailed godwit*, redshank*, turnstone, sanderling  Nationally important numbers of nine passage waders: ringed plover, grey plover, dunlin*, sanderling, ruff, black-tail godwit*, whimbrel, redshank*, greenshank  * indicates internationally important numbers of these spp.	*				*				

Birds	Breeding bird assemblage of lowland open waters and their margins	Nationally important numbers of bittern, marsh harrier, avocet, bearded tit.  The assemblage also includes little grebe, great crested grebe, mute swan, shelduck, gadwall, shoveler, pochard, tufted duck, water rail, little ringed plover, snipe, redshank, common tern, cuckoo, kingfisher, yellow wagtail, grasshopper warbler, sedge warbler, reed warbler, reed bunting (24 spp. in total)  Site index value for breeding birds = 69.5  Source: Humber Estuary SSSI – Supporting information – issued by English Nature’s Humber to Pennines Team on 3 February 2004	*								
Birds	Annex 1 wintering and passage birds	The Humber Estuary qualifies under article 4.1 of the Bird Directive as it is used by >1% of GB populations of: avocet, bittern, hen harrier, golden plover, bar-tailed godwit, ruff			*						
Birds	Annex 1 breeding birds	The Humber Estuary qualifies under article 4.1 of the Bird Directive as it is used by >1% of GB populations of: bittern, marsh harrier, avocet, and little tern.			*						
Birds	Aggregations of migratory species	The Humber Estuary qualifies under article 4.2 of the Bird Directive as it is used by 1% or more of the biogeographical populations of the following regularly occurring migratory species in any season: Shelduck, knot, dunlin, black-tailed godwit, redshank				*					
Birds	Assemblage of waterfowl	The Humber Estuary qualifies under article 4.2 of the Bird Directive, and Ramsar criterion 5 as it is regularly used by over 20,000 waterbirds. In the non-breeding season, the area regularly supports over 150,000 individual waterbirds, including : Dark-bellied brent goose, shelduck, wigeon, teal, mallard, pochard, scaup, goldeneye, oystercatcher, avocet, ringed plover, golden plover, grey plover, lapwing, knot, sanderling, dunlin, ruff, black-tailed godwit, bar-tailed godwit, whimbrel, curlew, redshank, greenshank, and turnstone.  Source: Ramsar designation citation, July 2007					*			*	
Birds	Wintering and	The Humber Estuary qualifies under Ramsar criterion									*

	passage waterbirds	6 because it regularly supports 1% of the individuals in the populations of the following species, or subspecies, of waterbird in any season: Shelduck, golden plover, knot, dunlin, black-tailed godwit, bar-tailed godwit, redshank								
Plants	Vascular plants assemblage  Nationally important. Assemblage score = 500.	The Humber Estuary supports ten nationally scarce species: <i>Alopecurus bulbosus</i> (Bulbous foxtail), <i>Bupleurum tenuissimum</i> (Slender hare's-ear), <i>Carex divisa</i> (Sedge), <i>Festuca arenaria</i> (Rush-leaved fescue), <i>Hippophae rhamnoides</i> (Sea buckthorn), <i>Parapholis incurve</i> (Curved hard-grass), <i>Poa bulbosa</i> (Bulbous meadow-grass), <i>Ruppia cirrhosa</i> (Spiral tasselweed), <i>Trifolium squamosum</i> (sea clover), <i>Elytrigia repens ssp arenosa</i> (Common couch sub species) Humber is of phytogeographical interest, with several scarce species of vascular plant occurring at or close to the northern or southern limits of their range on the east coast of Britain. For example saltmarsh flat-sedge <i>Blysmus rufus</i> (southern limit) and slender hare's ear <i>Bupleurum tenuissimum</i> (northern limit).	*							
Invertebrates	Invertebrate assemblages:	Invertebrates associated with estuarine and associated freshwater and terrestrial habitats are well represented.  A number of substantial and important assemblages are present, which are linked to habitats ranging from brackish and tidally inundated wetlands to reedswamp, and freshwater). They include a suite of scarce and threatened invertebrate species, see annex 2 for a list of four Red Data Book invertebrate species and thirty-seven nationally scarce invertebrate species present.  The Humber Estuary satisfies Intertidal Guideline criteria 6 and 3.2 as it contains a nationally scarce marine species, the tentacled lagoon worm, <i>Alkmaria romijni</i> , and the lagoon sand shrimp <i>Gammarus insensibilis</i> both listed in Schedule 5 of the WCA 1981.  Barton Blow Wells support the byrzoan UK BAP species <i>Lophopus crystallinus</i> (recorded from only 4 UK sites in last 30 yrs).	*					*		



Amphibian	Natterjack toad	The dune slacks at Saltfleetby-Theddlethorpe is the most north-easterly breeding site in Great Britain of the Natterjack toad, <i>Bufo calamita</i> .							*		
EC – Coastal Cliffs and foreshore	South Ferriby Cliff Quaternary of East England (South)	The geological conservation review identified South Ferriby Cliff as being of national importance its Late Pleistocene sediments. The interpretation of these sediments is key to understanding the history of the Humber Gap, the development of the glacial Lake Humber and the development of the Humber drainage system.	*								
IA – Active processes geomorphology	Spurn Head Coastal geomorphology of England	The peninsular is a dynamic spit system, very unusual if not unique in Europe in that it extends across the mouth of a macro-tidal estuary. There is a long historical map record and written accounts of Spurn dating back to the 7 <sup>th</sup> century.	*								

NB. Features where asterisks are in brackets (\*) indicate habitats which are not notified for specific habitat interest (under the relevant designation) but because they support notified species.

**Table 2a Estuary - extent objectives**

<b>Conservation Objective for habitat extent</b>	To maintain the designated features in favourable condition, which is defined in part in relation to a balance of habitat extents (extent attribute). Favourable condition is defined at this site in terms of the following site-specific standards.
<b>Extent - Dynamic balance</b>	On this site favourable condition requires the maintenance of the extent of each habitat type (either designated habitat or habitat supporting designated species). Maintenance implies restoration if evidence from condition assessment suggests a reduction in extent.

<b>Habitat Feature (BAP Broad Habitat level, or more detailed level if applicable)</b>	<b>Estimated extent (ha) and date of data source/ estimate</b>	<b>Site Specific Target range and Measures</b>	<b>Method of assessment</b>	<b>Comments</b>
Estuary	Total: 36657.15. (cSAC boundary)	No reduction in extent of estuary feature, except due to natural processes.	<p>Assessment of extent should be measured periodically against a baseline map/aerial image or through the review of any known activities that may have caused an alteration in extent.</p> <p>Possible sources of baseline data are archive remote sensing, aerial photographs and intertidal resource mapping.</p> <p>Baseline documents;</p> <p>ABP Humber Estuary Services. Humber Maintenance Dredging Baseline Document (2008)</p> <p>Humber Estuary Coastal Habitats Management Plant, CHaMP (2005)</p>	<p>Hard frontages, embankments and sea walls, constrain the upper boundary of the Humber Estuary and will prevent any landward migration of intertidal habitats.</p> <p>Physical loss may occur from the cumulative effects of ongoing activities such as maintenance dredging.</p> <p>Where changes in extent are known to occur due to cyclical natural processes, then the target value should accommodate this variability. If appropriate, a declining value may be established where sufficient information is available to predict a trend. Where changes in extent are clearly attributable to cyclical natural processes, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site, (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable. Changes in extent would be considered unfavourable if attributable to activities which interrupt natural coastal processes (e.g. hard sea defences, land reclamation).</p>

Littoral sediment: (Coastal Saltmarsh)	Total: 1643.61 ha  (source: Humber Estuary SSSI – Supporting information – Issued by English Nature’s Humber to Pennines Team on 3 February 2004)	No reduction in extent from the established baseline, subject to natural change.	Extent should be assessed using aerial photography against the baselines provided in Bullens (2001) and Dargie (2001).  NB – No NVC survey data to use as baseline for Trent SSSI extension; use aerial photos (1999 aerial photos - Environment Agency)	See CSM guidance on habitat extent, patterns of saltmarsh erosion, and effects of sea level rise (Section 4). Extent may be subject to periodic and seasonal variation, particularly pioneer saltmarsh. Extent should be measured at low tide.  Saltmarsh communities on the Humber are at a high exposure to loss of extent due to coastal squeeze – whereby intertidal habitats are trapped by artificial structures e.g. sea defences and rising sea levels. This may lead to loss of upper and mid marsh. This habitat is important for feeding, roosting, loafing and nesting designated bird features.  Smothering may also be a problem due to dumping of dredged spoil from land drainage outfalls.
Littoral sediment (mudflats and sandflats)	9382.46 Ha  Estimated using OS Landline intertidal and OS Mastermap.  To be updated following 2009/2010 mudflat report.	No reduction in extent of the littoral sediment biotope(s) identified for the site allowing for natural succession/known cyclical change.	Use combination of aerial photography and other remote sensing data to compare against baseline information.	Where there clearly established natural variation in extent or in cyclical succession between biotopes, then the target value should accommodate this variability. Where there is a change in extent outside the expected variation or a change in the structure of the biotope leading to a loss of the conservation interest of the site, then condition should be considered unfavourable.  Changes in extent would be considered unfavourable if attributable to activities which interrupt natural coastal processes e.g. hard sea defences. Mudflats in the Humber Estuary may be exposed to erosion and coastal squeeze. This habitat is important for feeding, roosting, loafing and nesting designated bird features.

<p>Inshore sublittoral sediment</p> <p>(Sandbanks which are slightly covered by sea water at all times)</p>	<p>Grimsby Middle; 206-236Ha</p> <p>Middle Shoal; 252-340Ha</p> <p>Bull Sand; 355-486Ha</p> <p>Extents were calculated in 2000, 2002, 2005, 2007.</p> <p>Source; Humber Subtidal Sandbanks (R.1489) 2008. ABPmer Ltd</p>	<p>No reduction in extent of inshore sublittoral sandbanks allowing for natural succession /known cyclical change.</p>	<p>Extent should be assessed and compared periodically against baseline figures calculated or through the review of any known activities which may have caused an alteration in extent.</p> <p>Baseline source; Humber Subtidal Sandbanks (R.1489) 2008. ABPmer Ltd. Further calculations may be required due to natural variability in extent</p> <p>Dredging activities baseline; Humber Maintenance Dredging Baseline Document. 2008. ABP Humber Estuary Services.</p>	<p>The subtidal environment of the Humber Estuary is highly dynamic and varies according to the composition of sediments, salinity, sediment load and turbidity, dissolved oxygen and anthropogenic factors which as water quality and dredging (Reg 33 interim advice, 2003). The subtidal morphology of the Humber Estuary has been identified as displaying a cyclical behaviour in the sandbank extent, with a period of approximately 14 years (ABPmer, 2008).</p> <p>If required a declining value may be established where sufficient information is available to predict a trend. Where the field assessment judges extent to be unfavourable, and subsequent investigation reveals the cause is clearly attributable to cyclical natural processes, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site, (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable. Changes in extent would be considered unfavourable, if attributable to activities which remove parts of the feature i.e. dredging.</p>
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Saline Lagoons	<p>Total: 22.77 ha</p> <p>Humberston Fitties: 1.75ha  Northcoates Point A 1.82ha  Northcoates point B 2.2ha  Blacktoft Sands 17 Ha</p> <p>(source: Humber Estuary SSSI – Supporting information – Issued by English Nature’s Humber to Pennines Team on 3 February 2004)</p>	<p>No reduction in extent of saline lagoon area.</p> <p>N.B. Northcoates Point lagoons lie outside the coastal protection works and are subject to natural coastal processes which may affect extent.</p>	<p>Extent should be assessed periodically against designation baseline extents, using aerial image or through the review of any known activities that may have caused an alteration in extent. Broadscale biotope maps at the Phase 1 scale may also be of benefit, showing distribution and extent of major habitats. For details of assessment techniques see Section 2 and Davies et al., 2001.</p>	<p>In many cases (applicable when lagoons are being managed within a wider coastal geomorphological context and are therefore expected to appear in some areas as they disappear elsewhere) where changes in extent are clearly attributable to natural processes, then the target value should accommodate this variability. A declining value may be established where sufficient information is available to predict a trend. Where the field assessment judges the extent to be unfavourable, and subsequent investigation reveals that the cause is clearly attributable to natural processes, the final assessment will require expert judgement to determine the reported condition of the feature. The feature’s condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site, (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable. Such natural changes may be attributable to infilling or coastal erosion processes and might be observed in isolated or percolation lagoons which are often transient features. For created and actively managed lagoons, natural processes leading to loss of extent may cause the site to become unfavourable and management action can be taken. In all cases, changes in extent would be considered unfavourable if attributable to the following: loss or damage to a sluice or other flow control mechanism; anthropogenic alterations to the separating barrier; infilling, land claim or other developments.</p>
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<p>Sand dunes</p> <p>(Fixed-dunes with herbaceous vegetation, "grey dunes" SD7 - SD10, CG10)</p>	<p>Total: 31.63 Ha</p> <p>source: Bullens (2001), Dargie (2001) as summarised in Humber Estuary SSSI – Supporting information – Issued by English Nature's Humber to Pennines Team on 3 February 2004</p>	<p>No reduction in extent from the established baseline, subject to natural change.</p>	<p>Comparison with the baseline should be made through maps and/or photographs, checked during the structured walk.</p>	<p>Give sources and dates of maps or photographs. If loss (or gain) of area is from natural causes this is not a decline in condition, but any significant loss due to human interference (e.g. sand extraction, visitor impacts, ploughing or conversion to improved grassland) is to be regarded as unfavourable. Increase in area is favourable unless related to coast protection or at the expense of other sand dune features.</p>
<p>Sand dunes</p> <p>(Fixed-dunes with herbaceous vegetation, "grey dunes" SD7 - SD10, CG10)</p>	<p>Total: 66.13 Ha <i>Hippophae scrub</i></p> <p>source: Bullens (2001), Dargie (2001) as summarised in Humber Estuary SSSI – Supporting information – Issued by English Nature's Humber to Pennines Team on 3 February 2004</p>	<p>No reduction in extent from the established baseline, subject to natural change.</p>	<p>Comparison with the baseline should be made through maps and/or photographs, checked during the structured walk.</p>	<p>Give sources and dates of maps or photographs. If loss (or gain) of area is from natural causes this is not a decline in condition, but any significant loss due to human interference (e.g. sand extraction, visitor impacts, ploughing or conversion to improved grassland) is to be regarded as unfavourable. Increase in area is favourable unless related to coast protection or at the expense of other sand dune features.</p>
<p>Sand dunes</p> <p>Strandline, embryo and mobile dunes SD2, SD4, SD5, SD6</p>	<p>Total: 39.14 Ha</p> <p>source: Bullens (2001), Dargie (2001) as summarised in Humber Estuary SSSI – Supporting information – Issued by English Nature's Humber to Pennines Team on 3 February 2004</p>	<p>No reduction in extent from the established baseline, subject to natural change, although location may change.</p>	<p>Comparison with the baseline should be made through maps and/or photographs, checked during the structured walk.</p>	<p>Give sources and dates of maps or photographs. If loss (or gain) of area is due to natural causes this is not a decline in condition, but any significant loss due to human interference (e.g. sand extraction, visitor impacts, ploughing or conversion to improved grassland) is to be regarded as unfavourable. Increase in area is favourable unless related to coast protection. Strandline may be absent in some years as a result of natural causes, but continued absence over the six year period would cause condition to be unfavourable. Extent, particularly of embryonic dunes, may be subject to periodic and seasonal variation</p>

Sand dunes Dune slacks SD15a, SD17, SD17b	Total: 11.49 Ha  source: Bullens (2001), Dargie (2001) as summarised in Humber Estuary SSSI – Supporting information – Issued by English Nature’s Humber to Pennines Team on 3 February 2004	No reduction in extent from the established baseline, subject to natural change.	Comparison with the baseline should be made through maps and/or photographs, checked during the structured walk.	Give sources and dates of maps or photographs. If loss (or gain) of area is from natural causes this is not a decline in condition, but any significant loss due to human interference (e.g. sand extraction, visitor impacts, ploughing or conversion to improved grassland) is to be regarded as unfavourable. Increase in area is favourable unless related to coast protection or at the expense of other sand dune features.
Standing open water and canals	Total 209.3 ha  <i>Source: ENSIS Units 111, 113, 116-122, 124, 126, 127, 129-137, 140-143, 145-146, Freshwater wetlands, last modified 06/06/06)</i>	No reduction in the extent of standing water	Assessment against baseline map (Bullens, 2001). Baseline aerial photographs (2003, UK Perspectives)	This attribute is to assess changes caused by active management, such as infilling or channel diversion. Changes due to drying out or successional change are covered under other attributes.
EC – Quaternary of East England	NA			
IA – Coastal geomorphology	NA			

<b>Audit Trail</b>
<b>Rationale for habitat extent attribute</b> (Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).
'Estuary' is prime reason for designation of the Humber and thus the boundary has been drawn to include the feature 'estuary', its component features and those areas required to ensure the long-term sustainability of these features. Much of the Humber Estuary is confined by flood defences due to the low-lying nature of the surrounding area. In a few locations, there are no flood defences and the boundary has been determined by the extent of the current interest, the need to allow for 50 years landward migration of the interest in response to predicted sea level rise and/or the need to identify a recognisable feature. For example, where fixed sand dunes back the intertidal areas of the estuary, the landward limit of the sand dune feature has been used.  Coastal lagoons extent is based on the areas of Humberstone Fitties and Northcoates A & B and Blacktoft as these lagoons were classed as being of 'SAC quality' in comparison to other lagoons in the AOS. This is based on the advice of specialists (Paul Gilliland) and information in the <i>Humber Estuary SSSI – Supporting information – Issued by English Nature's Humber to Pennines Team on 3 February 2004.</i>
<b>Rationale for site-specific targets (including any variations from generic guidance)</b>
<b>Other Notes</b>
Sources: Bullen Consultants, 2001. National Vegetation Classification (NVC) of Humber Estuary. Report to English Nature. Dargie, T. 2001. An NVC survey of the North Lincolnshire Coast SSSI. Peterborough: English Nature. ABP, Humber Estuary Services. 2008. Humber Maintenance Dredging Baseline Document. ABP mer Ltd. 2008. Humber Subtidal Sandbanks (R.1489) Black & Veatch, 2005. Humber Estuary Coastal Management Plan (CHaMP). Environment Agency Document.

**Table 2b Species population objectives - Grey seal**

<b>Conservation Objective for species populations</b>	To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards.
<b>Population balance</b>	On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.

<b>Species Feature (species or assemblage)</b>	<b>List supporting BAP Broad Habitats</b>	<b>Population Attribute (e.g. presence/absence, population size or assemblage score)</b>	<b>Site Specific Target range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)</b>	<b>Comments</b>
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Grey seal <i>Halichoerus grypus</i>	Littoral sediment	Pup production in the SAC/SSSI  Baseline: 34 pups in 1981 (LWT records)*	A stable or increasing number of breeding female grey seals in the SAC/SSSI/ASSI  Pup counts from aerial photography and extrapolation; direct counts from boat or shore	Pup counts standardised and extrapolated to give an annual estimate of production. Extrapolation to be based on work in SAC/SSSI/ASSI where possible. Counts once every three years, ideally more often.
Grey seal <i>Halichoerus grypus</i>	Littoral sediment	Distribution of grey seal pups within the SAC/SSSI	A stable or increasing area of usage within the SAC/SSSI/ASSI  Aerial photography or direct mapping from boat or shore	Can be carried out at same time as above  Main breeding colony is at Donna Nook (Dunes – which superseded Ranges colony) ,since 2002 a smaller colony has been established at Skidbrooke.
Grey seal <i>Halichoerus grypus</i>	Littoral sediment	Accessibility of SAC/SSSI for breeding	An accessible breeding site - Aerial photography or direct mapping from boat or shore  At designation there were no known restrictions from the breeding site to the estuary/ sea. Breeding area is restricted landward by provision of fencing from public areas for management purposes	Can be carried out at same time as above

#### Audit Trail

##### Rationale for species population attributes

(Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).

##### Rationale for site-specific targets (including any variations from generic guidance)

#### Other Notes

\*Pup production has increased substantially to 1194 in 2007 (LWT records), so a more realistic baseline/target may need to be set to reflect the increase on designation population size.

**Table 2c Species population objectives - River lamprey and Sea lamprey**

Conservation Objective Humber Estuary SSSI, Draft version 2, December 2009

<b>Conservation Objective for species populations</b>	To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards.
<b>Population balance</b>	On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.

<b>Species Feature (species or assemblage)</b>	<b>List supporting BAP Broad Habitats</b>	<b>Population Attribute (e.g. presence/absence, population size or assemblage score)</b>	<b>Site Specific Target range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)</b>	<b>Comments</b>
River lamprey ( <i>Lampetra fluviatilis</i> ) Sea lamprey ( <i>Petromyzon marinus</i> )	Estuary	Population a. Age structure ( <i>Lampetra</i> sp. only)	<b>Target:</b> For samples of 50 or less, at least two distinct size classes should normally be present. If more than 50 ammocoetes are collected, at least three size classes should be present.  <b>Measure:</b> Electrofishing of suitable habitat using quadrats. See the LIFE project methodology for details of the protocol.	Lamprey ammocoetes grow at a reasonably steady rate and distinct size classes are usually apparent. Ammocoetes typically range from 10 – 150 mm, corresponding to up to six year classes. The largest ammocoetes are usually brook lampreys (river lampreys metamorphose at about 100 – 120 mm), while the smallest individuals are likely to be young-of-year sea lampreys, since this species spawns later in the year than <i>Lampetra</i> . The full range of age classes of ammocoete larvae, from 0+ up to metamorphosis should be present. However, sampling error may make these difficult to discern unless large samples are taken. If more than 100 lampreys are collected, at least three size classes should be present. Suitable habitat includes silt and sand beds in the river, either at the margins or in the main channel.
River lamprey ( <i>Lampetra fluviatilis</i> ) Sea lamprey ( <i>Petromyzon marinus</i> )	Estuary	Population b. Distribution within catchment	<b>Target:</b> Lampreys should be present at not less than 2/3 of sites surveyed. As a minimum, there should be no reduction in the distribution of ammocoetes within the catchment. Where barriers to migration or pollution issues are thought to be a problem, the population should be classed as being in unfavourable condition and targets for an appropriate increase should be set.  <b>Measure:</b> Electrofishing of suitable habitat using quadrats. See the LIFE project methodology for details of the protocol.	Distribution in the catchment should be appropriate to the natural geomorphology. Any accessible silt beds should be expected to contain ammocoetes of <i>Lampetra</i> spp, although in practice some beds are likely to be naturally unoccupied (e.g. due to washout). Any silt beds adjacent to or downstream of known <i>Petromyzon</i> spawning sites should contain <i>Petromyzon</i> ammocoetes. If the distribution of <i>Petromyzon</i> in the catchment is unknown, surveys of spawning sites should be carried out in June-July. Suitable habitat includes silt and sand beds in the river, either at the margins or in the main channel.

<p>River lamprey (<i>Lampetra fluviatilis</i>) Sea lamprey (<i>Petromyzon marinus</i>)</p>	<p>Estuary</p>	<p>Population c. Ammocoete density</p>	<p><b>Target :</b> <i>Lampetra</i> spp: Optimal habitat: &gt;10 m<sup>-2</sup>. Chalk streams &gt;5 m<sup>-2</sup>, Overall catchment mean: &gt;5m<sup>-2</sup></p> <p><b>Measure:</b> Electrofishing of suitable habitat using quadrats. See the LIFE project methodology for details of the protocol.</p>	<p>Density targets need to relate to river type (at least in broad terms), since production varies considerably. Chalk streams are not as productive as other systems because their low physical variability and low energy means that large, deep silt beds suitable for lampreys are rare. However, ammocoetes are still common in marginal habitat, among macrophyte beds etc., though at lower densities. Suitable habitat includes silt and sand beds in the river, either at the margins or in the main channel.</p>
<p>River lamprey (<i>Lampetra fluviatilis</i>) Sea lamprey (<i>Petromyzon marinus</i>)</p>	<p>Estuary</p>	<p>Population c. Ammocoete density (contd.)</p>	<p><b>Target:</b> <i>Petromyzon</i>: Ammocoetes should be present in at least four sampling sites, each not less than 5 km apart.</p> <p><b>Measure:</b> Electrofishing of suitable habitat using quadrats. See the LIFE project methodology for details of the protocol.</p>	<p><i>Lampetra</i> ammocoetes cannot be distinguished in the field, so it will not normally be possible to set separate targets for <i>L. fluviatilis</i> and <i>L. planeri</i>. However, lampreys upstream of a natural barrier to migration will always be <i>L. planeri</i>. <i>Petromyzon</i> ammocoetes can be distinguished in the field, but typically occur at very much lower densities than <i>Lampetra</i> – approximately 1 ammocoete in 50 in UK rivers is normally <i>Petromyzon</i>. Setting of density targets for this species is therefore impractical. Suitable habitat includes silt and sand beds in the river, either at the margins or in the main channel.</p>
<p>River lamprey (<i>Lampetra fluviatilis</i>) Sea lamprey (<i>Petromyzon marinus</i>)</p>	<p>Estuary</p>	<p>Population d. Spawning Activity* (Sea Lamprey only)</p>	<p><b>Target:</b> No reduction in extent of spawning activity year on year</p> <p><b>Measure:</b> Direct observation or red counts</p>	<p>Sea lamprey ammocoetes are typically much less numerous than river / brook lamprey ammocoetes, so this may be the only cost-effective means of determining that a healthy spawning population is present. Sea lampreys spawn in June – August (depending on the river) and are usually easily observed at traditional spawning sites during these months.</p>

River lamprey ( <i>Lampetra fluviatilis</i> ) Sea lamprey ( <i>Petromyzon marinus</i> )	Estuary	*River morphology	<p><b>Target:</b> No artificial barriers significantly impairing adults from reaching existing and historical spawning grounds.</p> <p><b>Measure:</b> Planning consents. In addition, any barriers should be mapped and quantified. The Rivers Ouse, Derwent, Trent, Ancholme &amp; Hull have barriers to fish passage - but access is possible at some stages of the tides. These lead to suitable spawning grounds in headwaters.</p>	Lampreys can pass some potential barriers by attaching themselves to structures or river banks by their suction discs and creeping up by strong bursts of swimming. The passability of barriers by different species and sizes of lampreys should be assessed on a site-specific basis, most sensibly by survey of the upstream limit of distribution of each species.
River lamprey ( <i>Lampetra fluviatilis</i> ) Sea lamprey ( <i>Petromyzon marinus</i> )	Estuary	*Negative indicators	<p><b>Target:</b> No stocking of other fish species at excessively high densities.</p> <p><b>Measure:</b> Impact assessments of stocking consents on a catchment scale may be required to determine an acceptable level.</p>	The presence of artificially high densities of salmonids and other fish will create unacceptably high levels of predatory and competitive pressure on juvenile lampreys and adult brook lamprey.
River lamprey ( <i>Lampetra fluviatilis</i> ) Sea lamprey ( <i>Petromyzon marinus</i> )	Estuary	Water quality	<p><b>Target:</b> Biological GQA Class: b/B</p> <p><b>Measure:</b> England, Wales &amp; N.I only (EA &amp; EP standard monitoring protocol)</p>	Generally, water quality should not be injurious to any life stage. A wide range of water quality parameters can affect the status of interest features, but standard biological monitoring techniques provide a reasonably integrated picture in relation to many parameters. All classified reaches within the site that contain, or should contain, lamprey under conditions of high environmental quality should comply with the targets given.
River lamprey ( <i>Lampetra fluviatilis</i> ) Sea lamprey ( <i>Petromyzon marinus</i> )	Estuary	Water quality	<p><b>Target:</b> Chemical GQA Class: B</p> <p><b>Targets for DO:</b></p> <ul style="list-style-type: none"> <li>• DO should not fall below 2mg/l</li> <li>• DO should not fall below 5mg/l for more than 5 consecutive days</li> <li>• Following a period of DO of less than 5mg/l there should be at least 2 consecutive days where DO remains above 5mg/l (source: Hopkins, 2007)</li> </ul> <p><b>Measure:</b> England, Wales and N.I. only (EA &amp; EP standard monitoring protocol)</p>	The Chemical GQA classifications set standards for England & Wales and for Northern Ireland for dissolved oxygen (DO), biochemical oxygen demand (BOD) and ammonia. They therefore cover a number of water quality parameters that can cause problems within river systems. All classified reaches within the site that should contain lamprey under conditions of high environmental quality should comply with the targets given.

River lamprey ( <i>Lampetra fluviatilis</i> ) Sea lamprey ( <i>Petromyzon marinus</i> )	Estuary	Water quality	<b>Target:</b> Suspended solids*: Annual mean <25 mg L <sup>-1</sup>  <b>Measure:</b> Environmental agencies' monitoring programmes	Elevated levels of suspended solids can clog the respiratory structures of fish. The target of 25mg L <sup>-1</sup> is based on the EC Freshwater Fish Directive.
River lamprey ( <i>Lampetra fluviatilis</i> ) Sea lamprey ( <i>Petromyzon marinus</i> )	Estuary	Water quality	<b>Target:</b> Soluble Reactive Phosphorus*: <i>Targets should be set in relation to river/reach type(s) and should be near background levels</i>  <b>Measure:</b> Environmental agencies' monitoring programmes	Elevated phosphorus levels can result in enhanced plant growth leading to large diurnal sags in dissolved oxygen levels.
River lamprey ( <i>Lampetra fluviatilis</i> ) Sea lamprey ( <i>Petromyzon marinus</i> )	Estuary	Flow	<b>Target:</b> As a guideline, flow should be at least 90% and not more than 110% of the naturalised daily flow throughout the year.  <b>Measure:</b> Gauging stations	River flow affects a range of habitat factors of critical importance to lampreys, including current velocity, water depth, wetted area, substrate quality, dissolved oxygen levels and water temperature. The maintenance of both flushing flows and baseflows, based on natural hydrological processes, is vital. Detailed investigations of habitat-flow relationships may indicate that a more or less stringent threshold may be appropriate for a specified reach; however, a precautionary approach would need to be taken to the use of less stringent values. As a guideline, at least 90% of the naturalised daily mean flow should remain in the river throughout the year. Naturalised flow is defined as the flow in the absence of abstractions and discharges. The availability and reliability of data is patchy - long-term gauged data can be used until adequate naturalised data become available, although the impact of abstractions on historical flow records should be considered.

<p>River lamprey (<i>Lampetra fluviatilis</i>) Sea lamprey (<i>Petromyzon marinus</i>)</p>	<p>Estuary</p>	<p>River morphology</p>	<p><b>Target:</b> River habitat SSSI features should be in favourable condition. Note: In a few cases the SAC is not underpinned by an SSSI. Where this is the case the target is to maintain the characteristic physical features of the river channel, banks and riparian zone. Where fluvial audit has taken place, the audit should indicate that sediment transport processes both within the catchment and the river channel are appropriate for the maintenance or enhancement of lampreys for the foreseeable future. Areas of spawning and nursery habitat identified by the audit should not show signs of decline.</p> <p><b>Measure:</b> Assess river morphology using RHS.</p>	<p>Where there is a risk of damage occurring, or where lamprey are already believed to be in decline, a fluvial audit of the catchment is recommended. This is a relatively new approach developed by fluvial geomorphologists in the UK; further guidance should be sought from the appropriate freshwater specialists in the country conservation agencies. The characteristic channel morphology provides the diversity of water depths, current velocities and substrate types necessary to fulfil the spawning, juvenile and migratory requirements of the species. Lamprey species require a combination of coarse substrates for spawning and stable beds of fine sandy/silty material for larval development. The close proximity of these habitats facilitates movement to new preferred habitats with age. Operations that widen, deepen and/or straighten the channel reduce variations in habitat. New operations that would have this impact are not acceptable within the SAC, whilst restoration may be needed in some reaches. <u>Area of spawning habitat:</u> Defined as well-oxygenated gravel / pebble-dominated (1.5-11 cm) substrate of at least 10cm depth, overlain by a range of water depths (0.2-1.5 m). River and sea lamprey typically spawn in deeper water than brook lamprey, but in larger river reaches brook lamprey also spawn in deeper areas. Elevated levels of fines (particles &lt;0.83 mm) can interfere with egg survival. Most river SSSIs/ ASSIs and SACs do not extend to the entire catchment. Some life-cycle stages are potentially susceptible to damage from siltation, the source of which may lie elsewhere in the catchment outside the site boundary. Sources of fines include run-off from arable land, land (especially banks) trampled by livestock, sewage and industrial discharges. <u>Area of nursery habitat:</u> Defined as open-structured, aerated, silty and sandy substrates, between 2 and 40cm depth, typically overlain by less than 0.5 m of water. Slack-water channel margins are particularly important, whilst silt accumulations behind weirs can also be valuable in impounded sections. The requirements of the three species are similar and so they are often found in the same nursery beds, but in deeper water (up to 2.2 m) sea</p>
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Audit Trail
<b>Rationale for species population attributes</b> (Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).
When assessing the condition of this feature it is important to note that the Humber Estuary is used as a migration route only; other life stages are completed at sea and within rivers. So in order to assess the condition of lamprey within the estuary it may be necessary to survey the tributaries NOT the Humber for some of the attributes listed.
<b>Rationale for site-specific targets (including any variations from generic guidance)</b>
Site specific targets relating to dissolved oxygen have been drawn from the Habitats Directive Review of (Stage 4) Consents, Site Action Plan – Humber Estuary cSAC/SPA and Ramsar, Appendix B2.2 Dissolved oxygen requirements to permit upstream migration of adult sea lamprey through the tidal Ouse (Hopkins, D. 2007)
<b>Other Notes</b>

**Table 2d Species population objectives – Aggregations of non-breeding birds**

<b>Conservation Objective for species populations</b>	To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards.
<b>Population balance</b>	On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.

Species Feature (species or assemblage)	List supporting BAP Broad Habitats	Population Attribute (e.g. presence/ absence, population size or assemblage score)	Site Specific Target range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)	Comments
Aggregations of non-breeding birds: SSSI – wintering and passage waterfowl species, SPA/ Ramsar - internationally important populations of regularly occurring migratory species and internationally important assemblage of	Estuary Inshore sublittoral sediment Littoral sediment ( <i>Coastal saltmarsh, sandflats, mudflats, tidal reedbed</i> ) Saline Lagoons Standing open water and canals	B1 Habitat extent	<p><b>Target:</b> No decrease in extent of listed habitats from established baselines, subject to natural change. as defined in the conservation objectives for these habitats.</p> <p><b>Measure:</b> See conservation objectives for specified habitats</p>	<p>Many of the designated habitats within Humber Estuary SSSI, SAC, SPA and Ramsar site support the non-breeding bird interest features; these are listed in the BAP broad habitat column.</p> <p>Since the habitats are interest features of these designations, they have their own conservation objectives and will be assessed separately under these criteria.</p>
			<p><b>Target:</b> Maintain the ability of the estuary to support its bird populations:</p> <p>The ability of the estuary and its hinterland to support the highest mean peak of designated birds present in the 5 year period prior to</p>	<p>The Humber Estuary is confined by sea defences along much of its length and therefore most of the designated site is unavailable for birds to use at high tide. The inundation of the intertidal areas forces the birds to find suitable roosting, feeding and loafing habitat in other locations,</p>

waterfowl			<p>designation, OR any other 5 year period since designation (whichever is the highest), should be maintained.</p> <p><b>Measure:</b> In order to maintain the populations of SPA/ Ramsar birds across the Humber Estuary, further work is required to enable a quantifiable target to be developed. It is expected that this work will identify locations and areas (ha) of land outside the designated site boundary which are required to support the populations of SPA/ Ramsar birds as specified in the target.</p>	<p>beyond the designated site boundaries. The loss of the overall resource of this supporting habitat may place considerable stress upon the birds once the high tide displaces them. This land outside the designated site boundary is therefore vital for maintaining favourable condition.</p> <p>Detailed survey work has already informed a study of the South Humber Gateway which will be used to identify areas of land which are functionally linked to the designated site. These areas will be specifically managed and maintained for SPA/ Ramsar birds.</p>
		<p>B2 Bird population size – five year mean peak winter counts for each species is the main measure of the population size. The winter period is November to March.</p> <p>For some species, (as indicated), five year mean peak passage counts are used and refer to the periods July to October (Autumn passage) and April to June (Spring passage).</p> <p>The BTO's Wetland Bird Survey (WeBS) data will be used.</p>	<p><b>Target:</b> Maintain the population within acceptable limits:</p> <p><b>Measure:</b> Populations on the Humber Estuary are known to fluctuate naturally; in addition since designation some species have experienced a declining trend in population size, while other populations have increased. Targets should therefore be set on a species by species basis according to the following:</p> <ul style="list-style-type: none"> <li>• Based on the known natural fluctuations of the population, maintain the population at or above the minimum for the site (i.e. maintain the population above either the 5 yr mean peak count used at designation OR any other 5 year period since designation – whichever is the highest)</li> <li>• The WeBS dataset for the Humber Estuary goes back to XXXX and the estuary was a designated site before the designations were reviewed in 2004. Therefore, any longer term trends should also be assessed where robust analysis exists.</li> </ul> <p>Where long term datasets do not exist to enable</p>	<p>WeBS data is readily available annually in the "Waterbirds in the UK" book published by the WeBS partnership. This data will be utilised to determine the 5 year mean peak counts.</p> <p>For longer term trends, a Humber Estuary specific WeBS report has been produced by the British Trust for Ornithology detailing trends in 23 species of waterbird on the estuary over a 15 year period. This report will be used to identify those species which have suffered a decline greater than 25% over this period. It is expected that the report will be updated every 5 years.</p> <p>For species not covered by these datasets, additional data will be requested from the BTO and/ or data from any other relevant body such as RSPB, LWT and YWT. The generic threshold will be used for these populations.</p> <p><b>Mandatory features – wintering and passage waterfowl species listed on the SSSI citation:</b>  Wintering - Bittern, Dark-bellied Brent Goose, Shelduck, Wigeon, Teal, Pochard, Scaup, Goldeneye, Oystercatcher, Avocet, Ringed plover, Golden plover, Grey plover, Lapwing, Knot, Sanderling, Dunlin, Black-tail godwit, Bar-tailed godwit, Curlew, Redshank and Turnstone</p>



			<p>natural population fluctuations to be calculated, the generic threshold will be used.</p> <ul style="list-style-type: none"> <li>Maintain the population above 50% of that at designation</li> </ul> <p>A decline in population size as described in the datasets above will be determined to be unfavourable. A precautionary approach will be taken, thus if one of the datasets shows a decline, the feature will be determined to be in unfavourable condition. If the feature fails on this attribute it will require expert judgement as to whether the failure is due to anthropogenic impacts or natural causes and thus acceptable or not in terms of site condition.</p>	<p>Passage – Ringed Plover, Grey Plover, Sanderling, Dunlin, Ruff, Black-tailed Godwit, Whimbrel, Redshank and Greenshank.</p> <p><b>Mandatory features – non-breeding Annex 1 birds listed on the SPA and Ramsar citation:</b>  Wintering - Avocet , Bittern, Hen harrier, Golden plover, Bar-tailed godwit  Passage - Ruff</p> <p><b>Mandatory features - Migratory species listed on the SPA and Ramsar citation:</b>  Wintering – Shelduck  Wintering and passage - Knot, Dunlin, Black-tailed Godwit, Redshank</p> <p><b>Mandatory features - Wintering and passage waterbird species listed on the Ramsar citation:</b>  Passage – Golden Plover</p> <p><b>Mandatory features – Wintering and passage waterbird assemblage species, listed on the SPA and Ramsar citation:</b>  Wintering and passage - Dark-bellied Brent Goose, Shelduck, Wigeon, Teal, Mallard, Pochard, Scaup, Goldeneye, Oystercatcher, Avocet, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Sanderling, Dunlin, Ruff, Black-tailed godwit, Bar-tailed godwit, Whimbrel, Curlew, Redshank, Greenshank, Turnstone.</p> <p>The non-breeding waterfowl cited in the SSSI/SPA/Ramsar citations are mandatory interest features which must be assessed when a condition assessment of the site is undertaken. Non-breeding waterbirds which have subsequently qualified as internationally important since the time of site designation are considered discretionary interest features to assess.</p>
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		<p>B3 Disturbance and displacement</p>	<p><b>Target:</b> No significant reduction in bird numbers either on the site, or from one part of the site to another attributable to anthropogenic factors</p> <p><b>Measure:</b> The 'bird population size' attribute will be used to inform this target – i.e. the WeBS counts for the site and for the individual WeBS sectors</p> <p>A 'significant' reduction will be determined on a case by case basis, however a decline of 1% or greater should be taken as a guide.</p>	<p>Significant disturbance and displacement attributable to human activities can result in reduced food intake and/or increased energy expenditure.</p> <p>Information which will be used to inform this target include the BTO WeBS report mentioned above, which determines trends over 15 years by sector for 23 waterbird species; and the recreational disturbance project which will be undertaken by the Humber Management Scheme.</p> <p>The Humber Estuary is confined by sea defences along much of its length and therefore most of the site is unavailable for birds to use at high tide. Birds are forced off the site to find suitable roosting, feeding and loafing habitat in other locations, outside of the designated site boundaries. For this reason these habitats should also be included when assessing this attribute. However, some degree of displacement is acceptable outside of the designated site boundary, as long as the birds still utilise the designated site in the same way.</p>
		<p>B4 Variety of Species</p>	<p><b>Target:</b> Maintain assemblage diversity as at designation (2004) OR as at any other 5 year period since designation – whichever is the most diverse:</p> <p><b>Measure:</b></p> <ul style="list-style-type: none"> <li>◆ If the number of wintering species falls by 25% or more then the feature is in unfavourable condition (winter is November to February).</li> <li>◆ If the number of passage species falls by 25% or more then the feature is in unfavourable condition (passage periods are Autumn - August to October and Spring – March to April).</li> </ul>	<p>The non-breeding waterfowl assemblage consists of all Annex 1 and migratory species which are present on the site in any season and occur in the UK in their natural state.</p> <p>To determine the assemblage diversity, 5 year mean peak counts will be utilised to record the presence/absence of all species within the site during the relevant periods.</p> <p>This attribute may conflict with the 'Bird Population Size' attribute detailed above. When undertaking assessments, the population size attribute must take precedence.</p>

### Audit Trail

#### Rationale for species population attributes

(Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).

#### Bird population size:

A specific target has been produced for the Humber Estuary in recognition that the new designations (2004), and therefore the generic objectives, utilise recent datasets. Longer term datasets on breeding species on the Humber Estuary are available and therefore these will also be assessed to determine any longer term trends. The British Trust for Ornithology have analysed the last 15 years site specific data utilising their 'alerts system'. This is a standardised technique to monitor changes in the numbers of wintering waterbirds in the UK over a range of spatial scales and time periods using data collected as part of the Wetland Bird Survey (WeBS).

#### Rationale for site-specific targets (including any variations from generic guidance)

A variation on the generic targets has been used for bird population size and habitat extent to reflect the importance of the SSSI within the Humber Estuary Ramsar and SPA site, and due to the ongoing anthropogenic pressure experienced by the site.

#### Habitat extent:

A target has been produced to maintain the ability of the estuary to support its bird populations. This reflects the fact that birds rely upon land outside of the designated site boundaries. The availability of this land is therefore integral to the favourable condition of the feature.

Disturbance/ displacement has also been included and this target has been modified from the Regulation 33 advice document.

#### Other Notes

Monitoring of bird populations is fundamental to assessing the condition of the ornithological interest features of the Humber Estuary SSSI, SPA and Ramsar site and as a result the above attributes are mandatory. Failure of a mandatory attribute means that the site is considered to be in "unfavourable condition". Detailed monitoring of habitat quality have not been included as mandatory largely because the influences of each on the bird attributes are poorly understood, so meaningful targets cannot be set. The guidance relies on using an **indirect** way of assessing habitat condition and disturbance by the direct monitoring of bird population size and diversity; both typically respond relatively quickly to deterioration in habitats or living conditions and so provide an effective means of early detection of problems in a site.

It is likely that the Humber Estuary also supports a nationally important wintering population of hen harrier, although insufficient data are available to confirm the population size across the site. Golden plover and knot both occur in numbers of international importance on passage. However, in the absence of a national population estimate and associated 1% national threshold for these species, they cannot be included as reasons for SSSI notification.

Other non-qualifying SPA non-breeding species of interest: Bewicks Swan, Whooper Swan, Smew, Red throated diver, Slavonian grebe, little egret, spoonbill, merlin, peregrine, spotted crane, wood sandpiper, Mediterranean gull, sandwich tern, roseate tern, common tern, Arctic tern, short eared owl and kingfisher.

Other non-qualifying Ramsar non-breeding species of interest: hen harrier and breeding numbers of marsh harrier, avocet, little tern and bittern.

Data sources – WeBS data available online <http://www.bto.org/webs/index.htm> ; BTO research report 497 (in prep) Humber Estuary SPA waterbird populations: trend analysis by count sector; Mott MacDonald Report to Yorkshire Forward South Humber Bank Zone: Field usage by bird species from the Humber Estuary SPA; plus data from RSPB, YWT, LWT where required

**Table 2e Species population objectives - Breeding birds assemblage**

<b>Conservation Objective for species populations</b>	To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards.
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Conservation Objective Humber Estuary SSSI, Draft version 2, December 2009

<b>Population balance</b>	On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.
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<b>Species Feature (species or assemblage)</b>	<b>List supporting BAP Broad Habitats</b>	<b>Population Attribute (e.g. presence/absence, population size or assemblage score)</b>	<b>Site Specific Target range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)</b>	<b>Comments</b>
Assemblage of breeding birds – SSSI breeding bird assemblage of lowland open waters and their margins	Estuary Littoral sediment Coastal saltmarsh Saline Lagoons Standing open water and canals	B5 Habitat extent	<p><b>Target:</b> No decrease in extent of listed habitats from established baselines, subject to natural change. as defined in the conservation objectives for these habitats.</p> <p><b>Measure:</b> See conservation objectives for specified habitats</p>	<p>Many of the designated habitats within Humber Estuary SSSI support the breeding bird interest features; these are listed in the BAP broad habitat column.</p> <p>Since the habitats are interest features of these designations, they have their own conservation objectives and will be assessed separately under these criteria.</p>
		B6 Assemblage score (BTO index)	<p><b>Target:</b> Maintain assemblage diversity. <b>The baseline score is 69.5</b> (source: SSSI notification package)</p> <p>If the total score calculated for the breeding bird assemblage falls by the equivalent of 25% or more in points then the assemblage is in unfavourable condition.</p> <p><b>Measure:</b> Record presence/absence of breeding species within the assemblage. Breeding must be confirmed as proven or probable according to generic proof of breeding codes (See appendix 1 of CSM guidance).</p> <p>A count of the numbers of breeding pairs/units in a site is not needed. On the basis of presence/absence recalculate the assemblage score using the SSSI Guidelines for the relevant habitat.</p>	<p>Methods of survey will be a combination of those given in Part 2 of the CSM guidance depending on the species within the assemblage.</p> <p>At the time of designation the following species contributed to the SSSI breeding bird assemblage: Nationally important numbers of bittern, marsh harrier, avocet and bearded tit. Other species which also contribute are little grebe, great crested grebe, mute swan, shelduck, gadwall, shoveler, pochard, tufted duck, water rail, little ringed plover, snipe, redshank, common tern, cuckoo, kingfisher, yellow wagtail, grasshopper warbler, sedge warbler, reed warbler and reed bunting</p> <p>The species are concentrated in the clay pits, lagoons and reed beds at Far Ings – Barton, Read’s Island and Blacktoft Sands, although they also occur in other open water areas such as soke dykes, ditches and the tidal reed beds fringing the upper estuary.</p> <p>The species present at designation and each monitoring event do not need to be the same as this is a score-based assessment only.</p>
		B7 Disturbance and displacement	<p><b>Target:</b> No significant reduction in bird numbers either on the site, or from one part of the site to another attributable to</p>	<p>Significant disturbance and displacement attributable to human activities can result in reduced food intake and/or increased energy expenditure.</p>

			<p>anthropogenic factors</p> <p><b>Measure:</b> The 'assemblage score' attribute will be used to inform this target</p> <p>A 'significant' reduction will be determined on a case by case basis, however a decline of 1% or greater should be taken as a guide.</p>	<p>Information which will be used to inform this target include data from the RSPB, LWT and YWT and the recreational disturbance project which will be undertaken by the Humber Management Scheme.</p>
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<b>Audit Trail</b>
<b>Rationale for species population attributes</b>
(Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).
Generic attributes have been adopted
<b>Rationale for site-specific targets (including any variations from generic guidance)</b>
Disturbance/ displacement has also been included and this target has been modified from the Regulation 33 advice document.
<b>Other Notes</b>
Data sources – records from the RSPB, LWT and YWT, plus others where relevant

**Table 2f Species population objectives – Aggregation of breeding birds listed on the SPA citation**

<b>Conservation Objective for species populations</b>	To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards.
<b>Population balance</b>	On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.

<b>Species Feature (species or assemblage)</b>	<b>List supporting BAP Broad Habitats</b>	<b>Population Attribute (e.g. presence/absence, population size or assemblage score)</b>	<b>Site Specific Target range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)</b>	<b>Comments</b>
Aggregation of breeding birds – SPA Annex I species	Estuary Littoral sediment Coastal saltmarsh Saline Lagoons Standing open water	B8 Habitat extent	<p><b>Target:</b> No decrease in extent of listed habitats from established baselines, subject to natural change, as defined in the conservation objectives for these habitats.</p> <p><b>Measure:</b> See conservation objectives for specified habitats.</p>	<p>Many of the designated habitats within Humber Estuary SSSI, SAC, SPA and Ramsar site support the breeding bird interest features; these are listed in the BAP broad habitat column.</p> <p>Since the habitats are interest features of these designations, they have their own conservation objectives and will be assessed separately under these criteria.</p>

	and canals	B9 Habitat condition	<p><b>Target:</b> No decrease in extent of suitable habitat for breeding species from established baselines, subject to natural change, as defined in the conservation objectives for these habitats</p> <p><b>Measure:</b> See conservation objectives for specified habitats.</p>	<p>Bittern and marsh harrier – require active management of reedbeds, plus management of water levels and fish stocks for bittern</p> <p>Avocet – require water level management, plus action to be taken to secure new habitat to replace the loss of Read’s Island. Whilst this loss is due to natural change, habitats lost through coastal processes should be replaced where possible.</p> <p>Little tern – breeding success is declining and suitable habitat at the Lagoons is being lost to coastal squeeze. Compensation will be provided for loss of the main breeding site at Donna Nook realignment site, however as it is some distance from the original site, it will need to be closely monitored to determine success.</p> <p>Further information on this target can be found in the site management plans – for example Far Ings NNR management plan, Read’s Island Management Plan, Blacktoft Sands and Faxfleet Management Plan.</p>
		B10 Bird population size – five year mean counts for each species is the main measure of the population size.	<p><b>Target:</b> Maintain the population within acceptable limits:</p> <p><b>Measure:</b> Populations on the Humber Estuary are known to fluctuate naturally; in addition since designation some species have experienced a declining trend in population size, while other populations have increased. Targets should therefore be set on a species by species basis according to the following:</p> <ul style="list-style-type: none"> <li>Based on the known natural fluctuations of the population, maintain the population at or above the minimum for the site (i.e. maintain the population above either the 5 yr mean count used at designation OR any other 5 year period since designation – whichever is the highest)</li> </ul> <p>Information on breeding birds on the</p>	<p><b>Mandatory features – Breeding Annex 1 birds listed on the SPA citation:</b> Bittern, marsh harrier, avocet, little tern</p> <p>Datasets which will be used to assess this target are detailed by species in the English Nature Research Report 547 “The Humber Estuary – a comprehensive review of its nature conservation interest”. The report is available from the Natural England website.</p> <p>For species no longer covered by these datasets, additional data will be requested from the BTO and/ or data from any other relevant body such as the YWT and Spurn Bird Observatory.</p>

			<p>Humber Estuary is available prior to the designations review in 2004. Therefore, longer term trends should also be assessed were possible.</p> <p>A decline in population size as described above will be determined to be unfavourable. A precautionary approach will be taken, thus if one of the datasets shows a decline, the feature will be determined to be in unfavourable condition. If the feature fails on this attribute it will require expert judgement as to whether the failure is due to anthropogenic impacts or natural causes and thus acceptable or not in terms of site condition.</p>	
		B11 Disturbance and displacement	<p><b>Target:</b> No significant reduction in bird numbers either on the site, or from one part of the site to another attributable to anthropogenic factors</p> <p><b>Measure:</b> The 'bird population size' attribute will be used to inform this target.</p> <p>A 'significant' reduction will be determined on a case by case basis, however a decline of 1% or greater should be taken as a guide.</p>	<p>Significant disturbance and displacement attributable to human activities can result in reduced food intake and/or increased energy expenditure.</p> <p>Breeding birds are particularly vulnerable to disturbance and significant disturbance to adults when nesting can result in failure of egg clutches and fledged young. Information such as the recreational disturbance project which will be undertaken by the Humber Management Scheme over the next 3 years will also be used to monitor and assess the impact of disturbance.</p> <p>The breeding bird species may utilise land outside of the designated site boundaries for breeding. For this reason these habitats should also be included when assessing this attribute. However, some degree of displacement is acceptable outside of the designated site boundary, as long as the birds still utilise the designated site in the same way.</p>

**Audit Trail**

**Rationale for species population attributes**

(Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).

Population density attribute has not been used. The SPA breeding birds are not described as an 'aggregation' and no population density information is included in the designation documents. However it was felt that the habitat extent and population size attributes were relevant.

**Rationale for site-specific targets (including any variations from generic guidance)**

**A variation on the generic targets has been used for bird population size, and additional site specific targets have been included to reflect the importance of the SSSI within the Humber Estuary Ramsar and SPA site and due to the ongoing anthropogenic pressure experienced by the site.**

**Bird population size:**

A specific target has been produced for the Humber Estuary in recognition that the new designations (2004), and therefore the generic objectives, utilise recent datasets. Longer term datasets on breeding species on the Humber Estuary are available and therefore these will also be assessed to determine any longer term trends.

**Habitat condition:**

A specific target has been produced in recognition that the habitat must be suitable and well managed for the Annex I species to breed successfully

**Disturbance and displacement:**

This target has been taken from the Regulation 33 advice document.

Data sources – records from the RSPB, LWT and YWT, plus others where relevant

**Other Notes**

Other non-qualifying SPA breeding species of interest include: common tern, kingfisher

Other non-qualifying Ramsar breeding species of interest include: marsh harrier, avocet, little tern, bittern.

**Table 2h Species population objectives - Vascular plant species (Suite 6)**

Conservation Objective Humber Estuary SSSI, Draft version 2, December 2009



<b>Conservation Objective for species populations</b>	To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards.
<b>Population balance</b>	On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.

<b>Species Feature (species or assemblage)</b>	<b>List supporting BAP Broad Habitats</b>	<b>Population Attribute (e.g. presence/absence, population size or assemblage score)</b>	<b>Site Specific Target range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)</b>	<b>Comments</b>
Vascular plant species of disturbed/compacted, often summer-parched/winter-wet areas on sand-dunes, shingle, and seacliffs, and of sandy waste ground near the sea (Suite 6)	Sand dunes Littoral sediment	Presence/absence (direct attribute)	<b>Target:</b> Species should be present at known sites:  <i>Poa bulbosa</i> . This is the northern-most locality in GB. Recorded in localities at Cleethorpes between 1996-2002: TA3206, TA3107, TA320072  <i>Trifolium suffocatum</i> . This is the northern-most locality in GB. East Riding BAP species found only at Spurn Point.  <b>Method:</b> Identification of species	If all other targets are met but the species cannot be found then the feature should be referred to the Country Agency botanical specialists.
Vascular plant species (Suite 6)	Sand dunes Littoral sediment	Population size (discretionary direct attribute)	<b>Target:</b> At least a minimum viable population size present AND No more than 10% loss either in amount of area colonised or in the overall number of individual clumps  <b>Method:</b> Extent (metres) or numbers of clumps	<i>Asplenium obovatum</i> and <i>septentrionale</i> occur in clumps, mainly on exposed sea cliffs, and can be counted. <i>Carex maritima</i> tends to form mats or stands on wet sand just above the strandline and is best assessed by its extent as it is impossible to separate one individual from another in the field.
Vascular plant species (Suite 6)	Sand dunes Littoral sediment	Niche availability (indirect attribute)	<b>Target:</b> Sufficient area of suitable habitat to maintain population. No loss of extent of suitable habitat (though spatial arrangement of habitat 'patches' can change from year to year)  <b>Method:</b> Mapping (area)	Baseline survey required to establish extent of suitable habitat. Many colonies of these species are in long-established habitats (e.g. 'slack' grasslands on sand-dune golf course fairways), but others are more 'opportunistic', colonising intermittently suitable habitat patches whenever they become available (e.g. pathways cleared of scrub).

Vascular plant species (Suite 6)	Sand dunes Littoral sediment	Bare ground (indirect attribute)	<b>Target:</b> 5% bare ground <b>Method:</b> Visual assessment	Bare ground is essential for seed germination and seedling establishment; most 'suite 6 species' occur in open-textured swards with > 5% (often > 20%) bare ground in spring/early summer (in late summer-autumn-early winter may be much higher than this due to 'disappearance' of early annuals); baseline survey will help to establish appropriate levels of bare ground for particular species and sites
Vascular plant species (Suite 6)	Sand dunes Littoral sediment	Vegetation structure: sward height (indirect attribute)	<b>Target:</b> > 50% of sward < 2 cm sward height <b>Method:</b> Measure with ruler	These species favour very short (heavily grazed/trampled/mown) swards; sometimes these can be extensive (e.g. golf course fairways), but usually they occur as localized patches within a matrix of unsuitable habitat (e.g. on pathsides, trackways, picnic areas and car-parks)
Vascular plant species (Suite 6)	Sand dunes Littoral sediment	Hydrology (indirect attribute)	<b>Target:</b> Signs of flooding or direct evidence of dampness in winter <b>Method:</b> Visual assessment	Most 'suite 6 species' (apart from <i>Erodium moschatum</i> ) favour ground that is dry in summer but damp or intermittently flooded in winter. Direct evidence of 'winter dampness', along with the 'right' vegetation structure, is probably the best predictor of favourable condition for most species in this suite.
Vascular plant species (Suite 6)	Sand dunes Littoral sediment	Negative indicators: Shading (indirect attribute)	<b>Target:</b> No shading; no encroachment of scrub or tall grassland <b>Method:</b> Visual assessment	All these species are restricted to very open, unshaded situations, though some of the dune annuals can occur along scrub margins (and can quickly colonise areas cleared of scrub). Intervention may be necessary if scrub or rank grassland threatens to encroach onto open ground.

Vascular plant species (Suite 6)	Sand dunes Littoral sediment	Negative indicators: soil nutrient status (indirect attribute)	<b>Target:</b> <i>Poa annua</i> and/or <i>Plantago major</i> ssp <i>major</i> should be no more than occasional/< 5% cover  <b>Method:</b> Associated species (DAFOR)	All 'suite 6 species' occur on disturbed but relatively impoverished (infertile) soils. The abundance of ruderal species indicative of nutrient enrichment would indicate unfavourable condition. <i>Poa annua</i> and <i>Plantago major</i> ssp <i>major</i> are good indicators of eutrophication in heavily disturbed sites; following baseline survey, further species could be added to this list on a site-by-site basis. NB: the much smaller, and mainly coastal, taxon <i>Plantago major</i> ssp <i>intermedia</i> is perfectly acceptable, and is <i>not</i> indicative of unacceptable nutrient status.
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Audit Trail
<b>Rationale for species population attributes</b> (Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).
<b>Rationale for site-specific targets (including any variations from generic guidance)</b>
<b>Other Notes</b>
Species at this site which are in suite 6: <i>Poa bulbosa</i> , <i>Trifolium suffocatum</i> . Sources of information: S:\Designated Sites\SSSI Sites\Humber Estuary\Notification\HEDP\Features & Boundaries\Features\Plants Simon Leach (vascular plant specialist) was consulted for advice 25/03/09 on the reportable features for the site.

**Table 2i Species population objectives - Vascular plant species (Suite 14)**

<b>Conservation Objective for species populations</b>	To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards.
<b>Population balance</b>	On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.

Species Feature (species or assemblage)	List supporting BAP Broad Habitats	Population Attribute (e.g. presence/absence, population size or assemblage score)	Site Specific Target range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)	Comments
<p><b>Vascular plant species of coastal embankments, sea-walls, open poached, dry or periodically inundated brackish or saline muds (Suite 14)</b></p>	<p>Littoral sediment (Sandflats and Mudflats)</p>	<p>Presence/absence (direct attribute)</p>	<p><b>Target:</b> Species should be present at known sites:</p> <p><b><i>Bupleurum tenuissimum:</i></b> Found in following locations in <b>South bank</b> - TA263112, TF515840 (old Pyewipe and Cleethorpes SSSI, 1993-96.) <b>North bank</b> TA397168; 390166</p> <p><b><i>Parapholis incurva:</i></b> <b>South bank</b> -TF515840, TF4888 (Trusthorpe and Saltfleetby 1996-7) <b>North bank</b> – Northern limit of distribution, known at spurn.</p> <p><b><i>Trifolium squamosum:</i></b> <b>South bank</b> TA207145, TA136248, TA136248 (Stallinborough and Skitter ness 1993-95) <b>North bank</b> – Northern limit of distribution</p> <p><b><i>Alopecurus bulbosus:</i></b> <b>South Bank</b> - SE9024 (Whitton foreshore 1999) No records from North Bank</p> <p><b>Method:</b> Identification of species</p>	<p>If all other targets are met but the species cannot be found then the feature should be referred to the Country Agency botanical specialists.</p>

<b>Vascular plant (Suite 14)</b>	Littoral sediment (Sandflats and Mudflats)	Population size (discretionary direct attributes)	<p><b>Target:</b> At least a minimum viable population size present AND No more than 10% loss in overall coverage of the population</p> <p><b>Method:</b> Extent – metres. Most of these species occur in a restricted band so an estimate or measurement of the area covered is possible.</p>	<p><b><i>Bupleurum tenuissimum</i></b> This species has declined dramatically. It occurs sporadically in a given place producing good populations one year and none the next. Long-established stations at Saltend and Paull have been lost to coastal defence works; recent works to the East of Paull outfall have probably removed another known site. There is currently one remaining north bank site, on a ditch bank at GR TA397.168. In 2000 this was prolific; in 2002 it is absent. All other sites recorded by Crackles (1992) have failed to yield populations in the period 1996-2001 and no new sites have been recorded.</p>
<b>Vascular plant (Suite 14)</b>	Littoral sediment (Sandflats and Mudflats)	Disturbance (indirect attribute)	<p><b>Target:</b> Evidence of regular disturbance adjacent to borrow dyke and at seepage points along the sea wall berm (e.g. by poaching animals)</p> <p><b>Method:</b> Visual assessment</p>	<p>Acceptable levels of open ground may be created by vehicles/farm machinery using berm. Mandatory for: <b><i>Bupleurum tenuissimum</i>, <i>Hordeum marinum</i>, <i>Parapholis incurva</i>, <i>Polypogon monspeliensis</i>, <i>Puccinellia fasciculata</i>, <i>Puccinellia rupestris</i>, <i>Trifolium squamosum</i>.</b></p>
<b>Vascular plant (Suite 14)</b>	Littoral sediment (Sandflats and Mudflats)	Hydrology (indirect attribute)	<p><b>Target:</b> Land subject to seasonal inundation by brackish to salt water</p> <p><b>Method:</b> Visual assessment</p>	<p>Mandatory for: <i>Althaea officinalis</i>, <i>Atriplex pedunculata</i>, <i>Chenopodium chenopodioides</i>, <i>Lepidium latifolium</i>, <b><i>Parapholis incurva</i>, <i>Polypogon monspeliensis</i>, <i>Puccinellia fasciculata</i>.</b></p>
<b>Vascular plant (Suite 14)</b>	Littoral sediment (Sandflats and Mudflats)	Hydrology (indirect attribute)	<p><b>Target:</b> Seasonally wet conditions which dry out during the summer months</p> <p><b>Method:</b> Visual assessment</p>	<p>Mandatory for: <i>Hordeum marinum</i>, <b><i>Parapholis incurva</i>, <i>Puccinellia rupestris</i>, <i>Trifolium squamosum</i>.</b></p>
<b>Vascular plant (Suite 14)</b>	Littoral sediment (Sandflats and Mudflats)	Hydrology* (indirect attribute)	<p><b>Target:</b> Dry conditions throughout the year</p> <p><b>Method:</b> Visual assessment</p>	<p>Mandatory for: <i>Lactuca saligna</i>, <i>Peucedanum officinale</i>. These species prefer dry exposed conditions, and can thrive on sites such as sea-walls.</p>

<b>Vascular plant (Suite 14)</b>	Littoral sediment (Sandflats and Mudflats)	Vegetation* Structure (indirect attribute)	<b>Target:</b> > 20% bare ground in suitable niche <b>Method:</b> Visual assessment	Mandatory for: <i>Atriplex pedunculata</i> , <i>Chenopodium chenopodioides</i> , <i>Hordeum marinum</i> , <i>Polypogon monspeliensis</i> , <i>Puccinellia fasciculata</i> , <i>Puccinellia rupestris</i> .
<b>Vascular plant (Suite 14)</b>	Littoral sediment (Sandflats and Mudflats)	Vegetation Structure (indirect attribute)	<b>Target:</b> Open vegetation in suitable niche <b>Method:</b> Visual assessment	Mandatory for: <b><i>Bupleurum tenuissimum</i></b> , <i>Lepidium latifolium</i> , <b><i>Parapholis incurva</i></b> , <b><i>Trifolium squamosum</i></b> .
<b>Vascular plant (Suite 14)</b>	Littoral sediment (Sandflats and Mudflats)	Vegetation Structure* (indirect attribute)	<b>Target:</b> Area dominated by coarse grasses with scattered scrub and bare ground <b>Method:</b> Visual assessment	Mandatory for: <i>Althaea officinalis</i> , <i>Lactuca saligna</i> , <i>Peucedanum officinale</i> .
<b>Vascular plant (Suite 14)</b>	Littoral sediment (Sandflats and Mudflats)	Negative indicators: physical damage* (indirect attribute)	<b>Target:</b> No evidence of mowing or grazing <b>Method:</b> Visual assessment	Mandatory for: <i>Althaea officinalis</i> , <i>Peucedanum officinale</i> .

Audit Trail
<b>Rationale for species population attributes</b> (Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).
*All of the indirect attributes for suite 14 have been used in this table although some of them refer to species which have not been recorded at this site. The species may be present, but unrecorded so the use of these attributes will need to be judged during condition assessment.
Rationale for site-specific targets (including any variations from generic guidance)
Other Notes
Species at this site which are in suite 14: <i>Bupleurum tenuissimum</i> , <i>Parapholis incurva</i> , <i>Trifolium squamosum</i> , <i>Alopecurus bulbosus</i> Sources of information: S:\Designated Sites\SSSI Sites\Humber Estuary\Notification\HEDP\Features & Boundaries\Features\Plants Simon Leach (vascular plant specialist) was consulted for advice 25/03/09 on the reportable features for the site.

**Table 2j Species population objectives – Vascular plant species monitored using habitat guidance**

<b>Conservation Objective for species populations</b>	To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards.
<b>Population balance</b>	On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.

Species Feature (species or assemblage)	List supporting BAP Broad Habitats	Population Attribute (e.g. presence/absence, population size or assemblage score)	Site Specific Target range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)	Comments
<i>Hippophae rhamnoides</i>	Fixed dunes	Presence/absence (direct attribute)	<p><b>Target:</b> Species should be present at known sites: Native to east coast</p> <p><b>Method:</b> Identification of species</p>	If all other targets are met but the species cannot be found then the feature should be referred to the Country Agency botanical specialists.
<i>Festuca arenaria</i>	Strandline, embryo and mobile dunes: SD1, SD2, SD4, SD5, SD6 +	Presence/absence (direct attribute)	<p><b>Target:</b> Species should be present at known sites:</p> <p><b>South bank:</b> TF4888, TA30R, TA40, TA377030, TA377030, TA338049, TA3107, TA3206, TA3305, TA3107, TA3107, TA30I, TA3305 (1990-2002 Saltfleetby-Theddlethorpe, North Coates Point, Pye s Hall, Humberston Fitties, Cleethorpes Dunes)</p> <p><b>North bank</b> – records exist</p> <p><b>Method:</b> Identification of species</p>	If all other targets are met but the species cannot be found then the feature should be referred to the Country Agency botanical specialists.

<p><i>Carex divisa</i> <i>Ruppia cirrhosa</i></p>	<p>Pioneer saltmarsh: Equivalent NVC communities: SM4, SM5, SM6, SM7, SM8, SM9, SM11, SM12. Low-mid marsh communities: Equivalent NVC communities: SM10, SM13a, SM14. Mid-upper marsh communities: Equivalent NVC communities: SM13b,c,d, SM15, SM16, SM17, SM18, SM19, SM20, SM21, SM22, SM23, SM26, SM27 Driftline: Equivalent NVC communities: SM24 and SM25, SM28 Transitions: including mesotrophic grassland communities (e.g. MG 11, MG12, MG13) brackish mire (M28) and swamp communities (e.g. S4, S5, S18, S19, S20, S21, S26)</p>	<p>Presence/absence (direct attribute)</p>	<p><b>Target:</b> Species should be present at known sites:</p> <p><b>Carex divisa:</b> <b>South bank</b> – TA020231, TA019229, SE897246 (Whitton and Barton, 1997-9)</p> <p><b>North bank</b> – North Ferriby Ings, Spurn, Easington lagoon</p> <p><b>Ruppia cirrhosa</b> <b>South bank</b> - TA144231, TA185173, TA3900 (1993-9)</p> <p><b>North bank</b> – TA333190 with R. maritime, TA416153, TA409178, TA411170 (also Beacon and Easington Lagoon LNR, Kilnsea, Welwick saltmarsh). NE limit of GB distribution.</p> <p><b>Method:</b> Identification of species</p>	<p><b>Carex divisa</b> – declines of this species have been most marked at the W and N of its range (i.e. in SW England and E England north of the Wash). The Humber is at the northern limit, only 1 British site is further north.</p> <p>If all other targets are met but the species cannot be found then the feature should be referred to the Country Agency botanical specialists.</p>
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<p style="text-align: center;"><b>Audit Trail</b></p>	
<p style="text-align: center;"><b>Rationale for species population attributes</b> (Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).</p>	
<p><b>Assessment of indirect attributes for these species should be undertaken according to the appropriate habitat guidance provided in table 3 (Fixed dunes, Strandline, embryo and mobile dunes, Pioneer saltmarsh).</b> The key time for visiting the species in flower for assessment of direct attributes will depend on the species present. If in doubt consult a specialist. The mandatory direct measure is to assess the presence of the species.</p>	
<p style="text-align: center;"><b>Rationale for site-specific targets (including any variations from generic guidance)</b></p>	



#### Other Notes

The common couch grass sub-species *Elytrigia repens* ssp. *arenosa* has been included as a notable taxon in the notification. This grass has only recently been described as a distinct taxon and specialist opinion is that it is only known from fewer than twenty 10km squares so it should be regarded as nationally scarce. Other species of interest but not notified: *Blysmus rufus* (southern end of its GB distribution), *Anagallis tenella*, *Angelica archangelica*, *Apera interrupta*, *Althea officinalis*, *Anacamptis pyramidalis*, *Aira praecox*, *Atriplex laciniata*, *Atriplex portulacoides*, *Arenaria serpyllifolia*, *Blackstonia perfoliata*, *Blysmus rufus*, *Carex extensa*, *Catapodium marinum*, *Calystegia soldanella*, *Callitriche obtusangula*, *Carex distans*, *Catapodium marinum*, *Crambe maritima*, *Eleocharis quinqueflora*, *Dactylorhiza* sps, *Epipactis palustris*, *Eleocharis uniglumis*, *Eryngium maritimum*, *Filago vulgaris*, *Gymnadenia conopsea*, *Glaucium flavum*, *Hordeum marinum*, *Hypochaeris glabra*, *Juncus ambiguus*, *Juncus maritimus*, *Lathyrus nissolia*, *Lathyrus palustris*, *Lavatera arborea*, *Listera ovata*, *Limonium binervosum*, *Limonium vulgare*, *Lotus glaber*, *Lycopodium clavatum*, *Minuartia hybrida*, *Myosotis ramosissima*, *Ophrys apifera*, *Oenanthe crocata*, *Orobanche purpurea*, *Oenanthe lachenalli*, *Orchis simia*, *Ornithogalum angustifolium*, *Parapholis incurva*, *Parapholis strigosa*, *Petroselinum segetum*, *Phleum arenarium*, *Ruppia cirrhosa*, *Ruppia maritima*, *Ranunculus baudotii*, *Ranunculus sardous*, *Ranunculus parviflorus*, *Sagina maritime*, *Salix repens*, *Salsola kali*, *Samolus valerandi*, *Saxifraga tridactylites*, *Sison amomum*, *Sium latifolium*, *Spartina maritima*, *Stellaria pallida*, *Suaeda maritima*, *Thalictrum minus*, *Torilis nodosa*, *Tortula ruraliformis*, *Trifolium scabrum*, *Trifolium striatum*, *Triglochin palustris*, *Tolypella glomerata*, *Vulpia bromoides*, *Zostera noltei*.

This region is important for its position at the extreme of the Southern Temperate Major Biome Category in the British Isles. This accounts for the high density of regionally rare species that would not be expected to occur north of this zone even if habitats were there to support them. Southern temperate species of importance are as follows. Those marked (\*) constitute 100% of the known East Yorkshire resource; those marked (^) constitute 100% of the 'natural' resource (i.e. not on disused railways etc.):

*Aira praecox* (^), *Aira caryophylla* (^), *Callitriche obtusangula*, *Oenanthe lachenalii* (\*), *Parapholis strigosa*, *Petroselinum segetum* (\*), *Ranunculus parviflorus*, *Carex distans* (\*), *Carex extensa* (\*), *Eryngium maritimum* (\*), *Filago vulgaris*, *Juncus ambiguus* (\*), *Juncus maritimus* (\*), *Lotus glaber* (^), *Myosotis ramosissima* (^), *Ornithogalum angustifolium* (\*), *Phleum arenarium* (\*), *Sagina maritima* (^), *Saxifraga tridactylites* (^), *Trifolium striatum* (\*), *Salsola kali* (\*), *Stellaria pallida*, *Suaeda maritima* (\*), *Samolus valerandi*

The region also marks the northern limit of the Mediterranean elements and the following species are important:

*Atriplex portulacoides* (\*), *Calystegia soldanella* (\*), *Catapodium marinum* (\*), *Glaucium flavum* (\*), *Lavatera arborea* (\*), *Limonium vulgare* (\*), *Parapholis incurva* (\*), *Torilis nodosa* (^), *Trifolium suffocatum* (\*), *Blackstonia perfoliata* (^), *Catapodium rigidum* (^), *Ophrys apifera*, *Sison amomum* (\*), *Trifolium scabrum* (\*), *Vulpia bromoides* (^).

Sources of information: S:\Designated Sites\SSSI Sites\Humber Estuary\Notification\HEDP\Features & Boundaries\Features\Plants  
Simon Leach (vascular plant specialist) was consulted for advice 25/03/09 on the reportable features for the site.

**Table 2k - Species population objectives - Invertebrate assemblage**

<b>Conservation Objective for species populations</b>	To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards.
<b>Population balance</b>	On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.

<b>Species Feature (species or assemblage)</b>	<b>List supporting BAP Broad Habitats</b>	<b>Population Attribute (e.g. presence/absence, population size or assemblage score)</b>	<b>Site Specific Target range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)</b>	<b>Comments</b>
<i>Alkmaria romijni</i> Tentacled lagoon worm  Schedule 5 WCA 1981	Littoral sediment, Inshore sublittoral sediment, saline lagoons.	Presence/absence*	Target: Species is present  Measure: Identification of species	If this species is not found once in the monitoring cycle it should be referred to the invertebrate specialists.  There is no obligation to monitor Schedule 5 species, but all are included in the UK BAP. Monitoring BAP species is currently the responsibility of the BAP Lead Partner and/or Steering Group where one exists. Monitoring data for these species should be derived, where necessary, by liaison with the relevant Lead Partner. Some of the BAP-listed invertebrates are, however, impractical to monitor at present and monitoring should be started only when the steering group or lead partner considers that it has become practicable to do so as a result of new information.

<p><i>Lophopus crystallinus</i></p> <p>UK BAP freshwater bryozoan sp. Known from only 4 UK sites in last 30 years. RDB3.</p>	<p>Standing open water and canals</p>	<p>Presence/absence*</p>	<p>Target: Species is present at Barton blow wells</p> <p>Measure: Identification of species</p> <p>Discretionary target: Where the ecology is sufficiently fully understood for this to be meaningfully surveyed, an indication of actual or relative population size/extent. Estimates of numbers of individuals and/or population sizes are generally only applicable to those species which have been very well-studied and are not cryptic.</p>	<p>If this species is not found once in the monitoring cycle it should be referred to the invertebrate specialists.</p> <p>Monitoring BAP species is currently the responsibility of the BAP Lead Partner and/or Steering Group where one exists. Monitoring data for these species should be derived, where necessary, by liaison with the relevant Lead Partner. Some of the BAP-listed invertebrates are, however, impractical to monitor at present and monitoring should be started only when the steering group or lead partner considers that it has become practicable to do so as a result of new information.</p>
<p><i>Gammerus insensibilis</i></p> <p>Schedule 5 WCA 1981</p>	<p>Saline lagoon</p>	<p>Presence/absence*</p>	<p>Target: Species is present at Humberstone Fitties</p> <p>Measure: Identification of species</p>	<p>If this species is not found once in the monitoring cycle it should be referred to the invertebrate specialists.</p> <p>There is no obligation to monitor Schedule 5 species, but all are included in the UK BAP. Monitoring BAP species is currently the responsibility of the BAP Lead Partner and/or Steering Group where one exists. Monitoring data for these species should be derived, where necessary, by liaison with the relevant Lead Partner. Some of the BAP-listed invertebrates are, however, impractical to monitor at present and monitoring should be started only when the steering group or lead partner considers that it has become practicable to do so as a result of new information.</p>
<p><i>Alkmaria romijni</i> <i>Lophopus crystallinus</i> <i>Gammerus insensibilis</i></p>	<p>Littoral sediment, Inshore sublittoral sediment, saline lagoons, Standing open water and canals.</p>	<p>Food and habitat availability*</p>	<p>No more than 25% reduction from original baseline in core habitat area or abundance of foodplant <i>where the ecology is sufficiently fully understood for this to be meaningfully surveyed.</i></p>	<p>For most of these species, information may be available from invertebrate specialist support staff.</p>

<p>Invertebrate assemblages</p>	<p>Littoral sediment (coastal saltmarsh, tidal reedbed, mudflats and sandflats), Sand dunes, Standing open water and canals.</p>	<p>Direct monitoring of assemblage score based on presence/absence of specified proportion of species typical of habitat listed in ISIS.</p> <p>Monitoring should be undertaken in the following habitats: Saltmarsh, Sand dunes, Reedbeds, reedswamp, Wetlands, Freshwater pools/blow wells, Littoral sediment, using a combination of ground searching (pit fall traps), sweeping, spot-sweeping, water netting and spot sweeps in spring-summer.</p>	<p>Within any one 6 year reporting cycle both a direct and indirect (habitat based) condition assessment exercise should be carried out.</p> <p>Using defined invertebrate sampling protocols, threshold to be met for the following habitats: F11 unshaded early successional habitats (F111 = 25, F112 = 10); W12 slow flowing water and seepage (W124 = 3, W126 = 5), W21 mineral marsh and open water (W211 = 4); W22 litter rich fluctuating wetland (W221 = 7); W21 permanent wet mire (W313 = 7, W314 = 10); W53 saltmarsh, estuary and mudflat (W531 = 10)</p> <p><b>Full invertebrate assessment is required to validate assemblage types</b></p>	<p>The site unit might not be an appropriate scale to judge the site for invertebrates. Natural processes at the site, and shifts in the vegetation structure and location of microhabitats may result in invertebrates moving to different suitable areas. Therefore the apparent 'failure' of one unit where an invertebrate was first found may not necessarily fail the site for that feature. This ability of a species to migrate to a different part of the site is limited, however, by the availability and proximity of new areas of appropriate habitat and corridors to them, and the ability of individual species both to disperse and colonise nearby habitat. It is important to bear these points in mind when deciding where and at what scale to make the assessment and a general rule would be to extend the assessment technique to all similar units on a site, even if not physically connected, to assess the possibility of finding the interest habitat somewhere else on the site.</p>
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#### Audit Trail

##### Rationale for species population attributes

(Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).

David Heaver (invertebrate specialist) was consulted for advice on the reportable features for this site, 25/03/09.

\*Currently, *Alkmaria romijni*, *Lophopus crystallinus* and *Gammerus insensibilis* are not notified features so the attributes which refer to these species should be treated as discretionary. The site is currently listed as 'needing clarification' of the reportable features. The assemblages listed in the table are those which most closely match the description of habitats classed as important for invertebrates at the site. **Following a full investigation it may be that the chosen assemblages do not provide the best representation of the site features so this table will require updating once a full survey has been undertaken.**

**Rationale for site-specific targets (including any variations from generic guidance)**

**Other Notes**

Although ISIS does not rely on the same individual species with high fidelity to the habitat always being present in each monitoring event, they should be listed on the form and compared between monitoring events to evaluate if subtle changes can be detected as occurring. Along with the tentacle lagoon worm, 4 red data book species and 37 nationally scarce species are listed on the citation (see Annex 2). Saline lagoon species which are found at the site are also listed in Annex 2.

**Preferred surface and features tables for invertebrate assemblages**

**N.B. The following preferred surface and feature attributes should be incorporated into the relevant habitat attributes in Table 3 once the remainder of the FCT is completed.**

Habitat Type	Surface 0	Surface 1	Surface 2	Surface 3	Surface 4	Surface 5	Surface 6
<b>Wetland: Fen, Reed &amp; Other Swamp</b>	open water (where appropriate)	open mud or reed/sedge litter surface	short swards, usually along paths and tracks	<b>taller grasses, rush swards and herb surfaces, including those contained within reed or sedge swards</b>	<b>main reed or sedge sward surface</b>	young to medium-aged scrub - usually maintained by rotational coppice	mature scrub, developing wet woodland & wet woodland edge
<b>typical species</b>		none - or very sparse with bryophytes	grass species	<i>Thalictrum, Lysimachia, Lythrum etc</i>	<i>Phragmites, Cladium, Typha, Glyceria maxima</i>	shrubby <i>Salix spp, Alnus, Frangula, Rubus fruticosus</i>	mature shrubby <i>Salix, Alnus</i> , tree <i>Salix spp</i>
<b>Targets</b>		present in 10% of SRSs				present in 10% of SRSs, where appropriate	
	single surface present in no more than 50% of SRSs						
	3+ different surfaces present in at least 20% of SRSs						
<b>Preferred Features</b>							
scrub patches and margins - including small areas or mosaic with wet woodland		pools and pool margins		paths, tracks and their margins		localised poaching with water filled hoof prints and wet bare substrate	
flowy areas, including those on other habitats (verges, ruderal etc) including 'unwelcome' weeds such as ragwort and thistles							
<b>Negative Factors</b>							
change from grazing to mowing		closure and coalescence of scrub patches to >20% cover		excess grazing leading to loss of flowers or winter structures (seed heads - standing			

invasives balsams - *Impatiens* species

dead stems)

Habitat Type	Surface 0	Surface 1	Surface 2	Surface 3	Surface 4	Surface 5	Surface 6
<b>Wetland: Seepages and Flushes</b>	Thin water film	Bare muds and tufas, with algal mats and bryophytes, some low higher plants	Low sward	taller closed swards	young scrub and tall emergent herbs	extensive mature scrub, & trees - (emphasis on edges of unit)	
<b>typical species</b>	Algae, sub surface lower plants	<i>Palustriella</i> ( <i>Cratoneuron</i> ) moss, <i>Anagalis tenella</i> , <i>Montia fontana</i>	<i>Mentha</i> spp, <i>Valeriana dioica</i> , <i>Caltha palustris</i>	<i>Juncus</i> spp, <i>Oenanthe</i> spp <i>Iris</i> , <i>pseudacorus</i> ,	<i>Salix</i> , <i>Alnus</i> , <u>dense</u> <i>Eupatorium cannabinum</i> , <i>Filipendula ulmaria</i> , <i>Epilobium hirsutum</i>	as surface 5 + tree species	
<b>Targets</b>	present in 20% of SRSs single surface present in no more than 50% of SRSs  2+ different surfaces present in at least 20% of SRSs	present in 20% of SRSs	present in 20% of SRSs		present in <30% of SRSs	present at most only at edges of unit	
<b>Preferred Features</b>							
areas of tufa deposition		patches of giant horsetail - <i>Equisetum telmateia</i>		springs		very shallow surface water - record still and flowing separately	
patches of flowers - <i>Pulicaria dysentrica</i> small areas of <i>Eupatorium cannabinum</i> etc		moss carpets - especially if combined with tufa or surface water		small scale accumulation of plant litter			
<b>Negative Factors</b>							
evidence of drainage or ponding of water		scrub development leading to shading		overgrazing - excessive trampling and churning of soft ground, moss carpets etc			
evidence of eutrophication - nettles, elder, large continuous stands of <i>Epilobium hirsutum</i> and <i>Filipendula ulmaria</i> Invasives: scrub species, <i>Impatiens glandulifera</i>							

## Water bodies - Ponds, Pools, Ditches, Reeds & Lakes

Habitat Type	Layer 1/ 1*	Layer 2/2*	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7
<b>Water body : Preferred Layers</b>	<b>Bare substrate or detritus (Layer 1)</b>	Benthic layer	<b>Water Column layer</b>	<b>Water Surface layer</b>	<b>Low emergent layer</b>	High emergent layer	
<b>typical species</b>	Nothing or algal mats,	<i>Chara spp, Lobelia, Littorella</i>	<i>Ceratophyllum, Calitriche, Myriophyllum, Potamogeton spp</i>	<i>Nuphar, Nymphaea Stratiotes, crowfoots Ranunculus etc Glyceria fluitans, Polygonum amphibium</i>	<i>Alisma, Ranunculus flammula, Mentha, etc etc Eleocharis</i>	<i>Sparganium, Phragmites, Typha, Glyceria maxima Schoenoplectus sp Butomus, Saggitaria</i>	
<b>Margins : Preferred Surfaces</b>	<b>Wet muds, peats or thin water covered substrates (Bay Layer 1*)</b>	<b>marginal hygrophilic vegetation forbs- (Herb layer 2*)</b>	young to medium-aged scrub - often maintained by rotational coppice	mature scrub, developing wet woodland & wet woodland edge			
<b>typical species</b>	Bare, maybe with algal mats, sparse higher plants	<i>Lycopus, Scutellaria etc, grazed grassy vegetation</i>	<i>marginal Salix spp, Alnus, Frangula</i>	mature 2.5m + shrubby <i>Salix, Alnus, Salix tree spp</i>			
<b>Targets</b>	Which Surfaces and Layers required critically depends on the <b>successional stage required</b>						
	single surface present in no more than 5 out of 10 SRSs						
	>3 different surfaces present in at least 20% of SRSs						
<b>Preferred Features</b>							
(in oligotrophic waters) good benthic vegetation structure small patches of marginal scrub or trees	complex structure of submerged vegetation (where appropriate) fallen wood in water		areas with high proportion of macrophytes with floating leaves 'bay' areas of bare wet sediment		any emergents with abundant flowers		
<b>Negative Factors</b>							
steeply shelving banks	deepening of shallow water		excessive stock access to banks		eutrophication characterised by green algal blooms		
addition of large fish (trout & coarse fish) to otherwise fish-free water aquatic and marginal invasive species - <i>Azolla, Lemna minuta, Crassula, Hydrocotyle</i> etc	removal of fallen timber from water		excessive marginal trees and scrub leading to excess shading >50% of margin				

Habitat Type	Surface 1	Surface 2	Surface 3	Surface 4	Surface 5	Surface 6	Surface 7
<b>Coast: Grey Sand Dunes</b>	bare sand or very sparse short pioneer vegetation or meagre lichen/bryophyte cover	short grass swards and dwarf xerophytic forbs, usually with bare sand	longer grasses & forbs usually with bare sand	longer closed swards without bare sand	young scrub	extensive mature scrub, & trees	
<b>typical species</b>	<i>Anagalis arvensis</i> , <i>Myosotis ramosissima</i> etc xerophytic lichens bryophytes	<i>Festuca ovina</i> , <i>Sagina &amp; Cerastium</i> <i>spp</i> , <i>Sedum acre</i> , <i>smaller Geranium</i> <i>spp</i> <i>Erodium</i> , <i>Plantago spp etc</i>	<i>Euphorbia spp</i> , <i>Senecio</i> <i>Cynoglossum</i> , <i>Leymus arenarius</i> <i>etc</i>	<i>Leymus arenarius</i> , <i>Dactylus glomeratus</i> , <i>Cirsium</i> <i>spp</i>	<i>Ligustrum</i> , <i>Betula</i> , <i>Crataegus</i> , <i>Rubus</i> <i>fruticosa</i> , <i>Hippophae etc</i>	as surface 5 + tree species	
<b>Targets</b>	present in 20% of SRSs	present in 20% of SRSs	present in 20% of SRSs	present in <30% of SRSs		present in <30% of SRSs	
single surface present in no more than 50% of SRSs							
2+ different surfaces present in at least 20% of SRSs							
<b>Preferred Features</b>							
paths & tracks with mild erosion, including marginals 'microcliffs' transitions to other parts of dune system, slacks & saltmarsh		small areas of bare sand		limited areas of rabbit warrening		small patches of scrub, especially that creating shelter and with flowers	
flowerly areas, including those on other habitats (verges, sea banks, ruderal areas etc) including 'unwelcome' weeds such as ragwort and thistles							
<b>Negative Factors</b>							
totally closed grassy swards		large sand blows -		horse access along tracks and paths causing churning		path surfacing with stones, hoggin, woodchip, tarmac etc	
Invasives: =- excessive scrub development - >20% cover by willow, privet, birch, tree species, especially aliens							

Habitat Type	Surface 1	Surface 2	Surface 3	Surface 4	Surface 5	Surface 6	Surface 7
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<b>Coast: Dune Slacks</b>	<b>Wet / damp bare sands or v sparse short pioneer vegetation</b>	<b>short dense 'graminoid' swards</b>	<b>Low scrub or taller grasses</b>	Taller scrub	extensive mature scrub
<b>typical species</b>	Liverworts, low mosses, <i>Poa</i> , short <i>Holcus</i>	<i>Hydrocotyle vulgaris</i> , <i>Ononis repens</i> , <i>Poa</i> , <i>Pyrola rotundifolia</i> , <i>Holcus</i>	<i>Salix repens</i> , <i>Holcus</i> , <i>Festuca</i> ,	<i>Salix spp</i> , <i>Hippophae</i> , <i>Ligustrum</i>	as surface 4 + tree species
<b>Targets</b>	present in 20% of SRSs	present in 20% of SRSs	present in <20% of SRSs but present in >5% where appropriate	present in <10% of SRSs	
single surface present in no more than 50% of SRSs					
2+ different surfaces present in at least 20% of SRSs					
<b>Preferred Features</b>					
vernal pools and margins small patches of tall scrub - willow		permanent pools and margins scrub margin with flowers	naturally fluctuating water surface dynamics any areas of bare wet sand, including tidal areas of slacks open to the sea or saltmarsh	stands of creeping willow creeks leading into and out of the slacks	
flowery areas, including those on other habitats (verges, sea banks, ruderal areas etc) including 'unwelcome' weeds such as ragwort and thistles					
<b>Negative Factors</b>					
closure of open ground, especially bare wet sand beside pools invasive species		large stands of willow scrub			

Habitat Type	Surface 1	Surface 2	Surface 3	Surface 4	Surface 5	Surface 6	Surface 7
<b>Coast: Fore Dunes</b>	<b>Sand surface</b>	Lower strandline, more transitory	<b>Upper strandline – more permanent</b>	Pioneer sand binders			
<b>typical species</b>	bare	Seaweed wrack, drift material, transitory litter	<i>Honkenya</i> , <i>Cakile</i> , <i>Atriplex</i> etc Seaweed wrack, larger drift material, including driftwood & artificial materials	<i>Elymus</i> , <i>Ammonophila arenaria</i> ,			
<b>Targets</b>	present in at least 70% of SRSs		present along at least 20% of high water line				
<b>Preferred Features</b>							

large areas of bare sand transitions to other parts of dune system, grey dunes, accreting foreshore, saltmarsh	sandblows upper strandline forbs bearing nectar bearing flowers e.g. <i>Cakile</i> , <i>Honkenya</i> <i>Tripleurospermum</i> , etc	upper strandline	driftwood - natural and of human origin
<b>Negative Factors</b> evidence of beach cleaning of the upper strandline	changes to erosion/deposition cycle dynamics resulting from human activity	vehicle access to upper shore, especially strandline area	groynes, gabions and revetments

Habitat Type	Surface 0	Surface 1	Surface 2	Surface 3	Surface 4	Surface 5	Surface 6
<b>Coast: Saltmarsh (the upper saltmarsh)</b>	Brackish water in creeks and pools	<b>Bare sand, silt or mud</b>	<b>Sparse low halophytic vegetation</b>	<b>Taller halophytic / brackish tolerant vegetation</b>	<b>Taller graminoid swards</b>	scrub	
<b>typical species</b>	Algal community, some green seaweeds	unicellular algae or very incomplete filamentous algal film	<i>Salicornia</i> , <i>Cochlearia</i>	<i>Atriplex</i> , <i>Suaeda</i> , <i>Artimisia</i> , <i>Aster</i> , <i>Halimione</i> , <i>Plantago</i> ,	<i>Phragmites</i> , <i>Scirpus</i> , <i>Juncus</i>	<i>Salix spp</i>	
<b>Targets</b>		present in at least 20% of SRSs				present in <5% of SRSs	
	single surface present in no more than 50% of SRSs						
	2+ different surfaces present in at least 20% of SRSs						
<b>Preferred Features</b>							
upper strandline litter of both dead graminoid and woody material		natural transition from lower saltmarsh, through upper saltmarsh to other habitat (e.g. freshmarsh, dunes (including slacks), wet grassland etc		high structural heterogeneity resulting from long history of no grazing		presence of flowering saltmarsh forbs - notable <i>Aster</i>	
pools at various shore levels, including high shore hypersaline pools flowery areas, including those on other habitats		flat hard sand/silt at upper edge of creeks and estuaries (verges, sea banks, ruderal areas etc) including		vertical erosion clifflets high on the shore, especially (though not exclusively) if sandy		freshwater creeks in the upper shore	
<b>Negative Factors</b>		loss of forbs and heterogeneity through grazing		over-dominance by grasses resulting from past grazing		introduction of grazing to naturally long - ungrazed saltmarsh	
truncated succession through loss of upper saltmarsh, sea bank or concrete or gabion sea defences							

**Table 2l Species population objectives - Natterjack toads**

<b>Conservation Objective for species populations</b>	To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards.
<b>Population balance</b>	On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.

<b>Species Feature (species or assemblage)</b>	<b>List supporting BAP Broad Habitats</b>	<b>Population Attribute (e.g. presence/absence, population size or assemblage score)</b>	<b>Site Specific Target range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)</b>	<b>Comments</b>
Natterjack toad <i>Bufo calamita</i>	Sand dunes	Toadlet production (metamorphs emerging from breeding ponds <sup>1</sup> )	Target = For at least 1 year in every 4 years, each breeding pond to have baseline toadlet production <sup>2</sup> +/- 1 order of magnitude. Fail if zero production at all breeding ponds for 3 consecutive years.  Measure: Visual assessment of number seen at emergence (mid-May – July, depending on site), using log scale (0, 1s, 10s, 100s etc). Assess every year. 3 - 6 daytime visits required per year to identify peak number, depending on conditions.	<sup>1</sup> Breeding pond = a pond in which spawn is laid and successful metamorphosis is likely to occur at least 1 in every 4 years. <sup>2</sup> Baseline toadlet production = the number of emerging toadlets recorded at designation or in best year within 3 years of designation, if higher.
Natterjack toad <i>Bufo calamita</i>	Sand dunes	Aquatic macrophyte cover and shading	Target = >90% of breeding ponds to have: aquatic macrophyte covering/shading less than 25% of surface, and no scrub solidly shading southern margin of pond. Target may be adjusted to suit pond characteristics.  Measure = Visual assessment April-June. Record once every 3 years.	
Natterjack toad <i>Bufo calamita</i>	Sand dunes	Breeding pond presence	Target = No net loss in extent or number of breeding ponds.  Measure = Visual assessment March-September. Record once every 3 years.	In exceptional cases, a net loss may be acceptable if enhancements are made to remaining ponds.

Natterjack toad <i>Bufo calamita</i>	Sand dunes	Terrestrial habitat in proximity of breeding ponds - extent	<p>Target = No loss of area, or fragmentation, compared to designation status</p> <p>Measure = Visual assessment by walking site; most semi-natural habitats within 500m of breeding pond to be included. Map conditions at designation. Assess at any time of year. Record once every 3 years.</p>	Map suitable habitat at designation. Normally includes: bare ground, short-sward grassland, marram, ericaceous vegetation. Excludes woodland, scrub and dense, rank, grassland swards.
Natterjack toad <i>Bufo calamita</i>	Sand dunes	Terrestrial habitat in proximity of breeding ponds - condition	<p>Target = Set site-specific targets according to conditions. Use the following as a guide. Habitat structure to be open, with: no significant encroachment of dense scrub vegetation, and areas of low sward to remain low (height approx 1cm), and bare/sparsely vegetated areas to remain as such, and bare sand, slag or rock piles.</p> <p>Measure = Visual assessment by walking site. Map conditions at designation. Assess at any time of year. Record once every 3 years.</p>	Scrub encroachment: Pine, willow, birch and sea buckthorn scrub are of particular concern. Bare sand, slag or rock piles are used for burrowing and there should be some adjacent to breeding ponds.
Natterjack toad <i>Bufo calamita</i>	Sand dunes	Breeding pond persistence	<p>Target = Minimum summer water depth 5cm for at least 75% of breeding ponds on each year of assessment. Target may be adjusted according to pond type.</p> <p>Measure = Record approximate depth of water in identified breeding ponds between mid-May and July (timing dependent on normal metamorphosis date for area). Visual assessment is suitable. Record once every 3 years.</p>	Between-visit variation due to ephemeral nature of breeding ponds is likely. Target setting may require examination of historical site records and weather conditions to assess normal desiccation pattern.
Natterjack toad <i>Bufo calamita</i>	Sand dunes	Discretionary attribute: Breeding pond water quality (saltmarsh sites and saltmarsh ponds seaward of dunes only)	<p>Target = Breeding ponds exposed to seawater inundation.</p> <p>Measure = Assess by autumn or early spring site visit, according to local conditions. Record once every 3 years.</p>	Recharging by freshwater (inundation by run-off or rainfall) in late spring is essential but should be accommodated by other attributes.

<b>Audit Trail</b>
<b>Rationale for species population attributes</b> (Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).
<b>Rationale for site-specific targets (including any variations from generic guidance)</b>
<b>Other Notes</b>
The natterjack toad is an interest feature of the Humber Estuary Ramsar site and is not listed on the criteria for designation of the Humber Estuary SSSI. It is recorded from the Saltfleetby-Theddlethorpe Dunes SSSI within the Ramsar site and so reference should be made to the conservation objectives for that site for site specific targets.

**Table 3a Site-Specific definitions of Favourable Condition - Estuary**

<b>CONSERVATION OBJECTIVE FOR THIS HABITAT / GEOLOGICAL SITE-TYPE</b>	To maintain the <b>Estuary</b> at <b>Humber Estuary</b> in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:
<b>Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)</b>	

<b>Site-specific standards defining favourable condition</b>					
Criteria feature	Attribute term in guidance	Measure	Site-specific Targets	Comments	Use for CA?
Estuary	Distribution/spatial pattern of habitats	Assessment of the distribution of habitats identified for the site. Confirm the presence of named habitats at selected locations along the length of the estuary. The habitats will be representative of a range of estuarine environments from fully marine to freshwater. The sites will be selected to represent the limits of the range of the habitats along the salinity gradient of the estuary	<p>Maintain the pattern of distribution of predominant habitats throughout the feature.</p> <p>These habitats are:                      Subtidal sediment communities                      Sandbanks which are slightly covered by seawater all the time<sup>1</sup>                      Intertidal mudflats and sandflats<sup>1</sup>                      Atlantic salt meadows<sup>1</sup>                      Salicornia and other annuals colonising mud<sup>1</sup>                      Saline lagoons<sup>1</sup>                      Sand dunes; fixed, dune slacks, embryo<sup>1</sup>                      Open standing water<sup>1</sup></p> <p><sup>1</sup> Interest features in their own right in the site.</p>	<p>Where changes in distribution/spatial pattern are clearly attributable to cyclical succession or expected shifts in distribution, or they occur as a consequence of natural geomorphological changes in the estuary (e.g. change in the position of the low water channel) then the target value should accommodate this variability. Where there is a change in distribution/ spatial pattern outside the expected variation or a loss of the conservation interest of the site, possibly as a consequence of anthropogenic developments, then condition should be considered as unfavourable.</p> <p>For habitats which are interest features in their own right see the other sections of this table.                      Subtidal sediment communities should be assessed for the extent of characteristic subtidal sediment biotopes, this distribution and extent should not deviate from the baseline. The variety and location of subtidal biotopes are important structural and functional aspects of the interest feature. They demonstrate biological assemblages representative of a range of salinity conditions. Changes in extent and distribution may indicate long term changes in the physical condition of the estuary interest feature.</p>	Yes

<sup>1</sup>Individual interest features in their own right in the site.

Estuary	*Morphological equilibrium	<p>The TP/CS ratio of selected sites along the estuary should periodically be assessed. The horizontal boundary of mudflats/saltmarsh interface and the distribution of sandbanks and drainage channels should be measured periodically against an aerial image.</p> <p>NB. TP = Tidal Prism (total volume of water crossing a given cross section during the flood tide (m<sup>3</sup>). CS = Area of a given cross section at high water springs (m<sup>2</sup>).</p>	<p>Maintain the characteristic physical form and flow of the estuary.</p> <p>Baseline to be established. Potential data source: EA LiDAR data</p>	<p>Intra- and inter- estuarine TP/CS ratio/relationship should not deviate significantly from an established site- specific baseline. The horizontal boundary of mudflats/saltmarsh interface and the topography of sedimentary features, including the distribution of sandbanks and drainage channels, should not deviate significantly from a baseline. Where changes are attributable to cyclical natural processes, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site, (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable.</p>	
Estuary	Sediment budget	<p>Evaluation of the sediment fluxes, sources and sinks, using a variety of measures including bathymetry, suspended sediment concentrations, fluvial and marine influx/efflux, man-made changes (e.g. navigational dredging/marine minerals extraction), cliff erosion etc)</p>	<p>No decrease in sediment budget from the established baseline</p> <p>Baseline to be established using data from;</p> <p>Humber Estuary Coastal Habitat Management Plan, CHaMP,(2005)</p> <p>ABP Humber Estuary Services. Humber Maintenance Dredging Baseline Document (2008)</p>	<p>A sediment budget is a balance of the sediment volume entering and exiting a particular section of the coast or an estuary. Sediment budget analysis consists of the evaluation of sediment fluxes, sources and sinks from different processes that give rise to additions and subtractions within a control volume (e.g. a section of coast or an estuary) in order to gain a better understanding of the estuary system.</p> <p>An estuary provides a readily defined control volume, where point sources and sinks exist in the form of rivers, other terrestrial outfalls and the open sea. Line sources and sinks may be defined in terms of erosion from cliffs and transfers to or from saltmarshes, wetlands or other intertidal areas. The subtidal beds also needs consideration as an important source/sink as does material stored in suspension within the volume of water that moves back and forth under tidal action within the estuary.</p> <p>Identification and quantification of all the mechanisms giving rise to sediment transfers can be difficult, and for the most part are approximate estimates of sediment exchange between sources and sinks.</p>	Yes
Estuary	Salinity	<p>Assessment of salinity at key locations in the estuary,</p>	<p>Salinity gradient throughout the estuary should not deviate</p>	<p>Where changes in salinity are due to natural processes, such as high rainfall, then this will be considered to be a normal change</p>	Yes

		<p>measured periodically throughout the reporting cycle. Confirm the presence of named species/ biotopes at selected locations along the length of the estuary. The species/ biotopes will be representative of a range of estuarine environments from fully marine to freshwater. The sites will be selected to represent the limits of the range of the species/biotopes on the salinity gradient of the estuary.</p>	<p>significantly from an established baseline, subject to natural change and taking into account natural change in the area of transition from fully marine to freshwater environments.</p> <p>Baseline to be established.</p>	<p>to the feature and condition may be considered favourable if it does not compromise the conservation interest of the feature. Where changes in salinity through adverse impacts (e.g. industrial discharges, water abstraction) cause a loss or shift in community structure, such that the conservation interest is adversely affected, then condition should be judged as unfavourable.</p>	
Estuary	<p>Water quality</p> <p>Physio-chemical parameters (including temperature, dissolved oxygen, nutrients, pH)</p>	<p>Water quality parameters could be assessed directly using in water measurements or in appropriate biota, or using one or more indicators (for example, indicators of nutrient status are phytoplankton levels, chlorophyll-a concentrations or through the presence/thickness of green algal mats)</p>	<p>Target values should default to appropriate national or international standards where appropriate.</p> <p>Physio-chemical parameters should not pose a risk to the ecology* of the habitats and species of the SAC, SPA or Ramsar Site.</p> <p>Levels should comply with targets established under the EA Review of Consents and the Water Framework Directive.</p>	<p>Water quality standards are currently being established by the environmental protection agencies for European Directives (Water Framework Directive, Urban Waste Water Treatment Directive) and the OSPAR Convention. Monitoring data are or will be available from these agencies to support feature assessment under common standards monitoring. In all cases, local measurements should be compared with regional or national assessments to establish whether any local changes are part of a wider trend. Eutrophication due to effluent discharge or agricultural run-off will result in the condition of the attribute being designated as unfavourable.</p> <p>*i.e. does not compromise the quality, extent, distribution or species composition of habitats or their ability to support species features (e.g. feeding, breeding, resting) – the outcome sought is the healthy functioning of the estuary.</p>	Yes

**Audit Trail**

**Rationale for limiting standards to specified parts of the site**

**Rationale for site-specific targets (including any variations from generic guidance)**



<b>Rationale for selection of measures of condition (features and attributes for use in condition assessment)</b> (The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).
<b>Other Notes</b> Note that the estuaries feature is an over-arching feature which includes other notified features (interpreted as subfeatures). Many of the key subfeatures have its own FCT, which should be consulted when reporting on condition.

**Table 3b Site-Specific definitions of Favourable Condition - Saltmarsh**

<b>CONSERVATION OBJECTIVE FOR THIS HABITAT / GEOLOGICAL SITE-TYPE</b>	To maintain the <b>Littoral Sediment (coastal saltmarsh)</b> at <b>Humber Estuary</b> in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:
<b>Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)</b>	

<b>Site-specific standards defining favourable condition</b>					
<b>Criteria feature</b>	<b>Attribute term in guidance</b>	<b>Measure</b>	<b>Site-specific Targets</b>	<b>Comments</b>	<b>Use for CA?</b>
Littoral Sediment : Saltmarsh (including Atlantic Salt Meadows)	Vegetation structure: zonation of vegetation	The width of zones can be estimated using one or more transects extending from strand to lowest continuous marsh. The GPS information can be collected and marked on a map.	Maintain the baseline range of saltmarsh zonation for the inner, middle and outer estuary, NVC communities and Annex 1 habitats.  The baseline should be taken as that recorded in the Bullens (2001) and Dargie (2001) surveys. NB – No NVC survey data as a baseline for the Trent SSSI extension.	The NVC saltmarsh categories recorded within the Humber Estuary (Bullens 2001): Pioneer marsh: dominated by SM6, some SM8; Low- mid marsh: SM10 SM11, SM12 SM13. SM13a, SM13b, SM13c, SM13f, SM14, SM14a, SM14c; Mid-upper marsh – SM15, SM16. Upper marsh is unusually dominated by SM24. Transitional communities SM28, SM4.  The NVC saltmarsh categories recorded on North Lincolnshire coast (Dargie, 2001): Large extent of pioneer marsh (SM6, SM8, SM 9, SM10, SM11, SM12); Low-mid-marsh SM10, SM11, SM12, SM13 SM14, Mid -	Yes

				Upper marsh SM15, SM16, SM24 extensive.  The outcome sought is the maintenance of the general character of the saltmarshes of the Humber in terms of the continued presence and variation of the saltmarsh zones with local differences reflected – it is not to seek the retention of zones in situ but to allow them to shift and evolve in line with natural processes. Transitional communities MG11.	
Littoral Sediment :  Saltmarsh (including Atlantic Salt Meadows)	Vegetation structure: sward height	This can be assessed by taking average sward height from the quadrats forming part of the structured walk	Maintain site-specific structural variation in the sward.  For marshes currently and/or historically grazed or cut maintain the saltmarsh area as a mosaic of short turf swards (5 – 15 cm) interspersed with areas of tussocks (>15cm). These habitats should ideally occur together in roughly equal amounts, although actual levels will be determined by accessibility to grazing animals/birds, vulnerability to coastal erosion as well as the distribution and requirements of nationally important species.	Stocking levels need to be appropriate to the interest of the site. Over-grazing, and under-grazing, can lead to loss of rare plant species and affect bird breeding and feeding habitats, in addition under-grazing can lead to a loss of plant diversity by competitive exclusion. A varied vegetation structure is important for maintaining invertebrate diversity.	Yes
Littoral Sediment :  Saltmarsh (including Atlantic Salt Meadows)	Vegetation composition: characteristic species	Visual assessment of cover, using structured walk	Maintain frequency of characteristic species of saltmarsh zones for the inner, middle and outer Estuary as follows:  The generic guidance data should be followed with addition to the specific species listed below.  <u>Inner Estuary</u> Pioneer Zone: <i>Scirpus maritimus</i> should be at least frequent. Low-mid marsh: <i>Phragmites</i> should be at least frequent. Transitional zone: <i>Elymus repens</i> should be at least frequent. Typical MG11 species should be present ( <i>Agrostis stolonifera</i> , <i>Potentilla anserina</i> , <i>Festuca rubra</i> ).	Communities may be dynamic in their distribution and are linked to the physical processes operating at the site, including topography, creek patterns etc.  <u>Generic guidance for saltmarsh;</u> <u>Pioneer zone:</u>  At least one of the following species frequent and another occasional: <i>Salicornia</i> spp, <i>Suaeda maritime</i> , <i>Puccinellia maritime</i> , <i>Aster tripolium</i> .  <u>Low-mid marsh:</u> At least one of the following species dominant: <i>Puccinellia maritime</i> , <i>Atriplex portulacoides</i> ; and two of the following species at least frequent:	Yes

			<p><u>Middle Estuary</u> Maintain the frequency of characteristic species of saltmarsh zones typical of the <u>inner</u> estuary for:</p> <ul style="list-style-type: none"> <li>- Humber bridge to Saltend,</li> <li>- Humber bridge to Skitterness</li> </ul> <p>Maintain frequency of characteristic species of saltmarsh zones typical of the <u>outer</u> estuary for:</p> <ul style="list-style-type: none"> <li>- Saltend to Hawkins Point</li> <li>- Skitterness to Dover Strand</li> </ul> <p><u>Outer Estuary</u> Mid – upper zone: <i>Elytrigia atherica</i> should be at least frequent. Transitional zone: <i>Phragmites</i> and <i>Scripus maritimus</i> should be at least frequent.</p> <p>Baselines should be taken from Bullens (2001) and Dargie (2001) surveys.</p>	<p><i>Puccinellia maritima</i>, <i>Triglochin maritima</i>, <i>Plantago maritima</i>, <i>Atriplex patula</i>, <i>Aster tripolium</i>, <i>Spergularia maritima</i>, <i>Suaeda maritima</i>, <i>Salicornia</i> spp.</p> <p><u>Mid-upper marsh:</u> At least one of the following species abundant and three frequent: <i>Festuca rubra</i>, <i>Juncus gerardii</i>, <i>Agrostis stolonifera</i>, <i>Limonium vulgare</i>, <i>Armeria maritima</i>, <i>Artemisia maritima</i>, <i>Plantago maritima</i>, <i>Glaux maritima</i>, <i>Aster tripolium</i>, <i>Juncus maritimus</i>, <i>Triglochin maritima</i>, <i>Eleocharis uniglumis</i>, <i>Blysmus rufus</i>, <i>Seriphidium maritimum</i>, <i>Leontodon autumnalis</i>, <i>Carex flacca</i>, <i>Carex extensa</i>, turf fucoids, <i>Sueda vera</i>.</p>	
Littoral Sediment :  Saltmarsh (including Atlantic Salt Meadows)	Indicators of local distinctiveness*	Presence confirmed during visit at appropriate season (list species, add DAFOR score, mark locations on map(s) in file).	<p>Maintain distinctive elements at current extent/levels and/or in current locations (Baselines should be taken from Bullens (2001) and Dargie (2001) surveys).</p> <p>For transitional reedbed habitats, S4, S21, S26. <i>Phragmites</i> and <i>Scripus maritimus</i> are positive indicators however <i>Atriplex prostrata</i> (S21b) and <i>Agrostis stolonifera</i> (S21c) sub-communities are more species-rich and of greater conservation interest.</p> <p>Maintain existing populations of notable species below.</p> <ul style="list-style-type: none"> <li>- Curved hard-grass (<i>Parapholis incurve</i>)</li> <li>- Slender hares ear (<i>Bupleurum tenuissimum</i>)</li> <li>- Common couch (sub sp. <i>Elytrigia repens</i> ssp. <i>arenosa</i>)</li> <li>- Divided sedge <i>Carex divisa</i></li> </ul>	The extent of transitional reedbed habitats is of importance for birds and invertebrates. The structure of the reedbed should reflect the requirements of dependant species (e.g. bitterns) and should not be encroached by litter (<25% ground cover), open fen (<10%), exposed substrate (<10%) or woody species, ( <i>Betula</i> , <i>Salix</i> , <i>Rhododendron</i> , <i>Pinus</i> ) which should be no more than scattered.	Yes

			- Spiral tassleweed <i>Ruppia cirrhosa</i>		
Littoral Sediment : Saltmarsh (including Atlantic Salt Meadows)	Vegetation composition: negative indicator species <i>Spartina anglica</i>	Aerial photographs, together with visual assessment of cover, using structured walk	No recent evidence of expansion of <i>Spartina</i> (SM6) into pioneer saltmarsh (indicative target of less than 10 % expansion in last 10 years). Less than 1% by area in any unit.	<i>Spartina anglica</i> is a species that is considered undesirable in intertidal habitats where it is expanding at the expense of mudflats (see Section 7.2). However it can be a precursor to the development of saltmarsh where sediments are accreting. Natural die- back has occurred in some areas.	Yes
Littoral Sediment : Saltmarsh (including Atlantic Salt Meadows)	Physical structure: creeks and pans	Aerial photographs can be used in combination with information gathered from site visits.	Realignment of creeks absent or rare.  No further anthropogenic alteration of creek patterns or loss of pans compared to an established baseline.	Creeks and pans vary in size and density. Creeks absorb tidal energy and assist with the delivery of sediment into saltmarshes. Major erosion of saltmarsh is indicated by internal dissection and enlargement of the drainage network, ultimately leading to the creation of mud basins.  Site files (existing consents etc.) will indicate creeks etc subject to anthropogenic alteration.	Yes
Littoral Sediment : Saltmarsh (including Atlantic Salt Meadows)	Other negative indicators	Visual assessment during site visit	Turf cutting absent or rare  Artificial drainage channels adversely affecting hydrology are absent or rare  No obvious signs of pollution (including fly tipping).  No increase in bare substrate as a result of anthropogenic activities such as vehicle use or trampling at vulnerable locations (tracks, access points)  Poaching damage from stock or horses rare, with bare mud extent <5% No obvious signs of pollution.	Baseline levels are determined at the time of notification of the site or from the time authorisation was granted for the operation to be undertaken on the SSSI.	Yes

<b>Audit Trail</b>
<b>Rationale for limiting standards to specified parts of the site</b>
<b>Rationale for site-specific targets (including any variations from generic guidance)</b>
Species added to the generic list for vegetation composition reflect local species diversity.
<b>Rationale for selection of measures of condition (features and attributes for use in condition assessment)</b> (The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).
<b>Other Notes</b>
Sources: Bullen Consultants, 2001. National Vegetation Classification (NVC) of Humber Estuary. Report to English Nature. Dargie, T. 2001. An NVC survey of the North Lincolnshire Coast SSSI. Peterborough: English Nature.

**Table 3d Site-Specific definitions of Favourable Condition – Inshore sublittoral sediment**

<b>CONSERVATION OBJECTIVE FOR THIS HABITAT / GEOLOGICAL SITE-TYPE</b>	To maintain the <b>Inshore sublittoral sediment</b> at <b>Humber Estuary</b> in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:
<b>Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)</b>	

Site-specific standards defining favourable condition					
Criteria feature	Attribute term in guidance	Measure	Site-specific Targets	Comments	Use for CA?
Inshore sublittoral sediment  (Subtidal sandbanks)	Distribution of biotopes	Assessment of the distribution of (a) biotope(s) identified for the site.  See Davies et al 2001 for methodological details.	Maintain the distribution of biotopes, allowing for natural succession/ known cyclical change.  Currently no mapped baseline.	Where changes in distribution are known to be clearly attributable to cyclical succession or expected shifts in distribution then the target value should accommodate this variability. Where there is a change in biotope distribution outside the expected variation or a loss of the conservation interest of the site, then condition should be considered unfavourable.  Subtidal biotopes found in the Humber Estuary are listed in Allen et al. 2003, however these have never been mapped. In addition to this EA studies on the benthic invertebrate communities give an insight into the species composition across the Estuary and the different community types present (IECS, 2007).	Yes
Inshore sublittoral sediment  (Subtidal sandbanks)	Sediment character: sediment type	Distribution of sediment types should be assessed across the whole feature and compared with baseline conditions.  See Davies et al 2001 for methodological details.	No change in composition of sediment types across the feature, allowing for natural succession/ known cyclical change.  Key document for baseline information; ABPmer Ltd. 2008.Humber Subtidal Sandbanks (R.1489)	Where changes in sediment type are known to be clearly attributable to natural processes then the target value should accommodate this variability. Where extreme events cause a change in sediment type, then this may have caused a change in the structure of the feature, which may lead to the condition of the feature being considered as unfavourable.	Yes

			<p>ABP Humber Estuary Services. 2008. Humber Maintenance Dredging Baseline Document.</p> <p>Data on sediment character also available from EA's 1995 quinquennial survey and subsequent routine surveys (2000-2004).</p>		
<p>Inshore sublittoral sediment  (Subtidal sandbanks)</p>	<p>Topography</p>	<p>Assessment of the depth distribution/profile of the inshore sublittoral sediment and periodic comparison with baseline conditions.</p>	<p>No alteration in topography of the inshore sublittoral sediment, allowing for natural responses to hydrodynamic regime.</p> <p>Key document for baseline information;</p> <p>Black &amp; Veatch. 2004 Humber Estuary Management Plan – Phase 2. Summary of geomorphology studies.</p> <p>ABP Humber Estuary Services. 2008. Humber Maintenance Dredging Baseline Document.</p> <p>Other data sources – EA/ABP Bathymetry data, Admiralty charts.</p>	<p>The depth distribution of the sediment has a direct influence on the structure and function of the system.</p> <p>Sedimentation within the Humber Estuary originates from two sources; sediment from the North Sea, transported by tidal flows, and the sediment load from river outputs. Erosion and deposition can cause considerable natural change to the subtidal system (and related intertidal).</p> <p>Maintenance dredging is required within the Estuary for commercial and recreational transport. There is a record of dredging maintenance since the late 1700s (ABP, 2008) and it is one of the ongoing processes in the Estuary. Habitat Regulations should be applied to assess the impact of any new dredging proposals to assess on the integrity of the site and sub-feature.</p>	<p>Yes</p>

Inshore sublittoral sediment (Subtidal sandbanks)	Extent of sub-feature or representative/notable biotope(s)	Assessment of the extent of the sub-features subtidal gravels and sands and subtidal muddy sands identified for the site because of their nature conservation importance.	No change in extent of the inshore sub-littoral sediment sub-feature identified for the site allowing for natural succession/ known cyclical change.	Where there is clearly established natural variation in extent or in cyclical succession between biotopes, then the target value should accommodate this variability. Where there is a change in extent outside the expected variation or a change in the structure of the sub-feature leading to a loss of the conservation interest of the site, then condition should be considered unfavourable.	
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<b>Audit Trail</b>
<b>Rationale for limiting standards to specified parts of the site</b>
<b>Rationale for site-specific targets (including any variations from generic guidance)</b>
<b>Rationale for selection of measures of condition (features and attributes for use in condition assessment)</b> (The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).
<b>Other Notes</b>
Sources: Allen et al. 2003 The Humber Estuary: A comprehensive review of its nature conservation interest. English Nature Report No. 547. Davies et al. 2001. Marine Monitoring Handbook (Section 3). JNCC UK Marine SACs Project. IECS. 2007. An assessment of the benthic invertebrate communities of the Humber Estuary. Humber Estuary Review of Consents for the Habitats Directive. Review of Benthic Data Stage 1. Report to the Environment Agency YBB091 -1. ABPmer Ltd. 2008.Humber Subtidal Sandbanks (R.1489) ABP Humber Estuary Services. 2008. Humber Maintenance Dredging Baseline Document.

**Table 3e Site-Specific definitions of Favourable Condition – saline lagoons**

<b>CONSERVATION OBJECTIVE FOR THIS HABITAT / GEOLOGICAL SITE-TYPE</b>	To maintain the <b>Saline Lagoons</b> at <b>Humber Estuary</b> in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:
<b>Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)</b>	



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Site-specific standards defining favourable condition					
Criteria feature	Attribute term in guidance	Measure	Site-specific Targets	Comments	Use for CA?
Saline lagoons	Salinity regime	Seasonal averages (ppt) to be assessed periodically (preferably in late winter/early spring and later summer to determine seasonal lows and highs). Depending on the size and shape of the lagoon, it may be necessary to measure along a salinity gradient. In complex lagoonal systems salinity gradients may occur on more than one horizontal axis and may also include vertical stratification. For details of assessment techniques see Section 2 and Davies et al., 2001.	Average seasonal salinity, and seasonal maxima and minima, should not deviate significantly from an established baseline. In cases where reliable baseline data are unavailable the presence and abundance of lagoonal species/biotopes may act as a proxy measure of salinity. Changes in the biota that indicate sustained change in the salinity regime should act as a trigger for more intensive salinity surveillance surveys. Average salinity throughout a site would be expected to lie within a range of between 15ppt and 40ppt. Sustained levels of <10ppt and >50ppt should trigger management action in many cases, but a good understanding of local ranges and periodic variability's is essential to individual site management.	Where the field assessment judges the salinity change to be unfavourable, and subsequent investigation reveals the cause is clearly attributable to natural processes, the final assessment will require expert judgement to determine the reported condition of the feature. Where changes in salinity are attributable to wider geomorphological processes, where lagoons are expected to appear and disappear, then this will be considered to be a normal change to the feature and should be reflected in the target. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable. Isolated or percolation lagoons are most likely to be degraded this way. Changes in salinity would be considered unfavourable if attributable to the following: loss or damage to a sluice or other flow control mechanism; water abstraction or discharge altering the freshwater input; anthropogenic alterations to the isolating barrier.	Yes

Saline lagoons	Isolating barrier – presence and nature	For details of assessment techniques see Section 2 and Davies et al., 2001.	No change in measure(s) from established baseline. In many cases the horizontal level of the inlet bed should be a little below high water neaps. However the level of the inlet in naturally occurring lagoonal systems will be highly site specific.	The key factor determining input and output of seawater is the height of the bottom of the inlet bed relative to ambient low water levels. Retention of the majority of the lagoonal water at low tide depends on this (Applicable when lagoons are being managed within a wider coastal geomorphological context and are therefore expected to appear in some areas as they disappear elsewhere.). Where changes in the isolating barrier are attributable to natural processes (e.g. infilling or coastal erosion) also when restorative measures are not viable, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site, (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable. Changes in presence, nature and integrity of the isolating barrier would be considered unfavourable if attributable to loss or damage of a sluice or other flow control mechanism or due to alterations in structure arising from anthropogenic activities.	Yes
Saline lagoons	Biotope composition of lagoon	Repeated assessment of overall biotope composition or a subset of biotopes identified for the site. For details of assessment techniques see Section 2 and Davies et al., 2001.	Maintain the variety of biotopes identified for the site, allowing for succession/ known cyclical change.	Where the field assessment judges the biotope composition to be unfavourable, and subsequent investigation reveals the cause is clearly attributable to cyclical natural processes, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site, (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable.	Yes
Saline lagoons	*Distribution of biotopes	Assessment of the distribution of (a) biotope(s) identified for the site. For details of assessment techniques see Section 2 and Davies et al., 2001.	Maintain the distribution of biotopes, allowing for succession/known cyclical change.	Where a field assessment judges the condition of this attribute to be unfavourable and subsequent investigation indicates the cause is due to natural factors, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change in biotope distribution outside the expected variation or a loss of the conservation interest of the	

				site, then condition should be considered unfavourable.	
Saline lagoons	*Extent of sub-feature or representative/notable biotopes	Assessment of the extent of (a) biotope(s) identified for the site because of their nature conservation importance. For details of assessment techniques see Section 2 and Davies et al., 2001.	No change in extent of the biotope(s) identified for the site, allowing for succession/known cyclical change.	The advice concerning judgement of the feature condition provided under Extent (Section 2.1.1 Background to the attribute) equally applies to this section and should be consulted.	
Saline lagoons	* Species composition of representative or notable biotopes	Assessment of biotope quality through assessing species composition where the biotope is representative of the site or contains a number of species of conservation importance. Assessing this attribute will require specialist taxonomic expertise.	No decline in biotope quality due to changes in species composition or loss of notable species, allowing for natural succession/known cyclical change.	Where the field assessment judges the species composition to be unfavourable, and subsequent investigation reveals the cause is clearly attributable to cyclical natural processes such as mass recruitment and dieback of characterising species, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change in species composition outside the expected variation or a loss of the conservation interest of the site (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable.	
Saline lagoons	*Species population measures - Presence or abundance of specified species	Assessment of the presence/absence or abundance of a specified species identified for the feature. For details of assessment techniques see Section 2 and Davies et al., 2001	Maintain presence and/or abundance of the specified species.	Species selected should reflect the specific biological characteristics of the lagoon. Species should be used from the list of lagoonal specialists (Appendix A) The advice concerning judgement of the feature condition provided under species composition equally applies to this section and should be consulted.	
Saline lagoons	*Species population measures - Presence or abundance of specified species	Assessment of the presence/absence or abundance of a specified species identified for the feature. For details of assessment techniques see Section 2 and Davies et al., 2002	Absence of the specified species (such as an undesirable non-native species)	Species selected should reflect the specific biological characteristics of the lagoon. Species should be used from the list of lagoonal specialists (Appendix A) The advice concerning judgement of the feature condition provided under species composition equally applies to this section and should be consulted.	
Saline lagoons	*Species population measures - Population structure	Population structure should be assessed in terms of viability of the	Maintain age/size class structure of a (named) species.	Where there is a sizeable shift in the age/size class structure (i.e. loss of mature adults or recruitment failure) or if disturbance causes a species of nature conservation importance to be lost, or if	

	of a species	named species identified for the feature. For details of assessment techniques see Section 2 and Davies et al., 2001		there is a significant reduction in abundance, then condition would be considered unfavourable.	
Saline lagoons	*Extent of water	Area of water occupying the basin should be assessed periodically, at the same time of year (preferably in late winter /early spring and late summer). This may be assessed by direct measurement of the position of the waterline by dGPS or in relation to fixed surface features. For details of assessment techniques see Section 2 and Davies et al., 2001.	At least 60% of the water of the lagoon persisting at all times of year and states of tide.	In most cases the area recorded in past surveys is extent of water. Extent of water in late winter/spring may be taken as the likely extent of the lagoon basin. Extent of water in late summer in lagoons with a shallow basin is likely to be less than the extent of the basin.	
Saline lagoons	*Water Depth	Average water depth within the lagoon basin (metres) at low tide, assessed at the same time of year each time (preferably in late winter/early spring and late summer). Possible methods for measuring water depth are: bathymetric survey or stick/gauge measurements.	Average water depth should not deviate significantly from an established baseline, subject to natural change.	In many cases [Applicable when lagoons are being managed within a wider coastal geomorphological context and are therefore expected to appear in some areas as they disappear elsewhere.] where changes in depth are attributable to natural processes (sedimentation) then the target should reflect this variation. Where the field assessment judges the change to be unfavourable and subsequent investigation indicates the cause is due to natural factors, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable. Elsewhere, in created and actively managed lagoons, natural processes leading to loss of water depth may cause the site to become unfavourable. In all cases condition would be considered unfavourable if changes in depth are attributable to anthropogenic activities (e.g. infilling, land claim/development or increased run-off/ sedimentation arising from adjacent developments).	

<b>Audit Trail</b>
<b>Rationale for limiting standards to specified parts of the site</b>
<b>Rationale for site-specific targets (including any variations from generic guidance)</b>
<b>Rationale for selection of measures of condition (features and attributes for use in condition assessment)</b> (The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).
<b>Other Notes</b>
Generic information currently used for saline lagoons until further data sources can be identified to tailor objectives.

**Table 3f Site-Specific definitions of Favourable Condition – Sand dunes**

<b>CONSERVATION OBJECTIVE FOR THIS HABITAT / GEOLOGICAL SITE-TYPE</b>	To maintain <b>Fixed dunes, Humid dunes slacks and Strandline, embryo and mobile dunes</b> , at <b>Humber Estuary</b> in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:
<b>Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)</b>	

<b>Site-specific standards defining favourable condition</b>					
<b>Criteria feature</b>	<b>Attribute term in guidance</b>	<b>Measure</b>	<b>Site-specific Targets</b>	<b>Comments</b>	<b>Use for CA?</b>
Fixed dune grassland: SD7 – SD10	Vegetation structure: range of zones	The width of zones could be estimated using one or more transects extending from strandline to landward features. GPS locations and aerial photographs should be	Zonation from beach to fixed dune intact over at least 95% of coastal frontage.	Points may change due to natural dynamism but the overall diversity should not diminish. Mosaics on hindshore systems may make the width of the fixed dune grassland difficult to assess	Yes

		used as an aid, where available.			
Fixed dune grassland: SD7 – SD10	Vegetation structure: sward height	Assessment during structured walk or transects.	30-70% of sward to comprise species-rich short turf, 2-10 cm tall.  In areas where <i>Poa bulbosa</i> present (Cleethorpes) >50% of the sward should be < 2cm height.	Target for ratio of short turf to taller marram-dominated vegetation should be set on a site-specific basis – reduced from generic 30-70% as invert guidance indicates no single surface (e.g. bare sand, short sward etc) should be present in 50% of samples.	Yes
Fixed dune grassland: SD7 – SD10	Vegetation structure: bare ground	Visual assessment of cover during structured walk or transects. Aerial photographs should be used as an aid, where available.	Bare ground or sand present but no more than 10 % total area.  In areas where <i>Poa bulbosa</i> and <i>Trifolium suffocatum</i> is present, bare ground should be >5% and can be >20%.	Patches of bare sand are essential for a wide range of dune invertebrates (e.g. suite 6 species, see above). Also important on the Humber for seed germination of species <i>Poa bulbosa</i> and <i>Trifolium suffocatum</i> .  Areas of bare sand created by human induced disturbance should not increase.	Yes
Fixed dune grassland: SD7 – SD10	Vegetation composition: typical species	Visual assessment of cover (modified DAFOR scale), using structured walk or transects.	For calcareous dune grasslands (SD7, SD8, SD9, SD19), at least eight typical species) present at more than occasional level.	Other species may be included on a site specific basis (see also Indicators of local distinctiveness).  Typical species for SD7-SD9 <i>Aira praecox</i> , <i>Arrhenatherum elatius</i> (SD9 Only), <i>Festuca rubra</i> , <i>Galium verum</i> , <i>Astragalus danicus</i> , <i>Ammophila arenaria</i> , <i>Carex arenaria</i> , <i>Carex flacca</i> , <i>Cerastium fontanum</i> , <i>Crepis capillaries</i> , <i>Cladonia</i> spp., <i>Erodium cicutarium</i> , <i>Euphrasia officinalis</i> , <i>Geranium molle</i> , <i>Hypnum cupressiforme</i> , <i>Hypochaeris radicata</i> , <i>Linum catharticum</i> , <i>Lotus corniculatus</i> , <i>Luzula campestris</i> , <i>Odontites verna</i> , <i>Ononis repens</i> , <i>Peltigera</i> spp., <i>Pilosella officinarum</i> , <i>Plantago lanceolata</i> , <i>Prunella vulgaris</i> , <i>Rhinanthus minor</i> , <i>Rhynchospora squarrosus</i> , <i>Rhynchospora triquetrus</i> , <i>Thymus praecox</i> , <i>Tortula muralis</i> , <i>Trifolium repens</i> , <i>Sedum acre</i> , <i>Veronica chamaedrys</i> , <i>Viola canina</i> , <i>Viola riviniana</i> , <i>Viola tricolor</i> . <i>Trifolium arvense</i> .	Yes
Fixed dune grassland: SD7 – SD10	Vegetation composition: negative indicator species	Visual assessment of cover (modified DAFOR scale), using structured walk or transects.  % cover measured is cover	Non-native species, including sea buckthorn <i>Hippophae rhamnoides</i> where introduced, no more than rare.  Any one of the other negative indicators no more than frequent throughout the	Where <i>Hippophae rhamnoides</i> is native this species is not counted as a negative indicator. It has been widely introduced elsewhere and has proved very invasive  <i>Urtica dioica</i> and <i>Cirsium</i> spp. are indicative of poor condition Negative indicator species: <i>Senecio jacobaea</i> ,	Yes

		of the entire feature.	sward, or singly or together the cover of negative indicator species no more than 5%.	<i>Rosa spp.</i> , <i>Cirsium arvense</i> , <i>Cirsium vulgare</i> , <i>Urtica dioica</i> , <i>Lolium perenne</i> , <i>Pteridium aquilinum</i> , <i>Rubus fruticosus</i> . Abundance of <i>Senecio jacobaea</i> indicates overgrazing in summer. <i>Lolium perenne</i> is indicative of agricultural improvement.  <i>Poa annua</i> and <i>Plantago major ssp major</i> are also negative indicator species, being good indicators of eutrophication.	
Fixed dune grassland: SD7 – SD10	Vegetation composition: scrub/trees	Visual assessment of cover (modified DAFOR scale), using structured walk or transects. % cover measured is cover of the entire feature.	Scrub/trees no more than occasional, or less than 5% cover.  Tree invasion from adjacent plantations should be absent or rare.	See comments above about <i>Hippophae rhamnoides</i> .	Yes
Fixed dune grassland: SD7 – SD10	Vegetation structure: flowering/fruiting	Visual assessment (modified DAFOR scale) during structured walk or transects.	Flowering and fruiting of dune grassland to at least frequent level – depending on the time of year visited (May-Oct).	Level and timing of stock grazing should be sufficient to allow adequate seed production. Flowering is also important for many invertebrates (e.g. for nectar).	Yes
Fixed dune grassland: SD7 – SD10	Other negative indicators	Visual assessment during site visit	Vehicle damage or trampling at vulnerable locations (tracks, access points) should be absent or rare.		Yes
Fixed dune grassland: SD7 – SD10	*Indicators of local distinctiveness	Presence confirmed during site visit at appropriate season. (List species, add DAFOR score, mark locations on map(s) in file.) List to be tailored to each site.	Maintain distinctive elements at current extent/levels and/or in current locations (e.g. maintain existing populations of notable plant or animal species or transitions between habitats).	This attribute is intended to cover any site-specific aspects of this habitat feature (forming part of the reason for notification) which are not adequately covered by the previous attributes, or by separate guidance e.g. for notified species features. For notable species (e.g. vascular plants) it is not intended to set a target for detailed species monitoring, rather to provide a rapid indication of presence/absence and/or approximate extent, allowing for natural fluctuations in population size. *If part of the reason for the notification of the site, this is a mandatory attribute.	Yes
<i>Hippophae rhamnoides</i> dune scrub SD18, SD18a, SD18b	Vegetation succession and structure	Relative proportions of height classes of sea buckthorn scrub; measured once every 5 years from aerial photos, and measured once every 10 years from sample surveys.  Relative proportions of	Maintain at least three height classes of sea buckthorn scrub.  Maintain a range of sea buckthorn age classes, in particular <ul style="list-style-type: none"> <li>30% of scrub area being in colonising stage (SD18a), and</li> </ul>	It is not yet clear how long structural variety can be maintained in stands of sea buckthorn by rotational cutting.  It may be easier to cater for the “less than 5 years old” category in a “grassland-scrub mosaic” feature.	

		colonising (<50% cover sea buckthorn) and established (>50% cover sea buckthorn) scrub; measured once every 5 years from aerial photos, and measured once every 10 years from sample surveys.	<ul style="list-style-type: none"> <li>10% of scrub less than 5 years old and 20% more than 20 years old.</li> </ul> Also allow 5% of sea buckthorn scrub to develop into dune woodland.	This 5% area needs to be taken account of when setting a woodland feature extent figure (if any).	
<i>Hippophae rhamnoides</i> dune scrub SD18, SD18a, SD18b	Absence of non-native flora	Relative proportion of non-native trees and shrubs; measured once every 5 years from aerial photos, and measured once every 10 years from full survey.	Less than 5% cover of non-native trees and shrubs.		
Humid dune slacks: SD15a, SD17, SD17b	Vegetation structure: range of zones	Visual assessment during structured walk and transects.	All humid dune slack communities should be present – from embryonic dune slacks with a high percentage of bare ground to those with more closed vegetation and up to 33% cover of <i>Salix repens</i> . Early dune slack successional stages at least occasional.	Further research is required to define the attributes of early dune slack successional stages	Yes
Humid dune slacks: SD15a, SD17, SD17b	Vegetation structure: bare ground	Visual assessment of cover during structured walk and transects. Aerial photographs should be used as an aid, where available.	Bare ground or sand present, but less than 5% of the total dune slack area.	Bare ground target may need to be revised in view of the need for the presence of early dune slack successional stages. There is also a link across to lower plant condition assessment.	Yes
Humid dune slacks: SD15a, SD17, SD17b	Vegetation composition: forb/grass ratio	Visual assessment of cover during structured walk and transects.	The sward should contain >30% cover of forbs and <70% cover of grasses.	Drying and eutrophication of the slack can be indicated by increase in 'grassiness'.	Yes
Humid dune slacks: SD15a, SD17, SD17b	Vegetation composition: typical species	Visual assessment of cover (modified DAFOR scale) during structured walk and transects.	Four or more typical species at least frequent and two or more others at least occasional. Bryophytes (e.g. <i>Calliergon cuspidatum</i> , <i>Campylium stellatum</i> ) at least occasional.	Further research is required, as these indicators relate to fairly stable closed humid slack swards and not to the more open type. <i>Salix repens</i> , <i>Hydrocotyle vulgaris</i> , <i>Carex flacca</i> , <i>Prunella vulgaris</i> , <i>Potentilla anserina</i> , <i>Calliergon cuspidatum</i> , <i>Galium palustre</i> , <i>Carex nigra</i> , <i>Holcus lanatus</i> , <i>Scutellaria galericulata</i> , <i>Mentha aquatic</i> , <i>Carex arenaria</i> , <i>Ononis repens</i> , <i>Lotus corniculatus</i> , <i>Ranunculus flammula</i> , <i>Campylium stellatum</i> , <i>Equisetum variegatum</i> , <i>Lotus corniculatus</i> , , <i>Anagallis tenella</i> , Liverworts, low mosses	Yes
Humid dune	Vegetation	Visual assessment of cover	Non-native species no more than rare.	<i>Urtica dioica</i> and <i>Cirsium spp.</i> are indicative of poor	Yes



slacks: SD15a, SD17, SD17b	composition: negative indicator species	(modified DAFOR scale), using structured walk or transects. % cover measured is cover of the entire feature.	No more than one other negative indicator species more than frequent or singly or together the cover of negative indicator species no more than 5%.	condition Abundance of <i>Senecio jacobaea</i> indicates overgrazing in summer <i>Lolium perenne</i> is indicative of  Negative indicator species: <i>Cirsium arvense</i> , <i>Cirsium vulgare</i> , <i>Cirsium palustre</i> , <i>Lolium perenne</i> , <i>Senecio jacobaea</i> , <i>Urtica dioica</i> , <i>Pteridium aquilinum</i> , <i>Arrhenatherum elatius</i> <i>Lolium perenne</i> is indicative of agricultural improvement. agricultural improvement	
Humid dune slacks: SD15a, SD17, SD17b	Vegetation composition: cover of <i>Salix repens</i>	Visual assessment of cover during structured walk and transects. Aerial photographs should be used as an aid, where available.	Cover of <i>Salix repens</i> not more than 33%.	If <i>Salix repens</i> covers more than 33% it is likely to become a problem if grazing levels are not sufficient or if scrub control is not being carried out.	Yes
Humid dune slacks: SD15a, SD17, SD17b	Vegetation composition: scrub/trees	Visual assessment of cover (modified DAFOR scale), using structured walk or transects. Aerial photographs should be used as an aid, where available.	Scrub/trees in addition to <i>Salix repens</i> no more than occasional, or less than 5% cover.	If scrub/tree species are more than occasional throughout the sward, they are soon likely to become a problem if grazing levels are not sufficient or if scrub control is not being carried out. Where scrub or woodland is a notified habitat feature, the woodland monitoring guidance should be consulted.	Yes
Humid dune slacks: SD15a, SD17, SD17b	*Indicators of local distinctiveness	Presence confirmed during site visit at appropriate season. (List species, add DAFOR score, mark locations on map(s) in file.) List to be tailored to each site.	Maintain distinctive elements at current extent/levels and/or in current locations (e.g. maintain existing populations of notable plant or animal species or transitions between habitats).	This attribute is intended to cover any site-specific aspects of this habitat feature (forming part of the reason for notification) which are not adequately covered by the previous attributes , or by separate guidance e.g. for notified species features. For notable species (e.g. vascular plants) it is not intended to set a target for detailed species monitoring, rather to provide a rapid indication of presence/absence and/or approximate extent, allowing for natural fluctuations in population size. *If part of the reason for the notification of the site, this is a mandatory attribute. Rare or scarce plant species specific to the site may include <i>Epipactis palustris</i> , <i>Dactylorhiza incarnata</i> , <i>Parnassia palustris</i> , <i>D. purpurella</i> , <i>Selaginella selaginoides</i> , <i>Equisetum variegatum</i> .	
Strandline, embryo and mobile dunes: SD2, SD4, SD5, SD6	Vegetation structure: range of zones	Visual assessment, e.g. using transects (extending from beach to fixed dune) may be used to estimate the width of the strandline, embryonic dune and mobile dune at points described by GPS and	Zonation from beach to fixed dune should be intact over at least 95 % of coastal frontage	Points may change because of natural dynamism, but the overall diversity should not diminish. The target will be site- and feature-specific, dependent on the dune features present. If strandline is absent this may be acceptable if due to natural causes. The dune front may be vulnerable to heavy trampling/grazing by stock.	Yes

		marked on a map.			
Strandline, embryo and mobile dunes: SD2, SD4, SD5, SD6	Vegetation composition: typical species	Visual assessment of cover (modified DAFOR scale), using structured walk and transects.	Maintain frequency of characteristic species of the main sand dune zones as follows: Strandline: At least one species frequent and another occasional. Embryonic dunes: At least one species frequent. Mobile dunes: At least one species frequent.	Communities may be dynamic in their distribution and are linked to the physical processes operating at the site. Embryo and mobile dunes a typically species-poor and monospecific stands are common.  Strandline: <i>Cakile maritima</i> , <i>Honckenya peploides</i> , <i>Salsola kali</i> , <i>Atriplex</i> spp Embryonic dunes: <i>Elytrigia juncea</i> , <i>Leymus arenarius</i> Mobile dunes: <i>Ammophila arenaria</i> , <i>Leymus arenarius</i> , <i>Eryngium maritimum</i> , <i>Calystegia sodanella</i>	Yes
Strandline, embryo and mobile dunes: SD2, SD4, SD5, SD6	Vegetation composition: negative indicator species	Aerial photographs, together with visual assessment of cover (modified DAFOR scale), using structured walk.  % cover measured is cover of the entire feature.	Non-native species no more than rare.  Any one of the following negative indicators no more than frequent throughout the sward, or singly or together the cover of negative indicator species no more than 5%.	<i>Urtica dioica</i> and <i>Cirsium</i> species are indicative of poor condition because of enrichment. Abundance of <i>Senecio jacobaea</i> indicates overgrazing in summer.  Negative indicator species: <i>Senecio jacobaea</i> , <i>Cirsium arvense</i> , <i>Cirsium vulgare</i> , <i>Urtica dioica</i> , <i>Lolium perenne</i> , <i>Arrhenatherum elatius</i> .	Yes
Strandline, embryo and mobile dunes: SD2, SD4, SD5, SD6	Physical structure: functionality and sediment supply	Aerial photographs can be used, combined with information gathered from the site visit	No further anthropogenic increase in factors leading to the decrease of natural mobility of the system. The natural circulation of sand and organic matter should be retained.	Natural processes, particularly sediment supply, may be interrupted or prevented by coastal protection or artificial stabilisation (other than porous breach repair), by sediment extraction or tree planting. Accumulation of driftline organic material (seaweed etc.) is essential for trapping sand and initiating dune formation. Mechanical beach cleaning can adversely affect this process.	Yes
Strandline, embryo and mobile dunes: SD2, SD4, SD5, SD6	Vegetation composition: condition and flowering/fruiting of foredune grasses	Visual assessment of cover (modified DAFOR scale), using structured walk	Healthy <i>Ammophila arenaria</i> , <i>Leymus arenarius</i> or <i>Elytrigia juncea</i> with abundant fruiting heads at least frequent.	If flowering is not frequent, dunes are no longer mobile and condition is unfavourable (see text for details).	Yes
Strandline, embryo and mobile dunes: SD2, SD4, SD5, SD6	Other negative indicators	Visual assessment during site visit	Vehicle damage or visitor damage at vulnerable locations (e.g. tracks, access points) should be absent or rare	Impact of human activities will depend on the site. Notes should be made of the type of damaging activity, location and extent for future further assessment.	Yes
Strandline, embryo and mobile dunes: SD2, SD4,	*Indicators of local distinctiveness	Presence confirmed during site visit at appropriate season. List species, add DAFOR score, mark locations	Maintain distinctive elements at current extent/levels and/or in current locations (e.g. maintain existing populations of notable plant or animal species or	This attribute is intended to cover any site-specific aspects of this habitat feature (forming part of the reason for notification) which are not adequately covered by the previous attributes, or by separate guidance (e.g. for	

SD5, SD6		on map(s) in file. List to be tailored to each site.	transitions to non-dune habitats).  Maintain existing populations of <i>Festuca arenaria</i>	notified species features). For notable species (e.g. vascular plants) it is not intended to set a target for detailed species monitoring, rather to provide a rapid indication of presence/absence and/or approximate extent, allowing for natural fluctuations in population size. *If the indicators of local distinctiveness form part of the reason for the notification of the site, this is a mandatory attribute.	
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<b>Audit Trail</b>
<b>Rationale for limiting standards to specified parts of the site</b>
<b>Rationale for site-specific targets (including any variations from generic guidance)</b>
<i>Ammophila arenaria</i> added as a fixed dune positive indicator (common on SD7 communities). <i>Trifolium arvense</i> – characteristic dune ridges of the North-East coast. Acid dune removed as none present in the Humber.  <i>Hippophae rhamnoides</i> guidance from Graham Weaver advice note 2009
<b>Rationale for selection of measures of condition (features and attributes for use in condition assessment)</b> (The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).
<b>Other Notes</b>

**Table 3g Site-Specific definitions of Favourable Condition – Littoral sediment**

<b>CONSERVATION OBJECTIVE FOR THIS HABITAT / GEOLOGICAL SITE-TYPE</b>	To maintain the <b>Littoral sediment - (mudflats and sandflats)</b> at <b>Humber Estuary</b> in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:
<b>Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)</b>	

Site-specific standards defining favourable condition					
Criteria feature	Attribute term in guidance	Measure	Site-specific Targets	Comments	Use for CA?
Littoral sediment	Distribution of biotopes	Assessment of the distribution of biotope(s) identified for the site.	Maintain the distribution of biotopes, allowing for natural succession/ known cyclical change.	Where changes in distribution are known to be clearly attributable to cyclical succession or expected shifts in distribution (for example due to a movement of a drainage channel) then the target value should accommodate this variability. Where there is a change in biotope distribution outside the expected variation, or a loss of the conservation interest of the site, then condition should be considered unfavourable.	Yes
Littoral sediment	Biotope composition of littoral sediment	Repeated assessment of overall biotope composition or a subset of biotopes identified for the site.	Maintain the variety of biotopes identified for the site, allowing for natural succession/ known cyclical change.	Where changes in biotope composition are known to be attributable to natural processes (e.g. winter storm/flood events, changes in supporting processes or mass recruitment or dieback of characterising species) then the target value should accommodate this variability. Where there is a change in biotope composition outside the expected variation or a loss of the conservation interest of the site, then condition should be considered unfavourable.	Yes
Littoral sediment	Sediment character: sediment type	Distribution of sediment types should be assessed across the whole feature and compared to baseline conditions.	No change in composition of sediment type across the feature, allowing for natural succession/known cyclical change.	Where changes in sediment type are known to be clearly attributable to natural processes (e.g. winter storm/flood events, changes in supporting processes) then the target value should accommodate this variability. Where extreme events cause a change in sediment type, then this may have caused a change in the structure of the feature, which may lead to the condition of the feature being considered as unfavourable.	Yes
Littoral sediment	Extent of sub-feature or representative/ notable biotopes	Assessment of the extent of biotope(s) identified for the site because of their nature conservation importance.	No change in extent of the littoral sediment biotope(s) identified for the site allowing for natural succession/known cyclical change.	Where there clearly established natural variation in extent or in cyclical succession between biotopes, then the target value should accommodate this variability. Where there is a change in extent outside the expected variation or a change in the structure of the biotope leading to a loss of the conservation interest of the site, then condition should be considered unfavourable.	
Littoral sediment	Species population measures - Population structure of a species	Population structure should be assessed in terms of viability of the named species identified for the feature.	Maintain age/size class structure of a (named) species.	Where there is a sizeable shift in the age/size class structure (i.e. loss of mature adults or recruitment failure) or if disturbance causes a species of nature conservation importance to be lost, or if there is a significant reduction in abundance, then condition would be considered unfavourable.	
Littoral sediment	Species population	Assessment of the	Maintain presence or	Increased abundance of negative indicator species i.e. those	

	measures -Presence or abundance of specified species	presence or abundance of positive/negative indicator species identified for the feature.	abundance of named positive indicator species. No increase in presence or abundance of named negative indicator species.	indicative of stressed habitats which would be detrimental to the feature as a whole, would also cause condition to be considered unfavourable.	
Littoral sediment	Sediment character: Organic carbon content	Organic carbon content assessed in specified area.	Organic carbon content should not increase in relation to an established baseline.	An increase in organic carbon due to natural events such as floods or storms is a normal change to the feature and may be considered favourable if it does not compromise the conservation interest of the feature. An increase in organic content due to sewage effluent or nutrient enrichment, causing a change in the infaunal community of the sediment and thus the functioning of the littoral sediment, will be considered unfavourable. Organic carbon content is likely to be assessed by specialists.	
Littoral sediment	Sediment character: Oxidation-reduction profile (Redox layer)	Sediment character: Oxidation-reduction profile (Redox layer)	Average depth to the top of the black layer should not increase in relation to baseline.	An increase in anoxic conditions due to natural events such as mass deposition of organic material following floods or storms is a normal change to the feature and condition may be considered favourable if it does not compromise the conservation interest of the feature. An increase in anoxic conditions due to sewage effluent or nutrient enrichment, causing a change in the infaunal community of the sediment and thus the functioning of the littoral sediment, should be considered unfavourable. Degree of oxidation/reduction reflects the oxygen availability within the sediment that critically influences the infaunal community and the mobility of chemical compounds.	
Littoral sediment	Topography	Tidal elevation and shore slope to be assessed periodically.	No change in topography of the littoral sediment, allowing for natural responses to hydrodynamic regime.	Obvious changes in topography in terms of an overall lowering (shallowing) of the shore slope may act as a trigger for further investigation. Scouring adjacent to sea defences, which lowers the shore slope, should be considered unfavourable. A suitable period over which to ascertain trends resulting in a net lowering of shore profiles is 5 years.	
Littoral sediment	Species composition of representative or notable biotopes	Assessment of biotope quality through assessing species composition, where the biotope is representative of the site or contains a number of species of conservation importance. Assessing this attribute will require specialist taxonomic	No decline in biotope quality due to changes in species composition or loss of notable species, allowing for natural succession/known cyclical change.	Where a change in species composition is known to be clearly attributable to natural succession, known cyclical change or mass recruitment or dieback of characterising species, then the target value should accommodate this variability. Where there is a change in biotope quality outside the expected variation or a loss of the conservation interest of the site, then condition should be considered unfavourable.	

	expertise.			
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<b>Audit Trail</b>
<b>Rationale for limiting standards to specified parts of the site</b>
<b>Rationale for site-specific targets (including any variations from generic guidance)</b>
<b>Rationale for selection of measures of condition (features and attributes for use in condition assessment)</b> (The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).
<b>Other Notes</b>
Currently using generic guidance until 2009/2010 fieldwork on littoral biotopes has been completed.

**Table 3h Site-Specific definitions of Favourable Condition - Standing Open water**

<b>CONSERVATION OBJECTIVE FOR THIS HABITAT / GEOLOGICAL SITE-TYPE</b>	To maintain <b>Ditch systems</b> and <b>Standing waters</b> at <b>Humber Estuary</b> in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:
<b>Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)</b>	

<b>Site-specific standards defining favourable condition</b>					
<b>Criteria feature</b>	<b>Attribute term in guidance</b>	<b>Measure</b>	<b>Site-specific Targets</b>	<b>Comments</b>	<b>Use for CA?</b>
Ditch systems	Extent of the ditch feature	During the structured walk note any changes caused by active management, such as infilling or channel diversion.	No reduction in channel length	These observations do not include drying out or successional change, which are covered under other attributes.	Yes
Ditch systems	Habitat structure:	Make an assessment for each of	Maintain the baseline	Characteristic faunal assemblages require a range of successional	Yes

	extent/composition of in-channel vegetation	the structured walk sub-sections of the percentage (to nearest 5%) of channel length in early, mid and late successional stages. The overall results are the means of the three sets of values.	range of successional stages. Baseline yet to be established.	stages, from open water, through domination by submerged higher plants, to swamp communities. Some open water plant species require early and mid-successional stages, but late succession ditches are important for emergents.  The generic target is a mix of early, mid and late succession ditches: 10-25% early , 35-75% mid , 10-25% late. This is not appropriate at Far Ings.  Early succession ditches are defined here as those that have been desilted or reprofiled in the same year as the monitoring visit. Late succession ditches have >70% cover of emergents. This may not be apparent if ditch vegetation has been cut in the season of the site visit. The large amount of organic debris and stems under the water will indicate this.	
Ditch systems	Habitat structure: extent/composition of bankside vegetation	For each of the structured walk sub-sections, assess the percentage (to nearest 5%) of channel length that is heavily shaded (i.e. over 50% of the channel surface overhung) by coarse ruderal vegetation, scrub or hedges. The overall result is the mean of the values recorded for the sub-sections.	No more than 10% of the channel length should be heavily shaded.	Although some bankside shading can provide habitat for some invertebrate species, heavy shading is detrimental to characteristic ditch flora and fauna. It shades out aquatic plants, leading to the loss of plant diversity and vegetated habitat for aquatic invertebrates and vertebrates. Ditches may be shaded by vegetation for only half their width, completely shaded for part of the day only, or densely and continuously shaded. Heavy shading (the feature assessed here) is defined as >50% of the ditch surface being overhung by bankside vegetation.	Yes
Ditch systems	Habitat structure: channel form	During the structured walk, note variation in ditch profiles and make an estimate of the percentage (to the nearest 5%) of ditch length with trapezoidal and non-trapezoidal cross sections in each sub-section of the route. The overall result is calculated by taking the mean of the figures for the sub-sections.	Maintain the baseline variation of ditch profiles.  Baseline yet to be established.	Shallow, as well as deep water, is important for the maintenance of diverse plant and invertebrate assemblages.  The context and traditional management practices of the site should be taken into consideration when deciding on the target for non-trapezoidal ditch length. In a fenland site with ample areas of shallow standing water, trapezoidal ditch profiles may be acceptable.  Non-trapezoidal profiles include those where the banks have been trampled by stock, where the ditch has been allowed to silt up but still contains water, or where berms have been constructed.  Berm creation is especially desirable in sites where there is little opportunity for extensive stands of emergent vegetation to develop by leaving some ditches unmanaged, where trampling of the banks by stock is limited, or where ditches are the only permanent wetland	Yes

				feature present.	
Ditch systems	Aquatic vegetation composition: native species richness	5 to 10 fixed sampling points are established in each ditch. Between mid June and mid August, record (on DAFOR scale) all native aquatic plant taxa in each 20 m sampling site. Calculate the mean number of species to give the overall result. For fresh and brackish ditches calculate separate means.	Native aquatic flora of ditches species-rich: freshwater ditches  Baseline study of Far Ings ditches can be taken as the NCC fieldwork undertaken in 6 <sup>th</sup> October 1988 in addition to the 1988 study by E.C. Surveys should be used to provide a suitable target.	The site is not designated for the botanical interest of the ditches, however this target can be used as an indication that the ditch is being kept as a reasonably open, channel of clean fresh, flowing water.	
Ditch systems	Indicators of negative change: introduction of or natural colonisation by non-native plants	For each structured walk sub-section estimate abundance of non-native or introduced aquatic plant species: (a) for each of the four most invasive non-native species (see Appendix 3 of the common standards guidance): separate percentage cover values (b) for all non-native and introduced species: a combined percentage cover value (to the nearest 5%).  Occasionally sampling vegetation with a grapnel will be necessary. The overall results (for a and b) are the mean of the cover values for the sub-sections.	Mean cover of each very aggressive non-native plant not exceeding 1%.  Mean total combined cover of all non-native species and introduced species less than 30%.	Non-native plant invasions may result in gross distortions to aquatic plant communities. The very aggressive <i>Azolla</i> spp., <i>Crassula helmsii</i> and <i>Hydrocotyle ranunculoides</i> can blanket sections of ditch and out-compete native species, resulting in a significant loss in diversity. <i>Myriophyllum aquaticum</i> may also have this potential in ditches. A more stringent target may be necessary on large ditch systems.  Native plants are able to co-exist somewhat more easily with other non-native species, such as <i>Acorus calamus</i> , <i>Elodea</i> spp. and <i>Lagarosiphon major</i> . The non-native <i>Lemna minuta</i> is not included in this assessment unless it is found to be dominant, because it is very difficult to distinguish from <i>Lemna minor</i> .  Where invasive native plants with a restricted natural distribution in the UK (e.g. <i>Stratiotes aloides</i> and <i>Nymphoides peltata</i> ) are introduced to a site outside their natural range, these species should be treated as 'non-native'.	Yes
Ditch systems	Habitat functioning: water quality a) water clarity	Along the structured walk note unnatural turbidity or discoloration of water. For each sub-section, record % of the length (to nearest 5%) with clear water, % with slight turbidity/coloration and % with	Water clear or only slightly turbid/discoloured in at least 90% of channel length	Both turbidity and coloration are recorded under this attribute. Blooms of planktonic algae cause reduced water clarity.	Yes



		marked turbidity/coloration. The overall result is the mean of each set of figures from the sub-sections.			
Ditch systems	Habitat functioning: water quality b) extent of algal dominance	For each structured walk sub-section, in freshwater ditches only, estimate % cover of the channel (to nearest 5%) by filamentous algae and <i>Enteromorpha</i> species taken together. Occasional sampling of the vegetation by grapnel may be necessary. The overall result is the mean of cover values for the sub-sections.	Mean cover of filamentous macro-algae and <i>Enteromorpha</i> not more than 10% (mid June to end August)	The effect of excessive nutrient enrichment is often signified by increased prevalence of algae, either filamentous or planktonic. Algae such as <i>Enteromorpha</i> are not good indicators in saline conditions. Charophytes are not included in the group of macro-algae indicative of nutrient enrichment because they need clear water.	Yes
Ditch systems	Habitat functioning: water quality c) water chemistry	Water chemistry should be assessed by reference to existing Environment Agency monitoring data either for the site or, where this is not available, for the feeding waters.	Total phosphorus <0.1 mg L <sup>-1</sup> ;  Biological GQA Class 'a' or 'b' depending on reach type. In addition, no drop in class from existing situation.  Chemical GQA Class 'A' or 'B' depending on reach type. In addition, no drop in class from existing situation  Baseline yet to be established.	If water sampling and analysis are carried out routinely on the site or on waters feeding the ditch system these results should be assessed.  Total phosphorus levels for groundwater-fed systems should be considerably less than 0.1 mg L <sup>-1</sup> consult the national specialist for advice. Further work is being undertaken to develop Dutch ditch water quality modelling work to inform SSSI ditch targets . This work suggests preliminary acceptable phosphorus loads to ditch systems that allows for variations in ditch type. Reference should be made to these loads in setting conservation objectives.  Toxic substances are of concern, but there is currently no relevant standard biological monitoring technique or surveillance programme for ditches. For basic parameters (dissolved oxygen, biochemical oxygen demand and total ammonia) a minimum equivalent to biological and chemical GQA classes a/b and A/B respectively should be maintained, with no drop in class.	
Ditch systems	Habitat functioning: water availability	Ideally, depth gauges should be inserted in ditches at strategic points, including the main feeder. During the structured walk, water levels should be recorded using these gauges and/or by probing ditches with a pole marked in quarter metre intervals.	Characteristic water levels to be maintained. Generally, in wet ditches summer water depth at least 0.5 m in minor ditches and 1 m in major drains. 90% of channel length should reach this	The levels characteristic of the site, in relation to both freeboard and water depth, should be maintained. High water levels are particularly important in spring and early summer for semi-aquatic riparian invertebrates. Except for parts of the ditch system that dry up naturally in the summer or are being allowed to succeed to swamp in a long management rotation or are influenced by tidal flow, a good depth of water should be maintained. If the site is used as a wash, or if ditches within it are used as reservoirs by the	Yes

			target.	drainage authorities or the land manager, periodic flooding or high water levels will be encountered. Where there is a Water Level Management Plan for the site, satisfactory implementation of the plan should be included as a target within the conservation objectives.	
Ditch systems	* Indicators of local distinctiveness:	Species specific survey data supplied by site managers (LWT).	Existence of a viable population of <i>Lophopus crystallinus</i> bryozoan in the Blow Wells.	Maintain population levels	No
Standing waters	Lake substrate	Shoreline walk	Maintain shoreline (as at 2004 renotification)  Maintain characteristic substrate.	No increase in heavily modified shoreline compared to situation at 2004 renotification.  Establish baseline from air photos and Bullens NVC maps.  Changes in plant community may result from enriched sediments without an accompanying change in water chemistry.	Yes
Standing waters	Sediment load	Observe areas of increased erosion and deposition. [Establish sedimentation rates from cores or sediment traps where problems are suspected]	Maintain natural sediment load for this type of artificial, former clay/mineral workings.	Increases in salutation could result from increased lake productivity, changes in catchment land-use, lake level fluctuations or climatic fluctuations.	Yes
Standing waters	Vegetation composition: macrophyte community composition	Fixed point sector/transect sampling (boat or shore-based methods)	i) Characteristic species should be present.  ii) 6 out of 10 sample spots (boat or wader survey) should include at least one characteristic species. Where unit specific data exists (e.g.. 1987 water plant survey at B&B) the characteristic species are those listed for that specific waterbody/unit.  iii) There should be no loss of characteristic	Characteristic species can be taken as those recorded at baseline survey (for Barton and Barrow Clay Pits this is the 1987 water plant survey but disregarding species indicating saline intrusion)	Yes

			species recorded from the site.		
Standing waters	Vegetation composition: negative indicator species	Fixed point sector/transect sampling (boat or shore-based methods)	<p>Non-native species and species indicating saline intrusion should be absent or present at no more than baseline levels (e.g.. 1987 water plant survey at B&amp;B).</p> <p>Occurrence of <i>Elodea nuttallii</i> or <i>Elodea canadensis</i> at &gt;50% frequency is indicative of unfavourable condition.</p> <p>Cover of benthic and epiphytic filamentous algae should be less than 10%.</p>	<p>Introduced species should be identified. Species of particular concern are: <i>Crassula helmsii</i>, <i>Hydrocotyle ranunculoides</i>, <i>Myriophyllum aquaticum</i> and <i>Azolla filiculoides</i>. If any of these species are present, a water body should be considered as being in unfavourable condition. This list is not exhaustive and should be updated as new threats become apparent.</p>	Yes
Standing waters	Vegetation composition: macrophyte community structure	Fixed point sector/transect sampling (boat or shore-based methods)	<p>Zones of vegetation characteristic for the species recorded in 1987 should be present.</p> <p>25% cover of at least two generic guidance species (one from the "characteristic" list and one from the "associated" list).</p> <p>Maximum depth distribution characteristic of the species should be present.</p>	<p>Characteristic species can be taken as those recorded at baseline survey (for Barton and Barrow Clay Pits this is the 1987 water plant survey but disregarding species indicating saline intrusion)</p> <p>Despite the unstable substrate frequently found at old clay/gravel workings some cover of submerged species should be possible.</p> <p>The maximum depth at which submerged vegetation is able to grow is a direct indicator of water clarity and also a general indicator of the status of the macrophyte community.</p> <p>Consideration should be given to e.g. Isoetes species, charophytes (particularly Chara species) and Potamogeton species.</p>	Yes

			A decrease in the maximum depth of characteristic species colonisation along a fixed point transect of greater than 10% indicates a site moving out of favourable condition.		
Standing waters	Water quality	Existing data from Environment Agency monitoring programme. [Sampling should be carried out quarterly, ideally monthly. As a minimum samples should be taken in early spring.]  Existing data or temperature/dissolved oxygen profiles  Existing data, shoreline walk, sample of bloom	Stable nutrient levels appropriate to lake type.  Mean annual total phosphorus concentration less than target for appropriate lake type. At Barton and Barrow this is 50µg/l P (i.e.. for high alkalinity, shallow water bodies) .  Stable pH/ANC values appropriate to lake type  Adequate dissolved oxygen levels for health of characteristic fauna  No excessive growth of cyanobacterial or green algae.		Yes
Standing waters	Hydrology	Use existing data or develop a hydrological model and sampling regime. This should be carried out quarterly, ideally monthly.  Shoreline walk	A hydrological regime appropriate to a series of artificial waterbodies which are fed from a variety of sources.  No loss of marginal vegetation	The natural flushing rate and seasonal water –level fluctuations of the lake should not be affected by abstractions from inflow streams, groundwater or the lake or by changes to outflows.  Online lakes can be assessed by reference to changes in inflow stream flows and changes in lake residence times.  Data to assess the following targets should be available from the relevant environmental protection agency: Inflow streams: abstractions of no more than 10% of daily	Yes

				<p>naturalised flows</p> <p>Groundwater and abstractions from lake water body: natural residence time not affected by more than 10%.</p> <p>Where groundwater abstractions are suspected of affecting lake hydrology further investigation and/or modelling may be required to inform the flow naturalisation process.</p> <p>The Blow Wells supplies the Far Ings clay pits complex with clean, fresh water from a chalk aquifer. It sometimes stops running in dry summers. The aquifer is also subject to abstraction by Anglian Water. LWT will advise on what would be a reasonable number of "dry ups" in a 10 year period. Anymore and it's down to man-made influences and the relevant Far Ings units would fail this attribute.</p> <p>Erosion from boat wash may reduce marginal vegetation cover.</p>									
Standing waters	<p>Indicators of local distinctiveness</p> <p>Extensive phragmites dominated reedbeds associated with open water.</p>	Fixed point sector/transect sampling (boat or shore-based methods) and/or shoreline walk.	<p>No loss of extent of phragmites dominated reedbeds. Assessment against baseline map (Bullens NVC 2001) and/or Far Ings HLS mapping.</p> <p>The target age range for these fresh water reedbeds is:  Regenerating (0-2yrs)  Dynamic (3yrs+)  Mature  Degenerate</p>	<p>The reedbeds at Far Ings NNR are subject to a reserve management plan and HLS agreement. The aim being to achieve the following in terms of age ranges;</p> <table border="0"> <tr> <td>Regenerating (0-2yrs)</td> <td>20%</td> </tr> <tr> <td>Dynamic (3yrs+)</td> <td>40%</td> </tr> <tr> <td>Mature</td> <td>30%</td> </tr> <tr> <td>Degenerate</td> <td>10%</td> </tr> </table> <p>This is achieved through burning or cutting 8.3% of reed, within given management blocks, in a 12 year rotation. If an annual burn is missed, up to 12% of the management area can be burnt or cut in the following years to catch up with the 12 year rotation.</p> <p>The Far Ings management plan and HLS agreement is indicative of what constitutes appropriate management.</p> <p>Outside of Far Ings, reedbeds could be grouped into nominal management blocks of approx 0.2ha (as per Far Ings man plan) and the burning/cutting rotation applied to these areas. This avoids a single area of Barton and Barrow Clay Pits making up all of the 8-12% in a given year.</p>	Regenerating (0-2yrs)	20%	Dynamic (3yrs+)	40%	Mature	30%	Degenerate	10%	Yes
Regenerating (0-2yrs)	20%												
Dynamic (3yrs+)	40%												
Mature	30%												
Degenerate	10%												
Standing waters	Environmental		On water bodies	The problem of introduced animals is most acute in relation to the	Yes								

	disturbance: Fish community / Introduced animals		<p>managed as commercial fishing pits, achieve a balanced mixed fishery using agreed joint Natural England-Environment Agency guidance on fish stocking to standing water SACs.</p> <p>On water bodies managed for nature conservation, no non-native fish introductions and for fish populations to be self regulating.</p>	<p>fish community in standing waters which can have a major influence on trophic structure and ecosystem functioning. The removal of piscivorous fish or the introduction of benthic-feeding species, such as carp both have the potential to cause switches to phytoplankton-dominated states in lakes with moderate nutrient loads. Fish stocking also has the potential to alter natural fish communities and alter the lake food web.</p> <p>This helpnote should be used to set targets for fish stocking on standing water SSSIs/SACs.</p> <p>There are known longstanding issues with fish stocking at certain water bodies at Barton and Barrow. The ideal is for no non-native fish introductions and for fish populations to be self regulating.</p>
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<b>Audit Trail</b>
<b>Rationale for limiting standards to specified parts of the site</b>
<b>Rationale for site-specific targets (including any variations from generic guidance)</b>
<p>Shoreline – Generic target is no more than 5% increase in heavily modified shoreline. I've said no loss from the 2004 situation because the shoreline will already have been heavily modified and we don't want it to get any worse.</p>
<p>Substrate and sediment load – As a result of being old clay workings many of the water bodies inevitably have a very fine, unstable substrate and a limited diversity in terms of substrate type. This means that they are unlikely to ever be as diverse in terms of the macrophyte flora commonly found in naturally eutrophic lakes.</p>
<p>Vegetation composition and community structure - Recommended, generic species lists have not been used. Instead the 1987 survey species lists have been used as a basis for judging the macrophyte attributes. This is because the nature of B&amp;BCPs is such that it doesn't fit well into the generic habitat categories, the 1987 situation is achievable (all forms of current management existed at that time) and 1987 is around the time of renotification of B&amp;BCPs when its qualification as a SSSI was re-confirmed. It can be assumed that the health (characterised in part by the plant species, structure and communities existing in 1987) is reflective of the sites ability to support the bird species and communities which may be the predominant reason for notification.</p> <p>Balanced, mixed fishery.</p>
<b>Rationale for selection of measures of condition (features and attributes for use in condition assessment)</b>
<p>(The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).</p>

Other Notes
<p>Sources:            Stace et. al. (1987) Barton and Barrow Clay Pits. Water Plant Survey. Unpublished report for English Nature.            Denyer &amp; Jukes (2009) Condition assessment monitoring of Far Ings, Barton upon Humber (part of the Humber Estuary SSSI). Unpublished report to Natural England.</p> <p>Environmental disturbance            Even though targets are not yet available (wrt standing waters), the 'attributes' on environmental disturbance are important in safeguarding site integrity and preventing deterioration in attributes formally assessed. It is important that notes on these factors are included in conservation objectives.</p> <p>Fish community / Introduced animals            Recreational use            Recreational use in many forms may impact upon ecological integrity. Possible negative impacts include: ground-baiting for angling; disturbance through powered boat traffic; pollution from boat marinas; physical destruction of plant communities.</p> <p>Artificial structures            A wide range of artificial structures could impact upon standing water ecosystem function. In particular water level control structures alter hydrology and shoreline construction or hardening reduces habitat availability and may alter sediment dynamics.</p>

**Table 3i Site-Specific definitions of Favourable Condition – Coastal cliffs and foreshore**

<b>CONSERVATION OBJECTIVE FOR THIS HABITAT / GEOLOGICAL SITE-TYPE</b>	To maintain the <b>Coastal cliffs and foreshore (EC)</b> at <b>Humber Estuary</b> in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:
<b>Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)</b>	

Site-specific standards defining favourable condition					
Criteria feature	Attribute term in guidance	Measure	Site-specific Targets	Comments	Use for CA?
Coastal Cliff and Foreshore (EC)	Exposure of features of interest	Visual / fixed-point photography	The features of interest are exposed or can be re-exposed by 1 or 2 people, using hand tools, in less than 3 hours approximately.		
Coastal Cliff and Foreshore (EC)	Vegetation	Visual / fixed-point photography	Vegetation is not obscuring or damaging the features of interest.		
Coastal Cliff and Foreshore (EC)	Scree and sediment build-up	Visual / fixed-point photography	Build-up of scree and sediment from weathering and collapse of faces is not obscuring the features of interest.		
Coastal Cliff and Foreshore (EC)	Tipping or landfill	Visual / fixed-point photography	There is no unconsented tipping or landfill obscuring or damaging the features of interest.		
Coastal Cliff and	Tree planting	Visual / fixed-point	There is no unconsented tree planting obscuring or damaging the		

Foreshore (EC)		photography	features of interest.		
Coastal Cliff and Foreshore (EC)	Engineering works	Visual / fixed-point photography	There are no unconsented engineering works obscuring or damaging the features of interest.		
Coastal Cliff and Foreshore (EC)	Coastal processes	Visual / fixed-point photography	Coastal processes, which cause erosion, are not constrained by human activities or structures, within or adjacent to the site.		
Coastal Cliff and Foreshore (EC)	Geological specimen collecting	Visual / fixed-point photography	Specimen collecting is not damaging the features of interest.		

<b>Audit Trail</b>
<b>Rationale for limiting standards to specified parts of the site</b>
<b>Rationale for site-specific targets (including any variations from generic guidance)</b>
<b>Rationale for selection of measures of condition (features and attributes for use in condition assessment)</b>
<b>Other Notes</b>

**Table 3j Site-Specific definitions of Favourable Condition – Active process geomorphological**

<b>CONSERVATION OBJECTIVE FOR THIS HABITAT / GEOLOGICAL SITE-TYPE</b>	To maintain the <b>Active process geomorphological (IA)</b> at <b>Humber Estuary</b> in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:
<b>Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)</b>	



Site-specific standards defining favourable condition					
Criteria feature	Attribute term in guidance	Measure	Site-specific Targets	Comments	Use for CA?
Active Process Geomorphological (IA)	Condition of features of interest	Visual / fixed-point photography	The features of interest remain intact and are evolving naturally.		
Active Process Geomorphological (IA)	Exposure of features of interest	Visual / fixed-point photography	The features of interest are exposed or can be re-exposed by 1 or 2 people, using hand tools, in less than 3 hours approximately.		
Active Process Geomorphological (IA)	Vegetation	Visual / fixed-point photography	Vegetation is not obscuring or damaging the features of interest.		
Active Process Geomorphological (IA)	Tipping or landfill	Visual / fixed-point photography	There is no unconsented tipping or landfill obscuring or damaging the features of interest.		
Active Process Geomorphological (IA)	Tree planting	Visual / fixed-point photography	There is no unconsented tree planting obscuring or damaging the features of interest.		
Active Process Geomorphological (IA)	Engineering works	Visual / fixed-point photography	There are no unconsented engineering works obscuring or damaging the features of interest.		
Active Process Geomorphological (IA)	Quarrying	Visual / fixed-point photography	The features of interest have not been damaged or removed by quarrying.		
Active Process Geomorphological (IA)	Natural processes	Visual / fixed-point photography	There is no impediment to active geomorphological processes.		
Active Process Geomorphological (IA)	Capacity for re-creation	Visual / fixed-point photography	The features of interest can be re-created by natural processes where they have been damaged or destroyed.		
Active Process Geomorphological (IA)	Context and surroundings	Visual / fixed-point photography	The context and relationship of the features of interest to the surroundings have not been diminished through physical damage and use of the surrounding land does not lead to changes that might detrimentally affect the features of interest.		
Active Process Geomorphological (IA)	Geological specimen collecting	Visual / fixed-point photography	Specimen collecting is not damaging the features of interest.		

<b>Audit Trail</b>
<b>Rationale for limiting standards to specified parts of the site</b>
<b>Rationale for site-specific targets (including any variations from generic guidance)</b>
<b>Rationale for selection of measures of condition (features and attributes for use in condition assessment)</b>
<b>Other Notes</b>

Annex 1      Maps

*[Insert electronic image of map ideally produced from a GIS]*

Conservation Objectives: (SSSI name)  
(Draft status and version)  
(version date)  
Format Version 2.1

ember 2009

**Annex 2**

**Red Data Book and Nationally Scarce invertebrate species recorded since 1970 from the Humber Estuary SSSI**

Scientific name	Rarity status	Humberside North AOS	Humberside South AOS	Lincolnshire North AOS
<b>Bryozoa</b>				
<i>Lophopus crystallinus</i>	RDB3 (Rare)		✓	
<b>Coleoptera (Beetles)</b>				
<i>Agabus conspersus</i>	Scarce B		✓	✓
<i>Amara lucida</i>	Scarce B	✓		✓
<i>Aphodius plagiatus</i>	Scarce B	✓		✓
<i>Atomaria rhenana</i>	Scarce B	✓		✓
<i>Bagous limosus</i>	Scarce B		✓	
<i>Bembidion lunatum</i>	Scarce B	✓	✓	
<i>Cleonus piger</i>	Scarce B	✓		✓
<i>Crypticus quisquilius</i>	Scarce B	✓		✓
<i>Cryptorhynchus lapathii</i>	Scarce B		✓	
<i>Dolichosoma lineare</i>	Scarce B	✓		✓
<i>Donacia clavipes</i>	Scarce B		✓	
<i>Dromius longiceps</i>	Scarce A		✓	
<i>Dytiscus circumflexus</i>	Scarce B		✓	
<i>Enochrus halophilus</i>	Scarce A	✓		✓
<i>Gyrinus paykulli</i>	Scarce A		✓	
<i>Haliphus apicalis</i>	Scarce B		✓	
<i>Helophorus fulgidicollis</i>	Scarce B	✓	✓	✓
<i>Limnichus pygmaeus</i>	Scarce A		✓	
<i>Lithodactylus leucogaster</i>	Scarce B		✓	
<i>Masoreus wetterhalli</i>	Scarce A			✓
<i>Notaris bimaculatus</i>	Scarce B		✓	
<i>Notiophilus quadripunctatus</i>	Scarce B	✓		
<i>Ochthebius auriculatus</i>	Scarce B			✓
<i>Ochthebius marinus</i>	Scarce B		✓	✓

Scientific name	Rarity status	Humberside North AOS	Humberside South AOS	Lincolnshire North AOS
<i>Orthoperus brunnipes</i>	RDB3 (rare)			✓
<i>Panagaeus bipustulatus</i>	Scarce B			✓
<i>Polydrusus pulchellus</i>	Scarce B	✓		✓
<i>Pselactus spadix</i>	Scarce B	✓		✓
<i>Stenus carbonaris</i>	Scarce B	✓	✓	
<i>Stenus nigrutilus</i>	Scarce B		✓	✓
<i>Telmatophilis schoenherri</i>	pRDBK (proposed insufficiently known)		✓	
<i>Thryogenes scirrhosus</i>	Scarce B		✓	
<i>Trechus discus</i>	Scarce B		✓	
<i>Trichosirocalus dawsoni</i>	Scarce B			✓
<b>Diptera (True flies)</b>				
<i>Sphaerophoria loewi</i>	RDB2 (vulnerable)		✓	
<b>Lepidoptera (butterflies &amp; moths)</b>				
<i>Chilodes maritimus</i>	Scarce B	✓	✓	
<i>Cucullia asteris</i>	Scarce B		✓	
<i>Earias clorana</i>	Scarce B		✓	
<i>Mythimna litoralis</i>	Scarce B	✓		
<i>Sideris albicolon</i>	Scarce B	✓		✓

**Saloon lagoon specialists present at the site which are not included in the above table:** *Gammerus insensibilis*, *Nematostella vectensis*, *Idotea chelipes*, *Ventrosia ventrosa*, *Gammerus cheveuxi*, *Hydrobia acuta*, *Glyptotendipes barbipe*, *Paramysis novelli*, *Cerastoderma glaucum*, *Littorina saxatilis* var. *Lagunae* (Source: Humber Estuary SSSI supporting information (2004); The Humber Estuary European Marine Site Regulation 33 Interim Advice (2003)).

Other species present at the lagoons include: *Hydrobia ventrosa*, *H. Neglecta*, *Capitella capitata*, *Manayunkia aestaurina*, *Streblospio shrubsoli*, *Alkmaria romijni*, *Nereis diversicolor*, *Sphaeroma hookeri*, *Canopeum seurati*, *Caulleriella* spp., *Polydora cilliata*, *Arenicola marina*, *Hydrobia ulvae*, *Microdeutopus gryllotalpa*, *Corophium insidiosum*, *C. Volutator*, *Neomysis integer*, *Palaemonetes varians*, *Carcinus maenus*, *Tharyx* sp., *Pygospio elegans*, *Eurydice pulchra*, *Pomatoschistus microps*. Source Smith, B.P. and Laffoley, D. 1992. A directory of saline lagoons and lagoon like habitats in England. English Nature.

## European Site Conservation Objectives for Humber Estuary Special Area of Conservation Site code: UK0030170

With regard to the natural habitats and/or species for which the site has been designated ('the Qualifying Features' listed below);

**Avoid the deterioration of the qualifying natural habitats and the habitats of qualifying species, and the significant disturbance of those qualifying species, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving Favourable Conservation Status of each of the qualifying features.**

Subject to natural change, to maintain or restore:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats and habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and habitats of qualifying species rely;
- The populations of qualifying species;
- The distribution of qualifying species within the site.

### Qualifying Features:

H1110. Sandbanks which are slightly covered by sea water all the time; Subtidal sandbanks

H1130. Estuaries

H1140. Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats

H1150. Coastal lagoons\*

H1310. *Salicornia* and other annuals colonising mud and sand; Glasswort and other annuals colonising mud and sand

H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)

H2110. Embryonic shifting dunes

H2120. Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"); Shifting dunes with marram

H2130. Fixed dunes with herbaceous vegetation ("grey dunes"); Dune grassland\*

H2160. Dunes with *Hippophae rhamnoides*; Dunes with sea-buckthorn

S1095. *Petromyzon marinus*; Sea lamprey

S1099. *Lampetra fluviatilis*; River lamprey

S1364. *Halichoerus grypus*; Grey seal

\* denotes a priority natural habitat or species (supporting explanatory text on following page)

## **This is a European Marine Site**

This site is a part of the Humber Estuary European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at [enquiries@naturalengland.org.uk](mailto:enquiries@naturalengland.org.uk), or by phone on 0845 600 3078, or visit the Natural England website at:

<http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx>

### **\* Priority natural habitats or species**

Some of the natural habitats and species listed in the Habitats Directive and for which SACs have been selected are considered to be particular priorities for conservation at a European scale and are subject to special provisions in the Directive and the Habitats Regulations. These priority natural habitats and species are denoted by an asterisk (\*) in Annex I and II of the Directive. The term 'priority' is also used in other contexts, for example with reference to particular habitats or species that are prioritised in UK Biodiversity Action Plans. It is important to note however that these are not necessarily the priority natural habitats or species within the meaning of the Habitats Directive or the Habitats Regulations.

### **Explanatory Notes: European Site Conservation Objectives**

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each habitat or species of a [Special Area of Conservation \(SAC\)](#). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving favourable conservation status for those features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

## European Site Conservation Objectives for Humber Estuary Special Protection Area Site Code: UK9006111

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

**Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.**

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

### Qualifying Features:

- A021 *Botaurus stellaris*; Great bittern (Non-breeding)
  - A021 *Botaurus stellaris*; Great bittern (Breeding)
  - A048 *Tadorna tadorna*; Common shelduck (Non-breeding)
  - A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)
  - A082 *Circus cyaneus*; Hen harrier (Non-breeding)
  - A132 *Recurvirostra avosetta*; Pied avocet (Non-breeding)
  - A132 *Recurvirostra avosetta*; Pied avocet (Breeding)
  - A140 *Pluvialis apricaria*; European golden plover (Non-breeding)
  - A143 *Calidris canutus*; Red knot (Non-breeding)
  - A149 *Calidris alpina alpina*; Dunlin (Non-breeding)
  - A151 *Philomachus pugnax*; Ruff (Non-breeding)
  - A156 *Limosa limosa islandica*; Black-tailed godwit (Non-breeding)
  - A157 *Limosa lapponica*; Bar-tailed godwit (Non-breeding)
  - A162 *Tringa totanus*; Common redshank (Non-breeding)
  - A195 *Sterna albifrons*; Little tern (Breeding)
- Waterbird assemblage

## **This is a European Marine Site**

This site is a part of the Humber Estuary European Marine Site. These conservation objectives should be used in conjunction with the Regulation 35 Conservation Advice Package, for further details please contact Natural England's enquiry service at [enquiries@naturalengland.org.uk](mailto:enquiries@naturalengland.org.uk), or by phone on 0845 600 3078, or visit the Natural England website at:

<http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx>

## **Explanatory Notes: European Site Conservation Objectives**

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a [Special Protection Area \(SPA\)](#). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.



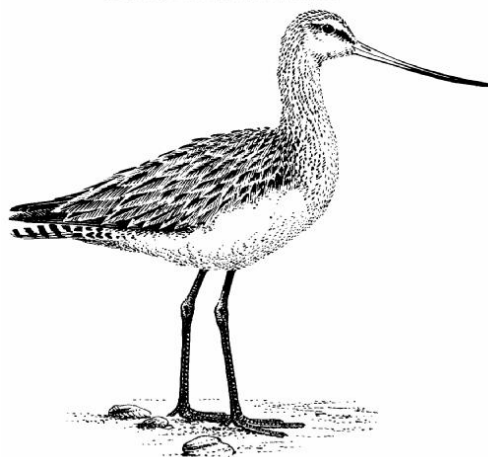


## **THE HUMBER ESTUARY EUROPEAN MARINE SITE**

**comprising:**

**Humber Estuary possible Special Area of Conservation  
Humber Flats, Marshes and Coast Special Protection Area & potential Special Protection Area  
Humber Flats, Marshes and Coast Ramsar Site & proposed Ramsar Site**

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



**INTERIM ADVICE  
APRIL 2003**

## **English Nature's advice for the Humber 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 Humber 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.

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 (classified under the Birds Directive which support significant numbers of internationally important wild birds). Ramsar sites support internationally important wetlands and wetland species (listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat). In accordance with DETR's<sup>1</sup> Planning Policy Guidance (PPG9) and the DETR statement *Ramsar Sites in England* (November 2000); Ramsar sites must be given the same consideration as European sites when considering plans and projects that may affect them.

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.

The Humber Estuary European marine site comprises a possible Special Area of Conservation – the Humber Estuary; a Special Protection Area and Ramsar site - Humber Flats, Marshes and Coast Phase 1 (classified in July 1994) and a potential Special Protection Area and proposed Ramsar site - Humber Flats, Marshes and Coast Phase 2 (yet to be classified). Although parts of these European sites have not yet been formally designated, it has been agreed by the relevant authorities that this Regulation 33 advice will be progressed for the pSAC, pSPA and pRamsar, as well as for the designated areas. Our advice within this document will cover the marine elements of all of these sites.

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

- understand the international 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 and 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 are maintained.

In addition, the Regulation 33 package will provide a basis to inform on the scope and nature of 'appropriate assessments' required in relation to plans and projects (Regulations 48 & 50 and by English Nature under Regulation 20). English Nature will also 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 designations on the Humber Estuary are currently under review by English Nature. This Regulation 33 advice will be updated in the future to reflect any subsequent changes to the boundaries or the features of the Humber Estuary European marine site.**

Richard Leafe, General Manager  
English Nature, September 2002

## Acknowledgements

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# **INTRODUCTORY SECTIONS**

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

### **1. Introduction to Regulation 33 advice**

#### **1.1 Natura 2000**

The European Union Habitats<sup>1</sup> and Birds Directives<sup>2</sup> are international agreements that 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<sup>3</sup>. 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) that support certain natural habitats or species, and in the Birds Directive, Special Protection Areas (SPAs) that support wild birds of European Union interest. In 1999, lists of candidate Special Areas of Conservation were submitted to the European Commission for a process known as moderation. Shortfalls across the whole Atlantic Biogeographic Region were identified, and in the UK these have been addressed by including further interest features occurring on existing sites, or by extending site boundaries to include more of particular habitats and species. However, 81 new sites were also identified and this included the Humber Estuary pSAC.

These SACs and SPAs are known as European sites and will form a network of conservation areas across the EU to be known as "Natura 2000". Where these sites 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.

The Convention on Wetlands of International Importance especially as Waterfowl Habitats was signed in Ramsar, Iran in 1971. The broad objectives are to stem the loss and progressive encroachment on wetlands now and in the future, through the designation of Ramsar sites. A habitat can qualify as a Ramsar site for its representation of a wetland, the plant or animal species it supports and for its role in supporting internationally important waterfowl. In accordance with DETR's Planning Policy Guidance (PPG9) and the DETR statement *Ramsar Sites in England* (November 2000); Ramsar sites classified under the Convention on Wetlands of International Importance<sup>4</sup> must be given the same consideration as European sites when considering plans and projects that may affect them.

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*, and Department of the Environment. 1998. *Planning Policy Guidance No. 9: Nature Conservation*. London, HMSO.

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

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

<sup>3</sup>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

<sup>4</sup>Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention), 1971.

## **1.2 English Nature's role**

The Conservation (Natural Habitats &c.) Regulations 1994 transpose 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 management scheme, which may be developed for these sites.

This document is English Nature's interim advice for the Humber 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 may be held at the English Nature local office, in Wakefield, West Yorkshire.

In addition to providing such advice, the Regulation 33 package informs on the scope and nature of 'appropriate assessments' which the Directive requires to be undertaken for plans and projects (Regulations 48 & 50 and by English Nature under Regulation 20, shown in appendix IX and sections 4.6 and 4.7). 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 competent authorities to exercise their functions so as to secure compliance with the Habitats Directive. The single management scheme which the relevant authorities are drawing up under Regulation 34 for the Humber Estuary European marine site will provide the framework through which this will be done and it should be based on the advice in this package. Relevant authorities must, within their areas of jurisdiction, have regard to both direct and indirect effects on interest features of the site. This may include consideration of issues outside the boundary of the European marine site.

Relevant authorities should ensure that all present and future plans for the area integrate with the management scheme for the European marine site. Such plans may include shoreline management plans, local Environment Agency plans, SSSI/Ramsar management plans, Local Nature Reserve (LNR) management plans, National Park management plans, Coastal Habitat Management Plans (CHaMPs), Sites of Nature Conservation Interest (SNCI), local and national Biodiversity Action Plans (BAP) 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 SAC, SPA and Ramsar site and may therefore need to modify the management scheme and/or the way in which they exercise their functions so as to maintain the favourable condition of interest features. There is no legal 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) and National Nature Reserves (NNR) 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<sup>5</sup>.

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

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. For the Humber Estuary European marine site a management group has already been set up and should be used to alert all relevant authorities to such issues so that they may be assessed and any appropriate measures taken. This does not, however, preclude relevant authorities from taking action to prevent deterioration to the interest features, for example by introducing or promoting codes of practice through the management group.

### **1.5 Responsibilities under other conservation designations**

In addition to its possible SAC; SPA and Ramsar site phase 1 and potential SPA and proposed Ramsar site phase 2 status, parts of the Humber Estuary European marine site are also designated and subject to agreements under other conservation mechanisms (e.g. SSSIs notified under the Wildlife and Countryside Act 1981). 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**

Sections 6, 10 and 14 of this document set out the conservation objectives for the Humber 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, or may in the future 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 Sections 8, 12 and 16 provide the basis for discussion about the nature and extent of the operations taking place within or close to the site, 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. However, it is known that some features of the site in some areas are currently not in favourable condition, although these habitats contribute to this interest features across the UK. 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.

### **1.8 European sites**

A European site is any one of the following, as defined in the Conservation (Natural Habitats, &c.) Regulations 1994, as amended.

- A special area of conservation (SAC) (designated under the Habitats Directive, which supports certain natural habitats and species of European importance);
- A site of community importance (SCI) (after a cSAC has been accepted by the government and European Commission it becomes an SCI);
- A site hosting a priority natural habitat type or priority species which the European Commission thinks should be on the list submitted by the UK government;
- A classified Special Protection Area (SPA) (classified under the Birds Directive which supports significant numbers of internationally important wild birds);

- A candidate Special Area of Conservation (after submission to the European Commission (but before designation by government) a site becomes a candidate SAC).

Also, in accordance with DETR's Planning Policy Guidance (PPG9) and the DETR statement *Ramsar Sites in England* (November 2000); Ramsar sites must be given the same consideration as European sites when considering plans and projects that may affect them.

Where the European site lies below highest astronomical tide i.e. land 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, it is described as a European marine site.

The marine areas of the Humber Estuary possible Special Area of Conservation and the Humber Flats, Marshes and Coast Special Protection Area and Ramsar site Phase 1 and Phase 2, together form the Humber Estuary European marine site.

### **1.9 Precautionary principle**

All forms of environmental risk should be tested against the precautionary principle which means that where there are real risks to the site, lack of full scientific certainty should not be used as a reason for postponing measures that are likely to be cost effective in preventing such damage. It does not however imply that the suggested cause of such damage must be eradicated unless proved to be harmless and it cannot be used as a licence to invent hypothetical consequences. Moreover, it is important, when considering whether the information available is sufficient, to take account of the associated balance of likely costs, including environmental costs, and benefits (DETR & the Welsh Office, 1998).

## **2. Identification of interest features under the EU Habitats and Birds Directives and the Convention on Wetlands of International Importance**

### **2.1 Introduction**

The Humber Estuary is one of the largest estuaries in the UK. At over 30,550 ha, (75,492 acres) and 14km at its widest point, it is the largest macro-tidal coastal plain estuary on the British North Sea, draining around 20% of the total land surface of England. It encompasses the outflow from the rivers Trent, Ouse and Hull and provides the largest single output of fresh water from Britain into the North Sea.

The estuary formed after the last glaciation and resulted from the influence of the sea on the soft boulder clay left after the ice retreated and subsequent sea level rise. It is macro-tidal with a mean spring tidal range of 5.7m at Spurn, increasing to 7.4m at Saltend, and decreasing to 6.9m at Hessle, which is 45km inland. The average width of the estuary is 4.3km and the depth 6.5m (Allen *et al.*, 2003). The bed of the estuary is mostly sandy with some patches of gravel and glacial till, grading into silty clay in the intertidal areas. The exception is the outer part of the south bank where the higher energy environment and greater marine sediment component results in the intertidal area being predominantly sandy. There are no natural rocky outcrops, except where the Humber Bridge is situated on the chalk of the Lincolnshire and Yorkshire Wolds. A small chalk cliff is also present at South Ferriby on the south bank, and an area of cobble substratum is found at Skitterness. In the outer estuary, Spurn Peninsula, a conspicuous spit of land protrudes 8kms into the mouth of the estuary from the south-eastern extremity of Holderness. The tip of Spurn is surrounded by hard glacial deposits known as moraine, which protect it from erosion. Inside this protective rim, sand dunes up to 15m high and extensive mudflats, known as Spurn Bight have formed. As the Holderness coast erodes, the mouth of the estuary moves inland and Spurn Point moves with it. Historical records show that the spit does occasionally break through.

The Humber Estuary is extremely turbid and sediment transport is particularly important within the estuary, with sediment entering the system from the North Sea, the Holderness coastline and from fluvial sources. The majority of suspended sediment is from the sea, with over 1,500 tonnes carried in per tide, compared to an average of 320 tonnes from riverine sources (Environment Agency, 1998). It has been estimated that up to 1.26 million tonnes of sediment may be present in the water column, with around 170 tonnes deposited in the estuary on each tide, and 150 tonnes exported to the sea (Environment Agency, 1998). The deposited sediments provide essential material to maintain the mudflats, sandflats and saltmarsh, and concentrate where the River Trent enters the estuary and on the extensive intertidal flats of the outer estuary. The erosion and accretion of sediments is a feature of much of the estuary, as is the changing position of the main channel upstream of the bridge. General channel morphology however is subject to regular spring-neap and winter-summer erosion-deposition cycles. Also, in the upper reaches of the estuary, the steeply sloping bed produces a tidal bore, which is particularly noticeable in the north channel around Whitton Sands (Allen *et al.*, 2003). The constant resuspension of sediment and the associated high suspended solids load gives the estuary its characteristic brown colouration (IECS 1994).

The natural processes acting on the estuary are immensely powerful, but the coastline (without human influence) can adapt in response to these forces as a dynamic system. On the Humber, much of the dynamic nature of the estuary is constrained by sea defences along almost its entire length, with these structures restricting the development of intertidal mudflats and saltmarsh (Allen *et al.*, 2003). Possibly the most dynamic section of the estuary is the inner reach between the Humber Bridge and Trent Falls where there are frequent channel migrations around Read's Island. Recent research has revealed a number of mechanisms responsible for channel movement in this area, including fresh water discharge and tidal regime. There are also dynamic interactions between the various bank systems in the inner and middle estuary releasing sediment which form mud and sand bars that create semi-permanent islands. There are also channel movements in the outer estuary.

Today, the Humber Estuary is a busy commercial waterway. The main influences on the system are urban developments, sea defences, industrial use and dock associated activities. The sea defences enclose much of the estuary and industrial complexes such as chemical works, oil refinery complexes and power stations dominate areas of its shores. It also houses the largest shipping complex in the UK. Alongside all this activity, the estuary also supports an impressive array of habitats and species.

The east coast of England contains almost 30% of the total area of tidal flats in Great Britain and the Humber Estuary contributes significantly to this figure. The intertidal area was estimated at 10,002ha in 1998 (Binnie *et*

al., 2001) and more than 90% of this is mudflat and sandflat. Intertidal flats, especially soft mudflats, support important populations of marine worms, molluscs and other invertebrates, often living in high densities and with high biomass. These provide an abundant food source for fish and are of particular importance for waterfowl, with over 175,000 visiting the site during the winter months.

Saltmarshes also have an important role to play in estuarine processes, both through the recycling of nutrients within the estuary, and through their role as soft sea defences, dissipating wave energy. They are highly productive biologically, providing nutrients that support other features within the marine ecosystem. They also have an important physical role, acting as a sediment store to the estuary as a whole and in providing roosting sites for waders and wildfowl at high tide. In addition, the upper and transitional marsh supports rare coastal invertebrates such as the scarce pug moth *Eupithecia extensaria occidua*. The combination of historical land claim for agricultural use and erosion has reduced the saltmarshes on the Humber. Also, the effects of “coastal squeeze”, whereby saltmarshes (and other intertidal habitats) are squeezed out between sea defences and rising sea levels, has caused the saltmarsh to erode at its seaward edge. In a natural system without sea walls, rising sea levels would cause the saltmarsh to move landwards, enabling it to compensate for its seaward losses. Sea defences however, prevent this landward migration and truncate the upper marsh, favouring the development of pioneer marsh species at the expense of Atlantic salt meadows. Local studies indicate that sea levels have been rising in the estuary at an average rate of 2 to 3mm per year in recent times. However, Government has asked defence and planning authorities to plan for an annual increase of 6mm per year over the next 50 years based on official predictions (Environment Agency, 2000). In some places on the Humber, the saltmarsh has been squeezed out completely and the mudflats themselves are being lost. The Environment Agency, through the Humber Shoreline Management Plan are currently proposing sites for managed realignment. These will provide new habitat to compensate for some of the predicted losses. Today, few saltmarshes in the UK show a full transition from pioneer saltmarsh species through to non-tidal vegetation. On the Humber, at Cherry Cobb on the north bank and south of Cleethorpes, there is some transition of saltmarsh vegetation, from pioneer species through to mid to upper marsh communities.

Saline lagoons also occur on the Humber Estuary and at Easington on the Holderness Coast. Lagoons are a priority habitat under the Habitats Directive and are the only priority maritime habitat that occurs in the UK. Lagoons in this region support a high species diversity, including some rare and uncommon species such as the starlet sea anemone *Nematostella vectensis* and the nationally scarce spiral tasselweed *Ruppia cirrhosa*. The lagoonal sand shrimp *Gammarus insensibilis* is found at its northernmost location in Humberston Fitties lagoon, which has been described as the third most important saline lagoon in Britain (Bamber 1992). The lagoons are also important for numerous waders and wildfowl. Little terns *Sterna albifrons* breed beside Easington Lagoons, and following the creation of saline lagoons on Reads Island and at Blacktoft Sands in the upper estuary, avocets *Recurvirostra avosetta* have returned to breed on the Humber after an absence of over 150 years.

The subtidal zone of the Humber is highly dynamic and the community structure is governed primarily by the salinity gradient, and also by the composition of the bottom sediments, sediment load, turbidity and anthropogenic factors related to water quality and dredging. Many of these factors vary with the season and state of the tide. Invertebrates dominate the Humber benthic community with diversity increasing towards the mouth of the estuary. The subtidal area also provides an important breeding, sheltering and nursery area for fish species. It is a major spawning area for the Dover sole *Solea solea* and low levels of commercial fishing for this species takes place as well as for plaice *Pleuronectes platessa*, cod *Gadus morhua*, eel *Anguilla anguilla* and shrimp *Crangon crangon*. In recent years, 82 species of fish have been recorded in the Humber Estuary, including the primitive river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*. Although numbers of lamprey have declined over the last 100 years, the UK is still one of their strongholds. They use the Humber as a migratory passage to and from their spawning and nursery grounds in the River Derwent and the River Ouse system.

Many estuaries in the UK are of great importance to migratory and wintering wildfowl, and the habitat mosaics of estuaries found on the east coast of England provide feeding and roosting sites. The relatively mild winter weather conditions found here compared to continental Europe can be of additional importance to the survival of wintering waterfowl during periods of severe weather. The Humber Estuary ranks amongst the top five British estuaries for the size of visiting waterfowl populations that it supports over winter. Outside of this period, it is of particular importance as a staging and moulting area in autumn and spring for migratory waterfowl species as it lies on the East Atlantic Flyway route and is also of importance for scarce and declining breeding birds.

Marine mammals are also found in and around the Humber Estuary. Donna Nook on the north Lincolnshire coast is an important breeding site for grey seals *Halichoerus grypus*; and harbour porpoises *Phocoena phocoena* are observed throughout the year off Spurn Head and at the entrance to the estuary.

At the time of compiling this advice, the Humber Estuary European marine site comprises the marine components of the Humber Estuary possible Special Area of Conservation (pSAC), the Humber Flats, Marshes and Coast Special Protection Area (SPA) Phase 1 and Phase 2, and the Humber Flats, Marshes and Coast Ramsar site Phase 1 and Phase 2. Phase 1 of these sites was classified in July 1994; Phase 2 is an extension to these sites and has not yet been classified. (These phase 2 sites are referred to as a potential SPA and proposed Ramsar site).

Although the pSAC, pSPA and pRamsar have not yet been formally designated; as stated in PPG 9<sup>6</sup> (Para 13), 'for the purpose of considering development proposals affecting them, potential SPAs. ...should be treated in the same way as classified SPAs'. While not required by law, or explicitly stated within Government policy, it is also good practice for developers and competent authorities to take account of the possible SAC in the preparation and assessment of applications for plans and projects, (particularly in light of the Review of Consents procedure under the Habitats Regulations). Likewise, developers should take account of the proposed Ramsar site, following the application of the Review of Consents procedure to these sites, stated in the UK Government's Policy Statement on Ramsar sites in England released in November 2000. It has therefore been agreed to develop this Regulation 33 advice for the Humber Estuary European marine site using the April and June 2000 citations, which cover the designated sites and pSAC, pSPA and pRamsar site to inform this process.

The marine components of all of these sites qualify as European marine sites, but for simplicity and for the purposes of this advice, the SAC, SPA and Ramsar site Phases 1 and 2 are referred to as the Humber Estuary European marine site and are covered within this single Regulation 33 package.

The boundaries of the European marine site are shown in Appendices I to IV.

Please note that the designations on the Humber Estuary are currently under review by English Nature, and this Regulation 33 advice will be updated in the future to reflect any subsequent changes to the boundaries or features of the European marine site.

## **2.2 Interest features under the EU Habitats Directive**

The Humber Estuary possible Special Area of Conservation, as designated under the Habitats Directive, qualifies as a SAC for the following Annex I habitats as listed in the EU Habitats Directive:

- Estuaries
- Coastal lagoons
- Atlantic salt meadows
- *Salicornia* and other annuals colonising mud and sand
- Mudflats and sandflats not covered by seawater at low tide (intertidal mudflats and sandflats)
- Sandbanks which are slightly covered by seawater all the time (subtidal sandbanks)

The Humber Estuary possible Special Area of Conservation, as designated under the Habitats Directive, also qualifies as a SAC for the following Annex II species as listed in the EU Habitats Directive:

- *Lampetra fluviatilis* (river lamprey)
- *Petromyzon marinus* (sea lamprey)

The Humber Estuary possible Special Area of Conservation has yet to be designated. It is the citation dated June 2000 on which this Regulation 33 advice is based.

## **2.3 Interest features under the EU Birds Directive**

The Humber Flats, Marshes and Coast Special Protection Area qualifies under Article 4.1 of the EU Birds Directive by supporting:

- Internationally important populations of regularly occurring Annex I 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 Humber Flats, Marshes and Coast Special Protection Area Phase 1, with an area of 15,230ha was classified on 28 July 1994. The Humber Flats, Marshes and Coast Special Protection Area Phase 2, with an area of 2,188 ha has yet to be classified.

It is the citation for the SPA Phases 1 and 2, dated April 2000 on which this Regulation 33 advice is based.

#### **2.4 Criterion under the Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat**

The Humber Flats, Marshes and Coast Ramsar site qualifies under Criterion 2 as it supports vulnerable, endangered or critically endangered species or threatened ecological communities;

- It holds an assemblage of threatened coastal and wetland invertebrates

The Humber Flats, Marshes and Coast Ramsar site qualifies under Criterion 3 as it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region:

- It holds a breeding colony of grey seal, *Halichoerus grypus* on the southern edge of its distribution

The Humber Flats, Marshes and Coast Ramsar site qualifies under Criterion 5 as it regularly supports

- 20, 000 or more waterfowl

The Humber Flats, Marshes and Coast Ramsar site qualifies under Criterion 6 as it regularly supports

- 1% or more of the individuals in a population of one species or sub-species of waterfowl

The Humber Flats, Marshes and Coast Ramsar site Phase 1, with an area of 15,230ha was listed on 28 July 1994. The Humber Flats, Marshes and Coast Ramsar site Phase 2, with an area of 2,188 ha has yet to be listed.

It is the citation for the Ramsar site Phases 1 and 2, dated April 2000 on which this Regulation 33 advice is based.

(This information is summarised in Table 1)

#### **2.5 Other qualifying features or features of interest within the SAC, SPA and Ramsar designations outside the European marine site**

The following features also qualify for each designation (SAC, SPA and Ramsar site) but do not, however, occur within the European marine site as they occur above the highest astronomical tide (HAT). Consequently, there are no specific conservation objectives within this document for these habitats and species. Objectives to maintain these features in favourable condition are identified within English Nature's conservation objectives for the relevant SSSIs within each European site boundary and will be dealt with through procedures outlined in the Conservation (Natural Habitat &c.) Regulations 1994. However, relevant authorities need to have regard to such adjacent interests as they may be affected by activities taking place within, or adjacent to the European marine site.

##### **2.5.1 Humber Estuary pSAC**

The Humber Estuary also qualifies as a possible SAC for the Annex I habitats **fixed dunes with herbaceous vegetation ("grey dunes")** (a priority interest feature); **embryonic shifting dunes** and **shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")**. These do not however, occur within the European marine site as they lie above highest astronomical tide and therefore are not considered further within this document.

Objectives to maintain these habitats in favourable condition are found within English Nature's conservation objectives for the relevant SSSI within the SAC boundary and will be dealt with through procedures outlined in the Conservation (Natural Habitats &c) Regulations 1994. Relevant authorities need to have regard to such adjacent European interests, as they may be affected by activities taking place within, or adjacent to the European marine site.

### **2.5.2 Humber Flats, Marshes and Coast SPA**

There are a number of habitats, such as wet grazing marsh and areas required for avocet to nest, which occur within the boundary of the SPA and support the qualifying bird species. They do not, however, occur within the European marine site as they occur above highest astronomical tide. Objectives to maintain this aspect of bird interest in favourable condition are found within English Nature's conservation objectives for the relevant SSSI within the SPA boundary and will be dealt with through procedures outlined in the Conservation (Natural Habitats &c) Regulations 1994. Relevant authorities need to have regard to such adjacent European interests, as they may be affected by activities taking place within, or adjacent to the European marine site.

### **2.5.3 Humber Flats, Marshes and Coast Ramsar site**

There are a number of **threatened coastal and wetland invertebrate species** listed under Criterion 2 of the Ramsar Convention on Wetlands of International Importance that occur within the boundary of the Ramsar site but outside of the European marine site as they occur above highest astronomical tide. Objectives to maintain habitats important to these species in favourable condition are found within English Nature's conservation objectives for the relevant SSSI within the Ramsar site boundary and will be dealt with through procedures outlined in the Conservation (Natural Habitats &c) Regulations 1994. Relevant authorities need to have regard to such adjacent European interests, as they may be affected by activities taking place within, or adjacent to the European marine site.

**Table 1** A summary of all the designations associated with the Humber Estuary European marine site and the habitats protected.

Site name	Designation	Qualifying feature	Habitats protected under each designation											
			Estuary	Coastal lagoons	Atlantic salt meadows	Salicornia and other annuals	Intertidal mudflats and sandflats	Subtidal sandbanks	River lamprey	Sea lamprey	Saltmarsh communities	Tidal reedbeds	Unvegetated sand and shingle	
<b>Humber Estuary</b>	Possible SAC	Annex I habitats <sup>1</sup>	√	√	√	√	√	√						
	(Yet to be designated, citation dated June 2000 used for this advice)	Annex II species <sup>2</sup>							√	√				
<b>Humber Flats, Marshes and Coast</b>	SPA and potential SPA  (Phase 1 classified 28/07/94, phase 2 yet to be classified, citation dated April 2000 used for this advice)	Annex I species <sup>3</sup>		√			√				√	√	√	
		Migratory species <sup>4</sup>		√			√				√	√		
		Waterfowl assemblage <sup>5</sup>		√			√				√	√		
	Ramsar and proposed Ramsar  (Phase 1 listed 28/07/94, phase 2 yet to be listed, citation dated April 2000 used for this advice)	Criterion 2 <sup>6</sup>		√								√		
		Criterion 3 <sup>7</sup>					√							
		Criterion 5 <sup>8</sup>		√			√					√	√	
		Criterion 6 <sup>9</sup>		√			√					√	√	

1. Qualifies under Annex I of the EU Habitats Directive. These habitat types are considered to be in most need of conservation at a European level

2. Qualifies under Annex II of the EU Habitats Directive. These species are considered to be in most need of conservation at a European level

3. Qualifies under Article 4.1 of the EU Birds Directive by supporting internationally important populations of regularly occurring Annex I birds

4. Qualifies under Article 4.1 of the EU Birds Directive by supporting internationally important populations of regularly occurring migratory species

5. Qualifies under Article 4.1 of the EU Birds Directive by supporting an internationally important assemblage of waterfowl

6. Qualifies under Criterion 2 of the Convention on Wetlands of International Importance, especially as a waterfowl habitat for hosting an assemblage of threatened coastal and wetland invertebrates

7. Qualifies under Criterion 3 of the Convention on Wetlands of International Importance, especially as a waterfowl habitat for supporting a breeding colony of grey seals on the southern edge of their distribution

8. Qualifies under Criterion 5 of the Convention on Wetlands of International Importance, especially as a waterfowl habitat for regularly supporting 20,000 or more water birds

9. Qualifies under Criterion 6 of the Convention on Wetlands of International Importance, especially as a waterfowl habitat for regularly supporting 1% or more of the biogeographic population of waterfowl species

### **3. Background to favourable condition tables**

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.

- The favourable condition table for the pSAC can be found in Section 7
- The favourable condition table for the SPA and pSPA can be found in Section 11
- The favourable condition table for the Ramsar and pRamsar can be found in Section 15

<b>Box 1</b>	<b>Glossary of terms used in favourable condition table</b>
<b>Interest feature</b>	The habitat or species for which the site has been selected.
<b>Sub-feature</b>	An ecologically important sub-division of the interest feature
<b>Attribute</b>	Selected characteristic of an interest feature/sub-feature which provides an indication of the condition of the feature to which it applies.
<b>Measure</b>	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.
<b>Target</b>	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.
<b>Comments</b>	The rationale for selection of the attribute.

## 4. 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 4.2 and on how it may be reviewed and updated in the future, in Section 4.4.

The advice is provided in summary form in Table 2 with more detail in Tables 4, 5, 8-13, 16 and 17 and in Sections 8, 12 and 16 including advice in relation to specific interest features and their sub-features.

### 4.1 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 Humber 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.

### 4.2 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 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).

#### 4.2.1 Sensitivity assessment

The sensitivity assessment used is an assessment of the relative sensitivity of the interest features or the component sub-features of the Humber 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). As an example, eelgrass beds are highly sensitive to changes in nutrient loading. Nutrient enrichment can lead to phytoplankton blooms that increase turbidity. This leads to a lack of light penetration, which may limit the ability of the eelgrasses to photosynthesise.

The sensitivity assessments of the interest features or their component sub-features of the Humber 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](http://www.marlin.ac.uk)).

#### **4.2.2 Exposure assessment**

This has been undertaken for the Humber 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 (as at July 2002). This was done through a workshop with relevant and competent authorities and members of the Humber Advisory Group. A meeting was also held with Environment Agency staff. It should be noted that the advice drawn together as a result of these discussions may be subject to further refinement in the future. As an example, high nutrient loads enter the Humber Estuary and therefore the subtidal habitats have a high exposure to changes in nutrient loading.

#### **4.2.3 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 VII.

### **4.3 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.

These broad categories provide a clear framework against which relevant authorities can assess activities under their responsibility. The more detailed information in Tables 4,5, 8-13, 16 and 17 provides relevant authorities with a context against which to consider an assessment of 'significant effect' or any plans or projects that 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.

#### **4.4 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 Humber Estuary European marine site. English Nature expects that the information on current activities and patterns of usage (which was used to derive tables 4, 8, 10, 12 and 16) 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, and has been used for the SPA section of this advice (see section 12). 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 (tables 5, 9, 11, 13 and 17) 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.

#### **4.5 Summary of advice on operations for the SAC, SPA and Ramsar interest features**

Table 2 is a summary of the advice on operations for the SAC, SPA and Ramsar interest features. More detailed information can be found in sections 8, 12 and 16.

In pursuit of the conservation objectives for all the interest features, the relevant and competent authorities for the Humber Estuary European marine site are advised to manage human activities within their remit such that they do not result in deterioration or disturbance of the habitats through any of the categories of operation listed in the table.

#### **4.6 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 IX for further information.

Tables 4, 5, 8-13, 16 and 17 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.

#### **4.7 Review of consents**

Regulation 50 of the Conservation (Natural Habitats, &c.) Regulations 1994, as amended, requires a competent authority to undertake a review of any existing consent or permission to which Regulation 48(1) would apply if it 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 2 Summary of operations that may cause deterioration or disturbance to the Humber Estuary European marine site interest features at current levels of use<sup>7</sup>**

The advice below is not a list of prohibitions but rather a checklist for operations for discussion with the management group, 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 that may be under relevant authority jurisdiction are also provided. Operations marked with a √ indicate those features (habitats and/or species) that are considered to be highly or moderately vulnerable to the effects of the operations.

Categories of operations which may cause deterioration or disturbance	SAC interest features						
	Estuary	Coastal lagoons	Atlantic salt meadows	<i>Salicornia</i> and other annuals	Intertidal mudflats and sandflats	Subtidal sandbanks	River and sea lamprey
<b>Physical Loss</b>							
Removal (eg land claim, dredging)	√	√	√	√	√	√	√
Smothering (eg depositing dredge spoil, beach feeding)	√		√		√	√	
<b>Physical Damage</b>							
Siltation (eg dredging, outfalls)	√		√	√	√		
Abrasion (eg recreational activity, vehicles)	√		√	√	√		
Selective extraction (eg aggregate extraction)	√			√	√		
<b>Non-physical disturbance</b>							
Noise (eg land/water-based recreation, marine traffic)							
Visual presence (eg land/water-based recreation, marine traffic)							
<b>Toxic contamination</b>							
Introduction of synthetic compounds (eg TBT, PCBs)	√	√	√	√	√	√	√
Introduction of non-synthetic compounds (eg trace metals from industrial or domestic effluent, crude oil)	√		√	√	√	√	√

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Introduction of radionuclides							
<b>Non-toxic contamination</b>							
Changes in nutrient loading (eg agricultural run-off, domestic effluent outfalls)	√	√	√	√	√	√	√
Changes in organic loading (eg domestic effluent outfalls, aquaculture)	√	√	√	√	√	√	√
Changes in thermal regime (eg power station discharges)							√
Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil)	√					√	
Changes in salinity (eg water abstraction, effluent outfalls)							
<b>Biological disturbance</b>							
Introduction of microbial pathogens (eg domestic/ industrial effluent outfalls)							
Introduction of non-native species and translocation	√		√	√			
Selective extraction of species (e.g. samphire picking, bait collection)	√			√	√		

Categories of operations which may cause deterioration or disturbance	SPA interest features								
	Inner Estuary			Middle Estuary			Outer Estuary		
	Annex I species	Migratory species	Waterfowl Assemblage	Annex I species	Migratory species	Waterfowl Assemblage	Annex I species	Migratory species	Waterfowl Assemblage
<b>Physical Loss</b>									
Removal (eg land claim, dredging)	√	√	√	√	√	√	√	√	√
Smothering (eg depositing dredge spoil, beach feeding)	√	√	√	√	√	√			
<b>Physical Damage</b>									
Siltation (eg dredging, outfalls)				√	√	√			
Abrasion (eg recreational activity, vehicles)	√	√	√	√	√	√	√	√	√
Selective extraction (eg aggregate extraction)							√		
<b>Non-physical disturbance</b>									
Noise (eg land/water-based recreation, marine traffic)	√	√	√	√	√	√	√	√	√
Visual presence (eg land/water-based recreation, marine traffic)	√	√	√	√	√	√	√	√	√
<b>Toxic contamination</b>									
Introduction of synthetic compounds (eg TBT, PCBs)	√	√	√	√	√	√	√	√	√
Introduction of non-synthetic compounds (eg trace metals from industrial or domestic effluent, crude oil)	√	√	√	√	√	√	√	√	√
Introduction of radionuclides									
<b>Non-toxic contamination</b>									
Changes in nutrient loading (eg agricultural run-off, domestic effluent outfalls)	√	√	√	√	√	√	√	√	√
Changes in organic loading (eg domestic effluent outfalls, aquaculture)	√	√	√	√	√	√	√	√	√
Changes in thermal regime (eg power station discharges)									

Categories of operations which may cause deterioration or disturbance	SPA interest features								
	Inner Estuary			Middle Estuary			Outer Estuary		
	Annex I species	Migratory species	Waterfowl Assemblage	Annex I species	Migratory species	Waterfowl Assemblage	Annex I species	Migratory species	Waterfowl Assemblage
Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil) Changes in salinity (eg water abstraction, effluent outfalls)									
<b>Biological disturbance</b> Introduction of microbial pathogens (eg domestic/ industrial effluent outfalls) Introduction of non-native species and translocation Selective extraction of species (e.g. samphire picking, bait collection)		√	√		√	√	√	√	√

Categories of operations which may cause deterioration or disturbance	Ramsar site interest features		
	Criterion 2: Assemblage of threatened coastal and wetland invertebrate species	Criterion 3: Breeding colony of grey seals	Criterion 5: Regularly supports 20,000 or more waterfowl species Criterion 6: Regularly supports 1% or more of a species or sub-species of waterfowl
<p><b>Physical Loss</b> Removal (eg land claim, dredging) Smothering (eg depositing dredge spoil, beach feeding)</p>	<p>For information on operations affecting the saltmarsh communities and coastal lagoons, see the assessments made under the SPA section.</p>	√	<p>For information on operations affecting the waterfowl assemblage and populations of waterfowl species, see the assessments made under the SPA sections</p>
<p><b>Physical Damage</b> Siltation (eg dredging, outfalls) Abrasion (eg recreational activity, vehicles) Selective extraction (eg aggregate extraction)</p>			
<p><b>Non-physical disturbance</b> Noise (eg land/water-based recreation, marine traffic) Visual presence (eg land/water-based recreation, marine traffic)</p>		√	
<p><b>Toxic contamination</b> Introduction of synthetic compounds (eg TBT, PCBs) Introduction of non-synthetic compounds (eg trace metals from industrial or domestic effluent, crude oil) Introduction of radionuclides</p>		√	
		√	
<p><b>Non-toxic contamination</b> Changes in nutrient loading (eg agricultural run-off, domestic effluent outfalls) Changes in organic loading (eg domestic effluent outfalls, aquaculture) Changes in thermal regime (eg power station discharges)</p>			

Categories of operations which may cause deterioration or disturbance	Ramsar site interest features		
	Criterion 2: Assemblage of threatened coastal and wetland invertebrate species	Criterion 3: Breeding colony of grey seals	Criterion 5: Regularly supports 20,000 or more waterfowl species Criterion 6: Regularly supports 1% or more of a species or sub-species of waterfowl
Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil) Changes in salinity (eg water abstraction, effluent outfalls)	For information on operations affecting the saltmarsh communities and coastal lagoons, see the assessments made under the SPA section.		For information on operations affecting the waterfowl assemblage and populations of waterfowl species, see the assessments made under the SPA sections
<b>Biological disturbance</b> Introduction of microbial pathogens (eg domestic/ industrial effluent outfalls) Introduction of non-native species and translocation Selective extraction of species (e.g. samphire picking, bait collection)		√	

<sup>7</sup>This advice has been developed using best available scientific information and informed scientific interpretation and judgement (as at July 2002). 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 in Tables 5, 9, 11, 13 and 17. 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 July 2002. 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.

## **SPECIAL AREA OF CONSERVATION**

## **5. The Humber Estuary pSAC interest features**

The Humber Estuary pSAC includes both marine areas (ie. land covered continuously or intermittently by tidal waters) and land that is not subject to tidal influence. The marine part of the pSAC is termed a European marine site. The seaward boundary of the European marine site is concurrent with that of the pSAC. The landward boundary of the European marine site is the upper boundary of the pSAC, or where that extends above land covered continuously or intermittently by tidal waters, it is at the limit of the marine habitats (highest astronomical tide).

Where the pSAC qualifying habitats and 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 Humber Estuary European marine site includes a possible Special Area of Conservation with eight interest features qualifying under Annex I and Annex II of the Habitats Directive. This section describes and explains the importance of each of these interest features together with their component sub-features.

### **5.1 Estuary**

#### **5.1.1 Definition**

Estuaries are complex and highly productive ecosystems, supporting a wide range of habitats and species. They form the interface between freshwater and marine environments and extend from the upper limit of tidal influence to the open sea. Where freshwater and seawater meet, and where current flows are reduced in the shelter of estuaries, fine sediments are deposited, often forming extensive intertidal mudflats and sandflats. These are typically inhabited by a variety of infaunal invertebrates, many of which provide important sources of food for fish, waterfowl and seabirds. At higher elevations within the tidal range, the mudflats and sandflats are exposed for sufficient periods to become vegetated with salt-tolerant plants forming saltmarshes, which play an important role in the nutrient and sediment cycling processes within the estuarine ecosystem. Saltmarshes also provide essential feeding and roosting areas for waterfowl. Towards the mouth of an estuary, where the water gradually becomes more saline, the silt content of the sediment declines and infaunal communities are dominated by invertebrates such as free-swimming polychaete worms and infaunal bivalve molluscs. Many of the habitats within an estuary are interdependent and inextricably linked to the structure and functioning of others.

The UK has a particularly large number of estuaries. In fact, more than a quarter of the area of the north-western European estuaries are located in the UK (Brown *et al.*, 1997). The wide range of estuary types occurring in the UK is also unusual in a European context. Sites in the UK have been selected to represent the geographical range of estuaries, and include examples of four geomorphological types (coastal plain, bar-built, complex estuaries and rias) and a range of substrates and associated fauna. The intertidal and subtidal sediments of estuaries support biological communities that vary depending on their geographic location, sediment type, salinity gradients and the tidal currents within the estuary.

#### **5.1.2 Importance of the estuary interest feature in the Humber Estuary European marine site**

Estuaries in the UK have been selected to take account of the UK's EU responsibility for this habitat type and so the site series contains a high proportion of the total UK resource. Sites have generally been selected as entire units, extending from the tidal limit or extent of brackish influence to the estuary mouth, and including all habitats that are important to the integrity of the site. In particular, the entire water column has been included due to its importance not only in the biological functioning of the system, but also as the means by which sediment is mobilised and transported.

The Humber is the second largest coastal plain estuary in the UK, and the largest coastal plain estuary on the east coast of Britain. A coastal plain estuary is formed when pre-existing valleys were flooded at the end of the last glaciation. They are usually less than 30m deep with a large width to depth ratio. The Humber is a muddy, macro-tidal estuary, which is fed by the rivers Trent, Ouse and Hull. Suspended sediment loads are high and are derived from a variety of sources, mostly marine from the North Sea and the eroding boulder clay along the Holderness coast, but also from riverine sediments. This is the northernmost English east coast estuary whose structure and function is intimately linked with soft eroding shorelines.



Habitats within the Humber Estuary include Atlantic salt meadows and *Salicornia* beds, together with subtidal sandbanks, extensive intertidal mudflats and sandflats, sand dunes and coastal lagoons. The saltmarshes on the estuary are predominantly ungrazed and species rich, but are not of the extent that one might expect for an estuary of this size due to historical land claim and drainage. It is estimated that nearly 2,700ha of intertidal land has been lost in the middle and outer estuary between 1828 and 1996, with 2,330ha attributed to land claim (Murby 2001). Nevertheless, there are still extensive mudflats and sandflats in the estuary, which support rich benthic communities. The most extensive intertidal areas are the mudflats of Spurn Bight on the north bank and the sandy areas of Cleethorpes to Donna Nook on the south bank. The inner estuary is also characterised by large, often mobile, mud and sand flats which are exposed at high water. The benthic communities of these areas provide an important food source for birds and also for fish species.

The Humber Estuary is extremely turbid and sediment transport is particularly important within the estuary. The majority of suspended sediments are from the North Sea, with smaller amounts coming from fluvial sources. Erosion and accretion of these sediments is a feature of much of the estuary, as is this changing position of the main channel upstream of the bridge. Possibly the most dynamic section of the estuary is the inner reach between the Humber Bridge and Trent Falls where there are frequent channel migrations around Read's Island. Recent research has revealed a number of mechanisms responsible for channel movement in this area, including fresh water discharge and tidal regime. There are also dynamic interactions between the various bank systems in the inner and middle estuary releasing sediment which form mud and sand bars that create semi-permanent islands. There are other channel movements in the outer estuary.

As salinity decreases upstream, reedbeds and brackish saltmarsh communities fringe the estuary, although much of this area is backed by sea defences. These habitats are best represented at the confluence of the rivers Ouse and Trent at Blacktoft Sands and also at Whitton Sands. Reedbeds across the estuary are important for bittern and marsh harrier. They also support some of the rarer species of hoverfly, moths and ground beetles.

Records of 82 different fish species have been recorded in the estuary including the river and sea lamprey, Alis and twaite shad and salmon (Mike Elliot, pers com). It is also used as a nursery for fish such as plaice and has some cockle and mussel beds in the outer estuary (McLeod, *et al.*, 2001).

The Humber, along with most other UK estuaries, is subjected to urban and industrial pressures. Many have been subjected to some form of sea defence measures, such as embankments or the construction of sea walls. This is due, in part to areas of land, rising or sinking relative to sea level. North of the Humber Estuary the land is rising relative to sea level, this lessens the need for sea defences. However, in the lower lying areas south of the Humber, the risk of flooding is greater. From the Humber southwards, almost all estuaries have linear defences along more than 50% of their shoreline, for most it is over 80% and the Humber is no exception.

### 5.1.3 Sub-features

**Saltmarsh communities** – ‘Atlantic salt meadows’ and ‘*Salicornia* and other annuals colonising mud and sand’ are both classified in the Habitats Directive as interest features in their own right and are therefore described separately in sections 5.3 and 5.4 below.

**Intertidal mudflats and sandflats communities** – ‘Mudflats and sandflats not covered by seawater at low tide’ are classified in the Habitats Directive as interest features in their own right and are therefore described separately in sections 5.5 below.

**Subtidal sediment communities** - The subtidal habitats and their associated communities form an important component of the Humber's estuarine ecosystem. The bed of the estuary is mostly sandy, with some patches of gravel and glacial till grading into silty clay in the intertidal areas of the main body of the estuary. An exception is the outer part of the south bank, where the intertidal is sandy.

In addition, ‘Sandbanks which are slightly covered by seawater all the time’ are classified in the Habitats Directive as interest features in their own right and are therefore described separately in section 5.6 below.

## 5.2 Coastal Lagoons

### 5.2.1 Definition

Coastal lagoons are areas of typically (but not exclusively) shallow, brackish or salt water, wholly or partially separated from the sea by sandbanks, shingle or, less frequently, rocks or other hard substrata. They retain a portion of their water at low tide and may develop as brackish (due to dilution of seawater by freshwater), fully saline or hypersaline (more salty than seawater due to evaporation). Lagoons show a wide range of geographical and ecological variations. Five main sub-types that differ in their form and function have been identified in the UK, on the basis of their physiography. These are isolated lagoons, percolation lagoons, silled lagoons, sluiced lagoons and lagoonal inlets. Some of these sub-types have a very restricted distribution.

Lagoons are the UK's only maritime priority habitat, i.e. they are considered in danger of disappearing, and the European Union has particular responsibility for their conservation. As well as being relatively uncommon in the UK, some of the lagoon sub-types found here are rare elsewhere in Europe. Therefore, a high proportion of the total UK resource of lagoons has been included within the site series. Site selection has aimed to represent the range of physiographic sub-types and to provide good geographical coverage across the UK.

The plant and animal communities of lagoons vary according to the physical characteristics and salinity regime of the lagoon, and consequently there are significant differences between lagoons, although they all possess a characteristic invertebrate fauna that shows little variation, even within Europe. The species present are specially adapted to varying salinity regimes and some are unique to lagoon habitats. The species found are often characterised by mysid shrimps and other small crustaceans, worms that burrow into the sediment, gastropod molluscs and some fish species. The vegetation may include beds of eelgrass *Zostera* spp., tasselweeds *Ruppia* spp. and pondweeds *Potamogeton* spp., or stoneworts such as *Lamprothamnium papulosum*. In more rocky lagoons, communities of fucoid wracks *Fucus* spp., sugar kelp *Laminaria saccharina*, and red and green algae are also found. Lagoonal specialist species and species associated with coastal lagoons, consequently have restricted distributions in the UK. These include the starlet sea anemone *Nematostella vectensis*, lagoon sand worm *Armandia cirrhosa*, lagoon sand-shrimp *Gammarus insensibilis* and the foxtail stonewort *L. papulosum*. Several of these species are very rare and are protected under the Wildlife and Countryside Act 1981.

Although uncommon, coastal lagoons may be clustered together on stretches of coast, where they are dependent on local physical processes, such as sediment transport systems. Such clusters have been considered particularly important for the conservation of lagoon structure and function and so site selection has reflected this distribution. However, only natural or near natural lagoon sites have been selected, although this may include sites that have been artificially created from natural substrata. Sites that are entirely artificial in origin are excluded such as disused docks, even though in some cases the communities present may be similar to those of more natural sites (McLeod *et al.* 2001).

### 5.2.2 Importance of the coastal lagoons interest feature in the Humber Estuary European marine site

The Humber region is highly significant in a national context and is particularly important for lagoons that have developed where there were formerly saltmarshes behind dune-capped barrier islands. The invertebrate fauna of the lagoons of this region include three nationally scarce species; the lagoon sand-shrimp *Gammarus insensibilis*, the tentacled lagoon worm *Alkmaria romijni* and the starlet sea anemone *Nematostella vectensis*. *N. vectensis* is particularly interesting as all the individuals found in the UK are female and are clones of one original animal, regardless of their location. The nationally scarce stonewort *Tolypella glomerata* is also found. Also notable in this region's lagoons are the opossum shrimp *Paramysis nouveli*, the lagoonal cockle *Cerastoderma glaucum*, the lagoonal periwinkle *Littorina saxatilis* var. *lagunae*, the lagoonal mud snails *Hydrobia ventrosa* and *H. neglecta*, together with a significant marine component, including the mud snail *Hydrobia ulvae* (Bamber and Barnes 1995).

The Humber Estuary supports two coastal lagoons within the Special Area of Conservation boundary. Humberston Fitties, south of Cleethorpes supports diverse communities of several lagoon specialist species and has been described as the third most important lagoon in Britain (Bamber 1992). The lagoon had its origins as a saltmarsh pool, although it has obviously had some human interference and appears to have been used as a boating lake at some time. The site comprises, one main lagoon and four saltmarsh pools. These saltmarsh pools dry out and become hypersaline during the summer, although one of them may be subject to more regular tidal inundation. The physiography of the site appears to have changed somewhat since the survey carried out by Sheader and

Shedder in 1986, which reports that the lagoon was connected to the estuary via a long channel through the saltmarsh. However, both Shedder and Shedder's 1998 survey and Seaton's 2001 survey report that this channel has silted up and Humberston Fitties now persists as an isolated lagoon, its water acquired through overtopping of the bank during spring tides. It has also been observed that although the channel is silted up, it is still slightly lower than the surrounding saltmarsh and so on high spring tides water will flow over it into the main lagoon (Andrew Grieve, pers com). Isolated lagoons are described in McLeod *et al* (2001) as being separated completely from the sea (or estuary) by a barrier of rock or sediment. Seawater enters by limited groundwater seepage or by overtopping of the sea barrier. The salinity is variable but often low. Isolated lagoons are often transient features with a limited lifespan due to the natural processes of infilling and coastal erosion. There is no freshwater input into Humberston Fitties lagoon, except from rain and surface runoff.

Humberston Fitties is a very important site; the community is diverse for a lagoon and comprises many lagoon specialist species (Seaton, 2001). Bamber (1992) devised a biotic index, which compares the relative abundance of specialist and non-specialist species. When used at Humberston Fitties, the lagoon receives a very high score which places it as the third most important lagoon in Britain in terms of community composition (Seaton, 2001). This is even more remarkable when its location is taken into account. Humberston Fitties is the most northerly site in Europe for the lagoon sand shrimp *Gammarus insensibilis*, an amphipod protected under Schedule 5 of the Wildlife and Countryside Act 1981. (The next nearest colony is believed to be in Norfolk.) The population of *G. insensibilis* is entirely confined upon the alga *Chaetomorpha linum* for which Humberston Fitties is one of the most northerly sites in Britain, if not Europe for this species. This association is well known and *G. insensibilis* does not occur in Britain without this plant. Other specialist species found are the lagoon mudsnail *Hydrobia ventrosa*, the lagoon sea mat *Conopeum seurati*, the lagoon slater *Idotea chelipes* and the beaked tasselweed *Ruppia maritima* (Seaton 2001).

Northcoates Lagoon is an extensive and narrow lagoon system behind low dunes and saltmarsh on the north Lincolnshire coast, south of Humberston Fitties. It is a complex system consisting of a high salinity silted lagoon and a moderate salinity percolation lagoon. Seawater enters the system at high tide through two channels and then moves through to fill the channels and flow through to the north and south of the system. In the late summer the lagoons occasionally dry out completely and become hypersaline, although the channel system that provides the in-flow of saltwater from the estuary is deeper and usually retains water throughout the summer (Andrew Grieve, pers com). It is therefore likely that the invertebrate species that have been recorded in the northern lagoon persist in the channel rather than in the desiccated lagoons during the summer (Andrew Grieve, pers com).

Unicomarine surveyed Northcoates Lagoon system in 2001 and a relatively diverse species list was identified, reflecting the progression from marine to brackish habitats through the system. The marine estuarine southern part of the system has a typical, unremarkable estuarine fauna. However, the brackish lagoon system to the north, supports saline lagoon specialists including *Gammarus chevreuxi*, which is only known from a few lagoon sites in the UK, *Idotea chelipes* and the lagoon mudsnails *Hydrobia acuta* and *H. ventrosa*. A limited distribution of spiral tasselweed *Ruppia cirrhosa* was also recorded.

### **5.3 Atlantic salt meadows (*Glauco-Puccinellietalia*)**

#### **5.3.1 Definition**

Atlantic salt meadows (*Glauco-Puccinellietalia*), develop when salt-tolerant vegetation colonises intertidal sediments of mud and sand in areas protected from strong wave action. This vegetation forms the middle and upper reaches of saltmarshes, where tidal inundation occurs with decreasing frequency and duration. The vegetation varies depending on the climate and position in the marsh. In the UK, Atlantic salt meadows occur on the North Sea, English Channel and Atlantic shores, with the largest examples in the sheltered estuaries of England. There are more than 29,000 hectares of this habitat in the UK (Brown *et al.*, 1997), which suggests that up to two-thirds of British saltmarshes are represented by this category. Sites have been selected to cover the geographical range and ecological variation of this habitat type, and for the most part they are the largest examples, supporting a well-developed zonation of plant communities. Many have transitions to terrestrial habitat assemblages, such as freshwater reedbed, sand dunes, vegetated shingle and woodland. There are marked regional variations in Atlantic salt meadow communities in the UK and those which are grazed differ significantly from those which are ungrazed, in terms of both structure and species composition.

Saltmarshes play a fundamental role in the life of an estuary, bringing stability to its margins and also operating as a source of primary production. They are a rare and specialised habitat in their own right and many of the plants that occur there survive nowhere else. Saltmarshes provide an important habitat for both marine and terrestrial fauna and serve as roosting and feeding areas for internationally important waterfowl.

### 5.3.2 Importance of the Atlantic salt meadows interest feature in the Humber Estuary European marine site

There are an estimated 627ha of saltmarsh on the Humber, accounting for only 2% of the estuarine area, compared with a national average of 6% (Billings *et al.* 2002). This is due to large historical losses from land claim. The composition of the Humber's saltmarshes is also unusual compared to other UK estuaries. Over half the marsh is dominated by common reed *Phragmites australis* and sea club-rush *Scirpus maritimus* especially in the inner estuary. Typical saltmarsh communities – pioneer marsh and low, mid and upper marsh communities are scarce, amounting to less than 1% of the total estuarine area.

Historically, land claim has been the greatest cause of saltmarsh loss on the Humber. Today, coastal squeeze is the biggest threat to the remaining saltmarsh, particularly the upper marsh communities, which may be 'squeezed out' and replaced by lower marsh communities. The extent to which the saltmarsh can migrate inland as sea level rises is likely to be especially valuable in re-dressing losses incurred to the feature through submersion. It is estimated that over the past 20 years, there has been a net loss of 24ha of saltmarsh in the outer estuary, although there has also been an increase in tidal marsh of 58ha in the inner estuary (Billings *et al.* 2002). The area along the North Lincolnshire coast from Cleethorpes southwards has also seen some saltmarsh accretion. For example, over the last 50 years, over 240ha of saltmarsh has developed around Saltfleet Haven (Graham Weaver, pers com). Further investigation to monitor the rate of change in the saltmarsh communities, and the degree to which this can be attributed to coastal squeeze is needed. Actions may also be identified to offset this net loss.

The Humber Estuary supports saltmarsh on both its northern and southern banks in varying degrees of diversity. In some places, the upper marsh communities have been lost due to coastal squeeze, but in other areas such as Cherry Cobb on the north bank, and south of Cleethorpes, there is clear zonation of saltmarsh vegetation from pioneer species through to mid to upper marsh communities. The Atlantic salt meadows of the Humber are notable as being predominantly ungrazed and subsequently support a range of communities dominated by sea purslane *Atriplex portulacoides* and *Puccinellia maritima* with frequent sea aster *Aster tripolium* and sea lavender *Limonium vulgare*. Atlantic salt meadows within the Humber provide a valuable habitat for a range of marine and terrestrial fauna and flora, including invertebrates and birds.

### 5.3.3 Sub-features

**Low to mid marsh communities** - Lying immediately landward of the pioneer saltmarsh zone, the low to mid marsh communities experience a greater number of tidal inundations than the mid to upper marsh, usually more than 360 a year. As a result of this, the vegetation communities of the low and mid marsh are often relatively species-poor, composed of halophytic plants that can withstand such conditions. Communities of common saltmarsh grass *Puccinellia maritima* and sea purslane *Atriplex portulacoides* typify the low to mid marsh.

**Mid to upper marsh communities** - The mid to upper marsh community is dominated by the saltmarsh rush *Juncus gerardii* and saltmarsh grass/fescue communities *Puccinellia/Festuca*. In the mid marsh zone, as the number of tidal inundations becomes less frequent, the vegetation becomes more diverse, with a more complex structure and a greater proportion of herbs. At the upper levels of the marsh, tidal inundation only occurs at the highest spring tides. The vegetation communities here reflect this with a greater diversity of species and some being restricted to this zone.

**Transitional communities** – Where there is a significant influence of fresh water in the upper reaches of the estuarine system, and where the marsh joins higher ground, important transitional communities are found. These occur around the extreme high water mark and commonly comprise of sea couch grass *Elymus pycnanthus* and *Phragmites australis* tidal reedbeds. This forms an important transition into freshwater reedbed habitats.

## 5.4 *Salicornia* and other annuals colonising mud and sand (pioneer saltmarsh)

### 5.4.1 Definition

This feature is known locally as samphire or glasswort and together with other annuals occurring on mud and sand is generally known as pioneer saltmarsh as these plants are the first saltmarsh species to colonise the bare flats. These species occur in many saltmarshes in the UK, and European marine sites were chosen to represent the geographical range of the habitat type. Generally the largest areas of pioneer saltmarsh have been selected, and since it occurs as an integral part of a sequence of habitats, from bare sand and mud flats through to more stable saltmarsh vegetation, preference is given to sites where it forms part of well-developed successional sequences (Brown *et al.*, 1997).

Pioneer saltmarsh vegetation colonises intertidal mud and sand flats in areas protected from strong wave action and is an important precursor to the development of more stable saltmarsh vegetation. It develops at the lower reaches of the saltmarshes where the vegetation is frequently flooded by the tide, and can also colonise open creek sides, depressions or pans within a saltmarsh, as well as disturbed areas of upper saltmarsh. The vegetation in this habitat comprises a very small number of species and is dominated by open stands of samphire *Salicornia* species or annual sea-blite *Suaeda maritima*. Pioneer saltmarsh also provides an important feeding area and a food source for many species of waterfowl.

### 5.4.2 Importance of the *Salicornia* and other annuals colonising mud and sand interest feature in the Humber Estuary European marine site

As mentioned under Section 5.3.2, the composition of the saltmarshes on the Humber is unusual. Recent saltmarsh surveys have determined that pioneer saltmarsh species are found predominantly in the outer estuary on both the north and the south banks with the largest concentration south of Cleethorpes, forming a key stage in the transition from intertidal sand and mud flats to saltmarsh vegetation. In the upper Humber, bare mud and sand flats are colonised by small amounts of common cordgrass *Spartina anglica* (SM6), and where freshwater influence is greater, sea club-rush *Scirpus maritimus* (S21). *Spartina anglica* is a non-native species, which was first planted on the Humber in 1936. It is a fertile hybrid and a naturally invasive species that may be considered damaging to pioneer marsh species, although more research is necessary. The area covered by *Spartina anglica* on the Humber has decreased from 160ha in 1969 to 120ha in 1989 (Billings *et al.* 2002). The recent NVC survey by Bullen Consultants (2002) also recorded almost 120ha of *Spartina anglica*.

### 5.4.3 Sub-features

**Annual *Salicornia* (samphire) saltmarsh community** – The annual *Salicornia* community (SM8) is the most extensive pioneer marsh community in the Humber pSAC and is dominated by annual species of *Salicornia* (samphire). *Salicornia* species germinate in May from a widespread dispersion of seeds over the whole marsh surface. The lower limit of the *Salicornia* community is set by the time between tides and the time taken for the seeds to become firmly anchored. *Salicornia* species are tolerant of frequent tidal inundations, enduring around 600 flooding per year at its lower limits where it forms the familiar pioneer stands. This sub-feature forms a distinct zone in the lower marsh (sometimes hundreds of metres wide) and can be separated from the main marsh by several hundred metres of bare flats, particularly on sandy substrates. SM8 communities can also form a mosaic community with other saltmarsh communities eg SM13 (common saltmarsh grass, *Puccinellia maritima*) and SM6 (common cordgrass, *Spartina anglica*). In some locations, the spread of the non-native species *Spartina anglica* has restricted the availability of lower marsh colonisation by *Salicornia* species (Rodwell, 2000). On the Humber, the annual *Salicornia* community (SM8) is found within the Humber Flats and Marshes Pyewipe and Cleethorpes Coast SSSI, Spurn head to Saltend Flats SSSI and North Lincolnshire Coast SSSI.

***Suaeda maritima* (sea-blite) saltmarsh community** – The *Suaeda maritima* community (SM9) is an annual pioneer community tolerant of a wide variety of soil types and tidal inundation regimes. Its growth appears to be dependent on nutrient supplies, especially nitrogen and it is particularly characteristic of open situations, free of competition from other established perennials. SM9 communities are dominated by *Suaeda maritima* with associations of *Salicornia* and occasional *Puccinellia maritima*, *Spartina anglica*, sea purslane, *Atriplex portulacoides* and sea aster, *Aster tripolium*. The community is characteristic of gravelly mud on the lower marsh, forming mosaics with stands of *Salicornia*. Pure stands of *Suaeda maritima* are a distinctive feature of

disturbed situations, such as those that may occur following the dumping of sediment onto marshes. On the Humber, the *Suaeda maritima* community (SM9) is uncommon. It is found within the Humber Flats and Marshes Spurn Head to Saltend Flats SSSI and the North Lincolnshire Coast SSSI, however the total extent is minimal.

## 5.5 Mudflats and sandflats not covered by seawater at low tide

### 5.5.1 Definition

Intertidal mudflats and sandflats are submerged at high tide and exposed at low tide. They form a major component of estuaries and embayments in the UK, but also occur extensively along the open coast. The physical structure of the intertidal flats ranges from the mobile, coarse sand beaches of wave-exposed coasts to the stable, fine sediment mudflats of estuaries and other embayments. This habitat type can be divided into three broad categories, clean sands, muddy sands and muds, although in practice there is a continuous gradation between them. Within this range, the plant and animal communities present vary according to the type of sediment, its stability and the salinity of the water.

Intertidal mudflats and sandflats are a widespread habitat type that occurs throughout the UK. European marine sites were selected to encompass the ecological variation across the geographical range of this habitat type in the UK. Sites with large areas of intertidal flats, as well as a range of environmental conditions and an associated diversity of communities were favoured. (McLeod *et al.*, 2001).

### 5.5.2 Importance of the mudflats and sandflats not covered by seawater at low tide interest feature in the Humber Estuary European marine site

The Humber Estuary supports a large area of intertidal habitats that are highly representative of North Sea estuaries. They range from gravels and sands, to muddy sands and mud, reflecting varying degrees of exposure to waves, currents and inflowing rivers. The Humber's intertidal flats represent 4.5% of the total British resource.

In contrast to other highly industrialised estuaries, the Humber has no abiotic areas or large areas dominated by opportunist species. Mudflats or sandflats fringe most of the shores of this large estuary, although in many places the intertidal zone is narrow and constrained by coastal defences. Substantial areas have also been lost to land claim. Of all British estuaries, only the Wash compares to the Humber in the area of intertidal land that has been taken. Since the 17<sup>th</sup> century, over 6,500ha of intertidal land on the Humber has been lost to land claim (Billings *et al* 2002). Studies have also shown that over the last 150 years, the form of the estuary has been changing with a loss of intertidal area as a result of sea level rise. The estuary has been moving slowly towards its equilibrium state, with a loss of coarse bed material and an import of fine sediment, and an increase in accretion in the inner estuary, together with erosion in the outer estuary around Grimsby (Townend *et al.*, 2000). The inner estuary is particularly dynamic, for instance the reach between Crabley and Brough has undergone accretion over the last 20 years, with Whitton Sands accreting to such an extent that it is now well-vegetated, whilst Read's Island has undergone a period of erosion. The interactions in local sediment budgets between these areas is important, with erosion of one area, leading to deposition elsewhere in the estuary (IECS, 1994).

At low tide, nearly 50% of the area of the Humber Estuary is exposed, and the intertidal flats extend from the confluence of the Rivers Trent and Ouse to the western outskirts of Hull and are dissected by two main channels. There are also extensive areas of mudflats in the outer estuary, particularly inside Spurn Bight and Cherry Cobb and there are smaller muddy embayments at Saltend/Paull on the north bank and at Pyewipe on the south. The effects of wave energy on the estuarine system and the movement of sediment due to wave action are largely restricted to the outer estuary and coastal reaches. This higher energy environment and greater marine sediment component means that the intertidal flats of this area are predominantly sandy. Near the sand capped shingle spit of Spurn Point, there are beds of dwarf eelgrass *Zostera noltei*. Areas such as the upper and mid-shore flats, are highly productive, supporting a large number of invertebrates, with 180 species of macrofauna, meiofauna and microfauna recorded at Spurn Bight alone (Key 1983). These features are fundamental to the ecology of the estuary, providing an important food source for internationally important numbers of waders and wildfowl and commercial fish species.

The Humber Estuary also supports several sand dune systems covering an area of over 200ha. Coastal dunes develop behind a sandy beach with a surface that dries out between high tides. The dry sand is then blown landwards and if deposited above the high water mark and trapped by obstacles and vegetation, the dune system begins to grow. Although the dunes are above highest astronomical tide and therefore outwith the European

marine site boundary, processes occurring within the site will affect them, particularly as the sandflats are their source of material.

### 5.5.3 Sub-features

**Intertidal gravel and sand communities** - This habitat occurs particularly on open coast beaches and in bays where wave action or strong tidal currents prevent the deposition of finer silt. On the Humber Estuary, the high energy environment and greater marine sediment component of the outer estuary means that the intertidal flats of this area are predominantly sandy. Areas of shingle are found around Hessle and South Ferriby. Owing to the mobility of the sediment and consequent abrasion, species that inhabit sands tend to be robust. They support high numbers of species such as polychaete worms, *Nephtys cirrosa* and *Scolelepis squamata*, amphipods crustaceans and the sand mason worm *Lanice conchilega*. The sandflats also support cockle beds on the north Lincolnshire coast and are also an important source of material for the areas of mature dunes that lie behind them.

**Intertidal muddy sand communities** - These occur particularly on more sheltered shores and at the mouth of the estuary from Cleethorpes to Donna Nook where sediment conditions are relatively stable. A wide range of species, such as dense populations of lugworm *Arenicola marina*, other polychaete worms and bivalve molluscs colonise these sediments.

**Intertidal mud communities** - These form in the most sheltered areas of the estuary, usually where large quantities of silt derived from rivers has been deposited. There are extensive mudflats in the mid and outer estuary and the stable sediment supports communities that are often highly abundant, typically dominated by polychaete worms such as *Arenicola marina* and *Manayunkia aestuarina* and bivalve molluscs. They may also support very high densities of the mud-snail *Hydrobia ulvae*, an important food source for many wading birds. The intertidal muds in the outer estuary support bivalves such as the Baltic Tellin *Macoma balthica* and the common cockle *Cerastoderma edule* and the catworm *Nephtys hombergii*. In the middle estuary, *M. balthica* and the fanworm *Manayunkia aestuarina* are more common. The upper estuary supports the polychaete worms *Hediste diversicolor*, *Heterochaeta costata*, *Tubificidae* species and the crustacean *Corophium volutator*. The high biomass of invertebrates in such sediments provides an important food source for a diverse range and large number of fish and benthic predators. Mudflats also provide a valuable feeding, roosting and resting area for species of wading birds and waterfowl.

**Eelgrass bed communities** – Eelgrass beds are nationally rare and are an important habitat as they provide spawning, nursery and refuge areas for fish. They also help to stabilise the sediment, contribute to primary productivity and are an important food source for overwintering wildfowl. In 1997, Buck reported that there were extensive beds of *Zostera noltei* (dwarf eelgrass) and *Zostera marina* (common eelgrass) on Spurn Bight and in the Grimsby area. These eelgrass beds have since declined, although the reasons why are not fully understood. It is likely that some eelgrass still exists in these areas.

## 5.6 Sandbanks which are slightly covered by seawater all the time

### 5.6.1 Definition

Subtidal sandbanks consist of sandy sediments that are permanently covered by shallow seawater, typically at depths of less than 20m below chart datum (but sometimes including channels or other areas greater than 20m deep). The habitat comprises distinct banks (i.e. elongated, rounded or irregular 'mound' shapes), which may arise from horizontal, or sloping plains of sandy sediment. Where these areas of sandy sediment are closely associated with the banks, they are included within the habitat type.

The diversity and types of community associated with subtidal sandbanks are determined by sediment type and a variety of other physical, chemical and hydrographic factors. These include geographical location (influencing water temperature), the relative exposure of the coast (from wave-exposed open coasts to tide-swept coasts or sheltered inlets and estuaries), the topographical structure of the habitat and differences in the depth, turbidity and salinity of the surrounding water. Subtidal sandbanks are frequently associated with other marine habitats, for example grading into intertidal mudflats and sandflats. They are often component habitats of estuaries too.

Key features of these subtidal areas are the range of invertebrate animals and seaweeds that colonise the seabed (epifauna) or which live in the seabed sediments (infauna). Shallow sandy sediments are typically colonised by a burrowing fauna of worms, crustaceans, bivalve molluscs and echinoderms. Mobile species at the surface of the

sand banks may include shrimps, crabs and fish. Where coarse stable material, such as shells or stones is present on the sediment surface, species of foliose seaweeds, hydroids, bryozoans and ascidians may form distinctive communities. Shallow sandy sediments are often important nursery areas for fish, and feeding grounds for seabirds.

Subtidal sandbanks occur extensively around the UK coast. They are widespread in inshore waters (within 12 nautical miles of the coast) and also occur more locally in offshore waters. The sites selected represent different physiographic types and the differing geographic character of this habitat around the UK coast.

### **5.6.2 Importance of the sandbanks which are slightly covered by seawater all the time interest feature in the Humber Estuary European marine site**

The subtidal environment of the Humber is highly dynamic and varies according to the composition of the bottom sediments, salinity, sediment load and turbidity, dissolved oxygen and anthropogenic factors relating to water quality and dredging. Many of these factors vary with the season or state of the tide (Billings *et al.* 2002).

The subtidal area of the Humber Estuary is over 16,800 ha or 55% of the total area of the estuary. The seabed is mostly sandy with some patches of gravel and glacial till, grading into silty clay in the intertidal areas of the main body of the estuary. Invertebrates such as polychaete worms, mysid shrimp and gammarid amphipod species dominate the benthic community with a general increase in benthic diversity towards the mouth of the estuary where conditions become more marine influenced.

The subtidal zone of the Humber Estuary also provides an important breeding, sheltering and nursery area for marine fish species and a migratory corridor for Atlantic salmon and sea trout. The Humber supports about 15% of the east coast population of juvenile plaice and large numbers of juvenile sole are also found. It is also a spawning ground for species such as bass. (Billings *et al.*, 2002)

### **5.6.3 Sub-features**

**Subtidal gravel and sands** - The subtidal gravel and sands are patchily distributed throughout the estuary. In the upper estuary, impoverished mobile sands support mysid shrimp and *Gammarus* species; in the middle estuary medium and fine sands occur with an infauna of the polychaete worms, *Capitella capitata*, *Nephtys cirrosa* and the amphipod *Bathyporeia* species. The outer to middle estuary supports a community of polychaete worms, crustaceans and bivalves, found on very poorly sorted sandy shell gravel. On the southern side of the outer estuary, more sheltered marine sands are characterised by the polychaetes *Spiophanes bombyx* and *Spio filicornis*. Off the mouth of the Humber, the seabed is composed largely of gravels and is characterised by species such as the bryozoan, *Flustra foliacea*, the common whelk *Buccinum undatum*, the horse mussel *Modiolus modiolus* with the tube-dwelling polychaete worm *Sabellaria spinulosa*.

**Subtidal muddy sands** - Subtidal muddy sands are found predominantly in the middle and outer estuary. A 'transitional' muddy sand community consisting of species such as the polychaete worms, *Scoloplos armiger*, *Nephtys hombergii* and *Polydora* species, along with the phoronid, *Phoronis muelleri* and the bivalve, the Baltic tellin *Macoma balthica*.

## **5.7 Lamprey**

Lamprey are one of the most primitive of all living vertebrate animals. They are distinct from all other fish in the British Isles, as they have no lower jaw. Their mouth is surrounded by a round sucker-like disc within which the adults have strong, rasping teeth. Other characteristic features are their eel-like shape, lack of paired fins or scales and a skeletal structure made of strong but flexible cartilage, rather than bone.

Most species of lamprey have similar life cycles and ecologies that involve the migration upstream into rivers to reach spawning grounds – normally stony or gravelly stretches of running water. Here they spawn in pairs or groups, laying eggs in crude nests. After hatching, the young, elongate larvae, known as ammocoetes swim, or are washed downstream by currents to areas of sandy silt in still water. The distribution of the larvae depends on the hydrodynamic regime of the river and, where the profile of a river is low, there may be little downstream movement. Here, the young lamprey burrow and spend the next few years in tunnels.



The metamorphosis from larvae to adult is a dramatic change which takes place within a relatively short time – usually a few weeks after up to four years of larval development. The lamprey then migrate downstream, away from the nursery areas and into estuaries where they may remain for some time to allow their osmoregulatory mechanisms to acclimatise before moving into coastal or offshore feeding grounds.

As adults they feed by attaching to the sides of other fish such as salmonids, gadoids and clupeids. They rasp through the skin, eating it and the body fluids and muscle underneath. However, although the lamprey is a parasitic species, there is no evidence of any significant damage to native fish stocks in Europe. Furthermore, it is a beneficial species to the ecology of rivers, both in helping to stabilise and aerate silt beds and in providing food for a range of other wildlife.

On reaching sexual maturity, the adult lamprey stop feeding and migrate to their spawning grounds. After spawning most adults die, although some do survive and migrate back out to sea.

Substantial lamprey fisheries did exist at one time on some large British rivers, however they are no longer of any commercial importance in Great Britain. (Maitland, 1997)

### **5.7.1 *Lampetra fluviatilis* (river lamprey)**

#### **General description**

The average adult length of the river lamprey is around 40cm with a weight of some 60g. It is confined to Western Europe, migrating from the sea to spawn in silt beds of many UK rivers. The species is normally anadromous – growing to maturity in estuaries and coastal waters and then migrating into freshwater to spawn. Like all species of lamprey, it requires clean gravel for spawning and marginal silt or sand for the burrowing juvenile fish. The larvae spend several years in silt beds before metamorphosing and migrating downstream into estuaries. Here they can be found in numbers feeding on estuarine fish. After 1-2 years, they stop feeding and migrate upstream to spawn in freshwater.

Pollution – either from direct toxic effects or through smothering of eggs, and barriers to migration are of particular concern for this species. Also, although considerable information is available on the biology of the river lamprey in freshwater, much less is known about its habits in estuaries and the sea. (Maitland, 1997)

#### **5.7.1.1 The importance of the river lamprey in the Humber Estuary European marine site**

Little is known about the river lamprey in the Humber Estuary, although data from power station fish impingement assessments indicate that they are present throughout the year. The mature adults begin their upstream migration to spawn in the River Derwent and the rivers of the Ouse system in November, although they do not actually spawn until May. It is thought that the migration is triggered by both water temperature and pheromones from juvenile lamprey. After spending several years as ammocoetes, the juvenile lamprey begin their descent into the estuary between October and March. (Paul Frear, pers com)

Although numbers have declined over the last 100 years, the UK is one of the strongholds of the river lamprey, which, although rare and threatened in some European countries, is still fairly widespread in England and other parts of the UK. These populations are considered important for the conservation of this species at an EU level. Marine sites that are considered to be important migration routes or feeding grounds have been selected. River lamprey are known to use the Humber as a migratory passage to and from their spawning and nursery grounds in the River Derwent, itself a candidate SAC for this species, and they also appear to feed in the estuary.

### **5.7.2 *Petromyzon marinus* (sea lamprey)**

#### **General description**

The sea lamprey is the largest and least common of the three lamprey species found in the UK and may reach a length of 120cm and weigh 2.5kg, although more usually is around 50cm. Relatively little is known about the precise habitats occupied by adult sea lamprey, but it is thought to occur over much of the North Atlantic, both in shallow coastal waters and deep offshore. The species is anadromous – growing to maturity in the sea and then migrating into fresh water to spawn. The larvae spend several years in silt beds before metamorphosing and migrating downstream to the sea. Like all species of lamprey, it requires clean gravel for spawning and marginal silt or sand for the burrowing juvenile fish.

The sea lamprey has a widespread distribution within the UK, although populations have declined over the last hundred years due to pollution and barriers to migration. Sea lamprey are probably more highly migratory than other species of lamprey and also appear to be particularly poor at ascending obstacles to migration. They have subsequently become extinct in a number of rivers (Maitland, 1997).

#### **5.7.2.1 The importance of the sea lamprey feature in the Humber estuary**

Very little is known about the sea lamprey in the Humber Estuary, although data from power station fish impingement assessments indicate that they are present throughout the year. It is thought that the mature adults begin their run up to the River Derwent and the rivers of the Ouse system in May, although little else is known about their behaviour. It is thought that the migration is triggered by both water temperature and pheromones from juvenile lamprey. After spending several years as ammocoetes, the juvenile lamprey begin their descent into the Estuary between October and March (Paul Frear, pers com).

The UK is one of the strongholds of the sea lamprey, which, although rare and threatened in some European countries and extinct in others, is fairly widespread in England and other parts of the UK. Marine sites that are considered to be important migration routes or feeding grounds have been selected. Sea lamprey are known to use the Humber as a migratory passage to and from their spawning and nursery grounds in the River Derwent, itself a candidate SAC for this species, and they also appear to feed in the estuary.

## **6. The Humber Estuary pSAC conservation objectives**

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 marine site. The conservation objectives for the Humber Estuary pSAC interest features are provided below and should be read in the context of other advice given in this package, particularly:

- the attached maps 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 interest feature and which will act as a basis for the development of a monitoring programme.

### **6.1 The conservation objective for the estuary**

Subject to natural change, maintain\* the **estuary** in favourable condition<sup>8</sup>, in particular the:

- Saltmarsh communities
- Intertidal mudflat & sandflat communities
- Subtidal sediment communities

### **6.2 The conservation objective for coastal lagoons**

Subject to natural change, maintain\* the **coastal lagoons** in favourable condition<sup>8</sup>.

### **6.3 The conservation objective for Atlantic salt meadows**

Subject to natural change, maintain\* the **Atlantic salt meadows** in favourable condition<sup>8</sup>, in particular the:

- Low to mid marsh communities
- Mid to upper marsh communities
- Transitional communities

<sup>8</sup> For a detailed definition of how to recognise favourable condition see attached table 3.

\* Maintain implies restoration if the feature is not currently in favourable condition.

**6.4 The conservation objective for Salicornia and other annuals colonising mud and sand.**

Subject to natural change, maintain\* **Salicornia and other annuals colonising mud and sand** in favourable condition<sup>8</sup>, in particular the:

- Annual *Salicornia* (samphire) saltmarsh community
- *Suaeda maritima* (sea-blite) saltmarsh community

**6.5 The conservation objective for mudflats and sandflats not covered by seawater at low tide**

Subject to natural change, maintain\* the **mudflats and sandflats not covered by seawater at low tide** in favourable condition<sup>8</sup>, in particular the:

- Intertidal gravel and sand communities
- Intertidal muddy sand communities
- Intertidal mud communities
- Eelgrass bed communities

**6.6 The conservation objective for sandbanks which are slightly covered by water all the time.**

Subject to natural change, maintain\* the **sandbanks which are slightly covered by seawater all of the time** in favourable condition<sup>8</sup>, in particular the:

- Subtidal gravel and sands
- Subtidal muddy sands

**6.7 The conservation objective for *Lampetra fluviatilis* (river lamprey)**

Subject to natural change, maintain\* the habitats of ***Lampetra fluviatilis* (river lamprey)** in favourable condition<sup>8</sup>.

**6.8 The conservation objective for *Petromyzon marinus* (sea lamprey)**

Subject to natural change, maintain\* the habitats of ***Petromyzon marinus* (sea lamprey)** in favourable condition<sup>8</sup>.

<sup>8</sup> For a detailed definition of how to recognise favourable condition see attached table 3.  
\* Maintain implies restoration if the feature is not currently in favourable condition.

7.

**Table 3 Favourable Condition Table for pSAC interest features of the Humber Estuary European marine site**

NB – It will be possible to monitor many of the attributes 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. Where relevant, National Vegetation Classification codes (NVCs) and marine biotope codes are provided and then referenced in Appendices V and VIII.

**THE HUMBER ESTUARY pSAC INTEREST FEATURES**

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
<b>Estuary</b>	All sub-features	Extent	Area (ha) of the estuary measured periodically during the reporting cycle (frequency to be determined).	No decrease in extent from an established baseline <sup>9</sup> , subject to natural change.	Extent is an attribute on which reporting is required by the Habitats Directive.
		Morphological equilibrium.	Intra and inter-estuarine Tidal Prism/Cross Section ratio (TP/CS ratio) measured during the reporting cycle (frequency to be determined).	The intra- and inter-estuarine TP/CS relationship should not deviate significantly from an established baseline subject to natural change.	TP = Tidal Prism = total volume of water crossing a given cross section during the flood tide (m <sup>3</sup> ). CS = Area of a given cross section at high water springs (m <sup>2</sup> ). The relationship between TP & CS provides a measure of the way the estuary has adjusted to tidal energy. Substantial departures from this characteristic relationship (determined on a regional basis) may indicate the influence of anthropogenic factors and this would trigger more detailed evaluation of potential problems.
		Water density - temperature and salinity	Water temperature and salinity measured periodically during the reporting cycle (frequency to be determined).	Average temperature and salinity should not deviate significantly from an established baseline, subject to natural change.	Temperature and salinity are characteristic of the overall hydrography of the area. Changes in temperature and salinity influence the presence and distribution of species (along with recruitment processes and spawning behaviour) including those at the edge of their geographic ranges and non-natives.
	Saltmarsh communities	<i>For information on attributes for the saltmarsh communities sub-feature see the sections of this table which relate to the following interest features: Atlantic salt meadows and Salicornia and other annuals colonising mud and sand</i>			

<b>Estuary</b>	Intertidal mudflat and sandflat communities	<i>For information on attributes for the intertidal mudflat &amp; sandflat communities sub-feature see the sections of this table which relate to the following interest feature: Mudflats and sandflats not covered by seawater at low tide</i>			
	Subtidal sediment communities	Distribution and extent of characteristic subtidal sediment biotopes for example: IMU, IMX biotopes (see Appendix VIII)	Distribution and extent of biotopes measured during the reporting cycle (frequency to be determined).	Distribution and extent should not deviate from an established baseline subject to natural change	The variety and location of subtidal biotopes are important structural and functional aspects of the interest feature. The subtidal biotopes demonstrate biological assemblages representative of a range of salinity conditions. Changes in extent and distribution may indicate long term changes in the physical condition of the estuary interest feature.
	<i>For information on attributes for the subtidal sediment communities sub-feature see the sections of this table which relate to the following interest feature: Sandbanks which are slightly covered by seawater all the time</i>				
<b>Coastal lagoons</b>	All sub features	Extent	Area (ha) of lagoon basin, measured once per reporting cycle	No decrease in extent from an established baseline <sup>9</sup> , subject to natural change	Extent is an attribute on which reporting is required by the Habitats Directive. Natural gradual reduction in area of the lagoons may be inevitable due to natural dynamic coastal processes.
		Salinity	Seasonal averages measured periodically throughout the reporting cycle (frequency to be determined).	Average seasonal salinity and seasonal maxima and minima, should not deviate significantly from an established baseline subject to natural change.	Salinity is a key structuring factor within lagoons. Note should be made of natural fluctuations that occur according to year on year variations in rainfall.
		Water clarity	Average light attenuation measured periodically throughout the reporting cycle (frequency to be determined).	Average light attenuation should not deviate significantly from an established baseline, subject to natural change.	Water clarity is important for maintaining the extent and density of algal and plant dominated communities. Clarity decreases through increased suspended organic/inorganic matter.
		Nutrient status – green algal mats	Extent and cover across whole or parts of the site, measured during summer months annually.	No increase in extent or cover of green algal mats from an established baseline, subject to natural change.	Nutrient status is important for the structure and functioning of the lagoon and its communities. Opportunistic and seasonal green algae compete with other vegetation and may affect associated faunal communities.

<b>Coastal lagoons</b>		Characteristic species - density of <i>Chaetomorpha linum</i> and <i>Ruppia</i> spp.	Density (number of shoots/ m <sup>2</sup> ) measured during peak growth (Aug), twice per reporting cycle.	Average shoot density should not deviate significantly from an established baseline, subject to natural change.	<i>Chaetomorpha linum</i> and <i>Ruppia</i> species are characteristic species of lagoons. Reduction in the density of plants is an early indicator of stress and reflects changes in biomass.
<b>Atlantic salt meadows</b>	All sub-features	Distribution and extent	Area (hectares) measured at low spring tide, once during the reporting cycle	No decrease in extent of saltmarsh communities from an established baseline <sup>9</sup> subject to natural change.	<p>Monitoring will need to take account of the dynamic nature of these habitats and seasonal and periodic random variations in vegetation types. Coastal squeeze may result in the replacement of Atlantic salt meadows with pioneer saltmarsh. A reduction in extent could be further indicated by a ground survey to assess for signs of erosion such as toppled vegetation blocks, signs of roots in intertidal mud, signs of stress/damage to plants. Extent needs to be measured at low tide.</p> <p>Much of the upper /transitional saltmarsh communities on the Humber are constrained by sea walls, and sea level rise may squeeze the habitat against these sea defences and submerge existing vegetation zones. The extent to which this habitat can migrate inland as sea levels rises, is likely to be especially valuable in re-dressing losses incurred to the feature from submersion. Monitoring the rate of change is therefore important. Site integrity will be dependent on maintaining the range of community types from low to high marsh by allowing natural rollback of the saltmarsh to occur.</p>
		Creek system pattern	Density and morphology of creek systems measured during the reporting cycle (frequency to be determined)	Creek system pattern should not deviate significantly from an established baseline, subject to natural change	<p>Meanders in creeks help to absorb tidal energy. Creeks transport sediment to and from the saltmarsh and act as drainage channels. The efficiency of this process depends on creek pattern.</p> <p>Vegetation cover, suspended sediment load and tidal influence influence creek density. Creeks allow pioneer vegetation to establish along their banks higher in the saltmarsh system than they would normally be found. Widening, lengthening and flattening of creeks are an indication of sea level rise/ increase in tidal energy. Though this dissipates the increased tidal energy over a larger area, it also allows higher energy to spread further inland.</p>
		Topography	Surface elevation of saltmarsh and intertidal region, measured periodically during the reporting cycle (frequency to be determined).	Topography should not deviate significantly from an established baseline, subject to natural change.	The presence of sea walls may prevent the saltmarsh from keeping pace with sea level rise and maintaining its position in the tidal frame (the landward migration of saltmarsh to compensate for sea level rise is prevented)

<b>Atlantic salt meadows</b>	Low to mid marsh communities	Species composition of characteristic low to mid marsh communities, for example: - SM10 - SM11 (See Appendix V)	Presence and abundance of constant species, measured once during the reporting cycle.	Presence and abundance of constant species of characteristic low to mid marsh communities should not deviate significantly from an established baseline, subject to natural change.	A recent NVC survey by Bullen Consultants (March 2002) recorded low to mid marsh NVC communities: SM10, SM11, SM12, SM13, SM13a, SM13b, SM13c, SM13f, SM14, SM14a, SM14c. Dargie's 2002 survey of the North Lincolnshire Coast SSSI also recorded SM10, SM11, SM12, SM13, SM14.
	Mid to upper marsh communities	Species composition of characteristic mid-marsh communities, for example:  - SM15 - SM 16 (See Appendix V)	Presence and abundance of constant species, measured once during the reporting cycle.	Presence and abundance of constant species of characteristic mid to upper marsh communities should not deviate significantly from an established baseline, subject to natural change.	A recent NVC survey by Bullen Consultants (March 2002) recorded mid to upper NVC communities: SM15, SM16a, SM16b, SM16c. Dargie's 2002 survey of the North Lincolnshire Coast SSSI also recorded SM15, SM16.
	Transitional communities	Species composition of characteristic transitional communities, for example:  - SM24 - SM28 - S4 (See Appendix V)	Presence and abundance of constant species, measured once during the reporting cycle.	Presence and abundance of constant species of characteristic transitional communities should not deviate significantly from an established baseline, subject to natural change.	A recent NVC survey by Bullen Consultants (March 2002) recorded transitional NVC communities: SM24, SM28, S4. Dargie's 2002 survey of the North Lincolnshire Coast SSSI also recorded SM24.
<b>Salicornia and other annuals colonising mud and sand</b>	Annual <i>Salicornia</i> / <i>Suaeda maritima</i> saltmarsh communities	Distribution and extent	Area (hectares) measured at low spring tide, once during the reporting cycle.	No decrease in extent of saltmarsh communities from an established baseline <sup>9</sup> , subject to natural change.	Monitoring will need to take account of the dynamic nature of these habitats and seasonal and periodic random variations in vegetation types.



<b>Salicornia and other annuals colonising mud and sand</b>		Species composition of characteristic pioneer marsh communities, for example:  - SM8 - SM9 (See Appendix V)	Presence and abundance of constant species, measured once during the reporting cycle.	Presence and abundance of constant species of characteristic pioneer marsh communities should not deviate significantly from an established baseline, subject to natural change.	
		Algal mat cover	Area and thickness of algal mat, measured once during the reporting cycle	No increase in algal mat cover from an established baseline, subject to natural change.	Algal mats (eg <i>Enteromorpha</i> spp) are often associated with pioneer and low marsh communities and are important primary producers. They can be affected by changes in water quality – eutrophication may lead to expansion and smothering of vegetation, or pollution can cause a decline which can then lead to destabilisation of sediment surfaces and initial erosion. An increase in algal cover can also indicate a decline in grazing invertebrates. (A reduction in algal mat cover can indicate active erosion)
		Distribution and extent of common cordgrass <i>Spartina anglica</i> community (SM6)	Distribution and extent of <i>Spartina anglica</i> , measured once during the reporting cycle	No significant increase in extent from an established baseline, subject to natural change.	<i>Spartina anglica</i> is considered to be an invasive species and may impact on pioneer and low-mid marsh communities. However, <i>Spartina</i> stands may have a role in sediment trapping following periods of erosion, although under certain tidal conditions, erosion around stands may be greater. Natural dieback has also been observed along the east and south coasts of England. If <i>S. anglica</i> increases to cover 20% or more of the site unit, then a monitoring programme may be advisable, possibly followed by control measures.
<b>Mudflats and sandflats not covered by seawater at low tide</b>	All sub-features	Extent	Area (ha) of intertidal flats, measured periodically during the reporting cycle (frequency to be determined).	No decrease in extent from an established baseline <sup>9</sup> , subject to natural change.	Extent is an attribute on which reporting is required by the Habitats Directive. Loss of intertidal mudflat communities is likely to be detrimental to the structure of the interest feature, e.g. associated with a change in sediment budget or geomorphological regime, and may indicate long term changes in the physical conditions of the estuaries interest feature. It will be important to assess the impact of coastal squeeze on coastal processes.
		Topography	Tidal elevation and shore slope, measured periodically during the reporting cycle (frequency to be determined).	Shore profile should not deviate significantly from an established baseline, subject to natural change.	In the intertidal, topography reflects the energy conditions and stability of the sediment, which is key to the structure of the interest feature. Topography is a major influence on the distribution of communities throughout the mudflats. Measuring topography may also indicate the position of channels through the interest feature, which is another important indicator of the processes influencing the site.

<b>Mudflats and sandflats not covered by seawater at low tide</b>		Nutrient enrichment - macroalgal mats	Extent and cover of macroalgal mats, measured in the summer during the reporting cycle (frequency to be determined)	Average abundance of macroalgal mats should not increase from an established baseline, subject to natural change	Nutrient status is a key functional factor that influences biota associated with sediments, including fauna as well as plants/algae at the surface. Certain macroalgae (eg <i>Enteromorpha</i> and <i>Ulva</i> spp) can act as indicators of elevated nutrient levels which can reduce the quality of the sediments and their communities, primarily through smothering and deoxygenation. The duration of the algal mats on the surface of the sediments is also important.
		Sediment character	1. Particle size analysis (PSA). Parameters include percentage sand/ silt/ gravel, mean and median grain size, and sorting coefficient, used to characterise sediment type. Measured in summer, once during the reporting cycle.	Average PSA parameters should not deviate significantly from the baseline, subject to natural change.	Sediment character defined by particle size analysis is key to the structure of the feature, and reflects all of the physical processes acting on it. Particle size composition varies across the feature and can be used to indicate spatial distribution of sediment types thus reflecting the stability of the feature and the processes supporting it.
			2. Organic content- % carbon from sediment sample measured periodically (frequency to be determined)	Average organic carbon content should not deviate significantly from an established baseline, subject to natural change.	Organic content critically influences the infaunal community and can cause deoxygenation of the feature which can be detrimental to the biota. However, a balance needs to be struck as organic content provides a measure of the material available to detritivores. A reduction in organic content could lead to a reduction in detritivores, with subsequent knock on effects throughout the food chain.
			3. Oxidation - reduction potential. Depth of black anoxic layer. Measured periodically during the reporting cycle (frequency to be determined).	Average black layer depth should not deviate significantly from an established baseline, subject to natural change.	Degree of oxidation / reduction, reflecting oxygen availability within the sediment, critically influences the infaunal community and the mobility of chemical compounds. It is an indicator of the structure of the feature.
	Intertidal gravel and sand communities	Range and distribution of characteristic gravel and sand biotopes, for example: LGS biotopes (see Appendix VIII)	Range and distribution of biotopes measured during reporting cycle (frequency to be determined).	Range and distribution should not deviate significantly from an established baseline, subject to natural change	The variety and location of biotopes is an important structural and functional aspect of the feature. Changes in extent and distribution may indicate long-term changes in the physical conditions at the site.

<b>Mudflats and sandflats not covered by seawater at low tide</b>	Intertidal muddy sand communities	Range and distribution of characteristic muddy sand biotopes, for example: LMS biotopes (see Appendix VIII)	Range and distribution of biotopes measured during reporting cycle (frequency to be determined).	Range and distribution should not deviate significantly from an established baseline, subject to natural change	Muddy sands dominated by the worm <i>Arenicola marina</i> (e.g. LMS.MacAre) are found throughout this sub-feature. The invertebrates within the sediment play an important structural and functional role as well as providing an important source of food for marine predators and birds.
	Intertidal mud communities	Range and distribution of characteristic mud biotopes, for example: LMU biotopes (see Appendix VIII)	Range and distribution of characteristic mud biotopes measured during late summer / early autumn, periodically during the reporting cycle (frequency to be determined).	Range and distribution should not deviate significantly from an established baseline, subject to natural change.	The variety and location of biotopes is an important structural and functional aspect of the feature. Littoral mud biotopes such as LMU.HedScr, LMU.HedStr and LMU.HedMac often support a high number of polychaete worms and bivalve molluscs, which form an important food source for birds and marine predators such as fish.
	Eelgrass bed communities	Extent	Extent (m <sup>2</sup> ) of the <i>Zostera</i> beds measured during the peak growth period (May to Aug) every three years during the reporting cycle	No decrease in extent from an established baseline, subject to natural change	Eelgrass beds ( LMS.Zos.Znol) contribute to sediment structure and stabilise foreshore sediments by reducing wave energy. The extent of <i>Zostera</i> beds is a key structural component of the sediments and provides a long-term integrated measure of environmental conditions across the feature. It is also particularly important in being an internationally scarce and declining habitat.  The eelgrass beds provide a rich source of food for wintering wildfowl and provide an important nursery area for fish.
<b>Sandbanks which are slightly covered by seawater all the time</b>	All sub-features	Extent	Area (ha) of subtidal sandbanks, measured periodically during the reporting cycle (frequency to be determined).	No decrease in extent from an established baseline <sup>9</sup> , subject to natural change.	Extent is an attribute on which reporting is required by the Habitats Directive. Loss of subtidal sediment communities is likely to be detrimental to the structure of the interest feature, e.g. associated with a change in sediment budget or geomorphological regime, and may indicate long term changes in the physical conditions of the estuaries interest feature. However, monitoring will also need to take into account the dynamic nature of the feature.
		Topography	Depth distribution of sandbanks from selected sites, measured periodically (frequency to be determined).	Depth should not deviate significantly from an established baseline, subject to natural change	Depth and distribution of the sandbanks reflects the energy conditions and stability of the sediment, which is key to the structure of the feature. Depth of the feature is of a major influence on the distribution of communities throughout.

<b>Sandbanks which are slightly covered by seawater all the time</b>		Sediment character	Grain size analysis. Parameters include percentage sand/ silt/ gravel, mean and median grain size, and sorting coefficient, used to characterise sediment type. Sediment type to be measured during summer once during the reporting cycle.	Average grain size parameters should not deviate significantly from an established baseline, subject to natural change.	Sediment character defined by grain size is key to the structure of the feature, and reflects all of the physical processes acting on it. Particle size composition varies across the feature and can be used to indicate spatial distribution of sediment types, thus reflecting the stability of the feature and the processes supporting it.
	Subtidal gravel and sands	Distribution and extent of characteristic subtidal gravel and sand biotopes, for example: IGS biotopes (see Appendix VIII)	Distribution and extent of biotopes measured during the reporting cycle (frequency to be determined).	Distribution and extent should not deviate from an established baseline subject to natural change	The variety and location of subtidal biotopes are important structural and functional aspects of the interest feature. The subtidal biotopes demonstrate biological assemblages representative of a range of salinity conditions. Changes in extent and distribution may indicate long term changes in the physical condition of the subtidal sandbank interest feature
	Subtidal muddy sands	Distribution and extent of characteristic subtidal mud biotopes, for example: IMS biotopes (see Appendix VIII)	Distribution and extent of biotopes measured during reporting cycle (frequency to be determined).	Distribution and extent should not deviate significantly from an established baseline, subject to natural change.	The variety and location of subtidal biotopes is an important structural and functional aspect of the interest feature. The subtidal biotopes demonstrate biological assemblages representative of a range of salinity conditions.
<b>River lamprey</b> <i>Lampetra fluviatilis</i> and <b>Sea lamprey</b> <i>Petromyzon marinus</i>		Water quality (physico-chemical properties)	Water quality measured regularly throughout the reporting cycle (frequency to be determined).	No significant variation in temperature, salinity, turbidity and pH, and no reduction in dissolved oxygen levels, from an established baseline <sup>9</sup> .	Significant variation in these physico-chemical parameters may be injurious to lamprey populations or act as a barriers to migration. (E.g. Effects on temperature regime may have important consequences for lamprey.) Mature adult river lamprey begin their upstream migration to the River Derwent and the rivers of the Ouse system in November. The sea lamprey begin their run in May. The timing, duration and consistency of this upstream migration is closely related to temperature and pheromone triggers from the juvenile lamprey during periods of high water flow. Peak migration usually coincides with temperatures that remain above 10°C and continues until temperatures reach 18°C. Dissolved oxygen can also be significantly reduced in stretches receiving significant BOD inputs, or through the resuspension of organic rich sediments.

<b>River lamprey</b> <i>Lampetra fluviatilis</i> and <b>Sea lamprey</b> <i>Petromyzon marinus</i>	Habitat structure	Estuary form	Maintain the characteristic physical form and flow dynamics of the estuary	The characteristic morphology provides the diversity of water depths, current velocities and substrate types necessary to fulfil the migratory requirements of the species.
	Access	Any barriers should be mapped and quantified (in relation to height, type and water depth below obstruction).	No artificial barriers significantly impairing adults from reaching existing and historical spawning grounds, or juveniles from moving downstream.	Dams, navigation and other weirs may prevent lamprey from reaching their spawning grounds. In particular, sea lamprey are known to be poor at ascending obstacles. Lamprey can pass some potential barriers by attaching themselves to structures or riverbanks by their suctorial discs and creeping up by strong bursts of swimming.
	Population structure	Population structure measured in terms of viability.	Maintain age/size class structure	Where there is a shift in the age/size class structure (e.g. loss of mature adults or recruitment failure) or if disturbance causes a significant reduction in abundance, then this would be considered unfavourable. On the Humber, sources of disturbance are likely to result from large numbers of lamprey being lost through impingement in power station cooling waters. Also, lamprey have recently become popular in the UK as bait for pike-fishing and are caught as by-catch in an eel fishery on the Ouse. There are also indications that UK populations are sought after as a delicacy in Europe, where stocks are declining. Adult lamprey are usually caught by trapping, whilst juvenile lamprey can be removed by sieving, netting or digging out nursery habitats. Anecdotal evidence of adult trapping suggests heavy losses of fish in some areas.

9 Baselines to be determined during the first reporting cycle

NB: Extreme events (such as storms reducing or increasing salinities or warm summers) also need to be recorded as they may be critical in influencing ecological issues in the Humber Estuary European marine site and may well be missed by routine monitoring

## **8. Detailed operations advice for the Humber Estuary SAC interest features**

This section provides information to help relate general advice to each of the specific interest features of the Special Area of Conservation.

These interest features are:

- Estuary
- Coastal lagoons
- Atlantic salt meadows
- *Salicornia* and other annuals colonising mud and sand
- Mudflats and sandflats not covered by seawater at low tide
- Sandbanks slightly covered by seawater all the time
- River lamprey
- Sea lamprey

This advice relates to the vulnerability of the interest features and sub-features of the pSAC within the Humber Estuary European marine site boundary as summarised in Table 2 and set out in more detail in Tables 4 and 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 5, to be made.

The categories of operation may cause damage or disturbance to the interest features and sub-features of the European marine site, either alone or in combination.

The Humber Estuary European marine site covers an extremely large geographical area and this operations advice refers to the interest features across the estuary. Therefore, activities have been allocated an 'average' exposure score based on their occurrence within the estuary. The following text will reflect where activities only occur in a small area of the site but may be undertaken intensively or frequently. Also, particularly in the middle and outer estuary, there may be a difference in the intensity of activities occurring on the north and south bank.

### **i) Physical loss**

- The Humber Estuary European marine site is a complex system, comprising one of the largest estuaries in the UK, and supporting an important diversity of intertidal and subtidal habitats. In turn, these support a rich variety of marine communities, many of which are dependent upon the ecological functioning of other communities. Physical loss through either removal or smothering could affect the survival of these communities and would be detrimental to the favourable condition of the European marine site.
- Physical loss can occur through the removal or smothering of the interest features and/or sub-features and can result from many sources, including one-off developments such as infrastructure construction and modification, coastal protection works, or from land claim. This can result in the loss of part of one or more of the interest features or sub-features and may occur more frequently in certain areas of the site – such as those close to heavy industry. Physical loss may also occur from the cumulative effects of ongoing activities such as maintenance dredging. Developments and activities may also indirectly cause the loss of estuarine habitats through changing the morphology and modifying coastal processes, subsequently leading to habitat erosion. Changes to coastal processes may also affect the sediment budget of the estuary and reduce the sediment supply to areas such as the intertidal flats, reducing the rates of accretion.

Hard frontages such as embankments and sea walls further compromise the estuarine system on the Humber, constraining the upper boundary and preventing the landward migration of intertidal habitats in response to rising sea levels.

Many of the interest features have a high or medium exposure to removal and this results in a high or moderate vulnerability for all the features.

- The **coastal lagoons** are highly sensitive to removal, as the loss of this habitat would impact directly on the characteristic plant or animal communities, some of which are internationally important and many are restricted to lagoon habitats. Lagoons and their associated flora and fauna also have long recovery times once damaged.  
The lagoons were determined to have a low exposure to removal and smothering, which may be due to occasional land claim or coastal developments. However, combined with the high sensitivity score for removal, results in a moderate vulnerability.
- The **saltmarsh communities** were determined to have a high exposure to physical loss through removal. This may occur as a result of coastal squeeze – whereby intertidal habitats are trapped between man-made structures such as sea defences, and rising sea levels. Under natural conditions, the saltmarsh would respond by migrating backwards, however the presence of sea defences restricts this process. Where this occurs on saltmarshes, it may result in the replacement of mid to upper marsh communities by pioneer marsh species. The Humber Estuary is almost entirely confined by sea defences, and much of the Humber's high marsh communities have already been lost due to coastal squeeze. In some areas, the low to mid marsh communities are now also threatened. Further investigation into the favourable condition of the saltmarshes on the Humber Estuary and the effects of coastal squeeze is needed.  
There have also been reports of large scale samphire collections on the Lincolnshire coast and on Spurn Bight. Samphire picking can be classed as a traditional longshore activity and may be sustainable when traditional methods are employed. However, large scale exploitation for resale is unlikely to maintain this interest feature in favourable condition and it has been reported that there are few plants left after these collections. The uprooting of plants will also result in the loss of the seed-bank and a lack of recolonisation of the mudflats.  
It has also been reported that in the past, dredged spoil from land-drainage outfalls has been dumped alongside the drainage channels and this has resulted in areas of saltmarsh being smothered. The saltmarsh communities are therefore highly vulnerable to removal and the mid to high marsh communities and transitional communities are moderately vulnerable to smothering.
- The **intertidal mudflats and sandflats** were determined to have a medium exposure to removal, except for the intertidal mud communities that are found in the mid to outer estuary. It was felt that there was considerable development in the areas where intertidal mudflats occurred, and this would result in the physical loss of the habitat and so the exposure score was determined to be high. There are also areas of mudflats being lost to erosion and coastal squeeze. Initial modelling for the Humber Shoreline Management Plan indicates intertidal losses of 460ha due to coastal squeeze over the next 50 years. In addition, North East Lincolnshire Council carries out beach feeding at Cleethorpes as part of their sea defence programme. The need for beach feeding is identified through twice yearly beach profile surveys and although it is undertaken infrequently, they have consent to remove up to 2000m<sup>3</sup> of sand each year from within the European marine site. This operation will cause physical loss of the intertidal flats both through removal and smothering.  
The intertidal mudflats and sandflats may also be exposed to smothering in localised areas from jetting and flushing of drainage outfalls. However, across the site as a whole, the exposure of the intertidal features to smothering is classed as low.
- The Humber is a busy commercial waterway, housing the largest shipping complex in the UK, and frequent maintenance dredging is carried out. The dredged spoil is put back into the estuary system, although it is currently unclear whether all the spoil is actually retained. The main dredging areas include the approaches to the main ports of Grimsby, Immingham and Hull, as well as within the docks themselves (although these areas are outwith the European marine site boundary). Maintenance dredging of the main Humber navigation channel at the Sunk Dredge Channel is also carried out. The material dredged is a mixture of sand, fine sand, muddy sand and silt depending on location, and ABP are licensed to remove up to 16,150,000 tonnes of sediment each year. Other companies also undertake maintenance dredging around wharfs and jetties to maintain access. There are a number of sites mainly within the middle and outer estuary, licensed for the disposal of the dredged material. In general, these are close to the areas where the dredge spoil was removed from and tend to be dispersive, redistributing the material throughout the estuary (ABP report 903).

Nevertheless, dredging will lead to physical loss of subtidal material in the areas dredged, and localised smothering of the benthic communities at and close to the depositing grounds. The Humber is an extremely turbid system with a naturally high sediment load and so depositing of dredge spoil is likely to have only localised effects. The exposure to smothering is classed as medium for the subtidal gravels and sands as these occur throughout the estuary, and low for subtidal muddy sands as these occur in the mid to outer estuary where these habitats are subject to a higher degree of flushing by seawater. Dredging and the disposal of dredge spoil may also lead to a change in the extent, distribution and nature of intertidal habitats, either through the removal of the source of intertidal sediment, or through the smothering of the intertidal flats.

The **subtidal sediment communities** and the **subtidal sandbanks** are therefore highly or moderately vulnerable to both removal and smothering.

- **River and sea lamprey** have a high exposure to physical loss through removal as large numbers are sucked up in power station cooling water systems. Studies by the Institute of Estuarine and Coastal Studies on Stallingborough power station recorded annual losses of over 13,000 lamprey (1999-2000) and nearly 17,000 lamprey the following year. Many of these lamprey were river lamprey as they tend to migrate along the banks of the estuary and are therefore more likely to be impinged by the cooling water intake. The sea lamprey tend to migrate through the middle of the estuary, and are less likely to be impinged. It has been calculated that the annual impingement of fish by this power station equals over 18% of the total fish biomass of the Humber Estuary. However, these figures have been derived using the estuary as a closed system without taking account that wider stocks replenish the estuarine fish biomass. This would result in lowering the percentage (Proctor *et al.*, 2000). It is believed that other power station cooling water systems must also remove both river and sea lamprey from the estuary, although there is currently little data on this.

In addition, lamprey are caught as by-catch in an eel fishery on the River Ouse at Naburn and are sold on as bait for pike fishing. Other fishing methods, such as trawling for shrimp and fyke netting for eels may also result in the removal of lamprey from the estuarine system (G. Bartlett, pers com).

These activities may have a significant impact on numbers of lamprey in the Humber Estuary and the river and sea lamprey are currently highly vulnerable to removal.

## ii) **Physical damage**

- Most estuarine communities are not considered to be highly sensitive to siltation, as estuaries are naturally silty environments. However, several of the sub-features are moderately sensitive to siltation and combined with a medium exposure score this leads to a moderate vulnerability. Silt in the water column can smother or block the feeding and respiratory organs of marine invertebrates living in the substrate. It can also affect recruitment processes of both marine flora and fauna and can contribute to a reduction in light penetration through the water column. Light penetration is of particular importance for the eelgrass beds that are found on Spurn Bight and in the Grimsby area. Eelgrasses can also be easily dislodged or uprooted from the sediment by physical damage from anchoring or abrasion from boats, vehicles or fishing gear.
- Siltation can occur from effluent outfalls, maintenance dredging and dredged spoil disposal and is likely to have localised effects. The exposure to siltation from dredging and other activities throughout the estuary is not considered to be high, due to dispersal and the Humber's naturally high sediment load. However, further investigation into the effects and distances travelled by sediment plumes would be useful.
- Abrasion can physically damage individual marine organisms and plants, as well as causing deterioration to the structure of saltmarshes and sediment communities. **Intertidal mudflats and sandflats** in particular are naturally dynamic, and therefore many of the organisms inhabiting them are not highly sensitive to abrasion. However, if the damage is intensive or persistent, this may be detrimental to the favourable condition of the interest features in relation to their structure and functioning. Exposure to abrasion varies across the site, arising from one-off developments or from on-going activities such as recreation or cockling.



- Abrasion of the **intertidal habitats** may occur from both land-based and water-based activities. Physical damage to soft sediment communities can alter the habitat structure and may lead to a change in species composition. Excessive damage may ultimately result in the destabilisation of the sediment and lead to rapid erosion.  
The intertidal habitats were determined to have a medium exposure to abrasion due to the number of activities that may cause physical damage. Bait collection on the intertidal flats locally disturbs the sediment through digging and to a lesser extent trampling. In many cases, the sediment is not put back into the dug holes which results in an increased recovery time for the benthos.  
On the southern shore of the outer estuary, the intertidal habitats are exposed to abrasion from recreational activities such as quad biking, canoeing and large numbers of visitors, which use areas such as Cleethorpes beach and Donna Nook National Nature Reserve. Until the cockle beds were closed in June 2002, cockle fishing took place at Horseshoe Point and the beds were accessed via an area of saltmarsh. This led to significant localised damage, both to the **saltmarsh** habitat and to the intertidal flats, particularly from the tractors and quad bikes that were driven onto the site. These cockle beds are currently closed after a stock survey undertaken by North Eastern Sea Fisheries Committee revealed the beds to be depleted. In addition, beach feeding is undertaken at Cleethorpes using excavators and large dumper trucks. This is likely to result in abrasion of the intertidal flats, although it is only undertaken infrequently.  
In the inner estuary, the exposure of the intertidal habitats to abrasion is likely to be lower, as there is little access to the foreshore.
- The **subtidal sediment communities** and **subtidal sandbanks** have a medium exposure to abrasion, which may result from maintenance dredging or from mobile benthic fishing gear such as beam trawls. Shrimp fishing is undertaken on the Humber, either using push nets, otter trawls or beam trawls. More commonly however, twin beam trawls between 4 and 9m in diameter are towed along the seabed, and 10 to 12 vessels operate in the estuary between August and January. Beam trawling is also undertaken heavily along the north Lincolnshire coast. In recent years, competition on the Wash has forced many shrimp trawlers to begin fishing in the Humber Estuary. Both dredging and to a lesser extent, beam trawls, can damage the benthic communities of the subtidal habitats, either through abrasion or removal of the substrate. This may lead to a change in the community structure.
- Exposure to selective extraction is low across the European marine site, except for the **pioneer marsh communities** where the exposure was determined to be medium, due to large scale samphire collecting. This extensive gathering may also cause physical damage to non-target species such as the *Suaeda maritima* (sea-blite) that grows on the lower shore alongside the samphire. There is also some offshore aggregate extraction which has the potential to affect the geomorphological processes within the estuary.

### iii) Toxic contamination

- Many estuarine species and communities are highly sensitive to toxic contamination through the introduction of synthetic compounds such as pesticides, PCBs (polychlorinated biphenyl) and biocides such as TBT (tributyltin). They are also moderately sensitive to non-synthetic compounds such as heavy metals and hydrocarbons. Toxicity may be increased by synergistic effects when there are mixtures of pollutants and this may also result in the loss of communities. The EC Directive on “pollution caused by the discharge of dangerous substances to the aquatic environment” aims to reduce the pollution of waters by seeking to eliminate the most dangerous substances in terms of persistence, toxicity and bioaccumulation. These substances are known as List I substances and include contaminants such as mercury, cadmium and DDT. The Directive also aims to reduce the input of List II substances such as lead, copper and TBT.
- Many synthetic compounds such as PCBs are known to have toxic effects even in low concentrations, and high levels of bioaccumulation can occur within many benthic organisms, such as molluscs, which are poor at regulating their uptake of contaminants. Such compounds may then ‘biomagnify’ up the food chain if these organisms are predated upon. Whilst the effects of individual synthetic compounds upon

the many species found within the habitats of the Humber Estuary are poorly understood, there is evidence of high levels of toxicity to some groups of species such as crustaceans (Cole *et al.*, 1999). The potential effects of toxic pollutants also vary according to the state and availability of the compound and the characteristics of the receiving environment. Where the effects are lethal and result in the removal of individual species, key grazers or predators may be lost and a dominance of pollution tolerant organisms may result. Sub-lethal effects however, may affect the healthy functioning of an organism such as its reproduction, physiology or genetics, which may ultimately reduce the organism's fitness for survival. Faunal communities within sediments, which primarily consist of species relying on larval dispersal for recruitment, are particularly recognised as being sensitive to toxic contamination. In sheltered low energy environments such as estuaries, muddy sediments can act as a sediment sink, with both synthetic and non-synthetic compounds binding to the fine sediments. If the sediment is disturbed (for example by dredging), the contaminants may be remobilised, making them available once more as potential pollutants and increasing water toxicity.

- Oil pollution can also cause deterioration of marine communities, and can persist in low energy environments, where natural degradation and weathering of the oil tends to be slow. Oil can also have a significant smothering effect on marine communities. In 2001, over 40 million tonnes of oil and chemicals were transported in and out of the Humber Estuary, so there is the possibility of a large spill occurring. Oil may also be brought into the estuary from an incident at sea or via the river systems. Consequently, there is a need to maintain and enhance measures to reduce the risk of pollution, and to have effective contingency plans for dealing with an incident. There are several plans currently in place on the Humber, and the organisations concerned with the containment and clean-up of an oil spill are advised by the Humber Environment Group, which involves environmental regulators supported by NGOs.

Although the exposure to toxic contamination is medium, if a large oil spill occurred, the exposure scores may increase to high, which would in turn increase the vulnerability scores of the SAC habitats.

- The Humber Estuary lies in a heavily populated, industrialised and intensively farmed catchment area and receives contaminants from the following sources:
  - Point source discharges from industry and waste water treatment works,
  - Wash-off from the land, roads and paved areas,
  - Leachate from landfill sites and contaminated land,
  - Pollution incidents involving the release of oil and/or chemicals.

These inputs may go directly into the estuary or the contaminants may be delivered from the wider catchment via the river systems. Pollution can also be brought in from the sea or from the washout and other deposition of atmospheric contaminants. A further source is the release of pollutants from the sediments of the estuary, which may result from activities such as dredging.

Over the last 20 years, there has been much investment in the clean up of point sources of pollution and reducing the risk of spillages. In addition, many consents and authorisations for direct discharges, and permits for existing activities that may impact on the estuary are the subject of 'appropriate assessments' in order to meet the requirements of the Habitats Regulations.

- The Humber receives sewage and industrial effluent from one-fifth of the area and population of England, both through the fresh water river systems and from direct effluent discharges. Although sewage and industrial effluents are treated to meet environmental quality standards, there will still be residual contaminants in the discharges (Environment Agency, pers com). Therefore, it was determined that there was a medium exposure score throughout the estuary to toxic contamination from synthetic and non-synthetic compounds, although the exposure may be lower in the outer estuary, as these habitats are subject to a higher degree of flushing by seawater. The **saline lagoons** are separated from the estuary by natural barriers, and so do not have riverine or effluent discharges released directly into them. Their exposure to synthetic and non-synthetic compounds, particularly those deposited in estuarine sediments was therefore determined to be low.
- A wide range of chemical determinants are regularly measured on the estuary by the Environment Agency, and the vast majority comply with environmental quality standards (Richard Freestone, pers com). However, several contaminants are present in the sediments of the upper estuary at higher levels than the standards set. These are TBT, copper and TPT (an organotin compound used as a fungicide to

protect crops). The use of TBT as an antifoulant on vessels less than 25m in length, has been banned since 1987 and the International Maritime Organisation (IMO) has agreed a global ban on all TBT application from 2003. Occasionally levels of TBT up to 10 times the environmental quality standard have been recorded on the Humber.

Much of this toxic contamination is due to historic discharges and reflects the persistent nature of certain contaminants, which may remain in the sediments and only leave the estuary when washed out by currents. Copper discharges are an exception to this historic contamination. Elevated levels of copper still enter the estuary in some of the main river inputs, such as the Trent, although levels are reducing.

Levels of other heavy metals, including lead, mercury and zinc fail the 'interim marine sediment quality guidelines', although they pass the levels set for 'probable effect'. Again, much of this contamination is due to historic discharges and lead mining in the Pennines in the 19<sup>th</sup> Century and earlier. There is also some arsenic contamination remaining in the sediments from Capper Pass – a metal smelting plant near Brough that closed down about 10 years ago.

(No environmental quality standards have been developed for sediments in the UK and so the Canadian/US approach was recommended. This uses 'probable effect levels' where the contaminant is likely to cause adverse effects in a wide range of organisms. 'Interim sediment quality guidelines' have also been adopted by Environment Canada for a range of toxic substances and these are currently in use in the UK. However, it should be noted that these guidelines have been developed using species that are not indigenous to the UK and that there may be fundamental differences in sediment geochemistry. In general, where sediment concentrations of toxic substances are close to or above the probable effect level, they indicate a high probability of risk of adverse effects and should be identified as a cause for concern (Cole *et al.*, 1999).

- Permethrin and other chemicals used in sheep dips and moth proofing enter the estuary via sewage treatment works and the river system. The wool scouring industry is centred on West Yorkshire, and produces up to 30,000 tons of scouring sludge per annum. The wool is prepared to make into clothes and carpets and the insecticides in the wool are washed into the sewers during the scouring process. There is likely to be a concentration gradient of these chemicals away from the point sources, which are generally the rivers that enter the system in the inner estuary. In addition, the high turbidity of the estuary means that contaminants can attach themselves to particles and be dispersed throughout the estuary fairly rapidly. In sheltered areas such as at Pyewipe and Saltend there may be some accumulation of sediments, however, eventually these will also be washed out of the estuary.
- The **saline lagoon** communities of the Humber are very diverse and include several internationally important species. Therefore, any disturbance to species composition, which may result in changes to the population structure and hence biodiversity is considered harmful. Communities within the lagoons are also sensitive to acute events such as oil spills due to their toxicity and smothering effects. Lagoonal communities often take many years to recover from pollution events, depending on their recruitment rates and the dispersal of the toxic substance. Lagoons are also poorly flushed and so any contaminant is likely to remain. The high sensitivity of the saline lagoons to synthetic compounds results in a moderate vulnerability score.
- **Saltmarshes** have a high sensitivity to toxic contamination by synthetic compounds and moderate sensitivity to non-synthetic compounds. Although saltmarsh plants may be reasonably tolerant of certain synthetic compounds, they can bioaccumulate toxic compounds and act as sinks for them (Holt *et al.*, 1995). They are also sensitive to oil and oil products, even at low levels, mainly due to their ability to trap sediments. Acute events such as an oil spill can be particularly damaging to saltmarsh plants, and the dispersants used to treat the spill can sometimes have an even more toxic effect on the plants than the oil itself. The use of dispersants to clean up oil spills on or close to saltmarshes is therefore, not recommended. Saltmarshes have been reported to take up to 10 years to recover from chronic oil pollution, although recovery depends largely on the degree to which oil is retained in the sediment and the clean up procedures used.  
The saltmarsh communities on the Humber are highly vulnerable to the introduction of synthetic compounds and moderately vulnerable to the introduction of non-synthetic compounds.

- The eelgrass beds of the **intertidal flats** can readily take up heavy metals and TBT, and this may reduce nitrogen fixation, leading to the loss of the plant in nutrient-poor substrates. Eelgrasses are also susceptible to hydrocarbon spills, however, the associated communities may be more sensitive to oil pollution, both from the toxic effects and from smothering, than the eelgrass beds themselves. The eelgrass beds were determined to be moderately vulnerable to synthetic and non-synthetic contamination. The benthic communities of both the intertidal flats and the **subtidal sediments communities** and **subtidal sandbanks** are known to be sensitive to toxic contamination, particularly those which rely upon larval dispersal for recruitment, therefore these sub-features were determined to be moderately or highly vulnerable to toxic contamination.
- The **river and sea lamprey** are moderately vulnerable to toxic contamination through the introduction of synthetic and non-synthetic compounds, as they are exposed to these contaminants as they live in or migrate through the estuary waters. The levels of toxic contaminants are considered to be higher in the upper estuary, where levels of contaminants such as copper and TBT fail environmental quality standards. This may affect both the adult river and sea lamprey as they migrate through the estuary to their fresh water spawning grounds, and the juvenile lamprey as they migrate down the estuary away from their nursery areas.
- None of the interest features or sub-features were determined to be vulnerable to the introduction of radionuclides, due to a low exposure throughout the site. Radioactive substances from hospitals or research and industrial waste may enter the Humber Estuary from effluent discharges. In addition, radionuclides from nuclear installations can be flushed into the estuary from the sea. A surveillance programme undertaken by the Centre for Environment, Fisheries and Aquaculture Science into the distribution of key radionuclides, concluded that the coastal waters of the British Isles, including the North Sea, are contaminated by radionuclides. The 1998 data for the North Sea shows a general distribution of falling concentrations as the distance from Sellafield increases.

iv) **Non-toxic contamination**

- Certain contaminants can have non-toxic, but nevertheless harmful effects on the features of the Humber Estuary European marine site, mainly because they can enter the environment in large quantities from sewage and industrial outfalls, riverine inputs and agricultural run-off.
- The over-enrichment of an aquatic environment with inorganic nutrients (especially nitrates and phosphates) can result in the stimulation of phytoplankton and bacterial growth. This may lead to a reduction in the oxygen content of water, particularly in areas of limited or reduced water circulation. Increased nutrient levels can also lead to the localised growth of opportunistic algae such as *Enteromorpha* species and *Ulva lactuca* on the foreshore, which can cause smothering and deoxygenation of the sediment communities (Cole *et al.*, 1999). Nutrient pollution can also reduce the diversity of communities and some species could be sensitive in terms of recovery, due to their slow growth and low larval dispersal. Increased levels of organic compounds can lead to a localised depletion of oxygen levels due to the increased activity of anaerobic bacteria that break down organic matter. A good supply of oxygen within the sediments and water column is important for the healthy functioning of most marine species. Elevated levels of organic matter can alter this natural balance, potentially causing changes to the species composition and distribution within the sediments and saltmarsh communities, caused primarily by the increased growth of opportunistic species at the expense of more sensitive species (Cole *et al.*, 1999).
- On the Humber Estuary, high nutrient and organic loads enter the system from sewage and industrial outfalls, and agricultural run-off. Between 1998 and 2001, two stage sewage treatment was provided for Cleethorpes, Goole, Grimsby and Hull. Previously, the effluent was discharged untreated into the estuary. This sewage treatment will not however, affect the concentrations of nitrogen and phosphorus in the estuary as by far the greatest loading of these contaminants comes from diffuse agricultural run-off from the wider catchment.

- The Humber Estuary is hyper-nutriented with the highest levels of nitrates found in the tidal rivers and the concentrations reducing towards the mouth of the estuary as a result of dilution with seawater. Nutrient levels may also vary over the tidal cycle and seasonally with freshwater flow. The Humber was originally designated under the Urban Waste Water Treatment Directive as a water for which nutrient removal is not required as the adverse effects of nutrient enrichment were not found. The high turbidity of the estuary greatly reduces light penetration through the water column and limits the photosynthesis of algae. However, it has been suggested by the EC that the Humber Estuary should be designated as a 'sensitive area' for the purpose of this Directive. Sensitive areas are described as 'freshwater bodies, estuaries and coastal waters which are eutrophic, or which may become eutrophic if protective action is not taken'. If this is enforced there will be an obligation to ensure that the input from effluent treatment works does not increase, and that the nutrient and eutrophication status of the estuary is periodically re-assessed. Recently, much of the Humber's catchment area became a Nitrate Vulnerable Zone under the Nitrates Directive. This requires restrictions on the application of manures and artificial fertilisers and may stem from the leaching of nitrate from farmland in the Humber's catchment area. However, it may take some time before the benefits are visible due to the large amounts of nitrates stored in some groundwaters.
- Some sediment communities are sensitive to non-toxic contamination, which may result in excessive blanketing of green algae and smothering of benthic communities. The sediments of the **saline lagoons** are particularly susceptible to nutrient and organic enrichment, due to the poor flushing rates. It is also suspected that there is some seepage into Humberston Fitties lagoon from the adjacent farmland and caravan site (Andrew Grieve, pers com). The **intertidal flats, subtidal sediment communities** and **subtidal sandbanks** are also highly or moderately sensitive to nutrient and organic loading. An excessive input of organic matter can result in anoxic conditions in the sediments, particularly in sheltered areas with low tidal flows, such as at Pyewipe and Saltend. Anoxic conditions can lead to the extinction of fauna living in the sediments, although some species may be tolerant to eutrophication. This can result in numbers of these species increasing, ultimately altering the community composition. The eelgrass beds are highly sensitive to changes in nutrient levels and moderately sensitive to changes in organic levels. Nutrient and organic enrichment can lead to phytoplankton blooms that increase turbidity, leading to a lack of light penetration, which may limit the ability of the eelgrasses to photosynthesise. Studies in North America have suggested that **saltmarshes** are unlikely to be highly sensitive to changes in water quality due to nutrient enrichment (Holt *et al.*, 1995). However, increased growth of algal species, as a result of eutrophication may cause localised smothering of lower saltmarsh species and have been known to have a detrimental effect on *Salicornia* species in particular. Saltmarshes may also trap nutrient and organic matter, retaining it within the estuarine system with the opportunity for it to be remobilised.  
A zone of deoxygenation on the tidal Ouse is present during the summer months. This has occurred for many years and is partially a natural phenomenon as currents stir up the silt; but it is also a result of effluent discharges. In recent years however, these have improved significantly due to improvements made by Yorkshire Water and industries. This zone of deoxygenation could potentially affect both the adult **river and sea lamprey** (and other fish species such as salmonids) as they migrate upstream to breed and the juveniles as they migrate downstream into the estuary.
- The Humber Estuary is considered to have a high nutrient regime from sewage and agricultural inputs, therefore it was determined that the sub-features which were covered continually or frequently by seawater were highly exposed to changes in nutrient loading. The sub-features that were less frequently inundated were considered to have a medium exposure. The **saline lagoons** were also determined to have a medium exposure as although they would be less exposed to contamination from the estuary waters, nutrient and organic enrichment may result from agricultural run-off entering the lagoons. These exposure scores resulted in all sub-features, (except for the low to mid saltmarsh communities) being moderately or highly vulnerable to nutrient loading. In addition, all sub-features are also highly or moderately vulnerable to changes in organic loading.
- Changes to the thermal regime of the water column may lead to changes in the distribution and composition of marine organisms. Ultimately a long-term thermal discharge is likely to lead to a change in community, with colonisation by species adapted to warm water temperatures. Changes in species productivity may also occur as some species may thrive in warmer temperatures, whilst others may

decline. This situation may consequently favour more opportunistic species and there are examples where increased temperatures have affected the growth and reproduction of invertebrates (Langford *et al.* 1998). The impact of heated water discharges are likely to depend on the location of the discharge point, the temperature of the discharge and the nature of tidal currents in the area. The temperature of the Ouse and Trent fell in the 1970s and 1980s as the older 'direct-cooled' power stations were closed. The water cooled power stations that are now found on and around the Humber, have cooling towers or return the discharge to deeper waters so that any temperature rise is minimised. Consequently, the sub-features of the European marine site were determined to have a low exposure to changes in thermal regime. However, the **river and sea lamprey** are highly sensitive to changes in water temperature, as their upstream migration is thought to be temperature dependent, relying on the detection of a small increase in water temperature. Therefore, the river and sea lamprey were determined to be moderately vulnerable to changes in thermal regime.

- The Humber Estuary is an extremely turbid system; therefore any increases in turbidity from anthropogenic actions are likely to have a minimal impact on the sub-features and their associated communities. The exposure to changes in turbidity was determined to be low throughout the estuary, except for the **subtidal sandbanks** and **river and sea lamprey**, which are continually covered by water and may be affected by changes in turbidity due to activities such as dredging and the depositing of dredge spoil. The **lagoons** are moderately sensitive to changes in turbidity as a decrease in the clarity of the water column will inhibit submerged macrophyte growth in species such as *Ruppia* with a consequent depletion of dependent invertebrates.

The Humber has been described as hyper-nutriented but not eutrophic, and it is likely that the turbidity of the estuary limits algal growth. Therefore, any activity that reduces turbidity in the estuary may trigger eutrophic effects, although the large amounts of sediment currently in the water column, mean that the activity would have to be significant, and this would also have other major impacts such as erosion and affect sedimentation.

- The exposure scores throughout the estuary to changes in salinity were determined to be low as the main influences on the salinity of the estuary would be from natural sources such as the tide and rainfall. However, warm water outfalls from power stations would have a slight effect on the salinity in a localised area, and the River Trent has an artificially high water flow due to receiving waste water from Wales and this may affect the salinity of water in the upper Humber. In addition, climate change resulting in extended or more frequent summer droughts, and sea level rise may result in increasing salinities in the upper estuary, which may affect the transitional saltmarsh communities.

#### v) **Biological disturbance**

- The **saltmarsh communities** on the Humber Estuary are moderately vulnerable to biological disturbance through the introduction, translocation and/or spread of non-native species. Introduced species may thrive at the expense of native species, resulting in a change in the biological composition, structure and functioning of estuarine habitats.

Common cordgrass *Spartina anglica* is a fertile strain of a hybrid between a native and non-native species. It demonstrates vigorous growth and is able to grow low down on the shore where the sediments are highly mobile. In the past, *Spartina anglica* was planted to assist in coastal defence and land claim of the intertidal area and was first planted on the Humber in 1936. Its role in saltmarsh development is poorly understood, but it is considered by some people to be an invasive species that may be damaging to other marsh communities. Conversely, on the Humber, the area covered by *Spartina anglica* has reduced from 160ha in 1969 to 120ha in 1989 and recent observations at Welwick suggest that saltmarsh grass *Puccinellia maritima* has largely replaced areas of *Spartina* (Billings *et al.*, 2002).

There are also records of other non-native species within the European marine site and the potential for further introductions which can have unforeseen consequences. Some species, such as the slipper limpet *Crepidula fornicata* may have been transported from overseas on the hulls of ships or in ballast waters in the pelagic larval stage. Others were deliberately introduced. The Chinese mitten crab *Eriocheir sinensis* has been reported from one of the tributaries on the Humber since 1976. During August, adult crabs migrate seawards and gather in large swarms to breed in estuaries. When populations are high, they may cause damage to soft sediment banks by burrowing. This may increase erosion and affect flood defences.

The Chinese mitten crab is also an intermediate host for the mammalian lung fluke, which may affect the grey seal population at Donna Nook.

- On the Humber, both *Zostera noltei* (dwarf eelgrass) and *Zostera marina* (common eelgrass) have been recorded on Spurn Bight and from the Grimsby area. These eelgrass beds have declined over recent years, although the reasons why are not fully understood. During the 1930's, a wasting disease was responsible for the loss of eelgrass beds around the UK and this has since reappeared in the south-west. However, other factors such as natural physical phenomena, dredging (resulting in a loss of deposition of sediments), increased turbidity, and abrasion from boats can all result in damage to eelgrass beds. Survey work would be advisable to establish the current status of the eelgrass beds on the Humber Estuary.
- The interest features and sub-features of the European marine site have a low exposure to the selective extraction of species, except for the **intertidal muddy sand communities** and the **intertidal mud communities**. These are the areas where activities such as baitdigging and cockling are carried out. The exposure score was determined to be medium for these activities, as although in areas such as on Spurn Bight and south of Cleethorpes these activities are fairly intensive, over the estuary as a whole the exposure is likely to be medium. Bait digging occurs frequently between Grimsby and Cleethorpes and at Tetney on the south bank, and at Spurn Bight to Easington Clays on the north bank. Cockling on the estuary is very localised and seasonal, although currently the cockle beds at Horseshoe Point are closed due to low stock densities. These cockle beds have an erratic presence, due to periodic dramatic movements of sediment around the Grainthorpe Haven basin, and the unpredictable nature of good spat fall years (Graham Weaver, pers com). In February this year, DEFRA confirmed a new byelaw to strengthen the management of the Humber cockle fishery. All fishermen harvesting more than 5kg of cockles per day require a permit from NESFC and the issuing of this permit is subject to the submission of monthly catch returns. In addition, the fishery can only be exploited using hand rakes and all cockles under 20mm must be returned to the beds. The beds will also be closed to commercial exploitation between May 1<sup>st</sup> and August 31<sup>st</sup> and NESFC also retain the right, following consultation with permit holders, to close the beds for several reasons, including environmental protection or conservation. As in other areas, such as the Wash, an ecological balance is achieved through the thirds rule, which allocates a third of the cockles to the fishermen, a third to birds and the remaining third to the stock.
- Exposure to the selective extraction of species was also determined to be medium for the **pioneer marsh communities**, due to the large scale collection of samphire on the north Lincolnshire coast and on Spurn Bight. Traditional samphire picking at these sites was localised and seasonal, however, there have been recent reports of gathering at Humberston and some large-scale gathering on Spurn Bight. Members of the Humber Advisory Group have reported that little samphire has been left at these sites after collection and that the whole plant has been pulled up, resulting in the loss of seeds to recolonise the intertidal flats.
- The unsustainable removal of particular species from estuarine habitats may affect the ecological balance of the marine communities and predator species, such as birds and fish that may rely upon them as a food source. However, the levels at which removal of a species becomes unsustainable are difficult to define. Fowler (1999) has produced guidelines on the collection of bait and other shoreline animals within European marine sites, and a bait-digging guide is given out on the Humber when people apply for licences in northeast Lincolnshire.

**Table 4 Assessment of the relative exposure of interest features and sub-features of the Humber Estuary European marine site (pSAC) to different categories of operations (as at July 2002)**

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

Categories of operations which may cause deterioration or disturbance	SAC interest features										
	Estuaries				Coastal Lagoons	Atlantic salt meadows			<i>Salicornia</i> and other annuals		
	Saltmarsh communities	Intertidal mudflat and sandflat communities	Subtidal sandbanks	Subtidal sediment communities		Low to mid marsh communities	Mid to high marsh communities	Transitional communities	Annual <i>Salicornia</i> (samphire) saltmarsh communities	<i>Suaeda maritima</i> (sea-blite) saltmarsh communities	
<b>Physical Loss</b> Removal (eg land claim, dredging) Smothering (eg depositing dredge spoil, beach feeding)	For information on these sub-features, see the individual assessments made under the separate interest feature sections:				Med	Low	High	High	High	Med	Med
<b>Physical Damage</b> Siltation (eg dredging, outfalls) Abrasion (eg recreational activity, vehicles) Selective extraction (eg aggregate extraction)	- Atlantic salt meadows; - <i>Salicornia</i> and other annuals; - Mudflats and sandflats not covered by seawater at low tide; - Sandbanks slightly covered by seawater all the time				Med	Low	Med	Med	Med	Med	Med
					Med	Low	Med	Med	Med	Med	Med
					Low	None	Low	Low	Low	Med	Med
<b>Non-physical disturbance</b> Noise (eg land/water-based recreation, marine traffic) Visual presence (eg land/water-based recreation, marine traffic)					N/A	N/A	N/A	N/A	N/A	N/A	N/A
					N/A	N/A	N/A	N/A	N/A	N/A	N/A



<p><b>Toxic contamination</b> Introduction of synthetic compounds (eg TBT, PCBs) Introduction of non-synthetic compounds (eg trace metals from industrial or domestic effluent, crude oil) Introduction of radionuclides</p>	<p>For information on these sub-features, see the individual assessments made under the separate interest feature sections:   <b>- Atlantic salt meadows;</b>  <b>- <i>Salicornia</i> and other annuals;</b>  <b>- Mudflats and sandflats not covered by seawater at low tide;</b>  <b>- Sandbanks slightly covered by seawater all the time</b></p>	Med	Low	Med	Med	Med	Med	Med
<p><b>Non-toxic contamination</b> Changes in nutrient loading (eg agricultural run-off, domestic effluent outfalls) Changes in organic loading (eg domestic effluent outfalls, aquaculture) Changes in thermal regime (eg power station discharges) Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil) Changes in salinity (eg water abstraction, effluent outfalls)</p>		High	Med	Med	Med	Med	Med	Med
<p><b>Biological disturbance</b> Introduction of microbial pathogens (eg domestic/industrial effluent outfalls) Introduction of non-native species and translocation Selective extraction of species (e.g. samphire picking, bait collection)</p>		Low	Low	Low	Low	Low	Low	Low
		Med	Low	Med	Med	Med	Med	Med
		Low	None	Low	Low	Low	Low	Low
		High	Med	Med	Med	Med	Med	Med
		High	Med	Med	Med	Med	Med	Med
		Low	None	Low	Low	Low	Low	Low
		Med	Low	Low	Low	Low	Low	Low
		Low	Low	Low	Low	Low	Low	Low
		Low	Low	Med	Med	Low	Med	Med
		Low	Low	Low	Low	Low	Med	Low

Categories of operations which may cause deterioration or disturbance	SAC Interest Features						
	Mudflats and sandflats not covered by seawater at low tide				Sandbanks which are slightly covered by seawater all the time		River and Sea lamprey
	Intertidal gravel and sand communities	Intertidal muddy sand communities	Intertidal mud communities	Eelgrass bed communities	Subtidal gravels and sands	Subtidal muddy sands	
<b>Physical Loss</b>							
Removal (eg land claim, dredging)	Med	Med	High	Low	Med	Med	High
Smothering (eg depositing dredge spoil, beach feeding)	Low	Low	Low	Low	Med	Low	Low
<b>Physical Damage</b>							
Siltation (eg dredging, outfalls)	Med	Med	Med	Med	Med	Med	Low
Abrasion (eg recreational activity, vehicles)	Med	Med	Med	Low	Med	Med	None
Selective extraction (eg aggregate extraction)	Low	Low	Low	Low	Low	Low	Low
<b>Non-physical disturbance</b>							
Noise (eg land/water-based recreation, marine traffic)	N/A	N/A	N/A	N/A	N/A	N/A	Low
Visual presence (eg land/water-based recreation, marine traffic)	N/A	N/A	N/A	N/A	N/A	N/A	Med
<b>Toxic contamination</b>							
Introduction of synthetic compounds (eg TBT, PCBs)	Med	Med	Med	Med	Med	Med	Med
Introduction of non-synthetic compounds (eg effluent outfalls, crude oil)	Med	Med	Med	Med	Med	Med	Med
Introduction of radionuclides	Low	Low	Low	Low	Low	Low	Low
<b>Non-toxic contamination</b>							
Changes in nutrient loading (eg agricultural run-off, effluent outfalls)	High	High	High	High	High	High	High
Changes in organic loading (eg effluent outfalls, aquaculture)	High	High	High	High	High	High	High
Changes in thermal regime (eg power station discharges)	Low	Low	Low	Low	Low	Low	Low
Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil)	Low	Low	Low	Low	Med	Med	Med
Changes in salinity (eg water abstraction, effluent outfalls)	Low	Low	Low	Low	Low	Low	Low

<b>Biological disturbance</b>							
Introduction of microbial pathogens (eg effluent outfalls)	Low	Low	Low	Low	Low	Low	Low
Introduction of non-native species and translocation	Low	Low	Low	Low	Low	Low	Low
Selective extraction of species (eg samphire picking, bait collection)	Low	Med	Med	Low	Low	Low	Low

**Table 5 Assessment of the relative vulnerability of interest features and sub-features of the Humber Estuary European marine site (pSAC) to different categories of operations.**

Shading indicates categories of operation to which the features or sub-features of the site are highly or moderately vulnerable to. This table also incorporates the relative sensitivity scores, used in part to derive vulnerability<sup>10</sup>.

**Key:**

	High vulnerability
	Moderate vulnerability

● ● ● ●	High sensitivity
● ● ●	Moderate sensitivity
● ●	Low sensitivity
●	No detectable sensitivity

Categories of operations which may cause deterioration or disturbance	SAC interest features												
	Estuaries				Coastal Lagoons	Atlantic salt meadows			<i>Salicornia</i> and other annuals				
	Saltmarsh communities	Intertidal mudflat and sandflat communities	Subtidal sandbanks	Subtidal sediment communities		Low to mid marsh communities	Mid to high marsh communities	Transitional communities	Annual <i>Salicornia</i> (samphire) saltmarsh communities	<i>Suaeda maritima</i> (sea-blite) saltmarsh communities			
<b>Physical Loss</b> Removal (eg land claim, dredging) Smothering (eg depositing dredge spoil, beach feeding)	For information on these sub-features, see the individual assessments made under the separate interest feature sections:  - Atlantic salt meadows; - <i>Salicornia</i> and other annuals; - Mudflats and sandflats not covered by seawater at low tide; - Sandbanks slightly covered by seawater all the time				● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●		
					● ● ●	● ● ●	● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ●	● ● ●
<b>Physical Damage</b> Siltation (eg dredging, outfalls) Abrasion (eg recreational activity, vehicles) Selective extraction (eg aggregate extraction)					● ●	● ● ●	● ● ●	● ●	● ●	● ● ●	● ● ●		
					● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●
					● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●
<b>Non-physical disturbance</b> Noise (eg land/water-based recreation, marine traffic) Visual presence (eg land/water-based recreation, marine traffic)					●	●	●	●	●	●	●		
					●	●	●	●	●	●	●	●	●

<p><b>Toxic contamination</b>                  Introduction of synthetic compounds (eg TBT, PCBs)                  Introduction of non-synthetic compounds (eg trace metals from industrial or domestic effluent, crude oil)                  Introduction of radionuclides</p>	<p>For information on these sub-features, see the individual assessments made under the separate interest feature sections:</p> <ul style="list-style-type: none"> <li>- Atlantic salt meadows;</li> <li>- <i>Salicornia</i> and other annuals;</li> <li>- Mudflats and sandflats not covered by seawater at low tide;</li> <li>- Sandbanks slightly covered by seawater all the time</li> </ul>							
<p><b>Non-toxic contamination</b>                  Changes in nutrient loading (eg agricultural run-off, domestic effluent outfalls)                  Changes in organic loading (eg domestic effluent outfalls, aquaculture)                  Changes in thermal regime (eg power station discharges)                  Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil)                  Changes in salinity (eg water abstraction, effluent outfalls)</p>								
<p><b>Biological disturbance</b>                  Introduction of microbial pathogens (eg domestic/industrial effluent outfalls)                  Introduction of non-native species and translocation                  Selective extraction of species (e.g. samphire picking, bait collection)</p>								

Categories of operations which may cause deterioration or disturbance	SAC Interest Features						
	Mudflats and sandflats not covered by seawater at low tide				Sandbanks which are slightly covered by seawater all the time		River and Sea lamprey
	Intertidal gravel and sand communities	Intertidal muddy sand communities	Intertidal mud communities	Eelgrass bed communities	Subtidal gravels and sands	Subtidal muddy sands	
<b>Physical Loss</b>							
Removal (eg land claim, dredging)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
Smothering (eg depositing dredge spoil, beach feeding)	● ● ● ●	● ● ●	● ● ●	● ● ● ●	● ● ● ●	● ● ●	● ●
<b>Physical Damage</b>							
Siltation (eg dredging, outfalls)	● ●	● ● ●	● ●	● ● ●	● ●	● ●	● ●
Abrasion (eg recreational activity, vehicles)	● ●	● ●	● ● ●	● ● ●	● ●	● ●	● ●
Selective extraction (eg aggregate extraction)	● ● ●	● ● ●	● ● ●	● ● ● ●	● ● ●	● ● ●	● ● ●
<b>Non-physical disturbance</b>							
Noise (eg land/water-based recreation, marine traffic)	●	●	●	●	●	●	● ●
Visual presence (eg land/water-based recreation, marine traffic)	●	●	●	●	●	●	● ●
<b>Toxic contamination</b>							
Introduction of synthetic compounds (eg TBT, PCBs)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ●	● ● ●	● ● ● ●	● ● ●
Introduction of non-synthetic compounds (eg effluent outfalls, crude oil)	● ● ●	● ● ● ●	● ● ● ●	● ● ●	● ● ●	● ● ●	● ● ●
Introduction of radionuclides	● ●	● ●	● ●	● ●	● ●	● ●	● ●
<b>Non-toxic contamination</b>							
Changes in nutrient loading (eg agricultural run-off, effluent outfalls)	● ● ● ●	● ● ● ●	● ● ●	● ● ● ●	● ● ●	● ● ●	● ●
Changes in organic loading (eg effluent outfalls, aquaculture)	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ●
Changes in thermal regime (eg power station discharges)	● ●	● ● ●	● ●	● ●	● ● ●	● ● ●	● ● ● ●
Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil)	● ●	●	● ●	● ● ●	● ●	● ● ●	● ●
Changes in salinity (eg water abstraction, effluent outfalls)	● ●	● ● ●	● ●	● ●	● ●	● ●	● ●
<b>Biological disturbance</b>							
Introduction of microbial pathogens (eg effluent outfalls)	● ●	● ●	● ● ●	● ● ●	● ●	● ●	● ●

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Categories of operations which may cause deterioration or disturbance	SAC Interest Features						
	Mudflats and sandflats not covered by seawater at low tide				Sandbanks which are slightly covered by seawater all the time		River and Sea lamprey
	Intertidal gravel and sand communities	Intertidal muddy sand communities	Intertidal mud communities	Eelgrass bed communities	Subtidal gravels and sands	Subtidal muddy sands	
Introduction of non-native species and translocation	● ●	● ● ●	● ● ●	● ● ●	● ●	● ●	● ● ●
Selective extraction of species (eg samphire picking, bait collection)	● ● ●	● ● ●	● ● ●	● ● ●	● ●	● ● ●	● ● ●

<sup>10</sup> 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 July 2002), 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 contrast 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.

## **SPECIAL PROTECTION AREA**



## **9. Humber Flats, Marshes and Coast SPA interest features**

The Humber Estuary European marine site also includes a Special Protection Area qualifying under the EU Birds Directive. An extension to the SPA has also been proposed, but this has not yet been designated and is therefore known as a potential SPA. This section describes and explains the importance of each the interest features of the SPA and pSPA, together with their component sub-features within the Humber Estuary European marine site.

The Humber Flats, Marshes and Coast SPA and pSPA include both marine areas (i.e. land covered continuously or intermittently by tidal waters) and land that is not subject to tidal influence. The marine part of the SPA or pSPA is termed a European marine site. The seaward boundary of the European marine site is concurrent with that of the SPA or pSPA. The landward boundary of the European marine site is the upper boundary of the SPA or pSPA, or where that extends above land covered continuously or intermittently by tidal waters, it is at the limit of the marine habitats.

Where the SPA or pSPA 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.

This section on the Humber Flats, Marshes and Coast SPA, applies to both the classified site and to the potential SPA.

### **9.1 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 DEFRA, 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 be 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 also directed to the inclusion of disturbance in the advice on operations provided in Section 12. Where disturbance is highlighted in such advice, relevant authorities need to avoid damaging disturbance to qualifying species when exercising their functions under the Directive.

## **9.2 Reductions in organic inputs**

Under the Urban Waste Water Treatment (UWWT) Directive, all coastal discharges above a certain volume must have had 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.

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.

## **9.3 General description**

In recognition that bird populations may change as a reflection of regional, 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. As with SAC interest features, sub-features are identified which describe the key habitats necessary to support the birds that qualify within the Humber Flats, Marshes and Coast SPA. Detailed information and targets for habitat condition will be listed in the favourable condition tables in section 11.

Bird usage of the sites varies, with different areas and prey species 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 populations and distribution trends, to assess whether this SPA is continuing to make an appropriate contribution to the Favourable Condition 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 their food distribution and availability differently. The bird populations at this site require habitats that are capable of supporting their feeding, roosting and nesting requirements. The most important factors related to this include:

- current extent and distribution of suitable feeding and roosting habitat;
- sufficient food availability;
- minimal levels of disturbance consistent with maintaining conditions for birds feeding and roosting and;
- water quality, quantity and salinity necessary to maintain plant and animal communities suitable for bird feeding, nesting and roosting.

There are also a number of habitats, such as the Grues and Goxhill Marsh Fields that support the qualifying bird species and occur within the SPA and pSPA boundary. However, these habitats lie above highest astronomical tide and therefore are not within the European marine site. Objectives to maintain these aspects of bird interest in favourable condition are found within English Nature's conservation objectives for the relevant SSSI within the SPA boundary and will be dealt with through relevant procedures outlined in the Conservation (Natural Habitats & c.) Regulations 1994.

Some species will also use areas of land and coastal waters outside the boundaries of both the European marine site and the SPA. Relevant authorities need to have regard to such adjacent interests, as they might be affected by activities taking place within, or adjacent to the European marine site.

#### 9.4 Internationally important populations of the regularly occurring Annex I species

The species listed in Annex I 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 I are in danger of extinction, rare or vulnerable. Annex I species that regularly occur at levels over 1% of the national population, meet the SPA qualifying criteria.

The Humber Flats, Marshes and Coast SPA supports internationally important populations of seven Annex I species (see Table 6).

The qualifying breeding species that occur within the European marine site are:

- marsh harrier *Circus aeruginosus*
- avocet *Recurvirostra avosetta*
- little tern *Sterno albifrons*

The qualifying wintering species that occur within the European marine site are:

- bittern *Botaurus stellaris*
- hen harrier *Circus cyaneus*
- golden plover *Pluvialis apricaria*
- bar-tailed godwit *Limosa lapponica*

The following Annex I species also occur on the Humber Estuary over winter; Bewick's swan *Cygnus columbianus*, whooper swan *Cygnus cygnus*, merlin *Falco peregrinus*, avocet *Recurvirostra avosetta*, ruff *Philomachus pugnax*, short-eared owl *Asio flammeus* and kingfisher *Alcedo atthis*. However, they occur in numbers of less than European importance (i.e. less than 1% of the Great Britain population).

##### 9.4.1 Key sub-features for the Annex I species

**Intertidal mudflats and sandflats** – Extensive areas of intertidal flats are found throughout the Humber Estuary European marine site, supporting rich populations of intertidal invertebrate species. In turn, these provide a crucial food source for several of the Annex I species. In general, more sheltered areas with a relatively high silt content such as at Paull, support a richer biomass than more exposed areas. This high biomass of invertebrates includes key species such as mudsnails *Hydrobia ulvae*, cockles *Cerastoderma edule*, marine worms such as ragworms *Nereis diversicolor* and lugworms *Arenicola marina* and crustaceans such as *Corophium volutator*.

Avocet feed on small invertebrates such as marine worms and crustaceans, which they obtain from the intertidal flats, feeding close to Reads Island and Blacktoft Sands, their main breeding areas. They favour saline still, shallow waters, flat bare sand and sheltered muddy tidal flats. Here the loose sediments are rich in food, which the avocet search for with their specialised bills.

The intertidal flats also provide important roosting sites for avocet and overwintering golden plover. The Humber is the only estuary in the UK that supports internationally important numbers of golden plover and large flocks of several thousand birds are found here. During periods of very cold weather, flocks on the Humber are augmented by populations from further afield. The birds may also feed on the intertidal flats when the surrounding farmland is frozen. Golden plover are very mobile and major concentrations occur in the inner estuary, although large numbers also occur east of the Humber Bridge, particularly around Saltend to Sunk Island, where flocks regularly contain in excess of 10,000 birds. The intertidal flats close to the RSPB reserve at Tetney Marshes also support large flocks of roosting golden plover.

The overwintering bar-tailed godwit relies on a small number of feeding and roosting sites on the estuary. They feed on the intertidal mudflats, favouring areas with abundant invertebrate food such as polychaete worms. Bar-tailed godwits occur almost exclusively on the outer estuary, although smaller numbers are found around Whitton Sands, Reads Island and Barton and Barrow Claypits.

When the tide is in, little terns will feed over the intertidal flats, hunting for sprats, sandeels and the fry of other fish. They will also feed on small crustaceans, molluscs and marine worms. They breed in the outer estuary - along the Holderness coast and south of Cleethorpes on the north Lincolnshire coast and often nest very close to shallow clear water where fish can be caught by plunging and without the necessity for making extended foraging flights.

**Saltmarsh Communities** – Saltmarsh are found throughout the Humber Estuary and provide important roosting and feeding sites for many of the Annex I birds. Avocet, golden plover and bar-tailed godwit require unrestricted views when roosting, and will utilise areas of saltmarsh with short sward heights as a roost site. Marsh harrier and hen harrier will use the saltmarshes as a hunting ground, quartering low over the vegetation, searching for small birds and mammals.

**Tidal reedbeds**- Stands of common reed *Phragmites australis* are found throughout the estuary. They exist as a fringe of varying width along the banks or as substantial reedbeds, such as at Blacktoft Sands, which is thought to be the second largest tidal reedbed in Britain. Broken stands of reed are also found along the north Lincolnshire coast.

Marsh harriers are now regular breeders on the Humber, requiring wetlands with tall dense vegetation for nesting and particularly favouring reedbeds. They nest on the ground where the vegetation is thick and are found throughout the inner estuary. They will also hunt over the reedbeds and adjacent farmland. The wintering population of hen harrier will use the reedbeds as a roost, favouring the south bank of the inner estuary, although they are also seen in the dune slacks on the north Lincolnshire coast and at Humberston Fitties.

When breeding, the bittern is predominantly a freshwater bird, however it will utilise areas of intertidal reedbed during the winter. This rare bird is seen regularly in the reedbeds of the inner estuary, and also at North Killingholme Haven pits. The Lincolnshire Wildlife Trust are currently undertaking a management programme to encourage bitterns to breed on the Humber after an absence of over 20 years. The first booming males were heard in 2000, with 3 chicks fledging that year. They have bred every year since, at a number of sites in the inner estuary with several chicks fledging each year.

**Coastal lagoons** – The Humber Estuary supports over 10% of the total UK resource of coastal lagoons. This rare and threatened habitat provides important breeding and feeding areas for avocet and little tern.

Avocet nest on open or bare ground, close to areas of shallow water and up to 90% of breeding avocet are associated with saline lagoons. On the Humber, the lagoons at Blacktoft Sands and on Reads Island support breeding avocet. The RSPB created six brackish lagoons at Blacktoft Sands between 1978 and 1987 and the water levels are controlled to provide a range of feeding and breeding habitats. Avocets colonised the lagoons in 1992 when a single pair nested. Reads Island has the fourth largest lagoon system occurring on an island in a British estuary. Although people once inhabited the island, it was finally abandoned in 1989 and is now jointly managed by the RSPB and the Lincolnshire Wildlife Trust as a nature reserve. In 1997, work was carried out to create nearly 20ha of saline lagoon habitat and the following year avocet began breeding on the island – the first breeding success in Lincolnshire since 1837! Avocet feed primarily on small crustaceans, marine worms and molluscs, which they obtain from the lagoon waters or sediments by sweeping their bills through the shallow water or by picking them from the surface of the mud. Following the digging of these lagoons in the upper estuary, avocet now breed in numbers of European importance on the Humber – in 2000, 71 pairs were recorded.

In the past there have been five little tern breeding colonies on the Humber, with the largest one at Easington lagoons. Unfortunately, over recent years, breeding success has varied greatly and Easington lagoons now appears to be the most successful colony with few birds fledging from any of the other sites. The lagoons are an important feeding area for the adult little terns, which feed on small fish and crustaceans. The little terns also feed on the lagoons at Humberston Fitties.

Golden plover and bar-tailed godwit may also utilise the lagoons such as those on Read's Island as a high tide roost.

**Unvegetated sand and shingle** – Little terns nest on bare sand and shingle, only just above normal tide, preferring a shallow, sloping shoreline to give maximum protection against flooding. However, whole colonies may still get washed out on spring tides. They usually nest in small single species groups, preferring areas with little vegetation so that they can see approaching predators. Easington lagoons support the largest colony of breeding little terns in the Humber Flats and Marshes SPA and have one of the highest success rates in eastern Britain. This is probably due to the intensive wardening and management of the site.

Little terns also nest on areas of sand at Donna Nook, in particular the extensive sandbars, and several pairs attempt to nest at other sites including Tetney, Spurn Point and Saltfleetby to Theddlethorpe dunes, although these sites have not been successful for several years. It is possible that where terns have moved from some areas due to disturbance or predation they may return in the future.

## 9.5 Internationally important populations of regularly occurring migratory bird species

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 Humber Flats, Marshes and Coast SPA supports internationally important numbers of regularly occurring migratory species on passage;

- ringed plover *Charadrius hiaticula*
- sanderling *Calidris alba*
- redshank *Tringa totanus totanus*

It also supports internationally important numbers of regularly occurring migratory species over winter;

- shelduck *Tadorna tadorna*
- grey plover *Pluvialis squatarola*
- lapwing *Vanellus vanellus*
- knot *Calidris canutus islandica*
- dunlin *Calidris alpina alpina*
- redshank *Tringa totanus totanus*

### 9.5.1 Key sub-features for the migratory bird species

**Intertidal mudflats and sandflats** – The extensive mudflats and sandflats of the Humber Estuary support rich populations of invertebrate species, which in turn provide an important food source for many species of migratory birds. The Humber supports massive populations of birds, many of which are highly mobile, feeding and roosting in different areas, depending on food availability and the state of the tide.

Ringed plover, grey plover, redshank and dunlin feed throughout the estuary on marine polychaete worms, crustaceans and molluscs such as the Baltic tellin *Macoma balthica*. They favour areas that have abundant invertebrate prey species and unrestricted views for the early detection of predators. Large flocks of feeding and roosting waders are found at the RSPB reserve at Tetney Marshes. During the winter of 1995-1996, the reserve held over 82% of the grey plover counted on the estuary.

Shelduck also exploit the rich resources of invertebrates found in the intertidal mudflats. Common prey species include the mudsnail, *Hydrobia* spp, mussels *Mytilus edulis*, the Baltic tellin *Macoma balthica* and small crustaceans such as the common shore crab *Carcinus maenas*. They feed in groups, on the mid to outer estuary where there are extensive areas of intertidal flats. Large numbers of moulting shelduck are also found on the estuary during July and August. They are concentrated to the west of the Humber Bridge, particularly around Whitton Sands and Brough.

Sanderling feed on small invertebrates found on sandy beaches, mainly by probing the substrate, but also by snatching prey items washed in on the tide. As a species that is mostly confined to sandy beaches, it is largely restricted to the outer southern shore of the estuary. Large numbers are found from Humberston to Cleethorpes, at Tetney Marshes and along the northern shore of Spurn Peninsula. Knot also feed on the outer estuary, although they will move further inshore during periods of severe weather, when the flats in the outer estuary may become

frozen. The intertidal sandflats of Cleethorpes are an important feeding area for sanderling and knot during the winter months when there are fewer tourists.

The Humber supports more lapwing than any other English estuary. They feed on polychaete worms and small crustaceans found in the intertidal mudflats, especially when surrounding farmland is frozen. Lapwing and golden plover are very similar in their habits and will often form mixed species flocks when feeding and roosting.

The extensive intertidal flats of the outer estuary provide feeding and low tide roosting sites for large numbers of waders, including ringed plover, grey plover, lapwing, sanderling, dunlin and redshank.

**Saltmarsh Communities** – The largest areas of saltmarsh on the estuary occur at Welwick, Skitter and south of Cleethorpes along the north Lincolnshire coast. The saltmarshes provide a rich feeding habitat for redshank and shelduck, which feed on invertebrate species in the sediments, such as the mudsnail *Hydrobia*. The saltmarshes also have an important function providing a safe haven from the tides that flood the mudflats twice a day. The low-growing dense vegetation provides a suitable roosting habitat for many waders, which prefer to roost on areas of short vegetation ensuring good visibility. The saltmarshes throughout the estuary provide an important communal roosting site for redshank, dunlin, grey plover, shelduck, knot and lapwing. The saltmarshes at Tetney and Grainthorpe Havens, Pye Hall, Skidbrooke to Saltfleet and Saltfleetby to Theddlethorpe are all important roosting habitats for these species. In addition, Donna Nook is of particular importance on very high spring tides when Tetney and Grainthorpe are completely covered by water.

**Tidal reedbeds** - Beds of common reed *Phragmites australis* are found throughout the tidal reach of the estuary. They exist as a fringe of varying width along the banks, or as substantial reedbeds such as at Blacktoft Sands and Whitton Sands on the inner estuary. Several of the migratory species, such as redshank and shelduck may use the reedbeds as a high tide roost as they provide some protection from predators and human disturbance.

**Coastal lagoons** – The lagoons on the Humber are important high tide roosts for several of the migratory species. Dunlin, redshank, grey plover and shelduck use Easington lagoons and Humberston Fitties, and North Killingholme Haven pits are also an important high tide roost. These pits were once used by wildfowling, but are now managed by the Lincolnshire Wildlife Trust. They support notable numbers of lapwing, ringed plover, sanderling and redshank and there appears to be a close link between the use of the pits and the adjacent foreshore. Dunlin and large flocks of roosting redshank also use the lagoons on Reads Island, and lapwing, shelduck, redshank and other waders use the lagoons at Blacktoft Sands as a high tide roost.

## 9.6 Internationally important assemblage of waterfowl

The Humber Estuary is one of the key estuaries in the UK for wintering waterfowl (wildfowl and waders). In addition to supporting internationally important populations of birds, it also qualifies for its wintering waterfowl assemblage, regularly supporting over 20,000 birds (Cranswick *et al.*, 1999). The wintering waterfowl assemblage (consisting of over 175,000 birds) includes all the internationally important regularly occurring migratory species as well as the Annex I wintering species. It also includes species present in nationally important numbers or species whose populations exceed 2,000 individuals. These species are dark-bellied brent geese *Branta bernicla bernicla*, wigeon *Anas penelope*, mallard *Anas platyrhynchos*, pochard *Aythya farina*, scaup *Aythya marila*, goldeneye *Bucephala clangula*, oystercatcher *Haematopus ostralegus*, ringed plover *Charadrius hiaticula*, sanderling *Calidris alba*, black-tailed godwit *Limosa limosa islandica* and curlew *Numenius arquata*.

### 9.6.1 Key sub-features for the waterfowl assemblage

**Intertidal mudflats and sandflats** - The Humber Estuary supports immense numbers of birds, supporting over 175,000 during winter. Many of these species are highly mobile, feeding and roosting in different areas, depending on food availability and tides.

Many of the waterfowl species, including ringed plover, sanderling and oystercatcher feed on the invertebrate species found in the extensive intertidal flats of the estuary. Oystercatchers also feed on shellfish such as cockles, oysters and mussels, and marine worms and crustaceans, which they find at low tide. They feed predominantly on the outer estuary, around Spurn Bight and along the north Lincolnshire coast. Black-tailed godwit and curlew also feed on the invertebrates in the intertidal mudflats. The Pyewipe frontage is of key importance as a feeding

and roosting area for black-tailed godwit, although smaller numbers also feed at Immingham docks. After their breeding season, curlew move to coastal habitats, especially where there are extensive mudflats and sandflats exposed at low tide. They are often found in flocks with lapwing and golden plover and regularly feed inland, on a variety of sites from wet pasture to ploughed fields. They occur throughout the estuary, but larger numbers are found around Spurn Bight and along the north Lincolnshire coast.

The Humber Estuary no longer receives the large arrivals of wintering mallard from Scandinavia and the east that once formed a large proportion of winter totals. It is believed that the increasingly mild winters which northern Europe now experiences, means that birds remain on the continent and only come to Britain to escape the harshest weather conditions (Catley, 2000). The Humber has experienced a huge decline in mallard numbers, 80% over the last 10 years, whilst the UK as a whole has only experienced a 50% decrease, therefore it is assumed that there are other factors affecting the mallard population on the Humber (Andrew Grieve, pers com). The distribution of mallard has also changed on the estuary, shifting from the inner estuary to the outer north shore. This redistribution is thought to reflect increasing releases of captive bred mallard of unknown origin by wildfowling clubs. These releases may be contributing to the long term inability of mallard to sustain natural populations, as released birds may comprise 50% of the birds overwintering (Andrew Grieve, pers com). Although mallard are typically a freshwater species, they are attracted to New Holland Jetty, which is used to unload animal feed from ships. A mixture of grain and feedstuff are spilt into the estuary during the handling procedure. This has resulted in a number of species exploiting this artificial food source. Alongside the mallards, several species of diving duck also feed here – pochard, goldeneye and scaup. These species will also feed close to Goxhill Skitter. The pochard and goldeneye feed on a falling tide and then roost and loaf on the ebbing water, drifting down as far as Immingham docks and Pyewipe. These diving ducks will utilise habitats of varying salinity, although scaup are the most marine species. They feed at night, predominantly on mussels, although they also feed where there are artificially high densities of food, such as those found around sewage outfalls. On the Humber, they gather in large flocks to feed around Spurn Bight.

Intertidal sand and mud flats also support surface plants and green algae, and dark-bellied brent geese feed over mudflats rich in *Zostera*, *Enteromorpha* and less frequently other green plants. They rarely dive, so when these plants are covered by the tide they will up-end or swim with their head and neck below the water surface. They occur almost exclusively on the outer estuary, principally along the southern shore from Cleethorpes to Saltfleetby with lesser numbers on Sunk Island and Spurn Bight where there are areas of dwarf eelgrass beds, *Zostera noltei*. Brent geese will also feed and roost on inland areas, on fields of pastures, cereals and oilseed rape. Wigeon and pochard also feed on plant material, using mostly maritime habitats during the winter, especially where there are extensive areas of intertidal muds and sands.

The intertidal mudflats and sandflats are also important low tide roosting sites for the wildfowl and waders.

**Saltmarsh Communities** – Large areas of saltmarsh occur throughout the Humber Estuary, providing important feeding and roosting habitats for many of the wildfowl and waders.

The vegetation height and species composition of the saltmarsh sward, combines to provide a rich feeding habitat for grazing species such as wigeon and dark bellied brent geese. These birds are almost entirely vegetarian and feed on the leaves, stems, rhizomes and seeds of saltmarsh plants such as *Salicornia* species and *Puccinellia maritima*. Large flocks of brent geese feed on the marshes near Humberston Fitties and around Grainthorpe and Saltfleet Havens on the north Lincolnshire coast.

The saltmarshes at Brough and Crabley are also utilised by wigeon as a high tide roost site. At night and when the marsh is covered on spring tides, they will often use areas of pastures and late oilseed rape adjacent to the estuary.

Mallard will also occasionally graze on marsh plants, plucking at the leaves and shoots and black-tailed godwit will also feed on the invertebrates in the saltmarsh substrate.

Oystercatchers and curlew roost on the saltmarshes of the outer estuary, particularly at Welwick, Cherry Cobb and on the extensive saltmarshes on north Lincolnshire coast, south of Cleethorpes.

**Tidal reedbeds** - Beds of common reed *Phragmites australis* are found throughout the tidal reach of the estuary. Substantial reedbeds occur at Blacktoft Sands and Whitton Sands within the Humber Wildfowl Refuge. The reedbeds provide important feeding and roosting areas for several of the wildfowl species, and are of particular importance for pochard, which feed in the open water pools of the reedbeds at Blacktoft Sands, Faxfleet and

Broomfleet. Reedbeds also provide protection from predators and human disturbance, and mallard, goldeneye and scaup may feed and roost in the reedbed pools.

**Coastal lagoons** – The lagoons of the Humber Estuary are an important high tide wader roost, particularly during spring high tides. The edges of the lagoons are also an important feeding habitat for many of the wildfowl species.

Large numbers of black-tailed godwit use North Killingholme Haven pits as a high tide roost. Numbers have grown rapidly on the estuary since the 1990s, and during the autumn months almost the entire population roosts at North Killingholme Haven. Other roosts for this species are found on Read's Island and at Blacktoft Sands. Black-tailed godwit are not widely dispersed throughout the estuary and are heavily reliant on certain areas for roosting and feeding (Nick Cutts, pers com).

Easington lagoons are also used as a high tide roost by oystercatcher, black-tailed godwit and curlew, and are also important feeding habitats for pochard, goldeneye and scaup. The open water areas of the lagoons at Barton are frequented by flocks of overwintering wildfowl, and are of particular importance for pochard and goldeneye.

Wigeon will use the lagoons on Reads Island and are found in smaller numbers at Blacktoft Sands and North Killingholme Haven pits. Mallard are adapted to a wide range of habitats and utilise the saline lagoons at Blacktoft Sands and Reads Island, where the waters are shallow and sheltered. Their numbers have declined nationally, and although in the past the Humber was the only UK nationally important site for mallard in Great Britain; the species has declined below this level here too.



## **10. The Humber Flats, Marshes and Coast SPA conservation objectives**

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 marine site. The conservation objectives for the Humber Flats, Marshes and Coast SPA interest features are provided below and should be read in the context of other advice given in this package, particularly:

- the attached maps 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 interest feature and which will act as a basis for the development of a monitoring programme.

### **10.1 The conservation objective for the internationally important populations of the regularly occurring Annex I species**

Subject to natural change, maintain\* in favourable condition<sup>11</sup> the habitats for the internationally important populations of the **regularly occurring Annex I species**, in particular:

- **Intertidal mudflats and sandflats**
- **Saltmarsh communities**
- **Tidal reedbeds**
- **Coastal lagoons**
- **Unvegetated sand and shingle**

Numbers of bird species using these habitats are given in Table 6.

### **10.2 The conservation objective for the internationally important populations of regularly occurring migratory bird species**

Subject to natural change, maintain\* in favourable condition<sup>11</sup> the habitats for the internationally important populations of the **regularly occurring migratory bird species**, in particular:

- **Intertidal mudflats and sandflats**
- **Saltmarsh communities**
- **Tidal reedbeds**
- **Coastal lagoons**

Numbers of bird species using these habitats are given in Table 6.

11 For a detailed description of how to recognise favourable condition, see the attached table 7

### 10.3 The conservation objective for the internationally important assemblage of waterfowl

Subject to natural change, maintain\* in favourable condition<sup>11</sup> the habitats for the internationally important **assemblage of waterfowl**, in particular:

- **Intertidal mudflats and sandflats**
- **Saltmarsh communities**
- **Tidal reedbeds**
- **Coastal lagoons**

Numbers of bird species using these habitats are given in Table 6.

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

11 For a detailed description of how to recognise favourable condition, see the attached table 7

\* Maintain implies restoration if the feature is not currently in favourable condition.

**Table 6 Information on populations of bird species qualifying under the Birds Directive using the Humber Flats, Marshes and Coast SPA at the time the SPA citation was compiled****Internationally important populations of regularly occurring Annex I species.**

Species	Population (5 yr peak mean)*	Importance	Period
Marsh harrier <i>Circus aeruginosus</i>	9 pairs – breeding (Five year mean)	5.7% of GB population	1994-1998
Avocet <i>Recurvirostra avosetta</i>	23 pairs – breeding (Five year mean)	3.9% of GB population	1995-1999
Little tern <i>Sterna albifrons</i>	69 pairs – breeding (Five year mean)	2.9% of GB population	1994-1998
Bittern <i>Botaurus stellaris</i>	2 individuals - wintering	2.0% of GB population	1991/92-1995/96
Hen harrier <i>Circus cyaneus</i>	9 individuals - wintering	1.2% of GB population	1993/94 - 1997/98
Golden plover <i>Pluvialis apricaria</i>	34,615 individuals - wintering	13.8 % of GB population	1993/94 - 1997/98
Bar-tailed godwit <i>Limosa lapponica</i>	1,780 individuals - wintering	3.4 % of GB population	1993/94 - 1997-98

**Internationally important populations of regularly occurring migratory bird species<sup>12</sup>**

Species	Population (5 yr peak mean)*	Importance	Period
Ringed plover <i>Charadrius hiaticula</i>	1,357 individuals - passage	2.7 % of Europe/Northern Africa	1993 - 1997
Sanderling <i>Calidris abla</i>	1,263 individuals - passage	1.3 % E Atlantic/W & S Africa	1993 -1997
Redshank <i>Tringa totanus totanus</i>	5,117 individuals - passage	3.4 % Eastern Atlantic	1993 - 1997
Shelduck <i>Tadorna tadorna</i>	4,369 individuals - wintering	1.5 % Northwestern Europe	1993/94 - 1997/98
Grey plover <i>Pluvialis squatarola</i>	1,667 individuals - wintering	1.1 % Eastern Atlantic	1993/94 - 1997/98
Lapwing <i>Vanellus vanellus</i>	33,635 individuals - wintering	1.7 % Europe	1993/94 - 1997-98
Knot <i>Calidris canutus islandica</i>	28,060 individuals - wintering	8.0 % NE Can/Grl/Iceland/NW Eur	1993/94 - 1997/98
Dunlin <i>Calidris alpina alpina</i>	20,325 individuals - wintering	1.5 % N Siberia/Europe/W Africa	1993/94 - 1997/98
Redshank <i>Tringa totanus totanus</i>	4,284 individuals - wintering	2.9 % Eastern Atlantic	1993/94 - 1997/98

**Internationally important numbers of waterfowl**

<b>Importance</b>	<b>Population (5 yr peak mean)*</b>	<b>Season</b>	<b>Period</b>
The Humber Estuary regularly supports over 20,000 waterfowl	175,768 individuals	Wintering	1993/94 - 1997/98

## Nationally important bird populations within the internationally important assemblage of waterfowl

<b>Species</b>	<b>Population (5 yr peak mean)*</b>	<b>Importance</b>	<b>Period</b>
Dark-bellied brent goose <i>Branta bernicla bernicla</i>	2,203 individuals	2.2 % of GB population	1993/94 - 1997-98
Wigeon <i>Anas penelope</i>	5,952 individuals	2.1 % of GB population	1993/94 - 1997/98
Mallard <i>Anas platyrhynchos</i>	2,360 individuals	0.5 % of GB population	1993/94 - 1997/98
Pochard <i>Aythya farina</i>	1,283 individuals	2.9 % of GB population	1993/94 - 1997-98
Scaup <i>Aythya marila</i>	202 individuals	1.8 % of GB population	1993/94 - 1997/98
Goldeneye <i>Bucephala clangula</i>	359 individuals	2.1 % of GB population	1993/94 - 1997/98
Oystercatcher <i>Haematopus ostralegus</i>	3,612 individuals	1.0 % of GB population	1993/94 - 1997-98
Ringed plover <i>Charadrius hiaticula</i>	302 individuals	1.0 % of GB population	1993/94 - 1997/98
Sanderling <i>Calidris alba</i>	504 individuals	2.2 % of GB population	1993/94 - 1997/98
Black-tailed godwit <i>Limosa limosa islandica</i>	495 individuals	7.1 % of GB population	1994/95 - 1998/99
Curlew <i>Numenius arquata</i>	2,446 individuals	2.0 % of GB population	1993/94 - 1997/98

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

\* SPA citation (**April 2000**) held on Register of European marine sites for Great Britain.

**11.**

**Table 7 Favourable Condition Table for the Humber Flats, Marshes and Coast SPA interest features of the Humber Estuary European marine site**  
**Numbers of bird species using these habitats are given in Table 6**

NB – It will be possible to monitor many of the attributes 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.

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
<b>Internationally important populations of regularly occurring Annex I species</b> (eg marsh harrier, avocet, little tern, bittern, hen harrier, golden plover, bar-tailed godwit)	All sub-features	Extent of habitat	Area (ha), measured once per reporting cycle.	No significant decrease in extent from an established baseline <sup>13</sup> , subject to natural change.	The habitats provide important breeding sites for marsh harriers, little terns and avocets and feeding and roosting areas for all Annex I species. In addition, if these habitats are unable to keep pace with sea level rise (coastal squeeze may be implicated in this), inundation of these features will become more frequent – decreasing feeding and roosting areas and increasing the risk of flooding to little tern nests, which are located close to the high tide mark.
		Disturbance	Reduction or displacement of all Annex I birds and productivity of breeding birds, measured periodically (frequency to be determined)	No significant reduction in bird numbers and productivity or displacement of birds attributable to human disturbance from an established baseline, subject to natural change.	Significant disturbance attributable to human activities can result in reduced food intake and/or increased energy expenditure.  Breeding birds are particularly vulnerable to disturbance and significant disturbance to adults on and off their nests can result in failure of egg clutches and fledged young. Productivity (number of successfully fledged young), together with other measures will also be used to monitor disturbance.  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 bird view lines, subject to natural change.	Avocet, little tern, golden plover and bar-tailed godwit require unrestricted views to allow early detection of predators when feeding, nesting and roosting.

<p><b>Internationally important populations of regularly occurring Annex I species</b> (eg marsh harrier, avocet, little tern, bittern, hen harrier, golden plover, bar-tailed godwit)</p>	Intertidal mudflats and sandflats	Food availability	Presence and abundance of suitable prey species, measured periodically (frequency to be determined)	No significant reduction in the presence and abundance of prey species from an established baseline, subject to natural change.	<p>Important prey species for avocet and bar-tailed godwit are marine invertebrates such as crustaceans, molluscs and marine worms. Golden plover may also feed on the intertidal mudflats and sandflats during periods of harsh weather.</p> <p>When the tide is in, the breeding little terns will feed over the intertidal flats, feeding on sand eels and sprats.</p>
	Saltmarsh Communities	Vegetation characteristics	Open, short vegetation or bare ground predominately in areas used for roosting, measured periodically (frequency to be determined)	Vegetation height and density throughout areas used for roosting should not deviate significantly from an established baseline, subject to natural change.	<p>Vegetation height of &lt;10cm is required throughout roosting areas. The bar-tailed godwit in particular, requires short vegetation with unrestricted views for roosting.</p> <p>The saltmarshes are also an important hunting area for hen harrier and marsh harrier.</p>
	Tidal reedbeds	Food availability	Presence and abundance of small - medium sized birds and mammals, measured periodically (frequency to be determined).	Presence and abundance of prey should not deviate significantly from an established baseline, subject to natural change.	Reedbeds are particularly important as a hunting area for marsh harriers and hen harriers. Prey species include small mammals and birds.
			Presence and abundance of fish and amphibians, measured periodically (frequency to be determined).	Presence and abundance of prey should not deviate significantly from an established baseline, subject to natural change.	Reedbeds are a particularly important habitat for wintering bittern which feed on fish, eels and amphibians.
		Vegetation characteristics	Vegetation height, density and age structure, measured periodically (frequency to be determined).	Vegetation height, density and age structure should not deviate significantly from an established baseline, subject to natural change	Suitability of reedbed vegetation for the Annex I species: Bittern and marsh harrier prefer pure reed stands with vigorous growth for nesting and concealment. Hen harrier will also use reedbeds for roosting.

<p><b>Internationally important populations of regularly occurring Annex I species</b> (eg marsh harrier, avocet, little tern, bittern, hen harrier, golden plover, bar-tailed godwit)</p>	Coastal lagoons	Food availability	Presence and abundance of crustaceans, annelids, fish and molluscs measured periodically (frequency to be determined)	Presence and abundance of prey species should not deviate significantly from an established baseline, subject to natural change.	<p>Little terns and avocets feed on crustaceans, annelids, fish and molluscs found in the lagoons.</p> <p>Food availability is important in maintaining the little tern and avocet breeding populations.</p>
	Unvegetated sand and shingle	Vegetation cover	Predominately open ground with sparse vegetation and bare surfaces, measured periodically (frequency to be determined)	Extent of vegetation height and bare ground should not deviate significantly in the nesting area from an established baseline, subject to natural change.	Vegetation cover <10% during the breeding season in areas used by little terns. Areas of largely bare sand and shingle are important for nesting little terns for early detection of predators.
<p><b>Internationally important migratory species and waterfowl assemblage</b></p>	All sub-features	Extent of habitat	Area (ha), measured once per reporting cycle.	No significant decrease in extent from an established baseline <sup>13</sup> , subject to natural change	<p>The habitats provide important feeding and roosting areas for the migratory species and waterfowl assemblage.</p> <p>If these habitats are unable to keep pace with sea level rise (coastal squeeze may be implicated in this), inundation of these features will become more frequent – decreasing feeding and roosting areas.</p>
		Disturbance	Reduction or displacement of birds measured periodically (frequency to be determined)	No significant reduction in bird numbers or displacement attributable to human disturbance from an established baseline, subject to natural change	<p>Significant disturbance attributable to human activities can result in reduced food intake and / or increased energy expenditure.</p> <p>Five year peak mean information on populations will be used as the basis for assessing whether disturbance is damaging.</p> <p>Tidal reedbeds are an important high tide roost as they provide some protection from predators and human disturbance.</p>
		Absence of obstructions to viewlines	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.	<p>Waders normally require unrestricted views &gt;200m and brent geese &gt;500m, to allow early detection of predators when feeding and roosting.</p> <p>Grey plover in particular require unrestricted views when feeding and roosting.</p>

<b>Internationally important migratory species and waterfowl assemblage</b>	Intertidal mudflats and sandflats	Food availability	Presence and abundance of suitable invertebrate prey species, measured periodically (frequency to be determined).	Presence and abundance of food species should not deviate significantly from an established baseline, subject to natural change.	Many species require areas of high biological productivity for feeding. Important prey species include marine polychaete worms, crustaceans and molluscs such as Baltic tellin.
			Presence and abundance of marine algae and eelgrass, measured periodically (frequency to be determined)	Presence and abundance of plant species should not deviate significantly from an established baseline, subject to natural change.	Intertidal sand and mudflats also support surface plants and green algae and dark-bellied brent geese, pochard and wigeon will feed over mudflats rich in <i>Zostera</i> , <i>Enteromorpha</i> and other green plants.
	Saltmarsh communities	Food availability	Presence and abundance of soft-leaved grasses, herbs and seed bearing plants measured periodically (frequency to be determined)	Presence and abundance of food species should not deviate significantly from an established baseline, subject to natural change.	Saltmarsh communities such as <i>Puccinellia maritima</i> and <i>Salicornia</i> species are an important food source for wigeon and dark-bellied brent geese. Mallard will occasionally also graze on the leaves and shoots of saltmarsh plants.
			Presence and abundance of surface and sub-surface invertebrates measured periodically (frequency to be determined)	Presence and abundance of prey species should not deviate significantly from an established baseline, subject to natural change.	Black-tailed godwit and other species feed on marine invertebrates in the substrate.
		Vegetation characteristics	Open, short vegetation or bare ground predominantly in areas used for roosting, measured periodically (frequency to be determined).	Vegetation height and density throughout areas used for roosting should not deviate significantly from an established baseline, subject to natural change.	Vegetation height of <10cm is required throughout roosting areas.  A vegetation height of <10cm is also required for feeding areas used by dark-bellied brent geese and wigeon.



<b>Internationally important migratory species and waterfowl assemblage</b>	Tidal reedbeds	Food availability	Presence and abundance of aquatic plants and invertebrates measured periodically (frequency to be determined).	Presence and abundance of aquatic plants and invertebrates should not deviate significantly from an established baseline, subject to natural change.	Reedbeds are of particular importance for pochard which feed in the open water pools of the intertidal reedbeds.
		Open water	Presence, size and depth of open water pools measured periodically, (frequency to be determined).	Presence, size and depth of pools should not deviate significantly from an established baseline, subject to natural change	Medium to large open water pools are used as high tide roosts and feeding areas by species such pochard and goldeneye. They also provide some protection from predators and human disturbance.
	Coastal lagoons	Food availability	Presence and abundance of aquatic plants and invertebrates measured periodically (frequency to be determined)	Presence and abundance of aquatic plants and invertebrates should not deviate significantly from an established baseline, subject to natural change.	The saline lagoons are an important feeding habitat for wigeon, mallard, pochard, goldeneye and scaup.

<sup>13</sup> Baseline to be determined during the first reporting cycle.

NB: Extreme events (such as storms reducing or increasing salinities or warm summers) also need to be recorded as they may be critical in influencing ecological issues in the Humber Estuary European marine site and may well be missed by routine monitoring.

## **12. Detailed operations advice for the Humber Flats, Marshes and Coast SPA interest features**

This section provides information to help relate general advice to each of the specific interest features of the Special Protection Area.

This advice relates to the vulnerability of the interest features and sub-features of the SPA within the Humber Estuary European marine site boundary as summarised in Table 2 and set out in more detail in Tables 8 to 13. 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 to be made between the categories of operation and the ecological requirements of the European marine site's interest features, as set out in Section 9.

The categories of operation may cause damage or disturbance to the interest features and sub-features of the Humber Estuary European marine site, either alone or in combination.

### **Zoning of the advice**

The Humber Flats, Marshes and Coast SPA covers an extensive area from the M62 bridge near Goole on the River Ouse, down to Spurn Point on the north coast and Saltfleetby - Theddlethorpe dunes on the south coast. Easington lagoons are also included. To make this Regulation 33 advice easier to use, we have decided to zone this section of the advice. The zoning has been based on the scoping report for the Humber Coastal Habitat Management Plan (Binnie, Black and Veatch, 2001), which splits the Humber Estuary into ecological cells. These cells are based on analyses of benthic samples collected between 1984 and 1998. The analysis showed that the assemblages of benthic organisms found in the estuary showed significant spatial variability. As many of the SPA species feed on these benthic assemblages it would seem logical to use this same zonation. The maps in Appendix IV show the geographical position of the three zones.

### **12.1 Inner estuary**

The inner estuary 'zone' stretches from the M62 bridge near Goole on the River Ouse to the Humber Bridge.

#### **i) Physical Loss**

- The Humber Flats, Marshes and Coast SPA provides important nesting, feeding and roosting habitats for the SPA birds. The loss by removal or smothering of any of the habitats on which they depend, could result in the loss of nesting and roosting sites and/or the reduction of food resources. It could also result in increased competition for food and space in areas that are already occupied, and ultimately reduce bird numbers on the estuary.

Physical loss may result primarily from one-off developments such as land-claim, infrastructure construction and modification, as well as indirectly as a result of modification of the local hydrography and subsequent coastal erosion, as well as through coastal squeeze. The containment of the estuary by sea walls prevents the intertidal habitats from migrating inland with sea level rise, and this leads to a decrease in intertidal area over time. Current estimates for the Shoreline Management Plan indicate that due to sea level rise, 460ha of intertidal habitat will be lost from the estuary over the next 50 years. The **intertidal flats** and **saltmarsh communities** are particularly sensitive to coastal squeeze and these habitats are important for many of the SPA species as feeding and roosting areas. Reads Island is currently eroding on its northern side and this is affecting the **lagoon habitats** used by the breeding colony of avocets.

- **All the habitats** used by the Annex I species and the migratory and waterfowl species are considered to be highly sensitive to physical loss by removal and moderately sensitive to smothering. The inner estuary has less industry than other sections of the estuary, and so the exposure of the habitats to physical loss through developments was determined to be low to medium. However, the high sensitivity of the features to removal results in either a moderate or high vulnerability.

## ii) Physical Damage

- Physical damage can alter habitat structure and lead to a change in species composition. This is likely to affect the bird species of the European marine site, either through the loss of the habitat or through the loss of prey species. Physical damage to intertidal habitats may ultimately lead to sediment destabilisation and increased erosion, and reduce the suitability of the area as a feeding and roosting habitat. There are many activities that could cause physical damage to the European marine site sub-features such as land-based and water-based recreation, and developments and their associated activity. It is also important to ensure that any development proposals outside the European marine site do not have a knock-on impact on the habitats within the boundary.
- Activities or developments resulting in siltation can cause localised increases in the levels of suspended sediments. Siltation may have an adverse effect on some species of birds through increased turbidity levels. This may reduce visibility, affecting birds which often feed by sight, such as avocet, dunlin and black-tailed godwit. Turbidity may also reduce light penetration through the water column, limiting photosynthesis and this may affect species that feed on plant material such as brent geese, wigeon and pochard. Siltation may also lead to a decrease in prey species through smothering, leading to blocked feeding and respiratory structures and affecting recruitment processes of both marine fauna and flora. Maintenance dredging is undertaken within the European marine site and the dredge spoil is deposited within the system and this may lead to localised siltation of the sub-features used by the birds. However, none of the sub-features are currently considered to be vulnerable to siltation.
- Activities that cause direct scouring or abrasion to the intertidal habitats may damage marine organisms and plants, as well as causing deterioration to the structure of saltmarshes and sediment communities. Repetitive or permanent damage can adversely affect the ability of these habitats to recover and may ultimately lead to their loss.

Recreational activities can cause physical damage through abrasion from the wash from boats or by trampling from walkers. The **tidal reedbeds** that support nesting marsh harriers and provide an important roosting habitat for several other species are particularly sensitive to abrasion. However, the large areas of reedbeds found in the inner estuary are unlikely to be accessible to large numbers of people or vehicles. There have also been reports of quad biking on the flood banks of the inner estuary. Quad bikes would cause considerable damage to the **saltmarsh communities** and **intertidal flats** if they came onto the European marine site. However, much of the shoreline of the inner estuary is difficult to access and so the exposure to abrasion was determined to be low to medium.

Areas of saltmarsh in the inner estuary are grazed by cattle and sheep. Grazing by livestock radically alters the floristic composition and structure of a saltmarsh, suppressing many of the dominant dwarf shrub and herb species and promoting the dominance of grasses. However, grazed sites result in a short turf that provides an important feeding and roosting habitat for many bird species. Once grazing is established, its abandonment leads to the invasion of upper saltmarsh communities by sea couch grass, which suppresses other plants and is unpalatable to wildfowl. Consequently, traditionally grazed marshes should continue to be grazed, although overgrazing can cause physical damage by trampling which can damage plants, compact mudflats and lead to a localised loss of habitat and excessive bare ground on saltmarshes (Toft *et al.* 1995). Traditionally ungrazed marshes should not be grazed to ensure the conservation of their plant and invertebrate interests.

Due to their sensitivity, the saltmarsh communities and tidal reedbeds are currently considered to be moderately vulnerable to abrasion.

## iii) Non-physical Disturbance

- Industry, transport and recreational activities may all result in noise and visual disturbance, although in the inner estuary, the sources are more likely to be related to recreation or transport. Transport related activities, such as shipping and aircraft, can have serious impacts on bird populations, and studies have shown that the most widespread and long-lasting disturbance often comes from aircraft. Slower aircrafts, such as helicopters, micro-lights and light aircraft (even when not low flying) are more

likely to cause disturbance than jets (Smit & Vassar 1993, Stock 1993). However, fast (jet) planes can also cause disturbance when flying low over feeding grounds and roosts (Koolhaas *et al.* 1993), although it is not clear whether the disturbance is due to the sudden loud noise or the plane's movement. A study of waders on a high-tide roost at Terschelling, the Netherlands, summarised by Smit & Vassar (1993), identified small aircraft and pedestrians as being the most significant sources of disturbance to the roosting birds. In the inner estuary, light aircraft are frequently seen, although it is unknown where these originate from as Brough airfield is only used infrequently. Under normal conditions the birds may become habituated to the presence of continuous aircraft noise, but are sensitive when under stress, for example during severe weather, and this could have a negative impact on the overwintering birds.

- The most disturbing human activities are those that cause fast or unpredictable movements, or loud and unexpected noises. The type of disturbance also has a bearing on the birds' response. For example, sudden noises and visual impacts, such as guns being fired or pedestrians are more likely to cause disturbance than continual noise that many species of birds will habituate to. Visual disturbance by people walking along the foreshore disturbs waterfowl more often than other activities, as species tend to feed in these or adjacent areas (Sidaway 1990). Some species such as dunlin, ringed plover, redshank and shelduck may be fairly tolerant to disturbance from recreation, but other species are more susceptible (Sidaway 1990), although responses will vary according to the time of year and the intensity of the activity. Flocks of golden plover for example, regularly move between Read's Island and New Holland in mid winter, often in response to disturbance levels (Catley, 2000). Much of the disturbance in the inner estuary may be due to pedestrians, as long distance footpaths - the Trans Pennine Trail, the Wolds Way and the Viking Way all run alongside the estuary, often on top of the flood bank. In addition, there have been reports of quad biking along the sea defences and disturbance from microlights and wildfowling are known causes of disturbance (Catley, 2000).

In the past, the use of the Humber Estuary for water sports and recreation remained comparatively undeveloped, partly because the waters are difficult for navigation due to the shifting sandbanks, high levels of commercial shipping and strong tidal currents (Rule, 1996). Over recent years however, there has been a large increase in the number of boats, particularly powerboats and the estuary is an established venue for powerboat racing.

Much of the foreshore of the inner estuary is difficult to access and so any disturbance is more likely to occur from afar and so have less impact than direct approaches. Lack of access to the foreshore, may also limit recreational boating activity. However, it should be also noted that the **intertidal flats** are very narrow in places, and so roosting and feeding birds using these areas may be susceptible to both land and water based disturbance.

- Areas subjected to persistent noise and visual disturbance may reduce the feeding and roosting opportunities for birds on the estuary. Birds will concentrate where feeding is best, and disturbance in these areas can prevent birds from feeding and effectively cause a loss of available habitat. In response to disturbance, birds either decrease their energy intake at their present (disturbed) feeding site through displacement activity, or they will move to an alternative, less favoured site, or one which is already occupied. This increases competition, with a larger number of birds dependent on one particular area. Such a response affects energy budgets and thus survival, and will be of particular concern during prolonged periods of cold weather, when energy requirements are increased and during severe conditions when intertidal flats can freeze. In addition, waders find it difficult to obtain sufficient food in mid to late winter as energy reserves and food resources are at their lowest and foraging for food can be difficult. The response of birds to disturbing events depends on a wide range of factors. These include the level of disturbance, reactions of other birds nearby, flock size and knowledge from earlier experiences (eg. habituation). Additional factors determine either their willingness to remain in the same place (scarcity of food, adverse weather, physiological condition of individual birds) or their motivation to leave for another place (daily and annual patterns of movement, related to time of year and tidal level, or the presence of alternative sites).
- Nesting birds are highly sensitive to noise and visual disturbance as this will cause them to expend energy at a time when they require more energy to breed and forage for food. The SPA birds nesting within the inner estuary are marsh harrier and avocet. The marsh harriers nest in the **tidal reedbeds** and so may be less exposed to noise and visual disturbance from recreational activities as the general public are less likely to access these areas. Also, although the overwintering birds using the reedbeds may be subjected

to noise and visual disturbance from wildfowling, breeding marsh harriers are not likely to be affected since they will be using the reedbeds for nesting outside the designated wildfowling season. However, in September at the start of the wildfowling season, recently fledged marsh harriers will still use areas of the tidal reedbeds to roost in. On the Humber, numbers of marsh harrier decline in September whereas in more secure areas such as East Anglia, roost numbers are sustained throughout the month (Andrew Grieve, pers com).

It has been documented that marsh harriers are particularly sensitive to disturbance when breeding, although they may become habituated to some noise and visual impacts. There have been reports of marsh harriers nesting alongside Environment Agency flood defence works, close to a footpath and busy road, although habituation may only occur in some birds that are previously used to some level of disturbance (Nick Cutts, pers com). It has also been reported that several marsh harrier nesting sites suffer from disturbance from the general public, and one site constantly fails due to this (Andrew Grieve, pers com).

Avocet also nest within the inner estuary – on Reads Island and at Blacktoft Sands. The RSPB and Lincolnshire Wildlife Trust manages both of these sites, and there is no public access to Reads Island. Disturbance from the general public and recreational activities are likely to be well managed, although the birds will still be subject to other forms of disturbance such as from aircraft.

- The exposure of the birds in the inner estuary to noise and visual disturbance was determined to be low to medium, with the exception of the reedbeds used by the overwintering and migratory birds. Their exposure to noise was determined to be high, due to wildfowling that occurs during the winter months throughout the inner estuary, particularly around the large areas of reedbeds. Wildfowling can also cause considerable noise disturbance to non-target waterfowl. Other sources of disturbance may come from aircrafts, which frequently fly over the inner estuary, pedestrians, horse riders and powerboats. In places, the intertidal areas of the inner estuary are very narrow and so birds using these areas will be particularly susceptible to both land and water based disturbance.

#### iv) Toxic contamination

- Birds are subject to the accumulation of toxic contaminants through the food chain or through direct contact with toxic substances when feeding. Their ability to feed can also be affected by changes in the palatability and/or abundance of prey items caused by toxic contamination. Bird populations may also be affected indirectly by contaminants affecting the abundance of their prey items. Toxic contamination may enter the European marine site from point and non-point sources, such as land-based discharges, sewage and industrial outfalls. Diffuse agricultural pollution also reaches the Humber Estuary, through its catchment area and so there is the possibility of pesticides entering the system.
- Toxic contaminants may have lethal or sub-lethal effects on marine organisms. Pollution-tolerant species may become dominant, reducing species richness, while sub-lethal effects can reduce the fitness of individuals by affecting reproduction, genetics, physiology and general health. Birds that are specialist feeders may be affected by the loss of a particular prey species, whilst generalist species may benefit from an abundance of opportunistic prey species. The combined effects of several pollutants may be responsible for causing the loss of communities and this will affect the bird species of the SPA through a loss or decrease in food items. Consideration should also be given to the potential indirect effects of toxic substances in depleting the food supply of birds as a result of lethal and sublethal effects of toxic substances on marine communities.

Marine organisms such as algae, invertebrates and fish are most sensitive to toxic substances (Cole *et al.*, 1999). Many synthetic compounds, such as PCBs are known to have toxic effects even in low concentrations, and are capable of high levels of bioaccumulation within many benthic organisms. Such compounds may then biomagnify up the food chain if these organisms are predated upon, and may have an adverse effect on the SPA birds. In addition, habitats such as saltmarshes and reedbeds can bioaccumulate toxic compounds and act as sinks for them (Holt *et al.*, 1995). This could have implications for the wildfowl, such as brent geese and wigeon that feed on the saltmarsh plants and seeds.

- The Humber Estuary receives effluent discharges from 1/5<sup>th</sup> of the population and area of England, and therefore some toxic contamination is likely to enter the site. Studies carried out by the Environment

Agency have shown that although most chemical determinants meet environmental quality standards, levels of TBT (tributyltin), copper and TPT (an organotin compound used as a fungicide to protect crops) do not. Many of these contaminants are present in the sediments of the upper estuary. The remobilisation of these sediments through dredging, bait collecting or erosion will cause these pollutants to be made available to feeding birds and for wider distribution throughout the estuary.

- All the sub-features are moderately sensitive to the introduction of synthetic and non-synthetic compounds, except for the lagoons, which are determined to be highly sensitive due to the restricted distribution of the communities and the poor flushing rates.

v) **Non-toxic contamination**

- Nutrient or organic enrichment can have indirect effects on bird populations, both through increasing and decreasing food availability. Nutrient and organic pollution can lead to an increase in benthic populations such as opportunistic marine worms. Whilst it may appear that birds are benefiting from this augmentation since large numbers feed at the site, it could indicate opportunism by a limited number of bird species. In the absence of such artificially enriched areas, a greater diversity of bird species may be more widely distributed throughout the estuary. Consequently, there is an apparent 'trade-off' between high benthic biomass and bird numbers, and a more diverse, stable ecosystem.  
An excessive supply of nutrients and organic carbon can result in deoxygenation of the sediments and water column and lead to the establishment of anoxic conditions, increasing oxygen demand and stimulating the release of ammonia and hydrogen sulphide which can be toxic to aquatic life. Severe eutrophication can also lead to the death of many benthic invertebrate species (Cole *et al.*, 1999), many of which may be key prey species. An increased growth of algal mats on the intertidal area can cause smothering, resulting in deoxygenation of the sediments and leading to the death of invertebrate prey species. Species such as wigeon may benefit from an increase in opportunist algae such as *Enteromorpha*, but other waders and wildfowl that feed on mud-dwelling invertebrates, will experience a reduction in prey and feeding areas. Algal blooms can also cause a reduction in water clarity, which will affect the visibility of prey items. This will impact on sight feeders such as avocet and redshank.
- On the Humber Estuary, high nutrient and organic loads enter the system from sewage and industrial outfalls, and agricultural run-off. Many of these nutrients and organic matter enter the estuary via rivers, such as the Trent and Ouse, and therefore levels will decrease towards the mouth of the estuary, away from the source and where the water is more strongly mixed. The habitats of the inner estuary were determined to have a high or medium exposure to changes in nutrient and organic loading, depending on the duration and frequency of submersion. This resulted in several of the habitats being moderately or highly vulnerable.
- The primary sources of thermal discharges to the Humber Estuary are from power station cooling water discharges. Changes to the thermal regime of the water column may lead to changes in the distribution and composition of marine organisms, resulting in changes to bird distribution. Ultimately a long-term thermal discharge is likely to lead to a change in community, with colonisation by species adapted to warm water temperatures. Changes in species productivity may also occur as some species may thrive in warmer temperatures, whilst others may decline. This situation may consequently favour more opportunistic species and there are examples where increased temperatures have affected the growth and reproduction of invertebrates (Langford *et al.* 1998). The impact of heated water discharges are likely to depend on the location of the discharge point, the temperature of the discharge and the nature of tidal currents in the area. The water cooled power stations on and around the Humber, have cooling towers or return the discharge to deeper waters so that the temperature rise is minimised. It is therefore unlikely that the intertidal habitats will be affected by changes in temperature from this source.
- Turbidity levels are usually much higher in estuaries than those in adjacent coastal waters, and the Humber is a particularly turbid system. Activities such as dredging and the depositing of dredge spoil, and the desilting of effluent outfalls may further increase turbidity, but the degree to which this occurs was thought to be low. Coastal defences such as sea walls deflect wave energy along the coast and can lead to scouring of saltmarshes and intertidal flats, resulting in a re-suspension of sediments (Cole *et al.*

1999). Most estuarine communities can tolerate turbid conditions, however excessive turbidity may have adverse effects on filter-feeding organisms, clogging feeding and respiratory structures that in turn may reduce food availability for the birds.

- Salinity gradients exist throughout the estuary and most of the estuarine communities are able to tolerate a wide range of salinities due to the dynamic environment they inhabit. Salinity changes caused by water abstraction or outfalls may have localised impacts on the benthic communities of intertidal habitats. For example, benthic invertebrate communities vary in response to salinity, with diversity decreasing with a decrease in salinity (Cole *et al.* 1999). The principle effect on the birds of the SPA to changes in the salinity regime is a potential change in bird communities in response to changes in communities of benthic invertebrates (Cole *et al.* 1999).

Studies carried out in Suffolk and Essex have indicated that freshwater flows over intertidal habitats may be important for waders and wildfowl (Ravenscroft, 1997 and 1998). The study found that the number and density of some wildfowl such as shelduck, wigeon, grey plover and redshank all showed statistically greater densities close to flows when compared with remaining areas of mudflats. However, the actual numbers recorded are generally low compared to numbers feeding in the adjacent areas.

#### vi) **Biological disturbance**

- The marine environment provides a hostile environment to microbial pathogens and they tend to die off rapidly, particularly in the presence of sunlight (Cole *et al.* 1999). However, they can become associated with suspended particles and accumulate to some extent in sediments, surviving for days or weeks (Cole *et al.* 1999). Microbial pathogens can also accumulate in filter-feeding organisms to levels that can be harmful to birds (Cole *et al.* 1999). However, the current exposure in the inner estuary to the introduction of microbial pathogens was determined to be low.

- The introduction of non-native species, both flora and fauna, could have an impact on the natural system and have a knock-on effect on the bird species. The introduction of a new species may out-compete the native invertebrate prey species and result in an altered community structure and may lead to a reduction in suitable food items.

*Spartina anglica*, common cordgrass was first planted on the Humber in 1936 to assist in coastal defence and land claim. It is considered by some people to be a naturally invasive species that may be damaging to other **saltmarsh communities** and lead to the loss of **intertidal mudflats**. This may impact on birds such as dunlin, redshank and shelduck, which use these flats as a feeding area. It also grows too tall for small waders to roost on, resulting in the loss of suitable roosting habitat. On the Humber however, the area covered by *Spartina* has decreased and in places been replaced by *Puccinellia*.

There are also records of other non-native species on the Humber Estuary, and species such as mink are likely to be particularly damaging to nesting bird populations, predated both the eggs and young. Currently however, mink are not thought to be a problem on the estuary.

- Selective extraction of prey species or habitat necessary for the maintenance of the SPA bird species may reduce the suitability of the estuary for feeding and roosting birds. The Annex I birds using the inner estuary, have a low exposure to selective extraction. However, there are a number of wildfowling clubs and private syndicates that operate in the inner estuary, and the migratory species and waterfowl assemblage were determined to have a high exposure to these activities, resulting in a high vulnerability score.

**Table 8 Assessment of the relative exposure of interest features and sub-features of the Humber Estuary European marine site (SPA & pSPA) inner estuary to different categories of operations (as at July 2002)**

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

**Inner Estuary**

Categories of operations which may cause deterioration or disturbance	SPA Interest Features							
	Internationally important populations of regularly occurring Annex I species				Internationally important migratory species and waterfowl assemblage			
	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons
<b>Physical Loss</b>								
Removal (eg land claim, dredging)	Med	Low	Low	Low	Med	Low	Low	Low
Smothering (eg depositing dredge spoil, beach feeding)	Med	Med	Low	Low	Med	Med	Low	Low
<b>Physical Damage</b>								
Siltation (eg dredging, outfalls)	Med	Med	Low	Low	Med	Med	Low	Low
Abrasion (eg recreational activity, vehicles)	Med	Med	Low	Low	Med	Med	Low	Low
Selective extraction (eg aggregate extraction)	Low	Med	Low	None	Low	Low	Low	None
<b>Non-physical disturbance</b>								
Noise (eg land/water-based recreation, marine traffic)	Med	Med	Med	Low	Med	Med	High	Low
Visual presence (eg land/water-based recreation, marine traffic)	Med	Med	Med	Low	Med	Med	Med	Low
<b>Toxic contamination</b>								
Introduction of synthetic compounds (eg TBT, PCBs)	Med	Med	Low	Low	Med	Med	Low	Low
Introduction of non-synthetic compounds (eg effluent outfalls, crude oil)	Med	Med	Low	Low	Med	Med	Low	Low
Introduction of radionuclides	Low	Low	Low	Low	Low	Low	Low	Low
<b>Non-toxic contamination</b>								
Changes in nutrient loading (eg agricultural run-off, effluent outfalls)	High	Med	Med	Med	High	Med	Med	Med
Changes in organic loading (eg effluent outfalls, aquaculture)	High	Med	Med	Med	High	Med	Med	Med
Changes in thermal regime (eg power station discharges)	Low	Low	None	None	Low	Low	None	None



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Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil)	Low	Low	None	Low	Low	Low	None	Low
Changes in salinity (eg water abstraction, effluent outfalls)	Low	Low	Low	Low	Low	Low	Low	Low
<b>Biological disturbance</b>								
Introduction of microbial pathogens (eg effluent outfalls)	Low	Low	Low	Low	Low	Low	Low	Low
Introduction of non-native species and translocation	Low	Low	Low	Low	Low	Low	Low	Low
Selective extraction of species (eg samphire picking, bait collection)	Low	Low	Low	Low	High	High	High	Low

**Table 9 Assessment of the relative vulnerability of interest features and sub-features of the Humber Estuary European marine site (SPA & pSPA) inner estuary to different categories of operations**

Shading indicates categories of operation to which the features or sub-features of the site are highly or moderately vulnerable to. This table also incorporates the relative sensitivity scores, used in part to derive vulnerability<sup>14</sup>.

**Key:**

	High vulnerability
	Moderate vulnerability

● ● ● ●	High sensitivity
● ● ●	Moderate sensitivity
● ●	Low sensitivity
●	No detectable sensitivity

**Inner Estuary**

Categories of operations which may cause deterioration or disturbance	SPA Interest Features							
	Internationally important populations of regularly occurring Annex I species				Internationally important migratory species and waterfowl assemblage			
	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons
<b>Physical Loss</b>								
Removal (eg land claim, dredging)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
Smothering (eg depositing dredge spoil, beach feeding)	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●
<b>Physical Damage</b>								
Siltation (eg dredging, outfalls)	● ●	● ●	● ●	● ● ●	● ●	● ●	● ●	● ● ●
Abrasion (eg recreational activity, vehicles)	● ●	● ● ●	● ● ● ●	● ● ●	● ●	● ● ●	● ● ● ●	● ● ●
Selective extraction (eg aggregate extraction)	● ● ●	● ●	● ●	● ●	● ● ●	● ●	● ●	● ●
<b>Non-physical disturbance</b>								
Noise (eg land/water-based recreation, marine traffic)	● ● ● ●	● ● ● ●	● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ●	● ● ● ●
Visual presence (eg land/water-based recreation, marine traffic)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
<b>Toxic contamination</b>								
Introduction of synthetic compounds (eg TBT, PCBs)	● ● ●	● ● ● ●	● ● ●	● ● ● ●	● ● ●	● ● ● ●	● ● ●	● ● ● ●
Introduction of non-synthetic compounds (eg effluent outfalls, crude oil)	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●

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Introduction of radionuclides	• •	• •	• •	• •	• •	• •	• •	• •
<b>Non-toxic contamination</b>								
Changes in nutrient loading (eg agricultural run-off, effluent outfalls)	• • •	• •	• • •	• • •	• • •	• •	• • •	• • •
Changes in organic loading (eg effluent outfalls, aquaculture)	• • •	• •	• • •	• • •	• • •	• •	• • •	• • •
Changes in thermal regime (eg power station discharges)	• •	•	•	• • •	• •	•	•	• • •
Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil)	• •	• •	•	• • •	• •	• •	•	• • •
Changes in salinity (eg water abstraction, effluent outfalls)	• •	• •	• • •	• • •	• •	• •	• • •	• • •
<b>Biological disturbance</b>								
Introduction of microbial pathogens (eg effluent outfalls)	• •	• •	• •	• •	• •	• •	• •	• •
Introduction of non-native species and translocation	• • •	• • •	• •	• •	• • •	• • •	• •	• •
Selective extraction of species (eg samphire picking, bait collection)	• • •	• • •	• • •	• • •	• • •	• • •	• • •	• • •

<sup>14</sup> 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 July 2002), 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 contrast 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.

## 12.2 Middle Estuary

This advice relates to the vulnerability of the interest features and sub-features of the SPA within the Humber Estuary European marine site boundary as summarised in Table 2 and set out in more detail in Table 10 and 11. 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 to be made between the categories of operation and the ecological requirements of the European marine site's interest features, as set out in Section 9.

The middle estuary 'zone' stretches from the Humber Bridge to a line drawn across the estuary at Grimsby docks. For more detailed information on each category of operation please refer to the inner estuary section.

### i) Physical loss

- Much of the middle estuary is highly industrialised and there are several large dock complexes, power stations and chemical factories along the shores. Consequently, there is significant pressure in this area for development, and the exposure of the **intertidal flats** to physical loss was determined to be high. In addition, the highly developed nature of this section of the estuary means that there is limited scope for restoration or mitigation of similar habitats. The other habitats used by the birds within this section of the European marine site are also subject to considerable pressures, both from commercial and to a lesser extent recreational uses, in what is already a busy developed area. Therefore, the **saltmarsh communities** and **tidal reedbeds** were determined to have a medium exposure to physical loss through removal.

The removal of habitats may lead to changes in coastal processes, such as increased wave exposure and this can exacerbate further habitat loss and change the nature of the existing sediments. In addition, sea defences confine much of this section of the estuary, and the saltmarshes and intertidal sediments are particularly vulnerable to coastal squeeze due to their inability to naturally migrate landward in response to rising sea levels.

Maintenance dredging and the disposal of dredge spoil is undertaken within this section of the estuary, and this may lead to a change in the extent, distribution and nature of intertidal habitats, either through the removal of the source of intertidal sediment, or through the smothering of the intertidal flats. This will impact on the dynamics on the system and could lead to a reduction in bird feeding and roosting areas.

All the habitats used by the SPA birds are currently vulnerable to physical loss through removal and the intertidal mudflats and sandflats and saltmarsh communities are moderately vulnerable to smothering.

### ii) Physical damage

- The **intertidal mudflats and sandflats** of the middle estuary were determined to have a medium exposure to physical damage through siltation. Siltation can reduce visibility through the water column and is likely to affect sight feeders such as black-tailed godwit. These birds have a very limited distribution through the estuary and large numbers feed on the mudflats from North Killingholme Haven pits to Pyewipe, and to a lesser extent, Saltend and Cherry Cobb. The maintenance and capital dredging, and depositing of dredge spoil that occurs primarily in this section of the estuary may affect the suitability of the intertidal flats for supporting black-tailed godwits.
- The intertidal flats and **saltmarsh communities** were determined to have a medium exposure to abrasion. In this section of the estuary, there is a large volume of commercial shipping and the wash from these vessels may result in abrasion and scouring of the intertidal habitats. In addition, the machinery used for developments and construction work may cause physical damage through abrasion to the intertidal habitats.

### iii) Non-physical disturbance

- Much of the middle estuary is highly industrialised, and persistent noise and visual disturbance is an everyday occurrence. Visual disturbance, such as the presence of artificial lights from industry, such as the oil refineries, has an impact on the birds using the intertidal habitats (Hill 1990). These impacts may

have some benefit, such as enabling some bird species to feed at night. This may be particularly advantageous during the winter when the day length is shorter. Night feeding also extends the foraging period and thus increases food intake. There is also evidence to show that invertebrates move closer to the surface at night and are therefore more readily available for foraging birds (Evans 1987). However, much of this evidence is largely inconclusive, and feeding at night may upset the natural biological functioning of some bird species. Artificial lights are also likely to have detrimental effects, causing aberrant behaviour in flying birds, causing them to disorientate, lose control of their flight and collide with the light source or its associated structures (Alerstam 1990). This may have a significant impact on the SPA birds if artificial lighting occurs along flyways or close to regular feeding and roosting areas. In these circumstances, the movements of large numbers of birds along with poor visibility and low cloud cover, could lead to very high levels of mortality. Such mortality could arise not only from collision with structures or the ground, but could also be due to birds becoming disorientated and wasting valuable energy reserves by flying around light sources for hours at a time (A. Drewitt, 2000). Some types of lighting will be less harmful than others (although any light source visible to humans is likely to constitute a potential hazard to birds) and as with all developments that have the potential to affect the SPA, consideration should be given to lighting when planning future developments.

- Noise and visual disturbance is likely to vary considerably between the north and south bank of this section of the estuary. Although along large sections of the bank there is heavy industry, the north bank, east of Hull is largely farmland. Sources of noise and visual disturbance in this section of the estuary may result from powerboating, wildfowling and there may also be some disturbance from the cycle path that runs from Grimsby to Immingham. There are also several national trails, such as the Viking Way, which runs along the south bank, and the Trans-Pennine Trail which runs along the north bank. On the south bank, there are also several caravan sites adjacent to the estuary. It should be noted that the **intertidal habitats**, particularly on the south bank, are very narrow in places and so roosting and feeding birds using these areas will be susceptible to both land and water based disturbance. This is especially true for birds using the **tidal reedbeds**, which exist as extremely narrow fragments in this section of the estuary.

#### iv) **Toxic contamination**

- Toxic contamination may reach this section of the estuary from point and non-point source sources, such as land-based discharges, run-off from roads, water-based discharges and atmospheric deposition. The levels of toxic contaminants are likely to be higher in the inner estuary and decrease towards the mouth. This is mainly due to the fact that many of these contaminants are the result of historic discharges and these reached the Humber via its major tributaries such as the Trent and the Ouse. However, diffuse agricultural pollution may reach this section of the estuary and so there is the possibility of pesticides entering the system. In addition, sheltered areas such as at Pyewipe and Saltend may accumulate contaminated sediments, which may be remobilised through activities such as dredging or bait digging. North Killingholme Haven Pits also suffers some atmospheric pollution from industry.

- The Humber Estuary supports a large volume of commercial shipping, consisting of large vessels carrying chemicals and hydrocarbons into and out of ports or Conoco and Lindsey oil refinery. Therefore, there is the potential for pollution events arising from these vessels and there are two oil spill contingency plans for the estuary.

Oil pollution is well known as a potential threat to the interest features and sub-features of the European marine site. **Intertidal habitats** are under the greatest threat from the physical effects of oil. Oil covering the intertidal area will prevent oxygen transport to the sediments, leading to anoxia and the death of infaunal species. The most vulnerable habitats are those that are sheltered and **saltmarshes** that may trap the oil. As well as the loss or contamination of food items, the birds of the SPA are directly threatened by oil pollution. Oil can cause physical damage to plumage and be ingested by the bird as it tries to preen. Wildfowl are more likely to be directly affected by water-borne oil pollution as they spend large amounts of time loafing and diving in the water. Oil affects the waterproofing of the bird's feathers by causing them to stick together. This results in waterlogging and the bird may die from hypothermia. Different oils vary in their toxicities, and effects are dependent upon exact conditions and duration of

exposure. The use of dispersants to remove the oil may also be harmful to both the intertidal habitats and their associated communities, and to the birds themselves.

- The intertidal mudflats and sandflats and the saltmarsh communities were determined to be moderately vulnerable to the introduction of synthetic and non-synthetic compounds. The coastal lagoons were also determined to be moderately vulnerable to the introduction of synthetic compounds.

**v) Non-toxic contamination**

- The Humber Estuary is considered to have a high nutrient regime, and high nutrient and organic loads enter the system from sewage and industrial outfalls, and agricultural run-off. The habitats of the middle estuary were determined to have a high or medium exposure to changes in nutrient and organic loading, depending on the frequency and duration of submersion.

**vi) Biological disturbance**

- The internationally important migratory species and waterfowl assemblage were determined to have a medium exposure to the selective extraction of species due to wildfowling that occurs along the north bank of this section of the estuary. There is also some bait digging on the north bank.

**Table 10** Assessment of the relative exposure of interest features and sub-features of the Humber Estuary European marine site (SPA & pSPA) middle estuary to different categories of operations (as at July 2002)

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

**Middle Estuary**

Categories of operations which may cause deterioration or disturbance	SPA Interest Features							
	Internationally important populations of regularly occurring Annex I species				Internationally important migratory species and waterfowl assemblage			
	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons
<b>Physical Loss</b>								
Removal (eg land claim, dredging)	High	Med	Med	Low	High	Med	Med	Low
Smothering (eg depositing dredge spoil, beach feeding)	Med	Med	Low	Low	Med	Med	Low	Low
<b>Physical Damage</b>								
Siltation (eg dredging, outfalls)	Med	Med	Low	Low	Med	Med	Low	Low
Abrasion (eg recreational activity, vehicles)	Med	Med	Low	Low	Med	Med	Low	Low
Selective extraction (eg aggregate extraction)	Low	Low	Low	None	Low	Low	Low	None
<b>Non-physical disturbance</b>								
Noise (eg land/water-based recreation, marine traffic)	High	High	High	High	High	High	High	High
Visual presence (eg land/water-based recreation, marine traffic)	High	High	High	Med	High	High	High	Med
<b>Toxic contamination</b>								
Introduction of synthetic compounds (eg TBT, PCBs)	Med	Med	Low	Low	Med	Med	Low	Low
Introduction of non-synthetic compounds (eg effluent outfalls, crude oil)	Med	Med	Low	Low	Med	Med	Low	Low
Introduction of radionuclides	Low	Low	Low	Low	Low	Low	Low	Low

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<b>Non-toxic contamination</b>									
Changes in nutrient loading (eg agricultural run-off, effluent outfalls)	High	Med	Med	Med	High	Med	Med	Med	Med
Changes in organic loading (eg effluent outfalls, aquaculture)	High	Med	Med	Med	High	Med	Med	Med	Med
Changes in thermal regime (eg power station discharges)	Low	Low	None	None	Low	Low	None	None	None
Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil)	Low	Low	None	Low	Low	Low	None	Low	Low
Changes in salinity (eg water abstraction, effluent outfalls)	Low	Low	Low	Low	Low	Low	Low	Low	Low
<b>Biological disturbance</b>									
Introduction of microbial pathogens (eg effluent outfalls)	Low	Low	Low	Low	Low	Low	Low	Low	Low
Introduction of non-native species and translocation	Low	Low	Low	Low	Low	Low	Low	Low	Low
Selective extraction of species (eg samphire picking, bait collection)	Low	Low	Low	Low	Med	Med	Med	Med	Med



**Table 11 Assessment of the relative vulnerability of interest features and sub-features of the Humber Estuary European marine site (SPA & pSPA) middle estuary to different categories of operations**

Shading indicates categories of operation to which the features or sub-features of the site are highly or moderately vulnerable to. This table also incorporates the relative sensitivity scores, used in part to derive vulnerability<sup>15</sup>.

**Key:**

	High vulnerability
	Moderate vulnerability

● ● ● ●	High sensitivity
● ● ●	Moderate sensitivity
● ●	Low sensitivity
●	No detectable sensitivity

**Middle Estuary**

Categories of operations which may cause deterioration or disturbance	SPA Interest Features							
	Internationally important populations of regularly occurring Annex I species				Internationally important migratory species and waterfowl assemblage			
	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons
<b>Physical Loss</b>								
Removal (eg land claim, dredging)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
Smothering (eg depositing dredge spoil, beach feeding)	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●
<b>Physical Damage</b>								
Siltation (eg dredging, outfalls)	● ●	● ●	● ●	● ● ●	● ●	● ●	● ●	● ● ●
Abrasion (eg recreational activity, vehicles)	● ●	● ● ●	● ● ● ●	● ● ●	● ●	● ● ●	● ● ● ●	● ● ●
Selective extraction (eg aggregate extraction)	● ● ●	● ●	● ●	● ●	● ● ●	● ●	● ●	● ●
<b>Non-physical disturbance</b>								
Noise (eg land/water-based recreation, marine traffic)	● ● ● ●	● ● ● ●	● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ●	● ● ● ●
Visual presence (eg land/water-based recreation, marine traffic)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
<b>Toxic contamination</b>								
Introduction of synthetic compounds (eg TBT, PCBs)	● ● ●	● ● ● ●	● ● ●	● ● ● ●	● ● ●	● ● ● ●	● ● ●	● ● ● ●
Introduction of non-synthetic compounds (eg effluent outfalls, crude oil)	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●

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Introduction of radionuclides	• •	• •	• •	• •	• •	• •	• •	• •
<b>Non-toxic contamination</b>								
Changes in nutrient loading (eg agricultural run-off, effluent outfalls)	• • •	• •	• • •	• • •	• • •	• •	• • •	• • •
Changes in organic loading (eg effluent outfalls, aquaculture)	• • •	• •	• • •	• • •	• • •	• •	• • •	• • •
Changes in thermal regime (eg power station discharges)	• •	•	• • •	• • •	• •	•	•	• • •
Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil)	• •	• •	•	• • •	• •	• •	•	• • •
Changes in salinity (eg water abstraction, effluent outfalls)	• •	• •	• • •	• • •	• •	• •	• • •	• • •
<b>Biological disturbance</b>								
Introduction of microbial pathogens (eg effluent outfalls)	• •	• •	• •	• •	• •	• •	• •	• •
Introduction of non-native species and translocation	• • •	• • •	• •	• •	• • •	• • •	• •	• •
Selective extraction of species (eg samphire picking, bait collection)	• • •	• • •	• • •	• • •	• • •	• • •	• • •	• • •

<sup>15</sup> 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 July 2002), 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 contrast 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.

### 12.3 Outer Estuary

This advice relates to the vulnerability of the interest features and sub-features of the SPA within the Humber Estuary European marine site boundary as summarised in Table 2 and set out in more detail in Table 12 and 13. 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 to be made between the categories of operation and the ecological requirements of the European marine site's interest features, as set out in Section 9.

The outer estuary 'zone' stretches from a line drawn across the estuary at Grimsby docks, to Saltfleetby to Theddlethorpe on the southern shore and to Spurn Point on the northern shore. Easington lagoons are also included.

For more detailed information on each category of operation please refer to the inner estuary section.

#### i) Physical loss

- The outer estuary is mostly undeveloped and there is little heavy industry other than around Grimsby. The exposure of the intertidal habitats in this section of the estuary to physical loss through removal or smothering was therefore determined to be low, although it may be higher in localised areas. Beach feeding is carried out at Cleethorpes as part of a sea defence programme. The need for beach feeding is identified through twice yearly beach profile surveys and although it is undertaken infrequently, North East Lincolnshire Council may remove and deposit up to 2,000m<sup>3</sup> of sand each year within the European marine site. This operation will cause physical loss of the **intertidal flats** both through removal and smothering. During the summer months, beach cleaning is undertaken every day at Cleethorpes and this may result in the loss of food material, such as invertebrates, which are often found in strandline debris. This may impact on specialist feeders, however, this area is used more frequently by the SPA species during the winter months. At this time, there is less disturbance from tourists and beach cleaning does not take place. There have also been reports of large scale samphire collections at Humberston on the Lincolnshire coast and on Spurn Bight. Samphire picking can be classed as a longshore activity and may be sustainable when undertaken using traditional methods. However, it has been reported that few plants are left after these large scale collections and this will result in the loss of the seed bank as well as the plants themselves. This may have a knock-on effect on birds such as wigeon, pochard and brent geese that feed on these pioneer marsh plants and seeds. The **saltmarsh communities** were determined to be highly vulnerable to removal.

#### ii) Physical damage

- The **intertidal mudflats and sandflats** were determined to have a medium exposure to siltation, which may occur as a result of dredging, depositing of dredge spoil and from effluent outfalls. The eelgrass beds are particularly sensitive to physical damage, and the Biodiversity Audit of Yorkshire and the Humber states that the eelgrass beds that were found on Spurn Bight and close to Grimsby may have now disappeared. The extent of eelgrass beds may vary as a result of many factors, both natural and anthropogenic, although dredging may have a significant effect. Dredging may alter the deposition of sediments onto eelgrass beds and increase turbidity, thus reducing photosynthesis. In addition, eelgrass beds are sensitive to abrasion, which may result from boat moorings and anchorages. Eelgrass beds are an important food source for brent geese and wigeon and further investigation into the status of eelgrass on the Humber Estuary is needed. Boat moorings and anchorages, plus the wash from boats may also cause physical damage through abrasion to the pioneer **saltmarsh communities** and also to the benthic communities of the intertidal flats. This may result in a loss of food species for the SPA birds.
- Several of the sub-features of the outer estuary were determined to be highly exposed to abrasion due to the large number of activities occurring in this section of the estuary that may lead to abrasion. Much of this activity is seasonal, such as large numbers of tourists visiting the south bank of the estuary during the

summer months. There are also reports of quad bikes, four-wheel drive vehicles, canoeing, and cockling and large scale samphire collections in this section of the estuary.

Cockling takes place at Horseshoe Point and limited gathering also occurs on a smaller bed on Cleethorpes foreshore. NESFC undertake regular stock surveys, and during 2002-03 the cockle beds at Horseshoe Point were closed due to a low abundance of fishable cockles. In February this year, DEFRA confirmed a new byelaw to strengthen the management of the Humber cockle fishery, which includes measures such as a permit system, a closed season, and a minimum landing size. When these beds are open there have been problems regarding the access route taken by the cocklers across an area of saltmarsh. Tractors and quad bikes have been driven onto the site, leading to significant localised damage to the **saltmarsh vegetation** and to the **intertidal flats**. It is possible to access the cockle beds via Stonebridge car park and when the cockle beds reopen, this alternative access route will be implemented. This will help to prevent damage to the saltmarsh vegetation.

Commercial fishing for shrimp also takes place in the outer estuary. It is usually undertaken by twin beam trawls, which are towed along the seabed; however, it is also carried out on the foreshore, using push nets. These may cause physical damage through abrasion to the intertidal flats and can damage the benthic communities, leading to a change in the community structure. However, this is only likely to occur in localised areas.

- Bait digging may also cause abrasion of the **intertidal flats** and occurs frequently between Grimsby and Cleethorpes and at Tetney on the south bank, and at Spurn Bight to Easington Clays on the north bank. Gatherers mainly target lugworm (*Arenicola* spp.) and ragworm (*Nereis* spp.). However, bivalve species may also be gathered such as gaper (*Mya* spp.) and razor (*Ensis* spp.). Bait-digging usually involves making holes or trenches and piling the removed sediments at the side. This alters the nature of the intertidal sediments and the invertebrate communities that they support, and this may have implications for birds feeding in the area (A. Drewitt, 2000). In particular, the overturning and piling of mud and sand next to the bait holes can cause the mortality of species sensitive to burying. It has also been found that mounds created by diggers are not fully repopulated until the mounds have been completely flattened by natural tidal processes. Conversely, the basins created by digging were quickly repopulated by lugworms (up to 34 days for complete recovery) and trenches that were infilled following digging were repopulated quickest of all (22 days) (McLusky *et al* 1983). This study shows that some of the impacts of bait-digging can be significantly reduced simply by back-filling holes and returning rocks and weed to their original position. This increases the rate of recolonisation of the bait species and decreases the mortality of other benthic invertebrates, as well as reducing damage to substrates.
- **Unvegetated sand and shingle** supports the breeding colonies of little terns that nest around the outer estuary. This habitat was determined to be highly vulnerable to physical damage from abrasion, resulting from land-based recreational activities. The areas where little terns nest, are easily accessible to the general public and are particularly popular during the spring and summer when the terns are nesting. The eggs are laid in shallow scrapes on the gravelly sand and can be easily damaged by human activity, especially as they are well camouflaged. The little tern colonies are considered to be highly exposed to activities such as trampling by people and dogs, and are also subject to damage from off-road vehicles such as quad bikes, which are frequently driven across the site.
- The **saltmarsh communities** were determined to have a medium exposure to selective extraction, due to the large scale samphire collecting that occurs at Humberston and on Spurn Bight. It is not known how the samphire is removed from the site, as it is often carried out during the night, but large areas are cleared and so it is likely that some physical damage occurs.

### iii) **Non-physical disturbance**

- The habitats of the outer estuary were determined to have a high or medium exposure to noise and visual disturbance due to the large number of activities that can cause this type of disturbance. However, it is likely that there is a significant difference between the levels, type and seasonality of disturbance, between the north and south bank.  
The outer estuary is popular with tourists, in particular Humberston, Cleethorpes beach and Donna Nook National Nature Reserve on the Lincolnshire coast, and Spurn Point. Saltfleetby to Theddlethorpe dunes

also have large numbers of tourists, possibly over 100,000 each year (Graham Weaver, pers com). Golden plover occur from Cleethorpes to Humberston and it has been reported that they suffer high levels of human disturbance (Catley, 2000). There are also reports of power boating at Cleethorpes, canoeing and off-road vehicles on the site. There are also several caravan sites, close to the north and south banks. These types of disturbances are more likely to occur in the spring and summer months, and so will have less impact on the migratory and overwintering birds that feed and roost on the **intertidal areas**. Disturbances likely to affect these birds may come from wildfowling, which occurs on both the north and south bank of this section of the estuary, and will also disturb non-target species. Punt-gunning also occurs at North Coates, although at very low levels. Bait-diggers and cocklers will also cause disturbance, particularly as they are likely to occur in the same areas as feeding birds, where prey density is highest. This accidental disturbance may prevent birds from feeding, or force them to expend energy flying to alternative and perhaps less favourable feeding areas. The Ministry of Defence has a bombing range at Donna Nook, which is used throughout the week. These sudden loud noises are more likely to cause disturbance than continual noise, which some birds may habituate to. Individuals engaged in bait-digging

There is currently a problem with microlights which have come from the old North Cotes airfield. The microlights fly out across the **saltmarsh** and **intertidal flats**, causing disturbance to feeding and roosting waterfowl (Graham Weaver, pers com).

- In the past there have been five little tern breeding colonies on the Humber, with the largest one at Easington **lagoons**. Unfortunately, over recent years, breeding success has varied greatly and Easington lagoons now appears to be the most successful colony with few birds fledging from any of the other sites. The breeding little terns were determined to have a high exposure to noise and visual disturbance, due to the high frequency of disturbances from people, dogs and vehicles. The areas used by the terns for breeding are accessible to the public and there are high levels of public activity, particularly during the spring and summer months, when the terns are nesting. Disturbance causes birds to expend energy at a time when they often require more energy to breed and forage for food, both for themselves and for their young.

Easington lagoons support the largest colony of breeding little terns in the Humber Flats and Marshes SPA and have one of the highest success rates in eastern Britain. This is probably due to the intensive wardening and management of the site. Disturbances from people are minimal and usually caused by people inadvertently entering the nesting areas. However, human disturbance can prevent the adult birds from landing and feeding chicks, which may lead to predation from birds of prey such as kestrels. In 1998 and 1999 over 40 chicks fledged from this colony, although the numbers have decreased over the last two years. The most recent figures (2002) are 32 birds fledging from 34 pairs.

Little terns also nest on areas of sand at Donna Nook, and several pairs attempt to nest at other sites including Tetney and Spurn Point, although none of these sites have been successful for several years, probably due to the high levels of disturbance.

Little terns have also attempted to nest at Saltfleetby to Theddlethorpe National Nature Reserve in recent years, however, all the nests have failed due to human disturbance. In 2001, 10 pairs nested when the site was closed due to foot and mouth disease. However, the site was reopened before the terns had successfully fledged their young and people, dogs and vandalism caused the little terns to abandon their nests, preventing any chicks from fledging. This year, around 60 little terns were seen in the area during the spring, and 3 pairs attempted to nest, but again disturbance, including 3,000 bird watchers attracted to the reserve by a lesser sand plover, caused the little terns to desert the site.

#### iv) **Toxic contamination**

- The levels of toxic contaminants are likely to be higher in the inner estuary and decrease towards the mouth. This is mainly due to the fact that many of these contaminants are the result of historic discharges and these reached the Humber via its major tributaries such as the Trent and the Ouse. However, toxic contaminants may still reach this section of the estuary from diffuse agricultural pollution, land-based discharges, run-off from roads, water-based discharges and atmospheric deposition. In addition, activities such as dredging and bait digging (which is fairly intensive on Spurn Bight) may remobilise contaminated

sediments. There have been several oil pollution incidents in the past from Tetney monobuoy and birds may be affected either through direct oiling, or indirectly through loss of their food source.

- The **intertidal mudflats and sandflats** and the **saltmarsh communities** were determined to be moderately vulnerable to the introduction of synthetic and non-synthetic compounds. The **coastal lagoons** were also determined to be moderately vulnerable to the introduction of synthetic compounds. Lagoons are particularly susceptible to pollution events due to their poor flushing rates and this results in a high sensitivity score.

v) **Non-toxic contamination**

- The Humber Estuary is considered to have a high nutrient regime, and high nutrient and organic loads enter the system from sewage and industrial outfalls, and agricultural run-off. The **intertidal habitats** of the outer estuary were determined to have a high or medium exposure to changes in nutrient and organic loading, depending on the frequency and duration of submersion. However, the area south of Donna Nook is likely to have a lower exposure due to its location on the open coast, where the waters are more strongly mixed. The **lagoons** at Easington are also likely to have a lower exposure to contamination from the Humber Estuary, although they may be affected from other sources, such as from diffuse agricultural run-off.
- Eutrophication of the shallow coastal waters or the lagoons can have a detrimental effect on the small fish and invertebrates that the breeding little terns feed on. In addition, an increase in turbidity can lead to a decrease in the clarity of the water column and in turn reduce the ability of the terns to catch food items. Areas of the Humber Estuary are important fish nursery areas and water quality is an important factor for their survival.

vi) **Biological disturbance**

- The **saltmarsh communities** were determined to have a medium exposure to the introduction of non-native species, as there are records of common cordgrass *Spartina anglica* from this section of the estuary. A recent survey (2002) by Bullen Consultants recorded over 90ha of *Spartina anglica* (SM6) within the Spurn Head to Saltend Flats SSSI. *S. anglica* is able to grow low down on the shore where the sediments are highly mobile and is considered by some to be an invasive species that may be damaging to other marsh communities. The encroachment of *S. anglica* over the intertidal flats may impact on birds such as dunlin, redshank and shelduck, which use these flats as a feeding area. It also grows too tall for small waders to roost on, resulting in the loss of suitable roosting habitat. On the Humber however, the area covered by *S. anglica* appears to be decreasing and in places *Puccinellia* has replaced it. There are also records of other non-native species occurring in the Humber Estuary, and species such as mink are likely to be particularly damaging to nesting little terns, predated both the eggs and young.
- The **saltmarsh communities** were also determined to have a medium exposure to the selective extraction of species due to large scale samphire collecting. It has been reported that the plants have been uprooted and large areas have been cleared. Collecting on this scale also removes the seed bank and will impact on the recolonisation of the intertidal flats and on species such as wigeon, pochard and brent geese which may feed on these plants and seeds. Wildfowling also occurs in this section of the estuary and there is a small amount of punt-gunning allowed at Northcoates.
- Bait digging results in the removal of sediment and associated sediment communities from **intertidal areas**. This may result in a localised reduction in food availability for feeding birds, particularly as the birds and bait diggers are likely to occur in the same areas, where prey density is highest. Extraction may also remove or damage non-target species, altering the species composition of marine communities and affecting waterfowl that may feed on these species. The sensitivity of the community to such damage will depend upon the destructiveness of the method of extraction, with less damage resulting where the species is extracted manually, compared to more damage to both species and habitat when mechanical means are used.

Different invertebrate species vary in their ability to recover from the effects of bait-digging. Long-lived, infrequently recruiting species such as the larger bivalves will take much longer to become re-established after removal or damage from digging. Other benthic invertebrates may also be vulnerable to bait-digging disturbance due to their fragile nature. Furthermore in some species, particularly the larger bivalves, recovery can take longer due to the annual variation in spat quality. As a result the older classes of large bivalve species may disappear in severely worked areas (Heiligenberg 1987).

The effects of bait-digging are unlikely to be restricted to the target species, and non-target species may be even more vulnerable to bait-digging as they may be less mobile and less able to repopulate dug-out areas. For example, a study of the exploitation of lugworms in the Wadden Sea showed a severe impact on other benthic species (Heiligenberg 1987). The reduction in numbers and biomass of these non-target species could have been caused by increased mortality, either as a direct consequence of digging or indirectly due to increased vulnerability to predation, or as a result of dispersal of populations away from the dug over area.

In another study of benthic species subject to bait-digging activities at Chichester Harbour, there was a dramatic and significant reduction in the density of six out of ten species sampled one month after removal, with four species still at low levels at least two years after the initial digging (Farrel 1999). There was also a long-term reduction in algal cover related to changes in mudflat topography. In contrast, there was no significant reduction in the density of ragworms, the target species.

The potential effects of the collection of bait and other shoreline animals within European marine sites has been documented by Fowler (1999).

- Commercial fishing for shrimp and cockles occurs in the outer estuary. Bird populations may be affected if they are in competition with humans in exploiting the food species. For example, cockling may affect birds such as oystercatchers, which feed on cockles. Cockling takes place at Horseshoe Point and limited gathering also occurs on a smaller bed on Cleethorpes foreshore. NESFC undertake regular stock surveys, and during 2002-03 the cockle beds at Horseshoe Point were closed due to low abundance of fishable cockles. In February this year, DEFRA confirmed a new byelaw to strengthen the management of the Humber cockle fishery, which includes measures such as a permit system, a closed season, and a minimum landing size. In addition, an ecological balance is achieved through the thirds rule, which allocates a third of the cockles to the fishermen, a third to birds and the remaining third to the stock. NESFC are still working towards an Regulating Order, which would further license cockle gatherers and limit the quantity of cockles exploited.

This fishery is currently closed until September 2003, although several people have been prosecuted for still fishing here.

**Table 12** Assessment of the relative exposure of interest features and sub-features of the Humber Estuary European marine site (SPA & pSPA) outer estuary to different categories of operations (as at July 2002)

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

**Outer Estuary**

Categories of operations which may cause deterioration or disturbance	SPA Interest Features								
	Internationally important populations of regularly occurring Annex I species					Internationally important migratory species and waterfowl assemblage			
	Unvegetated sand and shingle	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons
<b>Physical Loss</b>									
Removal (eg land claim, dredging)	Low	Low	Med	Low	Low	Low	Med	Low	Low
Smothering (eg depositing dredge spoil, beach feeding)	Low	Low	Low	Low	Low	Low	Low	Low	Low
<b>Physical Damage</b>									
Siltation (eg dredging, outfalls)	Low	Med	Low	Low	Low	Med	Low	Low	Low
Abrasion (eg recreational activity, vehicles)	High	High	High	Low	Low	High	High	Low	Low
Selective extraction (eg aggregate extraction)	Low	Low	Med	Low	Low	Low	Med	Low	Low
<b>Non-physical disturbance</b>									
Noise (eg land/water-based recreation, marine traffic)	High	High	High	Med	High	High	High	Med	High
Visual presence (eg land/water-based recreation, marine traffic)	High	High	High	Med	High	High	High	Med	High
<b>Toxic contamination</b>									
Introduction of synthetic compounds (eg TBT, PCBs)	Low	Med	Med	Low	Low	Med	Med	Low	Low
Introduction of non-synthetic compounds (eg effluent outfalls, crude oil)	Low	Med	Med	Low	Low	Med	Med	Low	Low
Introduction of radionuclides	Low	Low	Low	Low	Low	Low	Low	Low	Low



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<b>Non-toxic contamination</b>									
Changes in nutrient loading (eg agricultural run-off, effluent outfalls)	Low	High	Med	Med	Med	High	Med	Med	Med
Changes in organic loading (eg effluent outfalls, aquaculture)	Low	High	Med	Med	Med	High	Med	Med	Med
Changes in thermal regime (eg power station discharges)	None	Low	Low	None	None	Low	Low	None	None
Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil)	Low	Low	Low	None	Low	Low	Low	None	Low
Changes in salinity (eg water abstraction, effluent outfalls)	None	Low	Low	Low	Low	Low	Low	Low	Low
<b>Biological disturbance</b>									
Introduction of microbial pathogens (eg effluent outfalls)	Low	Low	Low	Low	Low	Low	Low	Low	Low
Introduction of non-native species and translocation	Low	Low	Med	Low	Low	Low	Med	Low	Low
Selective extraction of species (eg samphire picking, bait collection)	Med	Med	Med	Low	Low	High	High	Med	Med

**Table 13** Assessment of the relative vulnerability of interest features and sub-features of the Humber Estuary European marine site (SPA & pSPA) outer estuary to different categories of operations

Shading indicates categories of operation to which the features or sub-features of the site are highly or moderately vulnerable to. This table also incorporates the relative sensitivity scores, used in part to derive vulnerability<sup>16</sup>.

**Key:**

	High vulnerability
	Moderate vulnerability

● ● ● ●	High sensitivity
● ● ●	Moderate sensitivity
● ●	Low sensitivity
●	No detectable sensitivity

**Outer Estuary**

Categories of operations which may cause deterioration or disturbance	SPA Interest Features									
	Internationally important populations of regularly occurring Annex I species					Internationally important migratory species and waterfowl assemblage				
	Unvegetated sand and shingle	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons	
<b>Physical Loss</b>										
Removal (eg land claim, dredging)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	
Smothering (eg depositing dredge spoil, beach feeding)	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	
<b>Physical Damage</b>										
Siltation (eg dredging, outfalls)	●	● ●	● ●	● ●	● ● ●	● ●	● ●	● ●	● ● ●	
Abrasion (eg recreational activity, vehicles)	● ● ● ●	● ●	● ● ●	● ● ● ●	● ● ●	● ●	● ● ●	● ● ● ●	● ● ●	
Selective extraction (eg aggregate extraction)	● ● ● ●	● ● ●	● ●	● ●	● ●	● ● ●	● ●	● ●	● ●	
<b>Non-physical disturbance</b>										
Noise (eg land/water-based recreation, marine traffic)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ●	● ● ● ●	
Visual presence (eg land/water-based recreation, marine traffic)	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●	
<b>Toxic contamination</b>										
Introduction of synthetic compounds (eg TBT, PCBs)	● ●	● ● ●	● ● ● ●	● ● ●	● ● ● ●	● ● ●	● ● ● ●	● ● ●	● ● ● ●	
Introduction of non-synthetic compounds (eg effluent outfalls, crude oil)	● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	

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Introduction of radionuclides	• •	• •	• •	• •	• •	• •	• •	• •	• •
<b>Non-toxic contamination</b>									
Changes in nutrient loading (eg agricultural run-off, effluent outfalls)	•	• • •	• •	• • •	• • •	• • •	• •	• • •	• • •
Changes in organic loading (eg effluent outfalls, aquaculture)	•	• • •	• •	• • •	• • •	• • •	• •	• • •	• • •
Changes in thermal regime (eg power station discharges)	•	• •	•	•	• • •	• •	•	•	• • •
Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil)	•	• •	• •	•	• • •	• •	• •	•	• • •
Changes in salinity (eg water abstraction, effluent outfalls)	•	• •	• •	• • •	• • •	• •	• •	• • •	• • •
<b>Biological disturbance</b>									
Introduction of microbial pathogens (eg effluent outfalls)	•	• •	• •	• •	• •	• •	• •	• •	• •
Introduction of non-native species and translocation	• •	• • •	• • •	• •	• •	• • •	• • •	• •	• •
Selective extraction of species (eg samphire picking, bait collection)	• • • •	• • •	• • •	• • •	• • •	• • •	• • •	• • •	• • •

<sup>16</sup> 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 July 2002), 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 contrast 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.

# **RAMSAR**

## **13. Humber Flats, Marshes and Coast Ramsar site interest features**

The Humber Estuary European marine site also includes a Ramsar site qualifying under the Ramsar Convention. An extension to the Ramsar site has also been proposed, but this has not yet been listed and is therefore known as a proposed Ramsar site. This section describes and explains the importance of each the features of the Ramsar and pRamsar, together with their component sub-features within the Humber Estuary European marine site.

The Humber Flats, Marshes and Coast Ramsar and pRamsar includes both marine areas (ie. land covered continuously or intermittently by tidal waters) and land that is not subject to tidal influence. In accordance with a DETR policy statement, "Ramsar sites in England" (November 2000), Ramsar sites must be given the same consideration as European sites. Therefore, the areas of the Ramsar and pRamsar below highest astronomical tide will be considered as part of the Humber Estuary European marine site. The seaward boundary of the European marine site is concurrent with that of the Ramsar or pRamsar. The landward boundary of the European marine site is the upper boundary of the Ramsar or pRamsar, or where that extends above land covered continuously or intermittently by tidal waters, it is at the limit of the marine habitats.

Where the Ramsar or pRamsar 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.

This section on the Humber Flats, Marshes and Coast Ramsar site, applies to both the listed site and to the proposed Ramsar site.

### **13.1 Background and context**

The Convention on Wetlands of International Importance especially as Waterfowl Habitats was signed in Ramsar, Iran in 1971. The broad objectives are to stem the loss and progressive encroachment on wetlands now and in the future through the designation of Ramsar sites. In addition, signatories to the Convention are required to promote the conservation of wetland habitats and wise use of wetlands within their territories.

A habitat can qualify as a Ramsar site for its representation of a wetland, for supporting wetland plant or animal species or for its role in supporting internationally important waterfowl. Interest features are identified within certain criteria.

The Humber Flats, Marshes and Coast Ramsar site qualifies under the following San José criteria:

**Criterion 2:** A wetland should be considered internationally important if it supports vulnerable, endangered or critically endangered species or threatened ecological communities

**Criterion 3:** A wetland should be considered internationally important if it supports populations of a plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region

**Criterion 5:** A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds

**Criterion 6:** A wetland should be considered internationally important if it regularly supports 1% or more of the individuals in a population of one species or sub-species of waterbird.

As with SPAs, English Nature's conservation objectives provide information on maintaining the favourable condition of the habitats listed on the citation and/or the habitats used by the qualifying species. Also, the UK Ramsar Committee, led by JNCC, is scoping a review of listed Ramsar sites. This will document any changes to qualifying features on Ramsar sites since the sites were listed, taking account of the revised Ramsar site selection criteria and the need to increase coverage of non-avian interests. This will provide advice to Ministers on any changes required to Ramsar citations. Depending on the conclusions of the review, English Nature may review this advice.

The Ramsar site boundary within the Humber Estuary European marine site is concurrent with the corresponding SPA boundary. There are also a number of habitats within the Ramsar site that supports qualifying species but lie landward of the point of highest astronomical tide and therefore outside the European marine site. Objectives to maintain habitats important to these species in favourable condition are found within English Nature's conservation objectives for the relevant SSSI within the Ramsar site boundary and will be dealt with through procedures outlined in the Conservation (Natural Habitats &c.) Regulations 1994. Some species also use areas of land and coastal waters outside the boundaries of the Ramsar site. Relevant authorities need to have regard to such adjacent interests, as they might be affected by activities taking place within, or adjacent to the European marine site.

### **13.2 Internationally important wetland, hosting an assemblage of threatened coastal and wetland invertebrates**

The Humber Flats, Marshes and Coast qualifies as a Ramsar site under Criterion 2 because it supports an assemblage of threatened coastal and wetland invertebrate species (see table 14).

The qualifying invertebrate species that occur within the European marine site are:

- *Eupithecia extensaria occidua* – scarce pug moth
- *Gammarus insensibilis* – lagoon sand shrimp
- *Spilogona biseriata* – muscid fly
- *Pogonus luridipennis* – ground beetle

There are also a large number of qualifying invertebrate species that utilise habitats above highest astronomical tide and hence are outwith the European marine site boundary. Objectives to maintain habitats important to these species in favourable condition are found within English Nature's conservation objectives for the relevant SSSI within the Ramsar site boundary and will be dealt with through relevant procedures outlined in the Conservation (Natural Habitats & c.) Regulations 1994.

#### **13.2.1 Key sub-features**

**Saltmarsh communities** – Although saltmarsh vegetation is found throughout much of the estuary, the invertebrate species utilising this habitat tend to be localised.

*Eupithecia extensaria occidua*, the scarce pug moth was once common at Spurn Point, the larvae feeding on sea wormwood *Artemisia maritima*, a saltmarsh plant. In 1979, it seemed to disappear and then was recorded twice in 1988 and then not again until 1997. This species is only found around the Wash and Spurn Point.

*Spilogona biseriata*, a muscid fly is also found on saltmarshes, feeding on algal mats of *Enteromorpha*. There are records of this species from Spurn Point and at Blacktoft Sands.

*Pogonus luridipennis* is a green and yellow ground beetle found in saltmarshes under seaweeds and driftwood and under strandline litter. It is rare in Britain and has declined during the twentieth century, probably due to development on coastal habitats and pollution. It is very localised and has been recorded from the saltmarshes at Spurn and between Cleethorpes and Humberston.

**Coastal lagoons** – *Gammarus insensibilis*, the lagoon sand shrimp is an amphipod protected under Schedule 5 of the Wildlife and Countryside Act 1981. It is a lagoonal specialist species that is almost always associated with the green alga *Chaetomorpha linum*, which may form extensive drifting mats. Within the UK, the amphipod is fairly widely distributed in lagoons along the south and east coasts of England. On the Humber, the species is found at Humberston Fitties.

### **13.3 Internationally important wetland, supporting a breeding colony of grey seals**

The Humber Flats, Marshes and Coast qualifies as a Ramsar site under Criterion 3 because it supports a breeding colony of grey seals (*Halichoerus grypus*) on the southern edge of its distribution (see table 14).

Grey seals are amongst the rarest seals in the world and the UK population represents about 40% of the world population and 95% of the EU population. At the start of the 2000 breeding season, Great Britain held 124,000

grey seals (SCOS, 2000) and Donna Nook on the Humber Estuary holds Britain's most south-easterly breeding colony. Nationally, grey seal colonies have been growing by 6% each year since 1984, but at Donna Nook the colony grew by 21% in 2000. The most recent years count (2001), revealed the grey seal pup production at Donna Nook to be 634.

The grey seals will also utilise habitats outwith the boundary of both the European marine site and the Ramsar site, such as areas for feeding. Relevant authorities need to have regard to such adjacent European interests, as they might be affected by activities taking place within, or adjacent to the European marine site.

### **13.3.1 Key sub-features**

**Intertidal mudflats and sandflats** – The intertidal flats of the north Lincolnshire coast provide an important habitat for grey seals which come ashore in Autumn to form breeding colonies. Grey seals have been breeding at Donna Nook since the early 1970s and are probably related to the Farne Island colonies.

The seal pups are conceived in the shallow waters or on the beaches in November. After one weeks development, the foetus stops growing for about 100 days. After this, it continues to develop and is born the following November. Grey seal pups are born with white coats and suckle from their mothers for two to three weeks after which the mother leaves them and goes into the shallows to mate again for next years pup.

The intertidal flats also provide an important habitat throughout the year for grey seals to haul out or rest, particularly during the spring when all grey seals, except young born the previous year, are moulting. When the tide covers the flats, the seals will spend a large proportion of their time foraging for shellfish and sandeels or resting.

The Humber Estuary is also host to small numbers of common seals, although given the large areas of potential habitat for common seals, it seems surprising that this species is not found in larger numbers (SMRU, pers com).

## **13.4 Internationally important wetland, regularly supporting an assemblage of waterfowl**

The Humber Flats, Marshes and Coast qualifies as a Ramsar site under Criterion 5 because it regularly supports 20,000 or more waterbirds (see table 14).

### **13.4.1 Key sub-features**

The key sub-features for the 20,000 or more waterbirds are as for the **SPA section 9.6.1**:

- Intertidal mudflats and sandflats
- Saltmarsh communities
- Tidal reedbeds
- Coastal lagoons

### **13.5 Internationally important wetland, regularly supporting populations of waterfowl species**

The Humber Flats, Marshes and Coast qualifies as a Ramsar site under Criterion 6 because it regularly supports 1% or more of the biogeographic populations of waterfowl species (see table 14).

#### **13.5.1 Key sub-features**

The key sub-features for the populations of waterfowl species are as for the **SPA section 9.5.1**:

- Intertidal mudflats and sandflats
- Saltmarsh communities
- Tidal reedbeds
- Coastal lagoons



## **14. The Humber Flats, Marshes and Coast Ramsar site conservation objectives**

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 marine site.

The conservation objectives for the Humber Flats, Marshes and Coast Ramsar site interest features are provided below and should be read in the context of other advice given in this package, particularly:

- the attached maps 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 interest feature and which will act as a basis for the development of a monitoring programme.

### **14.1 Criterion 2: Conservation objective for the internationally important wetland, hosting an assemblage of threatened coastal and wetland invertebrates**

Subject to natural change, maintain\* **the wetland hosting an assemblage of threatened coastal and wetland invertebrates** in favourable condition<sup>17</sup>, in particular:

- Saltmarsh communities
- Coastal lagoons

The species using these habitats are given in Table 14

### **14.2 Criterion 3: Conservation objective for the internationally important wetland, supporting a breeding colony of grey seals *Halichoerus grypus***

Subject to natural change, maintain\* the **wetland hosting a breeding colony of grey seals** in favourable condition<sup>17</sup>, in particular:

- Intertidal mudflats and sandflats

### **14.3 Criterion 5: Conservation objective for the internationally important wetland, regularly supporting 20,000 or more waterfowl**

Subject to natural change, maintain\* the **wetland regularly supporting 20,000 or more waterfowl** in favourable condition<sup>17</sup>, in particular:

- Intertidal mudflats and sandflats
- Saltmarsh communities
- Tidal reedbeds
- Coastal lagoons

Number of bird species using these habitats are given in Table 14

**14.4 Criterion 6: Conservation objective for the internationally important wetland, regularly supporting 1% or more of the individuals in a population of one species or sub-species of waterfowl**

Subject to natural change, maintain\* the **wetland regularly supporting 1% or more of the individuals in a population of one species or sub-species of waterfowl** in favourable condition<sup>17</sup>, in particular:

- Intertidal mudflats and sandflats
- Saltmarsh communities
- Tidal reedbeds
- Coastal lagoons

Number of bird species using these habitats are given in Table 14

Note: The Ramsar site conservation objectives for **critterion 2 & 3** interest focus on the condition of the habitats that support or host species of international importance. Information on the status of the species in terms of national and international population and distribution trends will be used to inform judgements made with regards to the management and protection of the sites.

The Ramsar site conservation objectives for **critterion 5 & 6** interest focus on the condition of the habitats that support the bird populations. This is in recognition of changes in bird populations that may take place as a consequence 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 other available information on the national and international population and distribution trends to inform judgements regarding the management and protection of the site.

17 For a detailed description of how to recognise favourable condition, see the attached table 15

\* Maintain implies restoration if the feature is not currently in favourable condition.

**Table 14 Information on populations of species qualifying under the Ramsar Criterion 2, 3, 5 and 6 using those parts of the Humber Flats, Marshes and Coast Ramsar site lying within the European marine site boundary, at the time the Ramsar citation was compiled**

**Criteria 2: Internationally important wetland hosting an assemblage of threatened coastal and wetland invertebrates**

<i>Eupithecia extensaria occidua</i> – scarce pug moth
<i>Gammarus insensibilis</i> - lagoon sand shrimp
<i>Spilogona biseriata</i> – muscid fly
<i>Pogonus luridipennis</i> – ground beetle

**Criterion 3: Internationally important wetland hosting a breeding colony of grey seals**

Grey seal <i>Halichoerus grypus</i>
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**Criteria 5: Internationally important wetland regularly supporting 20,000 or more waterfowl**

Importance	Population (5 yr peak mean)*	Season	Period
The Humber Estuary regularly supports 20,000 or more waterfowl	175,768 individuals	Wintering	1993/94 - 1997/98

**Criterion 6: Internationally important wetland regularly supporting 1% or more of the individuals in a population of one species or sub-species of waterfowl**

Species	Population (5 yr peak mean)*	Importance	Period
Ringed plover <i>Charadrius hiaticula</i>	1,357 individuals - passage	2.7 % of Europe/Northern Africa	1993 - 1997
Sanderling <i>Calidris abla</i>	1,263 individuals - passage	1.3 % E Atlantic/W & S Africa	1993 -1997
Redshank <i>Tringa totanus totanus</i>	5,117 individuals - passage	3.4 % Eastern Atlantic	1993 - 1997
Shelduck <i>Tadorna tadorna</i>	4,369 individuals - wintering	1.5 % Northwestern Europe	1993/94 - 1997/98
Golden plover <i>Pluvialis squatarola</i>	34,615 individuals - wintering	1.9% Northwestern Europe	1993/94 - 1997/98
Grey plover <i>Pluvialis squatarola</i>	1,667 individuals - wintering	1.1 % Eastern Atlantic	1993/94 - 1997/98
Lapwing <i>Vanellus vanellus</i>	33,635 individuals - wintering	1.7 % Europe	1993/94 - 1997-98
Knot <i>Calidris canutus islandica</i>	28,060 individuals - wintering	8.0 % NE Can/Grl/Iceland/NW Eur	1993/94 - 1997/98
Dunlin <i>Calidris alpina alpina</i>	20,325 individuals - wintering	1.5 % N Siberia/Europe/W Africa	1993/94 - 1997/98

Bar-tailed godwit <i>Limosa lapponica</i>	1,780 individuals - wintering	1.8% Western Palearctic	1993/94 - 1997/98
Redshank <i>Tringa totanus totanus</i>	4,284 individuals - wintering	2.9 % Eastern Atlantic	1993/94 - 1997/98

\* Ramsar citation (**April 2000**) held on Register of European marine sites for Great Britain.

**15.****Table 15 Favourable Condition Table for Humber Flats, Marshes and Coast Ramsar site interest features of the Humber Estuary European marine site**

**Species using these habitats are given in Table 14.**

NB – It will be possible to monitor many of the attributes 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.

Criterion	Sub-feature	Attribute	Measure	Target	Comments
<b>Criterion 2: Internationally important wetland hosting an assemblage of threatened coastal and wetland invertebrates</b>	All sub-features	Extent of habitat	Area (ha), measured once per reporting cycle.	No significant decrease in extent from an established baseline <sup>18</sup> , subject to natural change.	The habitats provide important feeding sites and cover for the invertebrate species.
<b>Criterion 3: Internationally important wetland hosting a breeding colony of grey seals</b>	Intertidal mudflats and sandflats	Extent of habitat	Area (ha) measured once per reporting cycle.	No significant decrease in extent from an established baseline <sup>18</sup> , subject to natural change	The intertidal flats at Donna Nook are an important breeding and haul-out site for grey seals
		Disturbance	Reduction, displacement and productivity of grey seals, measured periodically using average count information (frequency to be determined)	No significant reduction in seal numbers, productivity or displacement of seals attributable to human disturbance from an established baseline <sup>18</sup> , subject to natural change.	Excessive disturbance can cause stress to both adults and pups and result in reduced food intake and/or increased energy expenditure. Disturbance in breeding areas may result in a reduced pup production.

<b>Criterion 5: Internationally important wetland regularly supporting 20,000 or more waterfowl</b>	Intertidal mudflats and sandflats	For information on the favourable condition of intertidal mudflats and sandflats see Humber Flats, Marshes and Coast SPA favourable condition table
	Saltmarsh communities	For information on the favourable condition of saltmarsh communities see Humber Flats, Marshes and Coast SPA favourable condition table
	Tidal reedbeds	For information on the favourable condition of tidal reedbeds see Humber Flats, Marshes and Coast SPA favourable condition table
	Coastal lagoons	For information on the favourable condition of coastal lagoons see Humber Flats, Marshes and Coast SPA favourable condition table
<b>Criterion 6: Internationally important wetland regularly supporting 1% or more of the individuals in a population of one species or sub-species of waterfowl</b>	Intertidal mudflats and sandflats	For information on the favourable condition of intertidal mudflats and sandflats see Humber Flats, Marshes and Coast SPA favourable condition table
	Saltmarsh communities	For information on the favourable condition of saltmarsh communities see Humber Flats, Marshes and Coast SPA favourable condition table
	Tidal reedbeds	For information on the favourable condition of tidal reedbeds see Humber Flats, Marshes and Coast SPA favourable condition table
	Coastal lagoons	For information on the favourable condition of coastal lagoons see Humber Flats, Marshes and Coast SPA favourable condition table

<sup>18</sup> Baselines to be determined during the first reporting cycle.

NB: Extreme events (such as storms reducing or increasing salinities or warm summers) also need to be recorded as they may be critical in influencing ecological issues in the Humber Estuary European marine site and may well be missed by routine monitoring.

## **16. Detailed operations advice for the Humber Flats, Marshes and Coast Ramsar site interest features**

This section provides information to help relate general advice to each of the specific interest features of the Ramsar site.

This advice relates to the vulnerability of the interest features and sub-features of the Ramsar site within the Humber Estuary European marine site boundary as summarised in Table 2 and set out in more detail in Tables 16 and 17. 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 13, to be made.

The categories of operation may cause damage or disturbance to the interest features and sub-features of the Humber Estuary European marine site, either alone or in combination.

- The Humber Flats, Marshes and Coast qualifies as a Ramsar site for supporting an assemblage of threatened coastal and wetland invertebrate species. The conservation objectives for these invertebrates focus on the condition of the habitats that support or host the species. The habitats identified as being of importance for the invertebrates, occurring within the European marine site are **saltmarsh communities** and **coastal lagoons**. For detailed operations advice on these habitats, please see the advice under section 12.

### **i) Physical loss**

- The intertidal flats of Donna Nook are an important habitat for the grey seal colony. Each year large numbers of female grey seals come ashore from October to January to give birth. They have been breeding here since the early 1970s and the colony has grown each year. The intertidal flats are also important for hauling out and resting at other times of the year. The loss by removal or smothering of these habitats or part of habitats may affect the suitability of Donna Nook for the breeding colony of grey seals. Currently, the exposure of the intertidal flats to removal or smothering was determined to be low, however, the high sensitivity score to removal results in a moderate vulnerability.

### **ii) Physical damage**

- It was determined that the intertidal flats at Donna Nook were highly exposed to abrasion due to the large number of visitors coming onto the site and the use of four wheel drive vehicles and quad bikes in the outer estuary.
- The use of netting to catch fish sometimes results in the accidental release of large nets into the marine environment. Seals may become entangled in these nets and may drown directly; or smaller pieces of netting may restrict normal swimming and diving activity, and therefore reduce the ability of the seal to hunt for food. Entanglement may also increase drag and therefore increase energy expenditure. There is very little netting used in the Humber Estuary, and so any entanglement is likely to result from the seals travelling to other locations where nets are used, or from lost nets being carried by currents. Seals are also sensitive to other forms of debris, such as small plastic fragments that may be ingested, or plastic packing bands that may get caught around a seal's neck. If this occurs whilst the seals are still growing, they could eventually die from strangulation or from infected wounds. On the Humber, entanglement in netting and plastic debris is not believed to be a problem, although it does occur infrequently and therefore the exposure was determined to be low.

### iii) **Non-physical disturbance**

- Grey seals are highly sensitive to both noise and visual disturbance. Although there is evidence that they can become habituated to human presence, unfamiliar or sudden noises or movements may cause disturbance and can displace seals from their haul-out sites or breeding grounds. Seals affected by such disturbance may move to an alternative and perhaps less favourable site, or increase their energy intake through stress.  
Female seals are particularly susceptible to disturbance during pupping, and disturbing nursing pups can result in poor condition and low weaning weights. This is likely to have an adverse effect on the pups' survival rates, especially as up to 60% are thought to die in their first year under normal conditions. Disturbance at haul-out sites, which are important for resting, sleeping and skin maintenance, can also lead to increased energy expenditure.
- Donna Nook attracts up to 45,000 visitors a year and many of these come to see the grey seal colony. The site is owned by the Ministry of Defence and is managed jointly by them and Lincolnshire Wildlife Trust. Whilst regular commercial boat traffic and controlled seal watching is not currently considered to be a problem, irregular disturbance for example, uncontrolled approaches made to the seals by people or dogs, or recreational activities may have an adverse effect on the seal colony. There have been infrequent reports of seals being found with propeller marks in their heads, and it is suspected that these have resulted from jet skis. The time of year the breeding seals use the site is likely to keep recreational disturbances to a minimum, although the colony also uses Donna Nook at other times of the year as a haul out and moulting site. A low fence has also been installed to keep visitors away from the breeding colony of seals.
- The grey seals are in close proximity to both land based and water based activities and the Ministry of Defence bombing range, which is used throughout the week. However, the Ministry of Defence have modified their activities to take account of the seals using the site. For example, during the breeding season, seals often encroach onto the bombing range and the targets have to be declared unusable. The seals also appear to have habituated to the MoD's current activities (Squadron Leader Jones pers com). Donna Nook was declared a National Nature Reserve in July 2002. It is currently very well managed and the seal colony appears to be suffering no adverse effects - numbers at the colony grew by 21% in 2000, whereas nationally grey seal rookeries are growing by 6% a year. However, noise and visual disturbance should be kept under review, especially if changes in on-site activities or management measures were to occur.
- The adult grey seals also spend a large proportion of their time in the waters offshore; therefore regard should be given to the potential to disturb the seals whilst they are in the waters or coming ashore, particularly those with nursing pups.

### iv) **Toxic contamination**

- Grey seals can be exposed to toxic contaminants through many routes, including uptake through the skin and ingestion of water and food, although the primary exposure route is likely to be via food intake. The grey seals at Donna Nook will feed offshore on species such as cod, sand eels and shellfish and may pick up contaminants such as organochlorines. Many toxic contaminants are thought to bioaccumulate in marine mammals with known sub-lethal toxicological effects. Certain synthetic compounds are also believed to be endocrine disruptors, posing a potential hazard for the local populations of grey seals or their prey species (WRc, 1999). Toxic contaminants that have accumulated in the blubber may be released into the seal's body when the animal is stressed or when its fat reserves are in demand. Here, they may cause damage to tissues, hormone balance and the immune system (SMRU website).  
In the UK, both grey and common seals have been found to have high levels of pollutants, especially fat-soluble organochlorine compounds such as DDT and industrial polychlorinated biphenyls (PCBs), which accumulate in the blubber. There is also evidence that the accumulation of chemicals such as PCBs in marine mammals can lead to lowered reproductive capacity (Reijnders, 1986) and may suppress the immune system, making them more susceptible to death from infectious diseases (de Swarl *et al.*, 1994). It is probable that the grey seals at Donna Nook are exposed to low levels of organochlorides and other



toxic contaminants, as data from Cole *et al.*, (1999) recorded positive levels of DDT, PCBs and HCBs in shellfish collected in the Humber Estuary. Therefore, although the exposure to the introduction of synthetic and non-synthetic compounds is considered to be low, the grey seals are currently moderately vulnerable to toxic contamination.

**vi) Biological disturbance**

- In 1988, seals around the UK coast were subject to an outbreak of the phocine distemper virus, which is thought to have killed 18,000 common seals or half the northern European total. Although no large-scale mortality was observed in grey seals (400 were believed to have died), pup production in 1988 and 1989 was lower than expected. This may have been caused by a temporary effect of PDV on grey seal reproduction (DEFRA website). During this phocine distemper virus outbreak, a local vet carried out research on grey and common seals at Donna Nook. The results showed that the seals were carrying very high burdens of a wide range of sewage derived infections, which led to depressed immune systems. In turn, this also led to unusually high parasitic burdens (Graham Weaver, pers com). Since this time the sewage outfalls in the UK have been cleaned up and so it would be useful to have further work done on the seals at Donna Nook.

Phocine distemper virus returned to Denmark in May 2002 and has killed thousands of seals in Denmark, Sweden and Norway. Holland and northern France have also been affected. The highly infectious virus cannot be treated, it attacks the seals' immune system and leaves them vulnerable to infection. PDV was identified in the UK seal population in August, and recent figures (November 2002) estimate that it has killed 3,285 seals around the UK, at least 370 are thought to be grey seals (DEFRA, pers com).

Although the exposure of the grey seals to this virus is low, their high sensitivity to infections, results in a moderate vulnerability score.

- The Humber Flats, Marshes and Coast qualifies as a Ramsar site for regularly supporting 20,000 or more waterbirds and 1% or more of the biogeographic population of waterfowl species. These criteria are identical to the Special Protection Area interest features; **an assemblage of waterfowl and internationally important migratory species**. For detailed operations advice on these features, please see the advice under section 12.

**Table 16** Assessment of the relative exposure of interest features and sub-features of the Humber Estuary European marine site (Ramsar & pRamsar) to different categories of operations (as at July 2002)

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

Categories of operations which may cause deterioration or disturbance	Ramsar Interest Features						
	Criterion 2: Assemblage of threatened coastal and wetland invertebrates		Criterion 3: Breeding colony of grey seals	Criterion 5: Regularly supports 20,000 or more waterfowl species Criterion 6: Regularly supports 1% or more of a species or sub-species of waterfowl			
	Saltmarsh communities	Coastal lagoons	Intertidal mudflats and sandflats	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons
<b>Physical Loss</b> Removal (eg land claim, dredging) Smothering (eg depositing dredge spoil, beach feeding)	<b>For information on these sub-features, see the assessments made under the SPA sub-features</b>		<b>Low</b> <b>Low</b>	<b>For information on these sub-features, see the individual assessments made under the SPA interest feature sections:</b>  <b>- Internationally important migratory species and waterfowl assemblage</b>			
<b>Physical Damage</b> Siltation (eg dredging, outfalls) Abrasion (eg recreational activity, vehicles) Selective extraction (eg aggregate extraction)			<b>Low</b> <b>High</b> <b>Low</b>				
<b>Non-physical disturbance</b> Noise (eg land/water-based recreation, marine traffic) Visual presence (eg land/water-based recreation, marine traffic)			<b>High</b> <b>High</b>				
<b>Toxic contamination</b> Introduction of synthetic compounds (eg TBT, PCBs) Introduction of non-synthetic compounds (eg effluent outfalls, crude oil) Introduction of radionuclides			<b>Low</b> <b>Low</b> <b>Low</b>				
<b>Non-toxic contamination</b> Changes in nutrient loading (eg agricultural run-off, effluent outfalls)			<b>Med</b>				

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<p>Changes in organic loading (eg effluent outfalls, aquaculture)          Changes in thermal regime (eg power station discharges)          Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil)          Changes in salinity (eg water abstraction, effluent outfalls)</p>	<p><b>For information on these sub-features, see the assessments made under the SPA sub-features</b></p>	<p><b>Med</b></p> <p><b>Low</b></p> <p><b>Low</b></p> <p><b>Low</b></p>	<p><b>For information on these sub-features, see the individual assessments made under the SPA interest feature sections:</b></p> <p><b>- Internationally important migratory species and waterfowl assemblage</b></p>
<p><b>Biological disturbance</b>          Introduction of microbial pathogens (eg effluent outfalls)          Introduction of non-native species and translocation          Selective extraction of species (eg samphire picking, bait collection)</p>		<p><b>Low</b></p> <p><b>Low</b></p> <p><b>Low</b></p>	

**Table 17 Assessment of the relative vulnerability of interest features and sub-features of the Humber Estuary European marine site (Ramsar & pRamsar) to different categories of operations**

Shading indicates categories of operation to which the features or sub-features of the site are highly or moderately vulnerable to. This table also incorporates the relative sensitivity scores, used in part to derive vulnerability<sup>19</sup>.

**Key:**

	High vulnerability
	Moderate vulnerability

● ● ● ●	High sensitivity
● ● ●	Moderate sensitivity
● ●	Low sensitivity
●	No detectable sensitivity

Categories of operations which may cause deterioration or disturbance	Ramsar Interest Features						
	Criterion 2: Assemblage of threatened coastal and wetland invertebrates		Criterion 3: Breeding colony of grey seals	Criterion 5: Regularly supports 20,000 or more waterfowl species Criterion 6: Regularly supports 1% or more of a species or sub-species of waterfowl			
	Saltmarsh communities	Coastal lagoons	Intertidal mudflats and sandflats	Intertidal mudflats and sandflats	Saltmarsh communities	Reedbeds	Lagoons
<b>Physical Loss</b> Removal (eg land claim, dredging) Smothering (eg depositing dredge spoil, beach feeding)	<b>For information on these sub-features, see the assessments made under the SPA sub-features</b>		● ● ● ●	<b>For information on these sub-features, see the individual assessments made under the SPA interest feature sections:</b>  <b>- Internationally important migratory species and waterfowl assemblage</b>			
<b>Physical Damage</b> Siltation (eg dredging, outfalls) Abrasion (eg recreational activity, vehicles) Selective extraction (eg aggregate extraction)			● ●				
<b>Non-physical disturbance</b> Noise (eg land/water-based recreation, marine traffic) Visual presence (eg land/water-based recreation, marine traffic)			● ●				
<b>Toxic contamination</b> Introduction of synthetic compounds (eg TBT, PCBs) Introduction of non-synthetic compounds (eg effluent outfalls, crude oil) Introduction of radionuclides			● ● ● ●				
			● ● ● ●				

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<p><b>Non-toxic contamination</b>          Changes in nutrient loading (eg agricultural run-off, effluent outfalls)          Changes in organic loading (eg effluent outfalls, aquaculture)          Changes in thermal regime (eg power station discharges)          Changes in turbidity (eg effluent outfalls, dredging, depositing dredged spoil)          Changes in salinity (eg water abstraction, effluent outfalls)</p>	<p><b>For information on these sub-features, see the assessments made under the SPA sub-features</b></p>	<ul style="list-style-type: none"> <li>●</li> <li>●</li> <li>●</li> <li>●</li> <li>●</li> </ul>	<p><b>For information on these sub-features, see the individual assessments made under the SPA interest feature sections:</b></p> <p><b>- Internationally important migratory species and waterfowl assemblage</b></p>
<p><b>Biological disturbance</b>          Introduction of microbial pathogens (eg effluent outfalls)          Introduction of non-native species and translocation          Selective extraction of species (eg samphire picking, bait collection)</p>		<ul style="list-style-type: none"> <li>● ● ● ● ●</li> <li>●</li> <li>● ●</li> </ul>	

<sup>19</sup>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 July 2002), 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 contrast 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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## 18. Glossary

<b>Abrasion</b>	The process of scraping or wearing down by friction
<b>Advisory Group</b>	The body of representatives from local interests, user groups and conservation groups, formed to advise the management group
<b>Algal bloom</b>	A massive reproduction and growth of algae, often free-floating, in response to the presence of higher than normal levels of nutrients.
<b>Annex 1 birds</b>	Bird species listed on Annex 1 of the Birds Directive. These are in danger of extinction, are rare, or are considered vulnerable within the European Union. Those that regularly occur at levels over 1% of the national population meet the SPA qualifying criteria.
<b>Annex I habitat type(s)</b>	A natural habitat(s) listed in Annex I of the Habitats Directive for which Special Areas of Conservation can be selected.
<b>Annex II species</b>	A species listed in Annex II of the Habitats Directive for which Special Areas of Conservation can be selected.
<b>Anthropogenic</b>	Produced by human activity.
<b>Assemblage</b>	A collection of plants and/or animals characteristically associated with a particular environment but not necessarily interdependent.
<b>Attribute</b>	Characteristic of an interest feature/sub-feature, which provides an indication of the condition of the feature or sub-feature to which it applies.
<b>BAP</b>	Biodiversity Action Plan.
<b>Baseline</b>	A standard or value from which it is possible to determine any deviation in the integrity of the interest features for which the site has been designated.
<b>Benthos</b>	Those organisms attached to, or living on, in or near, the seabed, including that part which is exposed by tides.
<b>Bioaccumulation</b>	The ability of organisms to retain and concentrate substances from their environment. The gradual build-up of substances in living tissue, usually used in referring to toxic substances, may result from direct absorption from the environment or through the food chain.
<b>Biodegradation</b>	Breakdown or decomposition by bacteria or other biological means.
<b>Biodiversity</b>	Biological diversity - the total variety of life on earth. This includes diversity within species, between species and of ecosystems.
<b>Biogeographic region</b>	A region which is separated from adjacent regions by barriers or a change in environmental conditions which limits the movement of species or prevents their establishment outside their natural geographical range.
<b>Biomagnification</b>	Increasing concentrations of a substance in successive trophic levels of a food chain.
<b>Biomass</b>	The total quantity of living organisms in a given area.

<b>Biotope</b>	The physical habitat with its biological community; a term which refers to the combination of physical environment and its distinctive assemblage of conspicuous species.
<b>Bioturbation</b>	The mixing of a sediment by the burrowing, feeding or other activity of living organisms.
<b>Characteristic</b>	Special to, or especially abundant in, a particular situation or biotope. Characteristic species should be immediately conspicuous and easily identified.
<b>Chart datum</b>	Approximately the lowest tidal level due to astronomical effects, and excluding meteorological effects.
<b>Circalittoral</b>	The rocky subtidal zone dominated by animals and below that which is dominated by algae (Animal dominated subtidal zone).
<b>Community</b>	A group of 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.
<b>Competent authority</b>	Any Minister, government department, public or statutory undertaker, public body or person holding a public office that exercises legislative powers.
<b>Conservation objective</b>	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.
<b>Crustaceans</b>	A class of invertebrates that include crabs, shrimps and barnacles.
<b>Diversity</b>	The richness of different types in a location, including the number of different biotopes and numbers of species.
<b>Epifauna</b>	Animals living on the surface of sediments or hard substrates.
<b>Eulittoral</b>	The main part of the intertidal zone characterised by limpets, barnacles, mussels, fucoid algae and with red algae often abundant on the lower part.
<b>European marine site</b>	A European site (SAC or SPA) which consists of, or in so far as it consists of, marine areas.
<b>Eutrophication</b>	The over-enrichment of an aquatic environment with inorganic nutrients, especially nitrates and phosphates, often anthropogenic (e.g. sewage, fertiliser run-off), which may result in stimulation of growth of algae and bacteria, and can reduce the oxygen content of water.
<b>Exposure</b>	The relative extent and intensity of the effects of broad categories of human activities currently occurring on the site to which the interest features or their component sub-features on the site are subject.
<b>Fauna</b>	Animal life in an area.
<b>Favourable conservation status</b>	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 biogeographic region in the long term. The condition in which the habitat or species is capable of sustaining itself on a long-term basis.

<b>Favourable condition</b>	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.
<b>Habitat</b> <b>Habitats Directive</b>	The place in which a plant or animal lives. The abbreviated term for <i>Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora</i> . It is the aim of this Directive to promote the conservation of certain habitats and species within the European Union.
<b>Halophytic</b>	Plants which thrive in, or tolerate the presence of saline conditions.
<b>Highest Astronomical Tide</b>	The highest tidal level that can be predicted to occur under average meteorological conditions and in any combination of astronomical conditions.
<b>Hydrodynamic regime</b>	The particular conditions of water movement at one particular site, including wave action, tidal streams and residual currents.
<b>Infauna</b>	Benthic animals that live within the seabed.
<b>Infralittoral</b>	The subtidal zone in which upward facing rocks are dominated by erect algae, typically kelps.
<b>Interest feature</b>	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.
<b>Littoral</b>	The area of the shore that is occupied by marine organisms which are adapted to or need alternating exposure to air and wetting by submersion, splash or spray. Also called intertidal.
<b>Maintain</b>	The action required for an interest feature when it is considered to be in favourable condition.
<b>Management group</b>	The body of relevant authorities formed to manage the European marine site.
<b>Management scheme</b>	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.
<b>Molluscs</b>	Soft-bodied unsegmented invertebrate animals usually with shells and includes cockles, whelks, limpets, oysters and snails.
<b>Nationally scarce/rare</b>	For marine purposes, these are regarded as species of limited national occurrence
<b>Natura 2000</b>	The European network of protected sites established under the Birds Directive and the Habitats Directive
<b>Natural change</b>	Changes in the condition of features that result wholly from natural causes, such as sea level rise. Natural change is determined to be something that is outside the control of the relevant authorities.
<b>Non-synthetic contamination</b>	Non-synthetic compounds are those materials that occur naturally. They may have to be refined before they are useful to man and could occur in many slightly

different forms. Examples of non-synthetic materials are; heavy metals and hydrocarbons (oil and petrol).

<b>Notable species</b>	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'.
<b>Operations which may cause deterioration or disturbance</b>	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 has been designated, or disturbance to the species and its habitats for which the site was designated. The purpose of the operations advice is to assist relevant authorities and others in managing those activities that could inhibit or prevent the conservation objectives for an interest feature being achieved. This advice is not limited to those activities being undertaken within the site boundary. The intent is to consider all activities that may have an effect on the interest features.
<b>Opportunistic species</b>	A species which is able to rapidly exploit changes in habitat conditions or circumstances to its own advantage.
<b>Plan or project</b>	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.
<b>Ramsar site</b>	A site listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat, which was agreed at Ramsar, Iran.
<b>Relevant authority</b>	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.
<b>Reporting cycle (also known as the monitoring cycle)</b>	A six year cycle where interest features on European sites will be monitored by the country agencies e.g. English Nature. Information on the condition of the features will be used to report to Europe as part of our obligations under the Habitats Directive.
<b>Restore</b>	The action required for an interest feature when it is not considered to be in a favourable condition.
<b>Sensitivity</b>	The intolerance of a habitat, community or individual species to damage, or death, from an external force.
<b>Sub-feature</b>	An ecologically important sub-division of an interest feature.
<b>Sublittoral</b>	The zone of the shore below low water exposed to air only at its upper limit by the lowest spring tides.
<b>Synthetic contamination</b>	Synthetic compounds are those materials that have been manufactured artificially by chemical reaction. Examples of some synthetic compounds are; antifoulant paints, detergents, pesticides (Polychlorinatedbiphenyls or PCBs) and biocides (tributyltin or TBT).
<b>Turbidity</b>	This is a measure of the attenuation of light in the water column and can be caused by the light adsorption properties of the water, plankton, suspended particulate organic and inorganic matter and dissolved colour.
<b>Typical species</b>	A species that is considered to be a typical component of a feature or sub-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**                    **Maps showing the boundary of the Humber Estuary possible Special Area of Conservation**



**Appendix II                    Maps showing the marine habitats of the Humber Estuary possible Special Area of Conservation**

**Data sources:**

**NVC surveys – Saltfleetby to Theddlethorpe, Terra (digitising) 2000  
North Lincolnshire Coast, Terra 2001  
All other sites, Bullens 2001**

**Land cover map 2000, CEH 2000**

**Aerial photography, Getmapping 1999-2001**

**OS Landline intertidal, last comprehensive tide line survey 1983, with local revisions 1993, 1995 and 1999.**

**Appendix III**            **Maps showing the boundary of the Humber Flats, Marshes and Coast Special Protection Area and Ramsar site**

**Appendix IV                    Maps showing the marine habitats of the Humber Flats, Marshes and Coast Special Protection Area and Ramsar site**

**Data sources:**

**NVC surveys – Saltfleetby to Theddlethorpe, Terra (digitising) 2000  
North Lincolnshire Coast, Terra 2001  
All other sites, Bullens 2001**

**Land cover map 2000, CEH 2000**

**Aerial photography, Getmapping 1999-2001**

**OS Landline intertidal, last comprehensive tide line survey 1983, with local revisions 1993, 1995 and 1999.**

**Appendix V Saltmarsh NVC communities occurring within the Humber Estuary European marine site pSAC (from Bullen Consultants 2002 and Dargie 2002)**

Interest feature	Sub-feature	NVC community	Saltmarsh plant species	
Salicornia and other annuals colonising mud and sand		SM8	<i>Salicornia</i>	
		SM9	<i>Suaeda maritima</i>	
Atlantic salt meadows	Low to mid marsh communities	SM10	Transitional low marsh with <i>Puccinellia maritima</i> annual <i>Salicornia</i> spp and <i>Suaeda maritima</i>	
		SM11	<i>Aster tripolium</i>	
		SM12	<i>Rayed Aster tripolium</i>	
		SM13	<i>Puccinellia maritima</i>	
		SM13a	<i>Puccinellia maritima</i> sub-community dominated by <i>Puccinellia maritima</i>	
		SM13b	<i>Puccinellia maritima</i> <i>Glaux maritima</i> sub-community	
		SM13c	<i>Puccinellia maritima</i> <i>Limonium vulgare</i> sub-community	
		SM13f	<i>Puccinellia maritima</i> <i>Puccinellia maritima</i> – <i>Spartina anglica</i> sub-community	
		SM14	<i>Atriplex portulacoides</i>	
		SM14a	<i>Atriplex portulacoides</i> - sub-comm <i>Atriplex portulacoides</i> dominant	
		SM14c	<i>Atriplex portulacoides</i> <i>Puccinellia maritima</i> sub-community	
		Mid to upper communities	SM15	<i>Juncus maritimus</i> <i>Triglochin maritima</i>
			SM16	<i>Festuca rubra</i>
	SM16a		<i>Festuca rubra</i> - <i>Puccinellia maritima</i> sub-community	
	SM16b		<i>Festuca rubra</i> - <i>Juncus gerardi</i> dominant	
	SM16c		<i>Festuca rubra</i> - <i>Festuca rubra</i> <i>Glaux maritima</i> sub-community	
	Transitional communities	SM24	<i>Elymus pycnanthus</i>	
		SM28	<i>Elymus repens</i>	
		S4	<i>Phragmites australis</i>	
		S4a	<i>Phragmites australis</i> with <i>Phragmites australis</i> sub-community	
		S21	<i>Scirpus maritimus</i> swamp	

**Appendix VI                    Map showing the extent and distribution of saltmarsh NVC communities occurring within the Humber Estuary European marine site pSAC**

**Data sources:**

**NVC surveys – Saltfleetby to Theddlethorpe, Terra (digitising) 2000  
North Lincolnshire Coast, Terra 2001  
All other sites, Bullens 2001**

**Aerial photography, Getmapping 1999-2001**

**Appendix VII 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:

		Relative sensitivity of the interest feature			
		High ● ● ● ●	Medium ● ● ●	Low ● ●	None detectable ●
Relative exposure of the interest feature	High				
	Medium				
	Low				
	None				

**Categories of relative vulnerability**

High	
Moderate	
Low	
None Detectable	

**Appendix VIII Summary of key biotopes for SAC features**

<b>LR</b>	Littoral rock
<b>MLR</b>	Moderately exposed littoral rock
<b>MLR.Ent</b>	<i>Enteromorpha</i> spp. on freshwater-influenced or unstable upper eulittoral rock
<b>SLR</b>	Sheltered littoral rock
<b>SLR. Fspi</b>	<i>Fucus spiralis</i> on moderately exposed to very sheltered upper eulittoral rock
<b>SLR. FvesX</b>	<i>Fucus vesiculosus</i> on mid eulittoral mixed substrata
<b>LS</b>	Littoral sediment
<b>LGS</b>	Littoral gravels and sands
<b>LGS.BarSh</b>	Barren shingle or gravel shores
<b>LGS. Tal</b>	Talitrid amphipods in decomposing seaweed on the strand-line
<b>LGS. AEur</b>	Burrowing amphipods and <i>Eurydice pulchra</i> in well-drained clean sand shores
<b>LGS.AP.P</b>	Burrowing amphipods and polychaetes (often with <i>Arenicola marina</i> ) in clean sand shores
<b>LGS. AP.Pon</b>	Burrowing amphipods <i>Pontocrates</i> spp. and <i>Bathyporeia</i> spp. in lower shore clean sand
<b>LGS. Lan</b>	Dense <i>Lanice conchilega</i> in tide-swept lower shore sand
<b>LGS.OI</b>	Oligochaetes in reduced or low salinity gravel or coarse sand shores
<b>LMS</b>	Littoral muddy sands
<b>LMS. MacAre</b>	<i>Macoma balthica</i> and <i>Arenicola marina</i> in muddy sand shores
<b>LMS. Znoi</b>	<i>Zostera noltei</i> beds in upper to mid shore muddy sand
<b>LMU</b>	Littoral muds
<b>LMU. HedMac</b>	<i>Hediste diversicolor</i> and <i>Macoma balthica</i> in sandy mud shores
<b>LMU.HedMac.Are</b>	<i>Hediste diversicolor</i> , <i>Macoma balthica</i> and <i>Arenicola marina</i> in muddy sand or sandy mud shores
<b>LMU.HedMac.Mare</b>	<i>Hediste diversicolor</i> , <i>Macoma balthica</i> and <i>Mya arenaria</i> in sandy mud shores
<b>LMU. HedScr</b>	<i>Hediste diversicolor</i> and <i>Scrobicularia plana</i> in reduced salinity mud shores
<b>LMU. HedStr</b>	<i>Hediste diversicolor</i> and <i>Streblospio shrubsolii</i> in sandy mud or soft mud shores
<b>LMU. HedOI</b>	<i>Hediste diversicolor</i> and oligochaetes in low salinity mud shores
<b>SS</b>	Sublittoral sediments
<b>IGS</b>	Infralittoral gravels and sands
<b>IGS. NcirBat</b>	<i>Nephtys cirrosa</i> and <i>Bathyporeia</i> spp. in infralittoral sand
<b>IGS. MobRS</b>	Sparse fauna in reduced salinity infralittoral mobile sand
<b>IGS. Ncir</b>	<i>Nephtys cirrosa</i> and fluctuating salinity-tolerant fauna in reduced salinity infralittoral mobile sand
<b>IGS. NeoGam</b>	<i>Neomysis integer</i> and <i>Gammarus</i> spp. in low salinity infralittoral mobile sand
<b>IMS</b>	Infralittoral muddy sands
<b>IMS. Cap</b>	<i>Capitella capitata</i> in enriched sublittoral muddy sediments
<b>IMU</b>	Infralittoral muds
<b>IMU. PolVS</b>	<i>Polydora ciliata</i> in variable salinity infralittoral firm mud or clay
<b>IMU. AphTub</b>	<i>Aphelocheata marioni</i> and <i>Tubificoides</i> spp. in variable salinity infralittoral mud
<b>IMU. NhomTub</b>	<i>Nephtys hombergii</i> and <i>Tubificoides</i> spp. in variable salinity infralittoral soft mud
<b>IMX</b>	Infralittoral mixed sediments
<b>IMX. CreAph</b>	<i>Crepidula fornicata</i> and <i>Aphelocheata marioni</i> in variable salinity infralittoral mixed sediments
<b>IMX. PolMtru</b>	<i>Polydora ciliata</i> , <i>Mya truncata</i> and solitary ascidians in variable salinity infralittoral mixed sediment

Taken from IECS, 2000, The Humber Estuary – An Environmental Assessment. Report to English Nature. Unpublished

Biotope codes taken from: Connor, D.W., Brazier, D.P., Hill, T.O. & Northen, K.O. 1997a. *Marine Nature Conservation Review: marine biotope classification for Britain and Ireland. Volume 1. Littoral biotopes*. Version 97.06 JNCC Report, No. 229. and Connor, D.W., Dalkin, M.J., Hill, T.O., Holt, R.H.F. & Sanderson, W.G.. 1997b. *Marine Nature Conservation Review: marine biotope classification for Britain and Ireland. Volume 2. Sublittoral biotopes*. Version 97.06 JNCC Report, No. 230.



**Appendix IX English Nature's Habitats Regulations Guidance Note HRGN1 'The Appropriate Assessment (Regulation 48)'**

**Appendix X List of relevant authorities on the Humber Estuary European marine site**

Associated British Ports Port House Northern Gateway HULL, HU1 1XB	North East Lincolnshire Council Devonshire House, Bullring Lane, GRIMSBY DN31 1ES	Adlingfleet & Whitgift IDB The Gables Business Court, Belton Road, Epworth North Lincs DN9 1JL	North East Lindsey IDB High Street, Ulceby, North Lincs DN39 6TG
Associated Petroleum Terminals (Immingham) Ltd, Queens Road, IMMINGHAM DN40 2PN	North Lincolnshire Council Church Square House, PO Box 42, SCUNTHORPE DN15 6XQ	Ancholme IDB c/o Grantham, Brundell and Farran, Pillar House, 20, South Parade, DONCASTER DN1 2DP	Ottringham IDB c/o 34, Lairgate, BEVERLEY HU17 8ES
British Waterways Board, 5, Bramley's Barn, The Menagerie, Skipwith Road, Escrick, YORK YO19 6ET	Anglian Water Services Ltd Endurance House, Chivers Way, Histon, Cambridgeshire CB4 9ZR	Dempster IDB 64-66 Aire Street, GOOLE DN14 5QS	Preston IDB c/o 34, Lairgate, BEVERLEY HU17 8ES
Crude Oil Terminals (Humber) Ltd, (Conoco Ltd), Humber Refinery, Eastfield Road South Killingholme, IMMINGHAM DN40 3DW	Eastern Sea Fisheries Joint Committee Unit 6, North Lynn Business Village, Bergen Way, KINGS LYNN PE30 2JG	Garthorpe IDB c/o Grantham, Brundell and Farran, Pillar House, 20, South Parade, DONCASTER DN1 2DP	Reedness and Swinefleet IDB c/o Grantham, Brundell and Farran, Pillar House, 20, South Parade, DONCASTER DN1 2DP
Hessle Dock Company, Livingstone Road, HESSLE HU13 0EA	English Nature Humber to Pennines Team, Bullring House, Northgate, WAKEFIELD WF1 3BJ	Goole and Airmyn IDB 7-13 Gladstone Terrace, GOOLE DN14 5AH	Scunthorpe IDB c/o Grantham, Brundell and Farran, Pillar House, 20, South Parade, DONCASTER DN1 2DP
Humber Sea Terminals Ltd, Simon Storage, North Killingholme Cargo Terminal, Clough Lane, North Killingholme DN40 3JP	Environment Agency 1 Viking Street, Great Gutter Lane East, Willerby, HULL HU10 6DE	Goole Fields IDB Clegg and Son, 69, Aire Street, GOOLE DN14 5QE	Skeffling IDB c/o 34, Lairgate, BEVERLEY HU17 8ES
East Lindsey District Council Tedder Hall, Manby Park, LOUTH LN11 8UP	North Eastern Sea Fisheries Committee County Hall, BEVERLEY HU17 9BA	Keyingham IDB c/o 34, Lairgate, BEVERLEY HU17 8ES	Thorngumbald IDB Ocean Chambers, 54, Lowgate, HULL HU1 1JF
East Riding of Yorkshire Council County Hall, BEVERLEY HU17 9BA	Yorkshire Water Services Ltd Western House, Western Way, Halifax Road, BRADFORD BD6 2LZ	Lindsey Marsh IDB Wellington House, Manby Park, LOUTH LN11 8UU	Thorntree IDB 4, Belgravia, GOOLE DN14 5BU
Kingston upon Hull City Council Kingston House, Bond Street, HULL HU1 3ER	Ministry of Defence, Defence Estates, East Stirling House, Denny End Road Waterbeach Cambs CB5 9QE	Lower Ouse IDB 91, Bridgegate, Howden, GOOLE DN14 7JJ	Winestead IDB c/o 34, Lairgate, BEVERLEY HU17 8ES
Lincolnshire County Council City Hall, Beaumont Fee, LINCOLN LN1 1DN		Market Weighton IDB Burnby Hall, Pocklington YORK YO42 2QF	

**Appendix XI Copies of the citations for the European sites:  
Humber Estuary pSAC  
Humber Flats, Marshes and Coast SPA and pSPA  
Humber Flats, Marshes and Coast Ramsar and pRamsar**

The **Sites of Special Scientific Interest** that underpin the European designations on the Humber Estuary are:

Humber Flats and Marshes: The Grues  
Humber Flats and Marshes: Pyewipe and Cleethorpes Coast  
Humber Flats and Marshes: Spurn Head to Saltend Flats  
Humber Flats and Marshes: Upper Humber  
Humber Flats and Marshes: Barton and Barrow Clay Pits  
North Lincolnshire Coast  
The Lagoons  
North Killingholme Haven Pits  
Saltfleetby-Theddlethorpe Dunes

The citations for these sites can be found on the English Nature website: [www.english-nature.org.uk](http://www.english-nature.org.uk)

## ANNEX C: Examining Authority's initial written questions – schedule of responses

In its Rule 8 letter the Examining Authority has decided to ask a number of initial questions and to receive further information about matters it considers relevant to the application. These questions are set out in Annex D1 and D2 of the Examining Authority's letter of 31 May 2012.

Natural England has been asked a number of these questions, some of which are already answered in Natural England's written representations and the expert technical reports appended to it. Natural England has provided the following schedule which provides an easy reference guide for the Examining Authority to see where in Natural England's Written Representations responses have been given to certain questions.

Examining Authority Question Number	Question	Location of response in Natural England's Written Representations
11	Were design alternatives discussed with Natural England or the Marine Management Organisation?	Para 7.6
13	What possible mitigation strategies (i.e. comprehensive and co-ordinated mitigation programmes) were investigated before consideration of compensation measures? Were possible strategies discussed with Natural England or the Marine Management Organisation?	Paras 7.7, 7.8, 7.11
14	How were any possible mitigation strategies assessed in relation to –  (a) the impacts on the integrity of the European sites?  (b) other possible impacts or effects?	Para 7.7
51	In conjunction with Natural England, Environment Agency, Marine Management Organisation and others as appropriate, please complete, correct and update the attached screening matrix and appropriate assessment matrix (Annex D2).	

<p><b>Annex D2 Questions (pp 42 – 44)</b></p> <p><b>D2/1</b></p>	<p>For Natural England:</p> <p>Do you agree with the statement that carrying out a ‘Through the Tide’ count in 2010/11, combined with the available WeB counts and other surveys referred to in the HRA and ES, provides sufficient data to assess the likely impacts of the proposed development on the bird populations using the estuary? (See paragraph 11.5.63, ES Chapter 11). If not what additional data is required?</p>	<p><b>Para 5.18</b></p>
<p><b>D2/2</b></p>	<p>For Natural England (NE) &amp; applicant</p> <p>Both construction &amp; operation will generate substantial traffic movements with the potential to generate localised air pollution. Has the impact of traffic generated air pollution on the European Sites been considered?</p>	<p><b>Para 6.16, 6.17, 6.18, 8.78</b></p>
<p><b>D2/3</b></p>	<p>Occasional records for bittern have been recorded for North Killingholme Haven Pits (ES Chapter 11, paragraph 11.5.15), although they have been excluded from the HRA because they have not been recorded in either the WeBS data for the site over the last five years or from the ‘Through the Tide Count’ surveys 2010-11. Given the rarity and shyness of bittern, does this provide adequate justification for the exclusion of the species from the HRA?</p>	<p><b>Para 6.17</b></p>
<p><b>D2/4</b></p>	<p>Ruff has been excluded from the HRA because so few birds were recorded either on the foreshore or at North Killingholme Haven Pits. The HRA concluded that, although the numbers recorded represented 1.6% of the population within the Humber Estuary, the area was clearly not important for ruff. Do you agree with this assessment?</p>	<p><b>Para 6.18</b></p>
<p><b>D2/5</b></p>	<p>Is there any realistic prospect of the estuary achieving an annual mean for suspended solids of &lt;25 mg/l (target within Conservation Objectives)? If there is, would the effect of the project prevent the achievement of Favourable</p>	<p><b>Paras 8.80, 8.81</b></p>

	Conservation Status with respect to sea and river lamprey?	
<b>D2/6</b>	The shadow appropriate assessment has reviewed the data on disturbance distances and has selected a distance of 275m (see HRA report, paragraph 6.3.8). It is assumed that any birds within 340 m of the development may experience disturbance. Do you agree with the selection of this distance? If not, what approach would you advise?	<b>Para 8.31</b>
<b>D2/7</b>	What conditions would you advise should be attached to the DCO to avoid or reduce impacts on lamprey? If there are residual impacts after mitigation what compensatory measures could be adopted?	<b>Paras 8.79, 8.81</b>
<b>78</b>	What authorities, whether judicial in origin or based on statements of policy contained in published documents, has Natural England used in its assessment of the project's effects on the integrity and coherence of the European sites? In particular are there authorities that Natural England draws on in its understanding of the terms "integrity" and "coherence"?	<b>Paras 3.24, 7.25, 7.26, 7.27, 7.29, 7.32</b>
<b>79</b>	Has Natural England reviewed the vulnerability of the European sites since first designation?	<b>Paras 7.16, 7.17, 7.18</b>
<b>80</b>	What has Natural England concluded about the cumulative and in combination impacts of the AMEP scheme in relation to other consented or proposed projects and plans affecting the European and Ramsar sites?	<b>Para 8.57</b>
<b>81</b>	Does the statement in paragraphs 65 and 66 of the <i>March 2012 Habitats Review</i> , "Applying a consistent approach to conservation objectives", that "Natural England, working with JNCC, will publish by the end of June 2012 its new approach to increasing the information available on conservation objectives including the features on the sites" have any implications for the current proposal?	<b>Paras 7.22, 7.23</b>
<b>82</b>	The applicant's Habitats Regulation Assessment Report makes multiple references to conservation objectives. In section 5.2.6 these are defined as follows -	<b>(a) Para 7.19</b>

	<p>The conservation objectives for the European sites are, subject to natural change, to maintain the habitats and species described above in favourable condition (or restore it to favourable condition if features are judged to be unfavourable) Natural England (December 2009) (<i>Conservation Objectives and Definitions of Favourable Condition for Designated Features of Interest - Humber Estuary SSSI. Draft Version 2. NE.</i>)</p> <p>In this context –</p> <p>(a) what is the legal status of the 2009 document, cited as still having ‘draft’ status, and is it the correct current authority for Humber conservation objectives?</p> <p>(b) is this document consistent with the sector guidance on port and harbour works set out in the European Commission’s Document: <i>Guidelines on the Implementation of the Birds and Habitats Directives in Estuaries and Coastal Zones</i> (January 2011) and the Commission Staff Working Document: <i>Integrating biodiversity and nature protection into port development</i> (March 2011)?</p> <p>(c) is the ‘no loss’ objective an absolute criterion applied to all proposed development in the area, or is it subject to a minimum threshold, either overall or in relation to specific habitats? If so, how are any thresholds set?</p>	<p><b>(b) Para 7.20</b></p> <p><b>(c) Paras 7.21, 7.29</b></p>
<p><b>83</b></p>	<p>The <i>Conservation Objectives and Definitions of Favourable Condition for Designated Features of Interest - Humber Estuary SSSI. Draft Version 2</i> also show a total of 1644 ha of coastal saltmarsh and 9382 ha of mudflats and sandflats. AMEP’s proposals claim to add 12.3 ha of saltmarsh and cause permanent loss of 40 ha of intertidal mudflat and 13.5 ha of sub-tidal mudflat. In this context –</p> <p>(a) how significant are these changes in the context of the integrity of the European sites?</p> <p>(b) do the proposed compensation measures maintain the coherence of the Natura 2000 network?</p>	<p><b>(a) Para 6.19</b></p> <p><b>(b) Para 8.10</b></p>

<p><b>84</b></p>	<p>In Natural England's assessment</p> <p>(a) within the qualifying species, how many birds are likely to be displaced by disturbance or development as a percentage of each species?</p> <p>(b) how important is the proposed development site in the context of the SPA as a whole?</p> <p>(c) is there sufficient proposed mitigation of the effects of the development (including noise and lighting) on the Havens and the residual areas of foreshore?</p>	<p><b>(a) Para 6.13</b></p> <p><b>(b) See section 5.</b></p> <p><b>(c) Para 8.82</b></p>
<p><b>85</b></p>	<p>How well are the dynamic qualities of the Humber Estuary understood through monitoring and modelling, and what account has Natural England taken of them?</p>	<p><b>Paras 5.7 to 5.9, 5.11</b></p>
<p><b>86</b></p>	<p>What does monitoring show to have been the extent of natural change in the size and characteristics of the European and Ramsar sites since designation?</p>	<p><b>Para 5.12</b></p>
<p><b>87</b></p>	<p>Are there any modelling results showing how further natural change might affect the sites in the future? Specifically, over a ten year period what percentage variation in the formation or loss of saltmarsh and mudflats and sandflats might be expected?</p>	<p><b>Para 5.13</b></p>
<p><b>88</b></p>	<p>In particular, is there data (monitored or modelled) on the rate of transition from inter-tidal mud flat to salt marsh, and are there particular conditions under which this change takes place?</p>	<p><b>Para 5.13</b></p>
<p><b>89</b></p>	<p>The baseline data used for assessing the possible rate of saltmarsh and mudflat creation at Cherry Cobb Sands is apparently no newer than 2008. What weight can be placed upon it?</p>	<p><b>Footnote 24</b></p>
<p><b>90</b></p>	<p>Is the 2:1 ratio for the creation of mudflat habitat to habitat loss (paragraph 1.16.2 of Natural England's Relevant Representation) a standard criterion or one that has been judged appropriate for this site? On what basis is it calculated? Specifically,</p>	<p><b>Paras 8.13 to 8.15</b></p>



	does it include an allowance for the likelihood of some mudflat turning into saltmarsh?	
<b>91</b>	What has been learned from other compensation sites in the Humber Estuary, specifically Chowderness and Paull Holmes Strays? To what extent are they proven to have provided the precise compensation habitat sought in each case?	<b>Para 8.23</b>
<b>92</b>	<p>Paragraph 1.2.1 of the Environmental Statement's Annex 30.1 states that Natural England has stipulated that the compensation site should be located within the Humber middle estuary. In that context –</p> <p>(a) is that statement correct?</p> <p>(b) if so, what was the basis for making this stipulation?</p> <p>(c) in the case of the Immingham Outer Harbour Ro-Ro development, two inter-tidal compensation sites of circa 50 ha were provided outside the middle estuary. Were the criteria for assessing the suitability of these sites the same as for AMEP? If not, how and why did they differ?</p>	<p><b>(a) Para 7.12</b></p> <p><b>(b) Para 7.12</b></p> <p><b>(c) Paras 7.13 to 7.15</b></p>
<b>93</b>	Does Natural England consider that future monitoring requirements should be the subject of either requirements in the DCO or s.106 obligations?	<b>Not applicable.</b>
<b>94</b>	Have Natural England and the applicant reached agreement on the issues set out in paragraph 1.20 of Natural England's Relevant Representation? If not, what is the state of the applicant's progress on each of the matters set out in Appendices 1 to 4 of that representation?	<b>Para 8.51, Table 8.1, Para 8.54</b>
<b>95</b>	What is the current state of discussion and agreement on the draft European Protected Species licence?	<b>Paras 8.34 to 8.45</b>
<b>96</b>	Key species identified as likely to be affected by the proposed development are the black-tailed godwit, redshank and curlew. Have any natural changes in the populations or distributions of these species been observed since the designation	<b>Para 5.22</b>

	of the European sites? If so, what if any reasons can be ascribed to these changes?	
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How the scale of effects on internationally designated nature conservation sites in Britain has been considered in decision making: A review of authoritative decisions  
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**Number 704**

**How the scale of effects on internationally designated nature conservation sites in  
Britain has been considered in decision making:**

**A review of authoritative decisions**

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## Cover note

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# Summary

## Introduction

The implementation of a wide range of plans or projects can affect the wildlife or habitats for which sites have been designated for their nature conservation importance. This report concentrates on internationally designated sites. Because of the level of protection afforded by law and policy to these sites, especially by the *Conservation (Natural Habitats &c) Regulations* 1994 (here referred to as the Habitats Regulations) it is uncommon for them to be threatened by a project that would have major adverse effects on them. However, small scale effects are more common.

A problem that is frequently encountered is how to judge whether these small scale effects on a site may adversely affect the site's integrity, indeed whether they are even significant in light of the conservation objectives for the site. The issue also arises in the context of the review of outstanding consents, which is required in respect of internationally designated sites under the Habitats Regulations. Decisions need to be made as to the significance of the effects of many ongoing projects and incomplete developments, which alone may have very small effects but which, in combination with other projects could have significant effects.

Whilst there is some guidance available, there has been no definitive explanation as to the scale of effect that should be regarded as significant, or how large scale an effect needs to be before it may be regarded as potentially adversely affecting the integrity of a site. In order to assist in future case work, English Nature commissioned this research report to conduct a review of previous legal judgments and Inspectors' decisions and reports in cases where the spatial scale of impacts was material to the conclusions reached.

## Published guidance

The research showed that published guidance explains the general approach to considering whether an effect is likely to be significant, but most does not attempt a quantification of what is a significant effect; none suggest what possible thresholds there might be. Two of the documents make suggestions as to what could be considered to be a significant effect.

## The case studies

After a preliminary analysis of many cases, the study looked at thirteen cases in detail, these are summarised in Table 1 at the end of this Summary. There are six examples of small scale effects of approx 1.0% or less of land take or habitat loss:

- London Gateway Port, Essex 0.1%
- Quay 2005 Hull 0.01% (in fact 0.03 when calculated correctly)
- Gilwern to Hafodyrynys Pipeline South Wales 0.15%
- Dibden Bay Terminal Southampton 0.76%
- The Outer Harbour Immingham 0.145%
- Santoña Marshes, Spain 0.5%

All these have the authority of being Secretary of State decisions except Santoña Marshes which is a ECJ judgment. All concluded a likely significant effect and all determined or

implied an adverse effect on integrity. There is a need to take into account a number of other factors in some cases, but there are three cases that appear to be wholly or largely related to landtake effects / habitat loss. They are Quay 2005, Gilwern and Immingham. Two further cases are important because they too are made by Secretaries of State and both involve landtake as the sole or primary issue, they are Barksore Marshes (1.79%) and Bathside Bay (1.87%).

### **Analysis of consistency of decisions with the guidance**

The key decisions were all taken in accordance with the guidance issued by the EC and the UK Government. There is no inconsistency with English Nature guidance. Where necessary, the decision makers correctly applied the precautionary principle embedded in the law and guidance.

### **Overall conclusions**

The overall conclusion is that each case should continue to be determined on its merits, as it is rare for the Secretary of State or an Inspector to have to determine a simple case of a single, permanent land take from a site. However, it is equally clear that Secretaries of State have held that very small scale losses or changes in habitat are likely to be a significant effect. Indeed they have concluded that very small scale losses, substantially less than 1%, would be an adverse effect on integrity; or at least they could not ascertain there would be no adverse effect on integrity.

Whilst it is concluded that very small scale losses can be decisive in important decisions about project proposals, there must be a point at which an effect may be considered *de minimis*. The term *de minimis* is widely used in a legal sense and is defined by the LAW.COM Dictionary as “*Latin for ‘of minimum importance’ or ‘trifling.’ Essentially it refers to something or a difference that is so little, small, miniscule or tiny that the law does not refer to it and will not consider it.*”

The Gilwern to Hafodyrynys Pipeline is the one case where the longevity of the effect led to the conclusion that a particular small scale effect was *de minimis*. The Secretary of State for Trade and Industry based his conclusions on the small scale of the affected area (0.09%), the short term nature of the effect **and** the degree of certainty that the affected vegetation could be restored to its original quality. Thus, it was concluded that one effect of the pipeline proposal on the Usk Bat Sites cSAC was *de minimis* and the other (long term effect on 0.15% of the site) would be likely to have a significant effect and, indeed, to have an adverse effect on the integrity of the site.

English Nature’s European Sites Guidance advises at paragraph 4.3 that “*the duration of any impact(s) and the potential for recovery/reversibility are important factors to consider when determining whether it is possible to demonstrate no adverse effect on integrity... a conclusion of no adverse effect may be able to be reached in the case of a small-scale effect from which the site/feature can quickly recover... the longer the recovery time the more difficult it will be to demonstrate no adverse effect on integrity.*”

In considering the relevance of the scale of any habitat loss in determining whether there is an adverse effect on site integrity, it should be noted that of the 13 cases included in this research report, only five cases actually quoted the area of habitat lost as a percentage. The



one case that referred to a percentage of habitat lost and concluded no adverse effect on site integrity was Mostyn Docks, which is a decision that looks increasingly doubtful in its application of the Habitats Regulations. The other four cases where percentages were calculated within the Inspector's report and where adverse effect on the integrity of the site was concluded all cited a percentage loss of less than 1.0%. Of the five cases that did include a percentage calculation, three of them were incorrect.

### **Recommended guidelines**

Unless a particular loss of habitat could be regarded as so trivial as to be *de minimis* (see definitions in section 4 above), it is capable of being a significant effect and may also be an adverse effect on the integrity of the site. Bearing in mind the precautionary principle embedded in the legislation, applied consistently by Secretaries of State and endorsed in court judgments, habitat loss of very small scale, including losses in the order of 0.1% or less of a site, can clearly be regarded as an adverse effect on the integrity of a designated site. By definition, the larger the SPA or SAC or Ramsar site, the larger an area would be that is represented by 0.1%, and thus the more important it may be in supporting individual plants or animals, or ecosystems, for which the site is classified, designated or listed. The value of each and every part of a large site is further emphasized when it is considered that all parts of large areas such as estuaries are potentially important because they are very dynamic and different parts of the system are used at differing times for different reasons, by the birds for which they were classified; for habitats that are rare, such as certain types of heathlands, peatlands or orchid-rich calcareous grasslands, every part of a large site is an important part of a globally scarce resource and part of a functional ecosystem.

Equally, whilst a 0.1% loss from a smaller site may represent a small area in spatial terms, it can be important to the ecological functioning of the site which, being a smaller unit, is likely to depend on much smaller ecosystems or communities, in spatial terms. The argument that a small loss does not matter is one that can be repeated until substantial losses have been incurred. This insidious reduction of habitat is as potentially damaging as a single larger loss. Such arguments are supported by the decisions examined in this research.

The cases identified and examined concentrated on single projects (albeit some had many component parts). Only Mawcarse (3.8) and Tideways (3.12) explicitly referred to combined effects with other projects. However, it is logical to conclude that the decision makers would come to the same conclusion about the significance of an effect irrespective of whether the effect was caused by one, ten or a hundred projects. In other words, where small scale effects are caused by a combination of even smaller-scale effects, the overall effect is still significant and can result in an adverse effect on integrity. Thus, even projects that may appear, *prima facie*, to be *de minimis*, may not be when their effects are combined with other, similarly very small scale effects.

The aim should be to avoid any significant disturbance or deterioration or habitat loss, other than trivial or inconsequential loss, from international sites, if projects are to avoid being subject to 'appropriate assessment' and potentially to the tests of regulation 49 of the Habitats Regulations 1994 (Article 6(4) of the Habitats Directive).

## Summary Table of Authoritative Decisions Reviewed

Cases granted after it was concluded that there would not be an adverse effect on site integrity (Paragraphs where the case is referred to in the report are indicated in brackets)			Cases refused after it was concluded that there would be an adverse effect on site integrity			Cases where it was concluded that there would be an adverse effect on integrity but permissions were granted because of imperative reasons of overriding public interest		
Case	% site affected	Comments	Case	% site affected	Comments	Case	% site affected	Comments
<b>White Horse Millenium Landmark (3.13)</b>	0.017-0.056 (actually 0.0076 – 0.0255)	Some additional construction disturbance. The Inspector relied on unconfirmed management measures as mitigation. See comments made by the Inspector in the Dibden Bay inquiry report regarding this case.	<b>Tideways Jetty (3.12)</b>	0.0000774	Disturbance from boats and jet-skis may have been the main concern.	<b>London Gateway (3.7)</b>	0.1	In addition to the direct habitat loss, 1.24% of site would be likely to functionally change as a result of the development. Compensatory measures must be provided because it was concluded that there would be an adverse effect on integrity.
<b>Mostyn Docks (3.9)</b>	0.07 (actually 0.04)	Loss not considered to be significant, but the SPA boundary is now under review as a result of habitat loss. See also comments made by the Inspector in the Dibden Bay inquiry report regarding this case.	<b>Dibden Bay (3.3)</b>	0.76	Habitat loss was compounded by the additional loss of 86 ha supporting habitat and other off site effects.	<b>Bathside Bay Container Terminal (3.2)</b>	1.87	Compensatory measures must be provided because it was concluded that there would be an adverse effect on integrity.
<b>Mawcarse Loch (3.8)</b>	Not calculated – pollution effect	The pollution effect was so reduced by the mitigation proposed that it could be concluded that there was unlikely to be any significant effect.	<b>Santoña Marshes, Spain (3.11)</b>	0.5	A multitude of hydrological changes, disturbance and habitat alteration added to the effects of direct habitat loss.	<b>Port of Hull Quay 2005 (3.10)</b>	0.01 (actually 0.03)	Compensatory measures must be provided because it was concluded that there would be an adverse effect on integrity.
			<b>Barksore Marshes (3.1)</b>	1.79	Habitat loss was clearly determined to have an adverse effect on the integrity of the site.	<b>Immingham Outer Harbour (3.5)</b>	0.145	Compensatory measures must be provided because it was concluded that there would be an adverse effect on integrity.
			<b>Linshaws Quarry (3.6)</b>	0.0000153 (actually 0.00153)	The Secretary of State declined to call this case in, but the local authority still concluded that the development was likely to have a significant effect on the site.	<b>Gilwern to Hafodyrynys Pipeline (3.4)</b>	0.15 AEOI 0.09 mitigated	This case provides an example of what was considered to be <i>de minimis</i> (0.09% of the site that could be restored in the short term) and what was not (0.15% of the site that could be restored only in the long term).

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Research Information Note

# 1 Introduction

## 1.1 Context

The implementation of a wide range of plans or projects can affect the wildlife or habitats for which sites have been designated for their nature conservation importance. They could be sites designated internationally, nationally or more locally. This report concentrates on internationally designated sites. These are Special Protection Areas (SPAs) classified under the EC Birds Directive<sup>1</sup>, Special Areas of Conservation (SACs) designated under the EC Habitats Directive<sup>2</sup> and Ramsar Sites listed under the Ramsar Convention<sup>3</sup>. Because of the level of protection afforded by law and policy to these internationally designated sites<sup>4</sup>, especially by the *Conservation (Natural Habitats &c) Regulations 1994* (here referred to as the Habitats Regulations) it is uncommon for them to be threatened by a project that would have major adverse effects on them. Most project proponents will do all that is possible to avoid adversely affecting such sites.

However, small scale effects are more common, either because the project proponents of a plan or project, which in some cases can be a competent authority, considers them to be so small as to be outweighed by the benefits of the development, or because the effects were not forecast, or because individually the effects are considered inconsequential, even if when combined with other, similar, effects, they would be significant.

A problem that is frequently encountered is how to judge whether these small scale effects on a site may adversely affect the site's integrity, indeed whether they are even significant in light of the conservation objectives for the site. These expressions all carry particular consequences in terms of the decision-making procedures prescribed by the Habitats Regulations (see section 1.4 below). Many factors need to be considered and different assessors can reach differing conclusions about the same proposal. This makes the task of decision-makers, who must apply the law and policy when deciding whether to allow a project to be carried out, very difficult.

The issue also arises in the context of the review of outstanding consents, which is required in respect of internationally designated sites under the Habitats Regulations. Decisions need to be made as to the significance of effects of ongoing projects and incomplete developments, which could potentially have important implications for the implementation of projects.

Whilst there is some guidance available, as summarised below in section 2, there has been no definitive explanation as to the scale of effect that should be regarded as significant, or how large scale an effect needs to be before it may be regarded as potentially adversely affecting the integrity of a site. The courts have rarely addressed the issue, because they tend to

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<sup>1</sup> Council Directive of 2/4/79 on the conservation of wild birds (79/409/EEC)

<sup>2</sup> Council Directive of 21/5/92 on the conservation of natural habitats and of wild fauna and flora (92/43/EEC)

<sup>3</sup> Convention on wetlands of international importance especially as waterfowl habitat, Ramsar, Iran 2/2/71 as amended by the Paris protocol 3/12/92 and the Regina amendments adopted at the extraordinary conference of contracting parties at Regina, Saskatchewan, Canada, between 28/5 and 3/6/87.

<sup>4</sup> European sites (SPAs and SACs) are protected by the Conservation (Natural Habitats &c) Regulations 1994, as amended, which transpose the requirements of the EC Birds and Habitats Directive into domestic law. As a matter of Government policy, expressed, for example, in *Planning Policy Statement 9 Biodiversity and Geological Conservation*, (Office of the Deputy Prime Minister, 2005), Ramsar sites are to be treated as if they are fully designated European sites for the purposes of considering development proposals that may affect them.

consider the lawfulness of decisions from a procedural point of view. They are generally reluctant to substitute their judgment for that of the decision maker in terms of the science and merits of a decision, unless it is clearly irrational or perverse.

## **1.2 The brief**

In order to assist in future case work, English Nature commissioned this research report with the following objectives. To conduct a review of previous legal judgments and Inspectors' decisions and reports in cases where the spatial scale of impacts was material to the conclusions reached. In undertaking the research we have done so whether or not the issue of scale was determinative in the decision. The cases reviewed have been limited to legal judgments, decisions by Secretaries of State (or the Scottish Ministers or Welsh Assembly Government) and Inspector decisions and reports, because these are considered to be the most authoritative. That is, they tend to be the cases which are cited to other decision-makers as precedents, or authoritative decisions that should be regarded as a guide as to how other decisions should be made. The Brief required a general review of the EU and government guidance to be included. It also requested, as far as reasonably possible, some rules of thumb that could be used by practitioners. The Brief also required an analysis to see whether there is evidence of a difference in the range of areas affected between those cases where the plan or project was permitted, compared to those where it was not.

## **1.3 Research method**

The researchers compiled a list of potentially relevant cases drawn from their own library of decisions, their empirical knowledge of case work and suggestions from officers in the Countryside Council for Wales (CCW), English Nature and Scottish Natural Heritage (SNH).

Each decision was examined and a summary prepared to standardise the information collated about each case. This included a description of the development and its location; the date of decision and decision maker; the area of the designated site, its habitats and sensitivities to the proposed change; the loss of habitat from the site and other relevant effects on the designated interest features; the decision and reasoning for it; whether there was considered to be a likely significant effect on the site, an adverse effect on the integrity of the site and, where relevant, whether there were considered to be alternative solutions or imperative reasons of overriding public interest; and, finally, whether any compensatory measures were proposed. Quotations were drawn from the decision letters and Inspectors' reports and points for discussion noted.

After consideration of each case a working table summarising the findings was generated and discussed before this report was drafted. Table 1 is a modified version of that Table omitting some cases that were researched but not reported, as they did not contribute to the purpose of the study. It should be noted that the report only includes the cases where the loss of small areas of habitat in the designated sites were considered to be relevant to the decision. Cases involving only larger scale losses or indirect effects such as disturbance have not been included.

## 1.4 Decision-making procedure of the Habitats Regulations

Small scale effects are relevant in the assessment of plans and projects that may have an effect on proposed or designated European sites or Ramsar sites at three main stages: firstly, when considering whether there is likely to be a significant effect on the site; secondly, when undertaking the ‘appropriate assessment’; and thirdly, when deciding whether it can be ascertained that there would not be an adverse effect on site integrity. The procedures under Regulation 48 of the Habitats Regulations 1994 are briefly outlined below to provide a context for the analysis of cases that follows. Further guidance on the procedures is found in the Government Circular: *Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System*. ODPM Circular 06/2005.

The approach equally applies to any plan or project for which a competent authority has given any consent, permission or authorisation prior to the classification of a European site (or prior to the commencement of the Habitats Regulations), if such a consent would be subject to Regulation 48 procedures if it was to be considered now. This is often referred to as the ‘review of consents’ process. Regulation 50 of the Habitats Regulations requires that competent authorities review existing decisions and affirm, modify or revoke any consent to the extent necessary to avoid any adverse effect on the integrity of a European site.

The approach to be taken in considering a development proposal that might affect a proposed or classified European site or a listed Ramsar site is set out below. This process is required by the Habitats Regulations and is summarised in the flow chart in Figure 1 of the Circular.

The decision-taker must first establish whether the proposed development is directly connected with or necessary to site management for nature conservation<sup>5</sup> of a proposed or classified European site or a listed Ramsar site. There will be few cases where a development is directly connected with, or the whole of the development is necessary to, site management and, therefore, not further subject to the requirements of Regulation 48.

### 1.4.1 Likely significant effect

If it is not directly connected with or necessary to site management the decision-taker must determine whether the proposal is likely to have a significant effect<sup>6</sup> on the site. The decision on whether an appropriate assessment is necessary should be made on a precautionary basis. This is in line with the European Court of Justice in Case C-127/02 (the Waddenzee judgment)<sup>7</sup>, which states that “*any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site’s conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects.*” Taking account of advice from the statutory nature conservation body<sup>8</sup>, they should consider whether the effect of the proposal on the site, either individually or in combination with other proposals<sup>9</sup>, is likely to be significant in terms of the ecological objectives for which the site was designated, classified or listed.

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<sup>5</sup> *The Conservation (Natural Habitats &c) Regulations 1994* Regulation 48(1)(b)

<sup>6</sup> *ibid* Regulation 48(1)(a)

<sup>7</sup> Landelijke Vereniging tot Behoud Van de Waddenzee, Nederlandse v Vereniging tot Bescherming von Vogels v Straatssecretaris Van Landbouw, Natuurbeheer en Visserij (C-127/02: [2005] Env. LR14 [ECJ])

<sup>8</sup> The statutory nature conservation body in England is English Nature (Natural England from October 2006)

<sup>9</sup> *The Conservation (Natural Habitats &c) Regulations 1994* Regulation 48(1)(a)

The decision-taker should require the proposer to provide further information reasonably necessary to assess the likelihood and significance of potential effects, and therefore whether an ‘appropriate assessment’ is required<sup>10</sup>. It is important that the likelihood of a significant effect is assessed in respect of each interest feature, for which the site is internationally classified, and for each designation where a site is designated, classified or listed under more than one international obligation.

If a plan or project would not be likely to have a significant effect on the site alone, it should nevertheless be considered in combination with other plans and projects to establish whether there would be likely to be a significant effect arising from their combined impacts.

#### **1.4.2 The appropriate assessment**

If the decision-taker concludes that a proposed development not directly connected with site management is likely to significantly affect a proposed or classified European site or a listed Ramsar site, they must make an appropriate assessment of the implications of the proposal for the site in view of the site's conservation objectives<sup>11</sup>. These relate to each of the interest features for which the site was designated, classified or listed and will be provided in more detail by the statutory nature conservation body. The scope and content of an appropriate assessment will depend on the nature, location, duration and scale of the proposed project and the interest features of the relevant site. It is important that an appropriate assessment is made in respect of each interest feature and for each designation where a site is designated, classified or listed under more than one international obligation. The decision-taker can require the applicant to provide such information as may reasonably be required to undertake the assessment<sup>12</sup>.

In the Waddenzee judgement, the European Court of Justice ruled that an appropriate assessment implies that **all** the aspects of a plan or project which can, by themselves or in combination with other plans or projects, affect the site's conservation objectives must be identified in the light of the best scientific knowledge in the field.

As part of the assessment process, the decision-taker must consult the statutory nature conservation body<sup>13</sup>. The decision-taker must have regard to any representations made by it. They may also consult the general public<sup>14</sup>.

#### **1.4.3 Ascertaining the effect on site integrity**

In the light of the conclusions of the assessment about the project's effects in view of the site's conservation objectives, the decision-taker must determine whether it can ascertain that the proposal will not adversely affect the integrity of the site(s)<sup>15</sup>. This test incorporates the precautionary principle. It is not for the decision-taker to show that the proposal would harm the site, in order to refuse the proposal. It is for the decision-taker to consider the likely and reasonably foreseeable effects and to ascertain that the proposal will not have an adverse

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<sup>10</sup> *ibid* Regulation 48(2)

<sup>11</sup> *The Conservation (Natural Habitats &c) Regulations 1994* Regulation 48(1)

<sup>12</sup> *ibid.* Regulation 48(2)

<sup>13</sup> *ibid.* Regulation 48(3)

<sup>14</sup> *ibid.* Regulation 48(4)

<sup>15</sup> *ibid* Regulation 48(5)

effect on the integrity of the site before it may grant permission. If the proposal would adversely affect integrity, **or the effects on integrity are uncertain but could be significant**<sup>16</sup>, the decision-taker should not grant permission, subject to the provisions of regulations 49 and 53, which relate to alternative solutions, imperative reasons of overriding public interest and compensatory measures. These are not discussed further in this report because they are not relevant to the project.

In the Waddenzee judgement, the European Court of Justice ruled that a plan or project may be authorised only if a competent authority has made **certain** that the plan or project will not adversely affect the integrity of the site. “*That is the case where **no reasonable scientific doubt** remains as to the absence of such effects.*” Competent authorities must be “**convinced**” that there will not be an adverse effect and where doubt remains as to the absence of adverse effects, the plan or project must not be authorised, subject to the procedure outlined in Article 6(4) of the EC Habitats Directive regarding imperative reasons of overriding public interest<sup>17</sup>.

The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified, designated or listed<sup>18</sup>.

In determining the effect on site integrity, the advice of the statutory nature conservation body and the citation issued by it saying why the site was designated, classified or listed will need to be carefully considered.

#### **1.4.4 Considering conditions or other restrictions**

As part of the judgement on integrity, the decision-taker must consider the way in which it is proposed to carry out the project and whether conditions or other restrictions would enable it to be ascertained that site integrity will not be adversely affected<sup>19</sup>. The decision-taker should consider whether a consent could be issued in accordance with regulation 48 subject to conditions. In practice, this means that it should identify the potential risks so far as they may be reasonably foreseeable in light of such information as can reasonably be obtained, and put in place a legally enforceable framework with a view to preventing the risks from materialising<sup>20</sup>. The principle established by the European Court of Justice ‘Waddensee judgment,’<sup>21</sup> that a competent authority must be “convinced” that there will not be adverse effects, applies equally to situations where the conclusion relies on conditions or restrictions identified in accordance with Regulation 48(6) of the Habitats Regulations.

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<sup>16</sup>See **ADT Auctions Ltd v Secretary of State Environment, Transport and the Regions and Hart District Council** (2000) JPL 1155 at p. 1171 where it was held that, it was implicit in the wording of regulation 48(5) that the adverse effect on the integrity of the site had to be a significant adverse effect.

<sup>17</sup> *The Conservation (Natural Habitats &c) Regulations 1994* Regulation 49 and paragraphs 25-28.

<sup>18</sup> Government Circular: *Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System*. ODPM Circular 06/2005

<sup>19</sup>*The Conservation (Natural Habitats &c) Regulations 1994* Regulation 48(6)

<sup>20</sup> See **WWF-UK Ltd and RSPB – v – Secretary of State for Scotland and others** [1999]1 C.M.L.R. 1021 [1999] Env. L.R. 632 opinion of Lord Nimmo-Smith

<sup>21</sup> *Landelijke Vereniging tot Behoud Van de Waddenzee, Nederlandse v Vereniging tot Bescherming van Vogels v Straatssecretaris Van Landbouw, Natuurbeheer en Visserij* (C-127/02: [2005] Env. LR14 [ECJ])



## **2 Guidance for decision-makers on small scale effects**

### **2.1 The principal sources of guidance for decision-makers**

The main sources of guidance in England and Wales currently available for use by decision makers determining whether consent should be given for plans or projects, with regard to international sites are as follows:

1. European Community, 2000, *Managing Natura 2000 Sites: The provisions of Article 6 of the Habitats Directive 92/43/EEC* (abbreviated here to MN2000), section 4
2. European Community, 2001, *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: methodological guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC* (abbreviated here to EC2001), sections 3.1 and 3.2
3. Office of the Deputy Prime Minister and the Department for Environment and Rural Affairs, 2005, Circular 06/2005 and 02/2005 respectively *Biodiversity and Geological Conservation – Statutory Obligations and Their Impact Within The Planning System* (referred to above and below as ‘the Circular’), Part 1 section B
4. Welsh Assembly Government, 2006, *Consultation on Draft Technical Advice Note 5 ‘Nature Conservation and Planning’* (abbreviated here to Draft TAN5) Annex 3
5. English Nature and others, *Habitats Regulations Guidance Note 1. The Appropriate Assessment (Regulation 48), the Conservation (Natural Habitats &c) Regulations 1994*. Peterborough: English Nature, (abbreviated here to HRGN1)
6. English Nature and others, *Habitats Regulations Guidance Note 3. The Determination of Likely Significant Effect under the Conservation (Natural Habitats &c) Regulations 1994*. Peterborough: English Nature, (abbreviated here to HRGN3)
7. Chapman, C. and Philp, C. 2004. *European Sites Guidance – Internal Guidance to Decisions on ‘Site Integrity’: a Framework for Provision of Advice to Competent Authorities.* Peterborough: English Nature.

### **2.2 Summary of guidance on determining likely significant effect and adverse impact on site integrity within the available guidance documents**

The guidance explains the general approach to considering whether an effect is likely to be significant, but most does not attempt a quantification of what is a significant effect; none suggest what possible thresholds there might be. Two of the documents listed do, however, make suggestions as to what could be considered to be a significant effect. MN2000 considers the different habitat types to which the significant effect test may be applied, suggesting the scale of the interest feature, be it landscape wide or relating to specific botanical rarities, could guide the interpretation of significant effect. English Nature’s HRGN3 infers that any direct habitat loss should be considered as a likely significant effect, but that some exceptions may occur. Again the habitat type is suggested to be the governing factor. It should be noted that although HRGN3 is published by English Nature, an endnote indicates that “*this guidance note was developed by the country agencies [including CCW and SNH] for the Government’s inter-departmental steering group on the Habitats Directive and approved by it.*”

The specific guidance offered, and pertinent quotes from each of the documents are summarised below.

### **2.2.1 European Community, 2000, *Managing Natura 2000 Sites: The provisions of Article 6 of the Habitats Directive 92/43/EEC***

Section 4 of this document does provide some guidance as to what is a “significant” effect. The Habitats Regulations do not offer any quantification of what is significant, but the MN2000 document suggests that the term needs to be used objectively and consistently, and goes on to clarify that an objective approach must be taken whilst also having regard to the specific features of interest and conservation objectives of the site, which will inevitably lead to conclusions whereby an effect may be significant on one site but may not be in relation to a different site. The key quotation from this text, which suggests what may or may not constitute a significant effect is at paragraph 4.4.1. The inference is that the scale of the habitat may influence whether or not an effect is considered significant.

*“For example, a loss of a hundred square metres of habitat may be significant in relation to a small rare orchid site, while a similar loss in a large steppic site may be insignificant.”*

The guidance goes on to explain that there may be a range of influencing factors in the determination of significant effect, and that these include the extent, magnitude, complexity, probability, duration, frequency and reversibility of the impact, and the impact can be within or outside the European site boundary.

The guidance advises on the scope of an appropriate assessment, and an important point to note is that the guidance states at paragraph 4.5.2 that *“mitigation measures are an integral part of the specifications of a plan or project. They may be proposed by the plan or project proponent and/or required by the competent national authorities.”*

At paragraph 4.6.3 the MN2000 guidance explains that ‘integrity of the site’ should be focussed on the specific site and the interest feature present, and should not consider any wider context such as the national or European status of the interest feature. It further explains that ‘integrity’ *“can be considered as a quality or condition of being whole or complete. In a dynamic ecological context, it can also be considered as having the sense of resilience and ability to evolve in ways that are favourable to conservation... A site can be described as having a high degree of integrity where the inherent potential for meeting site conservation objectives is realised, the capacity for self-repair and self-renewal under dynamic conditions is maintained, and a minimum of external management support is required.”*

### **2.2.2 European Community, 2001, *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: methodological guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC***

Guidance on what could constitute a significant effect is not specifically stated within this document, but advice is given as to what information is necessary in order to make a prediction on the magnitude of any effects. The list within Appendix 1, section 3.2 includes:

- A good understanding of the proposed development
- Detailed predictions of physical and chemical changes as a result of the proposal

- What decision variables are possible
- Knowledge of the site habitats
- Knowledge of outcomes of similar projects
- Knowledge of any potential cumulative effects when other plans or projects are taken into account.

With reference to the assessment of significance, it is stated in Appendix 1, Section 4 that “*In most cases this is essentially a judgement, built up from a number of factors, but it may also be made more objective with the use of criteria and standards.*” Factors upon which the assessment of significance should be based are listed, including:

- The character and perceived value of the environment
- Magnitude, duration and extent
- Environmental resilience
- Accuracy of predictions
- Existing policies, programmes and plans
- Current environmental standards that can assess the impacts quantitatively
- The degree of public interest
- The scope for suitable mitigation, sustainability and reversibility.

Little specific reference is made to what constitutes site integrity, but mention is made at section 3.2.6 in Figure. 4, which is an illustration of an example of an appropriate assessment, where it is stated the integrity of the site is “*determined by structure and function and conservation objectives.*”

### **2.2.3 Office of the Deputy Prime Minister and the Department for Environment and Rural Affairs, 2005, Circular 06/2005 and 02/2005 respectively *Biodiversity and Geological Conservation – Statutory Obligations and Their Impact Within The Planning System***

The Circular advises that significant effect should be assessed in terms of the conservation objectives for which the site was classified, and places emphasis on the precautionary principle, stating at Paragraph 13 that “*An appropriate assessment is required where there is a probability or risk that the plan or project will have significant effects.*”

The Circular does not provide any further indication of what could be an appropriate assessment, but does explain that the decision maker must decide whether it can be ascertained that the plan or project will not adversely affect site integrity, and a useful description of what constitutes site integrity is provided at Paragraph 20. “*The integrity of a site is the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it is classified... Competent national authorities must be ‘convinced’ that there will not be an adverse effect and where doubt remains as to the absence of adverse effects, the plan or project must not be authorised.*”

#### **2.2.4 Welsh Assembly Government, 2006, *Consultation on Draft Technical Advice Note 5 ‘Nature Conservation and Planning’***

The draft TAN 5 provides wording that is very similar to the Circular, as discussed above, and does not add anything further to the consideration of what constitutes a likely significant effect.

#### **2.2.5 English Nature and others, *Habitats Regulations Guidance Note 1. The Appropriate Assessment (Regulation 48), the Conservation (Natural Habitats &c) Regulations 1994*. Peterborough: English Nature.**

This guidance offers English Nature staff more detailed advice as to who undertakes appropriate assessments, when and what should be included. It explains that an appropriate assessment must be undertaken by the competent authority when a plan or project is likely to have a significant effect on a European site, either alone or in combination. The guidance given in terms of likely significant effect is that “*the plan or project does not have to be located within the designated area*” and that “*effects may be direct or indirect, temporary or permanent, beneficial or harmful to the site, or a combination of these.*”

With regard to adverse effect on integrity, the guidance explains that “*An adverse effect on integrity is likely to be one which prevents the site from making the same contribution to favourable conservation status for the relevant feature as it did at the time of its designation.*”

#### **2.2.6 English Nature and others, *Habitats Regulations Guidance Note 3. The Determination of Likely Significant Effect under the Conservation (Natural Habitats &c) Regulations 1994***

This provides more guidance on the test of significance than the other documents reviewed above. It explains that “*The ‘significance’ test acts as a course filter for all proposed plans and projects which are not directly connected with or necessary to the management of the site (whether or not the effect is likely to be adverse or beneficial) so directing attention to those which require further assessment.*” and that a judgement of likely significant effect “*must be based on sound judgement and bear scientific or expert scrutiny.*”

The guidance clearly states that any effect on the conservation objectives of a site that is not trivial or inconsequential must be considered to be a likely significant effect, which provides a greater certainty to English Nature staff providing advice to competent authorities. “*Likely significant effect is, in this context, any effect that may reasonably be predicted as a consequence of a plan or project that may affect the conservation objectives of the features for which the site was designated, but excluding trivial or inconsequential effects.*”

Some quantification is suggested by the guidance, and as with the MN2000 document it is the habitat type that is suggested as a determining factor in assessing the likely significant effect of any plan or project. The guidance infers a presumption that all habitat loss is a likely significant effect, but that in some exceptions the loss of a few metres of habitat could be considered to not amount to a likely significant effect. “*Permanent reductions in habitat area or species populations are likely to be significant unless they are very small scale. In the case of certain sites a loss of, say, a few square metres of the site area may not be considered significant (for example, there may be circumstances when this might apply in the*

case of estuarine SPAs which are selected for their bird interest), in others, such as limestone pavement, *any* further loss of the area of qualifying interest may be unacceptable.”

**2.2.7 Chapman, C. and Philp, C. 2004. *European Sites Guidance – Internal Guidance to Decisions on ‘Site Integrity’: a Framework for Provision of Advice to Competent Authorities.* Peterborough: English Nature.**

This internal guidance for English Nature staff gives more detailed guidance as to what constitutes an ‘adverse effect on site integrity.’ It considers that the definition of integrity should be determined in the context of delivering Favourable Conservation Status, and refers to Article 1 of the Habitats Directive for an explanation of Favourable Conservation Status. The guidance lists extracts that define Favourable Conservation Status from the Directive, and of those extracts, the points most relevant to this study are:

*“For habitats, their range and area must be stable or increasing”*

and

*“For species, the natural range is stable and likely to continue to be, and there is and will probably continue to be a sufficiently large habitat to maintain its population on a long term basis.”*

Other examples of relevant guidance within the document includes *“When looking at the ‘integrity of the site’ it is important to take into account a range of factors, including the possibility of effects manifesting themselves in the short, medium and long term”* and also in its explanation of the precautionary approach, the guidance cautions that *“advice provided must be reasonable and based upon information attributing foreseeable risk of a causal effect.”* The guidance also provides a checklist of questions to be addressed when considering whether the integrity of a site is likely to be affected.

## **3 The case studies**

### **3.1 Barksore Marshes**

#### **3.1.1 Description of development**

The reclamation of land by the deposit of river dredgings on land at Barksore Marshes. The existing planning permission was reviewed under Regulation 55 of the Conservation (Natural Habitats & c.) Regulations 1994 and an order made, partly modifying and partly revoking the permission.

#### **3.1.2 Location**

Land at Barksore Marshes, Lower Halstow, Sittingbourne, Kent.

#### **3.1.3 Date of decision**

9 November 1998

### **3.1.4 Decision maker**

The Secretary of State following the recommendations of Inspector Michael Hurley after a public inquiry.

### **3.1.5 Area of designated site**

The proposal had the potential to affect the Medway Estuary and Marshes SPA/Ramsar site, which totals 4,684.36 ha (4696.74 ha for the Ramsar site)<sup>22</sup>.

### **3.1.6 Area of habitat affected**

The continued deposit of dredgings in accordance with the planning permission would destroy the value of the land as supporting habitat for avocet *Recurvirostra avosetta*. The completion of the planning permission would have directly affected 16.5% of the grazing marsh within the SPA. The development site consisted of 104 ha of land, 20 ha of which was not classified as either SPA/Ramsar. The proposal therefore affected 84ha of SPA/Ramsar. Based on these figures the affected area equates to 1.79% of the SPA/Ramsar. The percentage of affected area has been calculated for the purposes of this research report. Whilst the areas of land affected were stated, the actual percentage of SPA/Ramsar land affected was not quoted within the Inspector's report.

### **3.1.7 Type of habitat affected – its importance and sensitivity**

Barksore Marshes are included within the SPA for their populations of waders and terns, in particular the breeding pairs of avocet, with the Inspector's report indicating that 76% of the SPA population of avocet bred within the Barksore/Funton area (1/IR 6.4<sup>23</sup>). Grazing marsh is one of the diversity of habitat types within the SPA, along with saltmarsh, and estuarine mud flats and eelgrass beds.

### **3.1.8 Decision**

The Secretary of State confirmed the Order made by Kent County Council (with a very minor modification), as recommended by the Inspector. The effect of the Order was to revoke the planning permission for all areas within the SPA, and modify the permission for the area outside, but adjacent to the SPA.

The Inspector was in no doubt that the loss of 84ha of the habitat within the SPA holding 76% of the SPA population of an Annex 1 species would be likely to have an adverse effect on the integrity of the site. The area of land equates to 1.76% of the SPA, but is 16.5% of the grazing marsh resource within the SPA, and holds the majority of the breeding pairs of avocets within the SPA.

*“I note that the development of the Order land could result in the loss of 16.5% of the grazing marsh in the SPA. That does not seem to me to be an insignificant proportion; I am aware of no policy guidance to suggest that even smaller losses (of, say, 5% or 1%) of a*

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<sup>22</sup> <http://www.jncc.gov.uk/page-4> and Colin McLeod, JNCC, pers comm.

<sup>23</sup> This format of reference is used throughout the remainder of this report to denote the case number (first number) in the Table of Cases in Appendix A, followed after the oblique by the relevant paragraph numbering either the Inspector's Report (IR) or Secretary of State's Letter (SoSL).

*valued habitat type within an SPA should be regarded as being acceptable. Habitats can be as much affected by a number of small losses as by one major reduction” (1/IR 6.7).*

*“Further disposal of dredgings at Barksore Marshes would be likely to have an adverse effect on the integrity of the SPA. I am certainly unable to conclude that there would be no such effect” (1/IR 6.8).*

In his letter the Secretary of State agreed with the Inspector’s conclusions and concluded that the case did not present any overriding reasons of public interest for which the development should be allowed to continue. The Secretary of State recognised *“the importance of the Port of Medway and that continued dredging is imperative for its continued success. However, he agrees with the Inspector that there are practicable alternative solutions for the disposal of dredgings and that the extra cost involved would be unlikely to jeopardise the commercial success of the port. He therefore concludes that there are no reasons of overriding public interest for the continued deposit of dredgings at Barksore Marshes.”* (1/SoSL 7)

## **3.2 Bathside Bay**

### **3.2.1 Description of development**

An application for a Harbour Revision Order and planning permission (together with other associated consents) for the development of an operational container port, including the construction of a quay wall, construction of a container handling and stacking facility, associated infrastructure, reclamation of inter-tidal area, realignment of sea wall and channel dredging.

### **3.2.2 Location**

The main development was located at Bathside Bay, Harwich, with the proposed compensatory habitat works being located at Little Oakley, Hamford Water.

### **3.2.3 Date of decision**

The Secretary of State issued a decision letter on 29 March 2006, authorising the Harbour Revision Order and also granting consent for the construction of the quay wall, breaching of the sea wall and channel dredging. The Secretary of State agreed with the Inspector’s conclusions that the project would have an adverse effect on the integrity of the European site, that there were no alternative solutions and that there were imperative reasons of overriding public interest for the authorisation of the Order and other consents.

### **3.2.4 Decision maker**

The Secretary of State, based on Inspector Ken Smith’s report following a public inquiry, which recommended that the Order should be made and the planning permission and other consents granted.

### **3.2.5 Area of designated site**

The Stour and Orwell Estuaries SPA/Ramsar is 3,676.92 ha. At the time of the Public Inquiry, part of the site was proposed SPA (pSPA).

### 3.2.6 Area of habitat affected

As a result of the development, 69 ha of habitat within the Stour and Orwell Estuaries SPA would be lost within the Bathside Bay area of the SPA. This loss would be permanent as a result of the port construction works. The area lost equates to 1.87% of the Stour and Orwell Estuaries SPA and Stour and Orwell Estuaries pSPA. The Inspector does not make reference to any percentage figures in his report. The percentage of affected area has been calculated for the purposes of this research report.

### 3.2.7 Type of habitat affected – its importance and sensitivity

The Stour and Orwell Estuaries SPA comprises mainly mudflats, low cliffs, grazing marsh and vegetated shingle. It is classified for over-wintering hen harrier *Circus cyaneus* and the following Annex 1 waterfowl species as over-wintering populations: black-tailed godwit *Limosa limosa islandica*, dunlin *Calidris alpina alpina*, grey plover *Pluvialis squatarola*, pintail *Anas acuta*, redshank *Tringa totanus*, ringed plover *Charadrius hiaticula*, shelduck *Tadorna tadorna* and turnstone *Arenaria interpres*<sup>24</sup>.

### 3.2.8 Decision

All relevant parties agreed a significant effect was likely and that there would be an adverse effect on the integrity of the site. *“In this case, there is no dispute that the BBCT proposal would adversely affect the integrity of a European site. Therefore we must move in the decision making process to regulation 49”* (2/IR 18.23).

With no alternative solutions it was recommended by the Inspector that there were imperative reasons of overriding public interest. Compensatory measures that would adequately compensate for the loss of habitat supporting SPA birds were agreed between all parties. The package also included mitigation and compensation measures for wildlife species that are not SPA features. A proposed sediment replacement programme is also a complementary proposal that should result in *“a decrease in the background rate of intertidal erosion in the estuarine system”* (2/IR 18.442).

## 3.3 Dibden Bay

### 3.3.1 Description of development

An application for a Harbour Revision Order, an Order under the Transport and Works Act, and a planning permission (together with other associated consents) for the development of an operational container port, with deep water terminal at Dibden Bay, the ‘Dibden Terminal,’ as an extension to the Port of Southampton. The development included a 1,850m quay and associated infrastructure.

### 3.3.2 Location

Dibden Bay, Southampton Water, New Forest District, Hampshire.

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<sup>24</sup> <http://www.jncc.gov.uk/page-4>



### 3.3.3 Date of decision

20 April 2004.

### 3.3.4 Decision maker

The Secretary of State for Transport and First Secretary of State who declined to make the orders and issued refusals of consent, in accordance with the recommendations of the Inspector, Mr Michael Hurley, following a 54 week long Public Inquiry in 2001.

### 3.3.5 Area of designated site

The Solent and Southampton Water SPA and Ramsar site is 5,505.86 ha of estuarine and coastal habitats. It should be noted that this case study relates only to the SPA and not to the SACs that would also have been adversely affected by the proposed port development and associated works. The effects on the SACs were more complex and involved either or both indirect effects and large scale habitat change.

### 3.3.6 Area of habitat affected

The proposal would result in a direct loss of intertidal habitat within the SPA at the quay wall amounting to about 42 ha, together with indirect effects of a loss of a further 3 ha arising from a reduction in tidal range and a further predicted loss of 10ha as a result of increased erosion over a 50 year period, which makes a total of 55ha. However, the SPA is classified only down to Mean Low Water (MLW). An extensive area of habitat below MLW, and therefore not in the SPA but considered by the Inspector to still be important to the species for which the SPA is classified would also be lost. The Inspector explained that *“The Dibden foreshore below MLW provides a habitat that is similar to the foreshore within the international nature conservation sites. Together with the adjacent shallow sub-tidal area, it helps support populations of waterfowl for which the SPA and Ramsar Site have been designated. The destruction of this habitat is unavoidable if the Dibden Terminal project is to proceed. This would have an adverse effect on the integrity of both these international sites, unless the impact could be mitigated by the provision of alternative supporting habitat. The area lost would be 34 ha between MLW and LAT; and a further 52 ha of shallow sub-tidal”* (3/IR 7.149).

The Inspector explained how he considered the mitigation proposals put forward to be compensatory measures rather than mitigation, because the proposed measures could not mitigate the adverse impacts of the development proposal. He states that *“In my view, the creation of new habitat outside a classified site cannot avoid or reduce the damage to the integrity of that site that would result from the destruction of existing protected habitat. The best that habitat creation could do in these circumstances is make restitution for the damage done (and there may well be a degree of uncertainty about its potential effectiveness in doing that). It would not mitigate the adverse impact on the site’s integrity, but might redress or compensate for the harm that would be sustained”* (3/IR 36.176).

Thus, with a total area of 5,505.86 ha the loss from the SPA of 55 ha amounts to about 1.0 % of the SPA. This percentage was not included within the Inspector’s report but was calculated for the purposes of this research report. The total area of non-SPA habitat supporting Annex 1 species for which the SPA is classified would have been 86 ha but this is not included in the calculated direct loss as it is not in the classified area.

### **3.3.7 Type of habitat affected – its importance and sensitivity**

The SPA contains mudflats and saltmarshes, complimented by coastal habitats including saline lagoons, shingle beach, reedbed and grazing marsh. They are classified for the following Annex 1 breeding birds: common tern *Sterna hirundo*, little tern *Sterna albifrons*, Mediterranean gull *Larus melanocephalus*, roseate tern *Sterna dougallii* and sandwich tern *Sterna sandvicensis*; and for over-wintering populations of black-tailed godwit *Limosa limosa islandica*, teal *Anas crecca*, ringed plover *Charadrius hiaticula* and dark-bellied brent goose *Branta bernicla bernicla*<sup>25</sup>.

### **3.3.8 Decision**

The Inspector advised the Secretary of State that there would be an adverse impact on the integrity of the designated site, that the applicant's appropriate assessment was inadequate, and that offsetting measures proposed would not be adequate mitigation to remove the adverse effect on integrity. He also advised that the measures would not be adequate should they be considered as compensatory measures under Regulation 53 of the Habitats Regulations.

In drawing his conclusions the inspector gives weight to the habitat loss outside the designated sites as well as the direct loss from within the SPA boundaries, stating that “*There would also be a direct loss of some 53ha of shallow sub-tidal habitat. No part of this area is within the boundary of any European site. Nevertheless, it provides a feeding resource for various fish eating birds, which are part of the assemblage for which the SPA was classified*” (3/IR 36.208).

## **3.4 Gilwern to Hafodyrynys Pipeline**

### **3.4.1 Description of development**

The installation of a 25 km long and 600mm diameter, gas pipeline from the installation at Gilwern to the installation at Hafodyrynys, in order to improve gas supplies to southern Wales.

### **3.4.2 Location**

Gilwern to Hafodyrynys, Fynwy and Monmouthshire, Wales.

### **3.4.3 Date of decision**

3 July 2002.

### **3.4.4 Decision maker**

The Secretary of State for Trade and Industry granted consent in accordance with Regulation 14(4)(a) of the Gas Transporter Pipe-line Works (Environmental Impact Assessment) Regulations 1999, after undertaking an appropriate assessment of the pipeline proposal.

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<sup>25</sup> <http://www.jncc.gov.uk/page-4>

### 3.4.5 Area of designated site

The Usk Bat Sites SAC is 1,686.4 ha<sup>26</sup>, it was a candidate SAC at the time when the project was being considered by the Secretary of State.

### 3.4.6 Area of habitat affected

The Usk Bat Sites SAC is 1,686.4 ha, of which 350 ha is European Dry Heath, a qualifying feature of the cSAC, but the primary reason for site selection was the presence of populations of lesser horseshoe bat *Rhinolophus hipposideros*. Caves not open to the public are also a qualifying Annex 1 feature. The appropriate assessment details impacts on the European Dry Heath in terms of direct removal of 2.5ha of this habitat type, and a potential for disturbance to the caves or their lesser horseshoe bats.

1 ha of the affected area was to be subject to turfing, ie the heathland turfs would be removed, the pipeline laid and the turfs replaced. The Secretary of State for Trade and Industry determined that this would not represent an adverse effect on integrity. The remaining 1.5 ha could not be turfed and the top soil was to be stripped, thus irreparably damaging the existing heathland vegetation and requiring heathland recreation by new planting and seeding.

The affected area of 2.5 ha is 0.15% of the total SAC. It was concluded that the effects on 1 ha of the total 2.5 ha could be mitigated, leaving 1.5 ha of affected habitat that could not be mitigated. There was therefore an unmitigated loss of 1.5ha of heath, equating to 0.09% of the total SAC. 2.5 ha is 0.71% of the area of European Dry Heath within the SAC<sup>27</sup> and the 1.5 ha represents 0.43% of the area of European Dry Heath within the SAC .

No adverse effect on integrity was considered to arise in relation to the lesser horseshoe bat population or cave habitats.

### 3.4.7 Type of habitat affected – its importance and sensitivity

The UK proportion of the European Dry Heaths is significant, and the UK heaths also exhibit remarkable diversity in comparison with those in other European countries. Within the UK, the climatic and altitude variations provide the rare circumstances in which such a range of heathland variations can be seen, with the range of upland to lowland heaths representative from north to south, and the oceanic to the continental heathland communities are represented from the west coast to the east<sup>28</sup>.

With typically nutrient poor, sandy and free draining soils, heathland turfs are easily damaged and broken up by soil movement. Whilst the 1ha of heathland where turfing could take place was not considered to have an adverse impact on the integrity of the site, where soils stripping was proposed it was considered that the soil, vegetation and seed bank would be so disturbed that recovery without intervention would be very slow, and that the habitat may never be fully replicated.

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<sup>26</sup> <http://www.jncc.gov.uk/page-4> and Colin McLeod, JNCC, pers comm.

<sup>27</sup> This is quoted in the appropriate assessment undertaken by the Secretary of State for Trade and Industry. All other percentages above were calculated for the purposes of this research report.

<sup>28</sup> <http://www.jncc.gov.uk/page-4>

### **3.4.8 Decision**

The Secretary of State for Trade and Industry granted consent and deemed planning permission subject to conditions, after determining that there would be a likely significant effect, and undertaking an appropriate assessment. In light of the appropriate assessment, it was concluded that the proposal would adversely affect the integrity of the cSAC and the Secretary of State therefore considered whether there were any alternative solutions, and concluded that there were none. The appropriate assessment stated that conditions were “very likely” to mitigate for the negative effects, but maintained that there was still a possibility that the pipeline would still have an adverse effect on site integrity. “*The DTI is not of the view that the area involved here should be construed as de minimis*” (4/SoSL page 3).

*“It is reasonable to consider the 1 to 2 years that the 1 ha turfed area is likely to take to restore its full species composition (ie restoration in area and quality), as de minimis. This would not therefore represent an adverse affect on the integrity of the cSAC. In contrast, the DTI is of the view that the 10-12 year-long effect on the 1.5 ha of cSAC habitat which will not be turfed cannot be considered de minimis, and thus should be considered as an adverse effect on the integrity of the site”* (4/SoSL page 3).

The mitigation methods proposed for the 1.5 ha of soil stripped heath included the propagation of dwarf shrubs for transplanting into the affected area. This method was experimental and therefore no reference could be made to previous applications to verify how successful the proposed method might be. Thus it is possible that the lack of certainty of recovery of the stripped 1.5ha was a factor in the Secretary of State’s decision, as well as the longevity of the adverse effect. In accordance with Regulation 49 of the Habitats Regulations, the Secretary of State considered whether there were imperative reasons of overriding public interest, and concluded that the need to serve southern Wales with a supply of gas to be such an imperative reason. In accordance with the Regulations, the Secretary of State then imposed a condition that provided compensatory measures in respect of Regulation 53 of the Habitats Regulations for the loss from the cSAC, which was in the form of enhancement and/or expansion of the European Dry Heath habitat.

## **3.5 Immingham Outer Harbour**

### **3.5.1 Description of development**

The expansion of Immingham Harbour to develop a five berth roll-on, roll-off (ro-ro) terminal in a tidal harbour. The new outer harbour will be dredged into the foreshore behind the existing terminal. The development includes the reclamation of SPA foreshore, and the construction of a bund, sea wall, five ramps, walkways and a quay.

### **3.5.2 Location**

Behind the existing terminal of Immingham Harbour, North Lincolnshire.

### **3.5.3 Date of decision**

7 July 2004.

### 3.5.4 Decision maker

The Secretary of State for Transport authorised the Harbour Revision Order under section 14 of the Harbours Act 1964, without a public inquiry.

### 3.5.5 Area of designated site

The Humber Flats, Marshes and Coast SPA is 15,202.53 ha and the Humber Estuary pSAC is 39,492.89 ha<sup>29</sup>. The Humber Flats, Marshes and Coast SPA is also a proposed Ramsar site.

### 3.5.6 Area of habitat affected

22 ha of habitat from within the SPA, which equates to 0.145% of the now classified site. The site was classified a few weeks after the Secretary of State for Transport issued the decision letter. The site is therefore referred to as proposed in that letter. This calculation of the percentage of land affected was not included in the Secretary of State's letter, but was calculated for the purposes of this research report. A further 5 ha of habitat from outside the SPA would also be lost as a result of the development proposal.

### 3.5.7 Type of habitat affected – its importance and sensitivity

Wetland and coastal habitats including reedbed, grazing marsh, saltmarsh, sand dunes and exposed mud and sand flats at low tide are important for breeding, over-wintering and migratory birds that utilise the site. The site is noted for both its wetland birds and raptor populations.

Breeding populations of little tern *Sterna albifrons* and marsh harrier *Circus aeruginosus* along with over-wintering or passage populations of bar-tailed godwit *Limosa lapponica*, bittern *Botaurus stellaris*, golden plover *Pluvialis apricaria*, hen harrier *Circus cyaneus*, redshank *Tringa totanus*, sanderling *Calidris alba*, dunlin *Calidris alpina alpina*, knot *Calidris canutus* and shelduck *Tadorna tadorna*<sup>30</sup>.

### 3.5.8 The Decision

With a likely significant effect on the European designated sites, Associated British Ports (ABP), as a competent authority (as set out in Regulation 6 of the Habitats Regulations), undertook an appropriate assessment of the proposed development and concluded that it could not be demonstrated that the Immingham Outer Harbour development proposal would not have an adverse effect on the integrity of the SPA/Ramsar/pSAC.

The Secretary of State considered the alternative solutions put forward by ABP, and concluded that given the Immingham Outer Harbour proposal would enable the new berths to be accessible at all times irrespective of the tide, this would create significantly more additional capacity than an alternative proposal from Humber Sea Terminal (HST) Ltd, which was tide limited.

The Secretary of State for Transport concluded that the proposal was for imperative reasons of overriding public interest for social and economic reasons, particularly in relation to the

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<sup>29</sup> <http://www.jncc.gov.uk/page-4> and Colin McLeod, JNCC, pers comm.

<sup>30</sup> <http://www.jncc.gov.uk/page-4>

national and regional economic importance of the port and the need for the port to continue to remain competitive internationally, and also the importance of the port for local employment.

With the conclusion that mitigation measures would not avoid an adverse impact, compensatory measures were proposed for the creation of wetland, coastal and maritime habitats on former agricultural land.

*“The Secretary of State Agrees with the advice of English Nature that the compensation measures set out in the Agreement, which include the managed realignment of agricultural land, of an area significantly greater than the area which would be lost to the works proposed in the Order, and creek habitat enhancement scheme, will enable the coherence of the Natura 2000 network to be protected. He therefore agrees that the requirements of Regulation 53 of the Habitats Regulations have been met” (5/SoSL 47).*

### **3.6 Linshaws Quarry, Peak District National Park**

#### **3.6.1 Description of development**

An application to re-open Linshaws Quarry at Dunford for the extraction of sandstone tilestone. This site was previously quarried for sandstone but had been unworked for approximately 50 years. In the interim period the site had naturally regenerated to the extent that it was included within the boundary of the South Pennine Moors SAC.

#### **3.6.2 Location**

Linshaws Quarry, Dunford, Peak District National Park.

#### **3.6.3 Date of decision**

On the 20 March 2002 the Secretary of State withdrew a direction under Reg 49(6) of Habitats Regulations that had directed the Peak District National Park Authority (PDNPA) not to determine the application. Withdrawal left the decision whether to grant planning permission to the NPA. This case therefore refers to the Secretary of State’s view as to the significance of the proposal as well as the PDNPA’s view as to its effects.

#### **3.6.4 Decision maker**

The Secretary of State withdrew his direction, considering his intervention unjustified. The PDNPA was then free to determine the application, which was refused. The appellant appealed against the refusal but withdrew the appeal after a public inquiry had been called.

#### **3.6.5 Area of designated site**

The South Pennine Moors SAC is 64,983.13 ha. The area affected was also part of the Peak District Moors SPA, which now forms part of the South Pennine Moors SPA Phase 1, which has an area of 45,270.52 ha<sup>31</sup>.

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<sup>31</sup> <http://www.jncc.gov.uk/page-4> and Colin McLeod, JNCC, pers comm.

### **3.6.6 Area of habitat affected**

An area of 0.99 ha of the then candidate SAC was affected by the proposal. According to the Secretary of State's letter, this equates to 0.0000153% of habitat within the South Pennine Moors cSAC. In fact this figure is wrong and the amount of designated site affected equates to 0.00153%, as calculated by the authors of this report.

### **3.6.7 Type of habitat affected – its importance and sensitivity**

The SAC is designated for its Annex 1 habitats, which include blanket bogs, a priority habitat, along with European dry heaths and old sessile oak woods with *Ilex* and *Blechnum* in the British Isles.

### **3.6.8 Decision**

The letter dated 20 March 2002 from the Department for Transport, Local Government and the Regions, indicated that the direction from the Secretary of State not to grant planning permission was withdrawn.

*“The Secretary of State has carefully considered all the national planning and other relevant planning issues relevant to this planning application and taken into account the fact that the proposed development will cover a very small part of the Peak District Moors SPA and the South Pennine Moors cSAC. Indeed, he notes that the proposed development will cover just 0.99 ha which is less than 0.0000153% of the total area of the South Pennine Moors cSAC which amounts to 64,983.13 ha. Taking all these factors into account, the Secretary of State has concluded that, on balance, any potential conflict with national planning policy is not sufficient to justify his intervention. He has, therefore, decided that he should leave the decision on whether or not to grant planning permission in this case to the NPA” (6/SoSL 10).*

Thus, whilst the Secretary of State decided that he should not intervene in the decision, he did not indicate whether he considered the habitat loss to be significant in terms of the Habitats Regulations. The PDNPA did consider it would be a significant effect.

## **3.7 London Gateway**

### **3.7.1 Description of development**

An application for a Harbour Revision Order and planning permission (together with other associated consents) for the development of an operational container port, including the construction of a quay wall, construction of a container handling and stacking facility, associated infrastructure, reclamation of inter-tidal area, realignment of sea wall and channel dredging.

### **3.7.2 Location**

London Gateway, on the north bank of the Thames Estuary, Thurrock, Essex.

### 3.7.3 Date of decision

The Secretary of State for Transport is yet to make a decision, but a letter was issued on 20 July following a public inquiry conducted by Inspector David Ward, which indicated that the Secretary of State for Transport was minded to grant the consents, and make the Order, subject to the resolution of some outstanding issues, which are not related to nature conservation.

### 3.7.4 Decision maker

Secretary of State for Transport, however no decision has yet been issued.

### 3.7.5 Area of designated site

The Thames Estuary and Marshes SPA is 4,838.94 ha in size (the Ramsar covers a larger area being 5588.59 ha in size)<sup>32</sup>. The Benfleet and Southend Marshes SPA was also considered regarding any indirect affects, but it was determined that there was no likely significant effect on this site.

### 3.7.6 Area of habitat affected

5 ha of habitat within the SPA would be lost, along with 9 ha of habitat outside the SPA boundary that is also used by the Annex 1 birds for which the SPA is classified. The development could also potentially cause a functional change in a further 60 ha of the SPA, as a result of changes in coastal and tidal processes as a consequence of the development.

5 ha equates to 0.1% of the SPA and 60 ha of habitat that would be affected and potentially suffer a functional change as a result of the development proposal equates to 1.24% of the total SPA. A total of 1.34% is therefore affected. These percentages have been calculated by the authors for the purposes of this research report and where not quoted within the Inspector's report or the Secretary of State's letter.

### 3.7.7 Type of habitat affected – its importance and sensitivity

The site is specifically classified for its over-wintering populations of avocet *Recurvirostra avosetta*, hen harrier *Circus cyaneus* and ringed plover *Charadrius hiaticula*, along with being a habitat of international importance for its large assemblage of water birds, with over 30,000 birds over-wintering at the site<sup>33</sup>.

### 3.7.8 Decision

The Secretary of State for Transport notes that all parties are in agreement that the port proposal “*is likely to have a significant effect upon the Thames Estuary and Marshes Special Protection Area (SPA) and Ramsar site and that such an effect is likely to be an adverse one*” (7/SoSL 93).

The Secretary of State concludes that he accepts that there are no alternative sites for the development and that the scheme is of overriding public interest.

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<sup>32</sup> <http://www.jncc.gov.uk/page-4> and Colin McLeod, JNCC, pers comm.

<sup>33</sup> <http://www.jncc.gov.uk/page-4>



English Nature advised that the compensation scheme put forward by the applicant is acceptable for the fulfillment of Regulation 53, and the Secretary of State agrees with this conclusion.

### **3.8 Mawcarse, Loch Leven, Kinross**

#### **3.8.1 Description of development**

The erection of two houses on land between Ashwood and White Rose Cottage, Mawcarse, Kinross, Scotland.

#### **3.8.2 Location**

Land between Ashwood and White Rose Cottage, Mawcarse, Kinross, Scotland.

#### **3.8.3 Date of decision**

23 December 2005

#### **3.8.4 Decision maker**

The Scottish Ministers, following two reports by Mr EDK Thomas.

A refusal of planning permission, by the Perth and Kinross Council, as planning authority, on policy grounds led to an initial appeal that was determined by written representations. The local planning authority challenged the Reporter's decision in the Court of Session, which held that the Reporter had erred in law because Scottish Natural Heritage had not been consulted on the proposal, which had possible implications for a European designated site that was in close proximity to the development site. This was deemed to be the only reason for quashing the previous grant of planning permission given by the Reporter, and other reasons raised by the local planning authority were dismissed. With the original appeal decision quashed the planning appeal then needed to be re-determined, and the Scottish Ministers requested that the same Reporter undertake a hearing in respect of the original appeal, with Scottish Natural Heritage being consulted on the proposal and its implications for Loch Leven SPA. A second report then followed this hearing, recommending that the appeal be upheld subject to conditions, and this was agreed by the Scottish Ministers. The second report included consultation with Scottish Natural Heritage, and appropriate mitigation measures were included at their request.

#### **3.8.5 Area of designated site**

Loch Leven SPA/Ramsar site has a designated site area is 1,611.81 ha<sup>34</sup>.

#### **3.8.6 Area of habitat affected**

Effects were considered in terms of the proposal's contribution to the deterioration of habitats supporting the migratory and Annex 1 species for which the SPA is classified. The proposal does not include any land take from the designated site, but the possible quantity of pollution

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<sup>34</sup> <http://www.jncc.gov.uk/page-4> and Colin McLeod, JNCC, pers comm.

in terms of phosphorus discharge arising from the original proposal was given as an estimated 8100mg/day.

### **3.8.7 Type of habitat affected – its importance and sensitivity**

Loch Leven SPA is designated for internationally important over-wintering populations of swans, geese and ducks which are migratory or listed on Annex 1 of the Directive. Whooper swan *Cygnus cygnus*, pink-footed goose *Anser brachyrhynchus* and shoveler *Anas clypeata* all overwinter at the loch<sup>35</sup>.

The water quality of the loch had declined considerably in the recent past, with large influxes of phosphorus causing algal blooms. Phosphorus pollution has a detrimental effect on the aquatic plant community within the loch through the growth of algal blooms which block essential light from reaching submerged plants. Efforts to reduce the phosphorus inputs to the loch by way of a catchment management plan and restrictive policies in the local plan, in the few years preceding the planning application, had proved successful and the condition of the loch was improving. The development in its original form proposed to use a septic tank for sewage from the two houses, which was currently the system in place for other dwellings in the area, including the existing large farmhouse, owned by the developer, close to the development site. The septic tank arrangement would have discharged water to the ground or local water courses, which would have contributed to the diffuse pollution entering the loch. The potential phosphorus discharge from two new houses was estimated at 8100mg/day (8/RR 1.11).

### **3.8.8 Decision**

The Scottish Ministers allowed the appeal, following the Reporter's recommendations that included mitigation measures to the satisfaction of Scottish Natural Heritage.

With advice from Scottish Natural Heritage it was considered that the proposal was likely to have a significant effect upon Loch Leven SPA. This then required an Appropriate Assessment, and the appellants submitted a mitigation scheme which was considered at the hearing by the Reporter, in consultation with Scottish Natural Heritage. The appellants proposed to upgrade the septic tank serving the existing large farmhouse, as well as installing new efficient treatment plants for the new dwellings, thus significantly reducing the phosphorus discharge from the existing dwelling. The reduction was such that the new farmhouse discharge rate plus the discharge rate for the two new dwellings was still below the discharge rate for the farmhouse, with the old septic tank system. With the overall reduction in phosphorus discharge rates as a result of the new development and the mitigation proposed, Scottish Natural Heritage confirmed that, the development proposal would not have an adverse effect on the integrity of Loch Leven SPA.

The following information was provided within the Reporter's report:

- Phosphorus discharge from new dwellings with the new treatment plant 8,100 mg/day
- Phosphorus discharge from existing farmhouse with the old septic tank system 21,060 mg/day

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<sup>35</sup> <http://www.jncc.gov.uk/page-4>

- Phosphorus discharge from existing farmhouse with the new treatment plant 8,100 mg/day
- Phosphorus discharge from the existing farmhouse 21,060 mg/day
- Phosphorus discharge from the development plus the existing farmhouse without mitigation 29,160 mg/day
- Phosphorus discharge from the development plus the existing farmhouse with mitigation 16,200 mg/day

The Reporter admitted that it was difficult to conclude that the proposal would have a likely significant effect alone. No analysis took place. However the precedent set by granting planning permission without mitigation was discussed and it is therefore assumed that the likely significant effect is in combination with any future proposals of a similar nature. He commented that “*Although it was difficult to conclude that the proposal alone would be likely to result in an adverse effect on the loch’s integrity, if it was approved without mitigation, an important precedent would be set, which would nullify the aims of the catchment and local plans*” (8/RR3.12)

The Reporter also made reference to the Waddenzee judgement to give weight to the conclusions drawn, stating that “*A recent European Court of Justice decision relating to a case in the Netherlands (Landelijke Vereniging tot Behoud Van de Waddenzee, Nederlandse v Vereniging tot Bescherming von Vogels v Straatssecretaris Van Landbouw, Natuurbeheer en Visserij (C-127/02: [2005] Env. LR14 [ECJ]) confirmed that where a proposal not directly connected with or necessary to site management was likely to undermine a site’s conservation objectives, it would have a significant effect*” (8/RR 3.9).

## **3.9 Mostyn Docks**

### **3.9.1 Description of development**

The construction of a new quay including mooring dolphins and reclamation of foreshore with dredged material. The proposal included a new quay across the foreshore and estuarine flats of the Dee Estuary, a new berthing facility, and the dredging of the channel to provide access for larger vessels. The dredged material would be spread and compacted within the development site. The majority of the development site is SPA and a Ramsar site.

### **3.9.2 Location**

The Port of Mostyn, south western bank of the Dee Estuary, North Wales.

### **3.9.3 Date of decision**

19 August 1996.

### **3.9.4 Decision maker**

The Secretaries of State for Wales and Transport granted planning permission following an inspectors report by Mr Anthony Vaughan, which only makes a partial recommendation for approval. An Assessor, Mr John Hellawell, also assisted the Inspector.

### 3.9.5 Area of designated site

The Inspector's report states that the Dee Estuary SPA/Ramsar site is approximately 13,055 ha. However the Ramsar Site Information Service<sup>36</sup> and the Joint Nature Conservation Committee<sup>37</sup> state that the actual boundary is 13,084.85 ha for both the SPA and the Ramsar site.

### 3.9.6 Area of habitat affected

The figures quoted within the Inspector's report for the amount of SPA that would be lost as a result of the development proposal do lead to some confusion. The key paragraph relating to the amount of SPA that would be lost is therefore quoted here in full:

*“The immediate 8.71 ha site of the proposed development is located in a bay with an area of upper shore-line and inter-tidal mudflat of approximately 5.67 ha within a total SSSI/SPA/Ramsar site of about 13055 ha. The development site contributes approximately 0.07% of the total Statutory Site and the mudflat which would be lost by the development forms 0.063% of the total area of about 9000 ha of this habitat” (9/IR 2.1.9).*

It appears that the Inspector may have used the total area of the development site, which was 8.71 ha, in calculating the percentage of 0.07%, yet not all of the development site is in the SPA. Furthermore the SPA site area is inaccurate (see 3.9.5 above). However, for the purposes of this report's calculation, the Inspector's own figures are used here because they were the basis of the decision. Assuming that the SPA is 13,055 ha, of which 9000 ha is mudflat, and on the basis of a loss of 5.67 ha of mudflat from the designated site, the loss would be 0.04% of the SPA and 0.063% of the mudflat resource within the SPA.

### 3.9.7 Type of habitat affected – its importance and sensitivity

The inter-tidal mud and sand flats, along with the salt marshes of the Dee Estuary are rich in invertebrates and therefore attract major populations of waterbirds that are of international importance. The upper shore line grades into brackish and swamp vegetation and maritime heathland and grassland, adding to the range of roosting habitat available for the birds that have come to the Estuary to feed on the rich invertebrate resource within the mudflats. The estuary supports a wader and wildfowl population of between 100,000 and 150,000 birds annually<sup>38</sup>.

The SPA supports an extensive area of inter-tidal feeding habitat and roosting habitat for the sandwich tern *Sterna sandvicensis* and bar-tailed godwit *Limosa lapponica*, and is also of European importance for its breeding populations of common tern *Sterna hirundo* and little tern *Sterna albifrons*. In addition to these Annex 1 species, the site supports populations of European importance of the following migratory species for winter feeding and roosting; redshank *Tringa totanus*, black-tailed godwit *Limosa limosa islandica*, curlew *Numenius arquata*, dunlin *Calidris alpina alpina*, grey plover *Pluvialis squatarola*, knot *Calidris canutus*, oystercatcher *Haematopus ostralegus*, pintail *Anas acuta*, shelduck *Tadorna tadorna* and teal *Anas crecca*<sup>39</sup>.

<sup>36</sup> <http://www.wetlands.org/RSDB/default.htm>

<sup>37</sup> <http://www.jncc.gov.uk/page-4> and Colin McLeod, JNCC, pers comm.

<sup>38</sup> <http://www.jncc.gov.uk/page-4>

<sup>39</sup> <http://www.jncc.gov.uk/page-4>

The Dee Estuary SPA includes 9000 ha of inter-tidal mudflat. The loss of 5.67 ha as a result of the planning proposal equates to 0.063% of this resource (9/IR 2.1.9).

The assessor's report is intended to assist the Inspector with the more specialist ecological aspects of the case. The assessor states "*I cannot avoid the conclusion that the site is not a significant feeding ground. Typically less than 100 birds are present. Even species which are considered to be most affected by the proposals, such as redshank and turnstone, did not reach median daily maxima of 25 birds. These figures must be compared with estimated winter counts for the Dee Estuary as a whole of 100,000 to 150,000 birds. As a fraction of the six-yearly mean given by CCW (about 135,000) the Mostyn shore supports about 0.074%*" (9/AR 16.5).

### **3.9.8 Decision**

The Inspector concludes that the project would be unlikely to have a significant effect upon the SSSI, stating that the proposal "*would not be likely to have an adverse effect on the nature conservation interests of the SSSI and its surroundings*" (9/IR 16.12.10). The Inspector makes a decision not to provide a recommendation in terms of likely significant effect on the SPA and does not form any formal conclusions with regard to impacts on the SPA or Ramsar, leaving that decision to the Secretaries of State for Wales and Transport.

Whilst declining to make a substantial recommendation, the Inspector does state that "*as the project would be unlikely to have a significant effect upon the SSSI there would seem to be no impediment to the grant of planning permission. It is therefore reasonable to assume that there would be no apparent breach of either the Ramsar Convention or the requirements of the "Habitats Directive"*" (9/IR 16.12.11).

The Secretaries of State therefore determined whether there was likely to be a significant effect and adverse effect on the integrity of the site without any recommendations from the Inspector. However, the letter from the Secretaries of State makes numerous references to the conclusions drawn in the Assessor's report.

Of particular relevance to this research report is the fact that the Secretaries of State disagreed with the assessor's indication that the small scale of the effect on its own rendered it insignificant. "*The Secretaries of State do not accept that the small scale of the proposal is, on its own, sufficient to justify the conclusion that the development is insignificant and therefore acceptable. The significance of effects of a development are not necessarily related to its scale*" (9/SoSL 13). However, after considering all the evidence, the Secretaries of State concludes that there is no likely significant effect on the SPA. "*The Secretaries of State accept that there is no evidence that the bird populations in the Dee Estuary are limited by food resources or roosting sites,*" and that "*The Secretaries of State agree with the Assessor's conclusion that the development proposal is not likely to have a significant effect on the designated sites of the Dee Estuary... as the development is considered to make an insignificant impact on the sites, it cannot destroy their integrity*" (9/SoSL 13). The Secretary of State for Wales and Transport's letter adds that there are "*no significant implications for the European site and they have reached the same conclusion in respect of the Ramsar site*" (9/SoSL 16).

### **3.9.9 Comments from the Inspector on the Dibden Bay inquiry regarding the Mostyn docks decision**

It is not uncommon for an Inspector to make reference to a previous public inquiry when it is of relevance to the case in hand. Inspector Michael Hurley made an important clarifying comment with regard to the Mostyn docks decision when reporting on the Dibden Bay public inquiry.

*“I have had regard to the Ministerial planning decision relating to Mostyn Docks, in which it was found that the destruction of 8ha of protected inter-tidal habitat would be unlikely to have a significant effect on a designated SPA and Ramsar site. It is not for me to comment on that decision. However, it does not seem to me to be necessary to demonstrate that birds would suffer “severe hardship” in order to conclude that a project would have a significant effect on a designated site” (3/IR 36.162).*

Note that Mr. Michael Hurley refers to the destruction of 8 ha of protected inter-tidal habitat, which is factually incorrect, but is probably quoted as a result of the inaccuracies discussed earlier (see 3.9.6), and is also similar to the area that is now thought to have actually been lost from the affected SPA as a result of the Mostyn Docks development.

The reference to “severe hardship” originates in the assessor’s report where he states *“Claims that loss of inter-tidal habitat at Mostyn Docks would impose severe hardships on feeding and roosting birds were not substantiated. It was conceded that the estuary provides a rich invertebrate food supply and that there is not evidence that the present bird populations are limited by food resources or roosting sites. The physiological stress of additional energy expenditure by a few birds having to fly slightly greater distances to roost was not quantified and is, in any case, likely to be insignificant” (9/AR 16.6).* The assessor is referring to comments made by CCW on the expenditure of extra energy by the SPA birds and the assertion by CCW that *“The potential loss of upper shore would be seriously harmful” (9/IR 11.9.4).*

## **3.10 Port Of Hull - Quay 2005**

### **3.10.1 Description of development**

The construction of a ‘lo-lo’ (lift on, lift off) handling facility accommodating vessels with a draft of up to 10.4 metres, reclamation of the river bed and the deepening, dredging and altering of the bed and shores.

### **3.10.2 Location**

The Humber Estuary, Hull, Yorkshire.

### **3.10.3 Date of decision**

21 December 2005.

### **3.10.4 Decision maker**

The Secretary of State made the order, against the recommendation by the Inspector, Mr Peter Beasley, after a public inquiry.

### 3.10.5 Area of designated site

The Humber Flats, Marshes and Coast SPA/Ramsar is 15,202.53 ha, and is also a Ramsar site. The Humber Estuary pSAC is 39,492.89 ha<sup>40</sup>.

### 3.10.6 Area of habitat affected

An area comprising 4 ha of the Humber Flats, Marshes and Coast SPA would be lost as a result of the development. Whilst the Secretary of State's letter refers to there being impacts on all of the Humber Estuary sites, ie the SPA/Ramsar and the pSAC, it is in fact only the adverse effects on the SPA features of interest that form the main part of English Nature's concerns and the discussion on the case.

When the public inquiry took place, the 4 ha of designated site only held a SSSI designation and was included in the boundaries of the international sites in the interim period between the public inquiry and the Secretary of State for Transport's final decision letter. Whilst this change is of importance to the Secretary of State in his decisions, a value of 0.01% of the SSSI, which is 37,000 ha, is nevertheless quoted by the Secretary of State from the Inspector's report

The pSAC site is of a roughly equivalent size to the SSSI originally discussed at the inquiry, being approximately 40,000ha and 37,000 ha respectively, therefore both losing approximately 0.01% of the designated area when 4 ha is calculated as a percentage. However, the SPA is only 15,202.53 ha, and the loss of 4 ha from this designated site equates to 0.03%, which is not referred to at all.

### 3.10.7 Type of habitat affected – its importance and sensitivity

The Humber Flats, Marshes and Coast SPA contains wetland and coastal habitats including reedbed, grazing marsh, saltmarsh, sand dunes and exposed mud and sand flats at low tide are important for the breeding, over-wintering and migratory birds that utilise the site. The site is noted for both its wetland birds and raptor populations. Breeding populations of little tern *Sterna albifrons* and marsh harrier *Circus aeruginosus* along with over-wintering or on passage populations of bar-tailed godwit *Limosa lapponica*, bittern *Botaurus stellaris*, golden plover *Pluvialis apricaria*, hen harrier *Circus cyaneus*, redshank *Tringa totanus*, sanderling *Calidris alba*, dunlin *Calidris alpina alpina*, knot *Calidris canutus* and shelduck *Tadorna tadorna*<sup>41</sup>.

### 3.10.8 Decision

The Secretary of State for Transport confirmed the Harbour Revision Order, subject to obligations to provide compensatory habitat.

### 3.10.9 Discussion on decision – how it was made

At the time of the public inquiry the proposed development site lay outside, but within 100m of the SPA. The inter-tidal mud flats that were to be directly affected by the development

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<sup>40</sup> <http://www.jncc.gov.uk/page-4> and Colin McLeod, JNCC, pers comm.

<sup>41</sup> <http://www.jncc.gov.uk/page-4>

were used by water birds for which the SPA is classified, thus having a likely significant effect on the SPA interest features. Mitigation proposed by the applicant was considered by English Nature to be such that it could remove the likelihood of an adverse effect on integrity.

In the time period between the public inquiry and consideration of the Inspector's report by the Secretary of State, proposed changes to the boundary of the Humber Flats, Marshes and Coast SPA had subsequently incorporated the land that would be directly affected by the Quay 2005 proposal.

It was then necessary for English Nature to provide further advice to the Secretary of State. English Nature advised that it could not now be ascertained that Quay 2005 would not have an adverse effect on site integrity.

The Secretary of State concluded that there are no alternatives to the proposed development at its proposed location, and therefore went on to consider if there were any imperative reasons of overriding public interest, given English Nature's advice that the provision of alternative land does not serve as adequate mitigation. Concluding that there were imperative reasons of overriding public interest, of an economic and social nature in terms of regional employment and economy, the Secretary of State accepted the advice of English Nature that the provision of 6 ha of land for habitat creation, although not accepted as mitigation, is acceptable compensation to ensure the requirements of Regulation 53 have been met and that the overall coherence of Natura 2000 is protected. The 6 ha of compensatory habitat was in fact part of a much larger habitat creation and enhancement scheme. A legal agreement<sup>42</sup> between Associated British Ports and English Nature, the Environment Agency, the Royal Society for the Protection of Birds, Lincolnshire Wildlife Trust and Yorkshire Wildlife Trust was made to provide the necessary mitigation and compensatory measures for a number of schemes being undertaken by Associated British Ports.

### **3.11 Santoña Marshes, Spain**

#### **3.11.1 Description of development**

The Spanish government was challenged in the European Court of Justice to answer allegations that there had been a failure to fulfil obligations under Directive 79/409/EEC of April 1979 on the Conservation of Wild Birds. The Spanish government had failed to classify the Santoña Marshes as an SPA and had failed to take steps to avoid pollution or deterioration of habitat or any disturbances affecting the birds. Specific development, including the construction of a road, the discharge of untreated waste water and the granting of permits for clam farming within the marshes were noted within the judgment as being damaging in that the extent of marshland available to the birds had been reduced as a result of such development or activities.

#### **3.11.2 Location**

Marismas de Santoña, within the Autonomous Community of Cantabria, on the north coast of Spain.

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<sup>42</sup> Compensation Agreement for Immingham Outer Harbour and Hull Quay 2005



### 3.11.3 Date of decision

2 August 1993.

### 3.11.4 Decision maker

The Court of Justice of the European Communities. The Court declared that the Kingdom of Spain had failed to fulfil its obligations under the EEC Treaty.

### 3.11.5 Area of designated site

Approximately 35,000 ha of wetland<sup>43</sup>.

### 3.11.6 Area of habitat affected

Of the many impacts listed, only the road construction is quantified in terms of the amount of wetland that has been lost. The road had removed 185 ha of the wetland, and that this equated to approximately 0.5% of the total area<sup>44</sup>.

### 3.11.7 Type of habitat affected – its importance and sensitivity

Located at the confluence of several rivers, the Santoña marshes are an expanse of wetland that provides feeding and roosting habitat for 19 annex 1 species, along with 14 listed migratory species.

### 3.11.8 Decision

In its infringement of the birds directive, the Court declared that the Kingdom of Spain had failed to fulfil its obligations under the EEC Treaty. Throughout the judgment there is a clear message that disturbance is effectively habitat loss, because it results in the habitat being less effective in maintaining the bird populations. The following quotations are from the European Communities English Translation of the Judgement of the Court.

*“The commission claims that the new route followed by the C-629 road between Argoños and Santoña results not only in a considerable reduction in the surface area of the Santoña marshes but also in disturbances affecting the peaceful nature of the area and consequently the wild birds protected by the provisions of the directive”* (11/ECJ trans 33).

*“Although Member States do have certain discretion with regard to the choice of territories which are most suitable for classification as special protection areas, they do not have the same discretion under Article 4(4) of the directive in modifying or reducing the extent of those areas”* (11/ECJ trans 35).

*“The installation of aquaculture facilities, which not only reduce the surface area of the marshland and cause variations in the natural sedimentation processes there, but also modify*

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<sup>43</sup> Institute for European Environmental Policy, 1993, *Preliminary non-technical summary of the Judgment of the European Court of Justice: The Santoña Wetlands and the implementation of the Birds Directive (Case C-355/90)*.

<sup>44</sup> *ibid*

*the structure of the existing marsh bed, has the effect of destroying the particular vegetation of those areas, which is an important source of food for the birds” (11/ECJ trans 44).*

*“the activity in question has caused a significant deterioration in the habitat and the quality of the living conditions of the birds in the middle of the Santoña marshes” (11/ECJ trans 46).*

The wording of the judgment with regard to the damaging construction work and permission of damaging activities suggests the equivalent of adverse effect on integrity, and the judgment includes a failure to take appropriate steps to avoid pollution or deterioration of habitats. The European Communities English Translation of the Judgement of the Court gives the following:

*“Reduction in surface area of the marshland...aggravated by the erection of a number of new buildings near this new section of road...have resulted in the loss of refuge, rest and nesting areas for birds. In addition... the action in question has modified the ebb and flow of the tide, causing this part of the marshland to silt up” (11/ECJ trans 36).*

*“harmful impact on the aquatic environment” with regard to the filling in of land adjoining the marshes” (11/ECJ trans 41).*

*“significant deterioration” (11/ECJ trans 46) as a result of the clam farming.*

*“detrimental effects” (11/ECJ trans 50)of the discharge of untreated water.*

## **3.12 Tideways Jetty**

### **3.12.1 Description of development**

The installation of a reinforced concrete slipway over the inter-tidal area from the curtilage of a private house “Tideways.”

### **3.12.2 Location**

Land at 46 Sinah Lane, Hayling Island, Havant, Hampshire.

### **3.12.3 Date of decision**

23 May 1997.

### **3.12.4 Decision maker**

Planning Inspector Colin Grimsey, on appeal following written representations.

### **3.12.5 Area of designated site**

Chichester and Langstone Harbours SPA/Ramsar and the development site is also within the Solent Maritime SAC. Although the Maritime SAC designation was not proposed at the time of the inspector’s report, English Nature reported the likely inclusion of Langstone Harbour

SSSI within the new designation. Chichester and Langstone Harbours SPA/Ramsar is 5,810.03 ha<sup>45</sup>.

### 3.12.6 Area of habitat affected

A total of 45 square metres of foreshore, most of it below high water mark, crossing inter-tidal habitat that is important for foraging waders.

In addition to habitat loss, the Inspector notes that there will be additional disturbance impacts from the use of the jetty for launching boats and jet-skis.

45 square metres equates to 0.0000774% of the total SPA (45 sq m = 0.0045 ha) but this figure was not quoted in the Inspector's report. The calculation has been made for the purposes of this research report.

### 3.12.7 Type of habitat affected – its importance and sensitivity

The Chichester and Langstone Harbours SPA supports breeding populations of little tern *Sterna albifrons* and sandwich tern *Sterna sandvicensis*, along with the following Annex 1 species over winter or on migratory passage; little egret *Egretta garzetta*, bar-tailed godwit *Limosa lapponica*, ringed plover *Charadrius hiaticula*, black-tailed godwit *Limosa limosa islandica*, dark-bellied brent goose *Branta bernicla bernicla*, dunlin *Calidris alpina alpina*, grey plover *Pluvialis squatarola* and redshank *Tringa totanus*<sup>46</sup>.

The harbours are of European importance for water birds, with mud and sand flats and algal beds that offer extensive feeding grounds for the range of Annex 1 species feeding and breeding at the site.

The development proposal would have resulted in the loss of a small proportion of the important feeding grounds below high tide.

### 3.12.8 Decision

The appeal was dismissed by the Inspector. After determining likely significant effect the Inspector summarised the implications of the proposal as direct loss of feeding habitat and disturbance as a result of the jetty use. He further commented on how the damage may be compounded by the precedent set by granting permission for development that may then result in similar planning applications within the SPA.

*“The proposed slipway would lead to increased disturbance both during construction and thereafter, and reduce the inter-tidal area available to waders... I consider that the proposed slipway would adversely affect the integrity of the site. This damage would be compounded as the precedent set by the granting of planning permission for your proposal would make it more difficult for the planning authority to resist pressure for similar developments elsewhere in Langstone Harbour”* (12/IR 9).

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<sup>45</sup> <http://www.jncc.gov.uk/page-4> and Colin McLeod, JNCC, pers comm.

<sup>46</sup> <http://www.jncc.gov.uk/page-4>

### **3.13 White Horse Millennium Landmark**

#### **3.13.1 Description of development**

The creation of a white outline depicting a horse across the hillside of Cheriton Hill, to be viewed from a distance, by the removal of turfs of calcareous grassland to create a line within which chalk slabs could be laid.

#### **3.13.2 Location**

Cheriton Hill, Crete Road West, Folkstone, within the Kent Downs.

#### **3.13.3 Date of decision**

27 March 2002.

#### **3.13.4 Decision maker**

The Secretary of State for Transport Local Government and the Regions granted following Inspector Chris Frost's report as a result of a public inquiry.

#### **3.13.5 Area of designated site**

The Inspector refers to a site area of 120 ha for the Folkstone to Etchinghill Escarpment cSAC. However the site area, as confirmed by the Joint Nature Conservation Committee is 260.75 ha (an amendment in 2001 increased the site boundary by approximately 80ha, but this change is prior to the decision in 2002)<sup>47</sup>.

#### **3.13.6 Area of habitat affected**

The area of excavation was 0.02 ha according to the applicant, and potentially as much as 0.0665 ha according to English Nature. The inspector acknowledges that "*the precise area remains uncertain*" (13/IR 79).

Taking the inspector's reference to 120ha and the potential land take of between 0.02 ha and 0.0665 ha, the percentage lost is between 0.017% and 0.056%.

Taking the actual site area of 260.75 ha and the potential land take of between 0.02 ha and 0.0665 ha, the percentage lost is between 0.0076% and 0.0255%.

#### **3.13.7 Type of habitat affected – its importance and sensitivity**

The site has the following Annex 1 habitat: semi-natural dry grasslands and scrub facies on calcareous substrate (*Festuco-Broetalia*) (important orchid sites). The calcareous grassland has a number of rare and scarce plants, with particular importance placed on the rare orchid species present, including early spider orchid *Ophrys sphegodes*, late spider orchid *Ophrys fuciflora* and burnt orchid *Orchis ustulata*.

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<sup>47</sup> <http://www.jncc.gov.uk/page-4> and Colin McLeod, JNCC, pers comm

### 3.13.8 Decision

Planning permission granted by Secretary of State for Transport Local Government and the Regions in accordance with Inspector's recommendations, which concluded there would be no adverse effect on the integrity of the site.

*"In absolute terms the cSAC would be better able to retain its integrity without the hill-figure and it must be acknowledged that the proposals would have an immediate adverse effect on the site in terms of habitat loss. However, this does not equate to an adverse effect on its integrity if that integrity can be preserved, in the longer term, by reason of the effective management of the considerable habitat resource that the cSAC holds. Accordingly I do not regard the changes proposed as so significant that they amount to what could, overall, be regarded as an 'adverse effect on the integrity of the cSAC' (taking account of the definition of integrity given in PPG9)" (13/IR 81).*

After agreement on the fact that the development proposal was likely to have a significant effect, the Inspector held the view that the removal of the turfs from the hillside would have a short term adverse effect on the SAC, but that with appropriate management there would not be a long term adverse effect on site integrity. However, the Inspector did not ensure that the mitigation relied upon to avoid the adverse effect on integrity (improvements to the effective management of the site) was in place. The Secretary of State agreed with the Inspector's conclusions. The management of the site has not significantly changed, and is cattle grazed in the same way that it has been since before the planning application was made<sup>48</sup>.

The Inspector does take note of the fact that the site contains a priority habitat, and as such is subject to Reg 49 (2) if it is determined that there is an adverse effect on the integrity of the site. The Inspector makes reference to this in case the Secretary of State decided that there is an adverse effect on integrity, concluding that *"I find that the integrity of the European site would not be adversely affected. If however, this view is not accepted, there are reasons based on the contribution of the scheme to strategic economic development and regeneration to justify considering seeking the opinion of the European Commission"* (13/IR 96).

Owing to a priority habitat being affected, Regulation 49(2) of the Habitats Regulations requires that where there are adverse effects on integrity, and no alternative solutions, the imperative reasons of overriding public interest need to be reasons relating to human health or public safety, or reasons relating to beneficial consequences of primary importance to the environment. Without such reasons the case would need to be referred to the European Commission, as recommended by the Inspector if the Secretary of State had considered there to be an adverse effect on site integrity.

*"The Secretary of State agrees that although the proposal will have an immediate adverse effect on the site in terms of habitat loss, it will not have an adverse effect on its integrity (IR81). Having taken this view, the provisions of section 49 do not apply"* (13/SoSL 9).

This case was raised in evidence and submissions at the Dibden Terminal public inquiry and the Inspector Michael Hurley noted in his report that *"The conclusion in the White horse Millennium Landmark case is striking, since the Secretary of State agreed with the Inspector's opinion that "the cSAC would be better able to retain its integrity" without the*

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<sup>48</sup> Phil Williams, Conservation Officer, English Nature (Kent Area Team) pers. comm.

*proposed development. The decision does not establish a binding precedent” (3/IR 7.30) and further “I note that the inspector (with whom the Secretary of State agreed) considered that “the cSAC would be better able to retain its integrity without the hill-figure.” Taken alone, that would necessarily imply that the hill-figure could adversely affect the integrity of the European site” (3/IR 36.173).*

*“However, the Inspector continued by arguing that the habitat loss would not equate to an adverse effect on the site’s integrity “if that integrity can be preserved in the longer term, by reason of the effective management of the considerable habitat resource that the cSAC holds.” It was on that basis that he concluded that there would be no adverse effect on the integrity of the cSAC” (3/IR 36.174).*

## **4 Conclusions**

### **4.1 Analysis of the decisions**

#### **4.1.1 Tideways**

We are excluding Tideways from further analysis because disturbance may have been the prevailing consideration in the Inspector’s mind and he was also considering the in combination effects through the precedence it could set. These were legitimate factors to take into account but they obscure the judgement as to the significance of the very small scale of direct landtake (0.0000774%).

#### **4.1.2 The eight key decisions**

There are six examples of small scale effects of approx 1.0% or less of land take or habitat loss:

- London Gateway Essex 0.1%
- Quay 2005 Hull 0.01% (in fact 0.03 when calculated correctly)
- Gilwern to Hafodyrynys Pipeline South Wales 0.15%
- Dibden Bay Terminal Southampton 0.76%
- Outer Harbour Immingham 0.145%
- Santoña Marshes Spain 0.5%

All these have the authority of being Secretary of State decisions except Santoña Marshes which is a ECJ judgment. All concluded a likely significant effect and all determined or implied an adverse effect on integrity. However, there is a need to take into account a number of other factors:

- The London Gateway percentage habitat loss included an area that would suffer a change in function of habitat.
- Dibden Bay would cause a loss of supporting habitat in addition to the percentage of habitat loss within the SPA.
- Santoña Marshes was complicated by a number of other factors including impacts on hydrology and several causes of disturbance.

Nevertheless, there are three cases that all appear to be wholly or largely related to landtake effects / habitat loss: Quay 2005, Gilwern and Immingham.

Two further cases are important because they too are made by Secretaries of State and both involve landtake as the sole or primary issue, they are Barksore Marshes (1.79%) and Bathside Bay (1.87%).

#### **4.1.3 The other cases**

The other cases included in this report are important for various reasons and provide useful contributions to the wider picture of the scale of effects. However, the White Horse case is difficult to draw firm conclusions from. On the face of it, as the Inspector at the Dibden Inquiry concluded, it can only be read as a decision that there would be an adverse effect on integrity if the effects were not offset by the anticipated management measures. These measures were assumed by the Inspector but not secured by him. The loss of 0.17% is therefore a further example of a Secretary of State decision on likely significant effect and potential adverse effect on integrity.

Linshaws Quarry is also a difficult case to draw firm conclusions from. Whilst the Secretary of State decided that it did not justify his intervention, he was aware that the PDNPA considered the effects to be significant and that they might refuse the application. By not intervening he was allowing the Authority to take whatever decision they wanted to make. They did refuse the application and the subsequent appeal was withdrawn.

The Mawcarse case at Loch Leven is included for its comparative value and as a measurable, small-scale, indirect effect that would be significant when combined with other projects and in absence of the mitigation. It is different in the type of effect, being indirect pollution, but illustrates how a very small scale effect can be deemed to be a likely significant effect and without the offsetting measures an adverse effect on integrity. It was accepted on the basis of a net improvement in the discharges that would guarantee no adverse effect on the water quality of the Loch. The original proposal without mitigation made a negative contribution towards the improvement of the condition of the designated site. The mitigation measures proposed made a positive contribution towards the achievement of favourable conservation status for the designated site.

Mostyn Docks is a decision that we regard as questionable. Indeed, it is understood that CCW is recommending to the Welsh Assembly Government that the reclaimed area should be removed from the SPA<sup>49</sup>, a point that we consider further demonstrates an adverse effect on integrity if the boundary of the site has to be re-drawn.

#### **4.1.4 Analysis of consistency of decisions with the guidance**

The eight key decisions referred to above were all taken in accordance with the guidance issued by the EC, and the UK Government; there is no inconsistency with the English Nature guidance in HRGN1 or HRGN3. In particular the decision makers were meticulous in their application of the precautionary principle embedded in the law and guidance.

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<sup>49</sup> Adam Cole-King, pers.comm.

#### 4.1.5 Overall conclusions

The overall conclusion is that each case should continue to be determined on its merits, as it is rare for the Secretary of State or an Inspector to have to determine a simple case of a single, permanent land take from a site. However, it is equally clear that Secretaries of State have held that very small scale losses or changes in habitat are likely to be a significant effect. Indeed they have concluded that very small scale losses, substantially less than 1%, would be an adverse effect on integrity; or at least they could not ascertain there would be no adverse effect on integrity.

Whilst it is concluded that very small scale losses cannot ascertain no adverse effect on integrity purely because of the small scale of the effect, there must be a point at which the effect is considered *de minimis*. The term *de minimis* is widely used in a legal sense and is defined by the LAW.COM Dictionary as “Latin for ‘of minimum importance’ or ‘trifling.’ Essentially it refers to something or a difference that is so little, small, miniscule or tiny that the law does not refer to it and will not consider it.”<sup>50</sup>

The Gilwern to Hafodyrynys Pipeline is the one case where the longevity of the effect led to the conclusion that a particular small scale effect was *de minimis*. The Secretary of State for Trade and Industry based his conclusions on the small scale of the affected area (0.09%), the short term nature of the effect **and** the degree of certainty that the affected vegetation could be restored to its original quality. Thus, it was concluded that one effect of the pipeline proposal on the Usk Bat Sites cSAC was *de minimis* and the other (long-term effect on 0.15% of the site) would be likely to have a significant effect and, indeed, to have an adverse effect on the integrity of the site.

*“It is reasonable to consider the 1 to 2 years that the 1 ha turfed is likely to take to restore its full species composition (ie restoration in area and quality), as de minimis. This would not therefore represent an adverse affect on the integrity of the cSAC. In contrast, the DTI is of the view that the 10-12 year-long effect on the 1.5 ha of cSAC habitat which will not be turfed cannot be considered de minimis, and thus should be considered as an adverse effect on the integrity of the site” (4/SoSL page 3).*

English Nature’s European Sites Guidance<sup>51</sup> advises at paragraph 4.3 that “*the duration of any impact(s) and the potential for recovery/reversibility are important factors to consider when determining whether it is possible to demonstrate no adverse effect on integrity... a conclusion of no adverse effect may be able to be reached in the case of a small-scale effect from which the site/feature can quickly recover... the longer the recovery time the more difficult it will be to demonstrate no adverse effect on integrity.*” The Managing Natura 2000 guidance<sup>52</sup> explains at paragraph 4.6.3 that “*when looking at the ‘integrity of the site’ it is important to take into account a range of factors, including the possibility of effects manifesting themselves in the short, medium and long-term.*”

In the Dibden Bay inquiry, the Inspector was not convinced by the argument put forward by ABP regarding the short term nature of potential adverse effects.

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<sup>50</sup> <http://dictionary.law.com>

<sup>51</sup> Chapman, C. and Philp, C. 2004. *European Sites Guidance – Internal Guidance to Decisions on ‘Site Integrity’: a Framework for Provision of Advice to Competent Authorities.* Peterborough: English Nature.

<sup>52</sup> European Community, 2000. *Managing Natura 2000 Sites The provisions of Article 6 of the Habitats Directive 92/43/EEC*



*“I have some difficulty with this approach. A short-term effect may have longer-term consequences. For instance, dredging and recharge operations may result in there being a reduced concentration of dissolved oxygen in Southampton Water for just a few weeks. But if that period coincides with the migration of salmon through the affected area, the consequences could be far reaching...similarly the smothering of benthic invertebrates on a foreshore could be regarded as a short term effect, since it might reasonably be expected that the area would be re-colonised within 3 years or so. However, during that period the condition of wading birds on the foreshore could deteriorate” (3/IR 36.186-187).*

In considering the relevance of the scale of any habitat loss in determining whether there is an adverse effect on site integrity, it should be noted that of the 13 cases included in this research report, only five cases actually quoted the area of habitat lost as a percentage. The only case that referred to a percentage of habitat lost and concluded no adverse effect on site integrity was Mostyn Docks. The other four cases where percentages were calculated within the Inspector’s report and where adverse effect on the integrity of the site was concluded all cited a percentage loss of less than 1.0%. Of the five cases that did include a percentage calculation, three of them were incorrect.

The conclusions of the Inspector in the Dibden Terminal Inquiry report are worth considering here. In determining that there would be an adverse effect on the integrity of the SPA and Ramsar Site he stated that *“the destruction of protected habitat on a significant scale necessarily implies that the site’s ecological structure will be damaged and rendered less coherent. Manifestly, it will no longer sustain, across the whole of its area, the habitat for which it was classified”* (3/IR 36.172). In light of the definition of the integrity of a site then given in Annex C of PPG9 this would lead to an adverse effect on the integrity of the site. ABP argued that the concept of “sufficiency” enabled a decision maker to exercise judgement in considering whether the loss of habitat from a SPA would be permissible (3/IR 36.176). The Inspector did not accept this. *“One of the purposes of classifying SPAs is to protect a sufficient diversity and area of habitat for the conservation of particular bird species. This implies that a Member State may exercise discretion in deciding whether a sufficient area has been classified. But once a SPA has been classified, it is not open to a competent authority to permit the destruction of protected habitat on the grounds that a sufficiency of habitat would remain. Such an approach would negate the Member State’s original decision to classify the site, and undermine the protective regime”* (3/IR 36.189).

## **5 Guidelines**

We have been asked to recommend guidelines for the future based on the research. In light of our conclusions, we offer the following advice.

Unless a particular loss of habitat could be regarded as so trivial as to be *de minimis* (see definitions in section 4 above), it is capable of being a significant effect and may also be an adverse effect on the integrity of the site. Bearing in mind the precautionary principle embedded in the legislation, applied consistently by Secretaries of State and endorsed in court judgments, habitat loss of very small scale, including losses in the order of 0.1% or less of a site, can clearly be regarded as an adverse effect on the integrity of a designated site. By definition, the larger the SPA or SAC or Ramsar site, the larger an area would be that is represented by 0.1%, and thus the more important it may be in supporting individual plants or animals, or ecosystems, for which the site is classified, designated or listed. The value of

each and every part of a large site is further emphasized when it is considered that all parts of large areas such as estuaries are potentially important because they are very dynamic and different parts of the system are used at differing times for different reasons, by the birds for which they were classified; for habitats that are rare, such as certain types of heathlands, peatlands or orchid-rich calcareous grasslands, every part of a large site is an important part of a globally scarce resource and part of a functional ecosystem.

Equally, whilst a 0.1% loss from a smaller site may represent a small area in spatial terms, it can be important to the ecological functioning of the site which, being a smaller unit, is likely to depend on much smaller ecosystems or communities, in spatial terms. The argument that a small loss does not matter is one that can be repeated until substantial losses have been incurred. This insidious reduction of habitat is as potentially damaging as a single larger loss. Such arguments are supported by the decisions examined in this research.

The cases identified and examined concentrated on single projects (albeit some had many component parts). Only Mawcarse (3.8) and Tideways (3.12) explicitly referred to combined effects with other projects. However, it is logical to conclude that the decision makers would come to the same conclusion about the significance of an effect irrespective of whether the effect was caused by one, ten or a hundred projects. In other words, where small scale effects are caused by a combination of even smaller-scale effects, the overall effect is still significant and can result in an adverse effect on integrity. Thus, even projects that may appear, *prima facie*, to be *de minimis*, may not be when their effects are combined with other, similarly very small scale effects.

The aim should be to avoid any significant disturbance or deterioration or habitat loss, other than trivial or inconsequential loss, from international sites, if projects are to avoid being subject to ‘appropriate assessment’ and potentially to the tests of regulation 49 of the Habitats Regulations 1994 (Article 6(4) of the Habitats Directive).

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## Appendix A Table of cases

Number in text	Date	Case name	Reference
1	9 November 1998	Barksore Marshes	GOSE/104/4/KENT/1
2	29 March 2006	Bathside Bay Container Terminal	APP/P1560/A03/1129387
3	20 April 2004	Dibden Bay	P89/24/59
4	3 July 2002	Gilwern to Hafodyrynys Pipeline	RFBZ/C/001/00019
5	7 July 2004	Immingham Outer Harbour	P89/3/397
6		Linshaws Quarry	NP/B/0300/001
7	20 July 2005	London Gateway	
8	23 December 2005	Mawcarse, Loch Leven, Kinross	P/PPA/340/275/1
9	19 August 1996	Mostyn Docks	PP013/98/005 (formerly APPX6015/X/95/508310)
10	21 December 2005	Port Of Hull - Quay 2005	P89/3/381/PCP/2/4/1
11	2 August 1993	Santoña Marshes, Spain	Case C-355/90: Commission .v. Kingdom of Spain Translation reference: STS 891/93
12	23 May 1997	Tideways Jetty	T/APP/X1735/A/96/274856/P9
13	27 March 2002	White Horse Millenium Landmark	GOSE 108/001/SHEP/004



## Research Information Note

*English Nature Research Reports, No. 704*

**How the scale of effects on internationally designated nature conservation sites in Britain has been considered in decision making: A review of authoritative decisions**

Report Authors: Rachel Hoskin and David Tyldesley Date: 1 September 2006

Keywords: Habitats Regulations; site integrity; spatial scale; *de minimis*

### Introduction

The implementation of a wide range of plans or projects can affect the wildlife or habitats for which sites have been designated for their nature conservation importance. This report concentrates on internationally designated sites. Because of the level of protection afforded by law and policy to these sites, especially by the *Conservation (Natural Habitats &c) Regulations 1994* (here referred to as the Habitats Regulations) it is uncommon for them to be threatened by a project that would have major adverse effects on them. However, small scale effects are more common.

A problem that is frequently encountered is how to judge whether these small scale effects on a site may adversely affect the site's integrity, indeed whether they are even significant in light of the conservation objectives for the site. The issue also arises in the context of the review of outstanding consents, which is required in respect of internationally designated sites under the Habitats Regulations. Decisions need to be made as to the significance of the effects of many ongoing projects and incomplete developments, which alone may have very small effects but which, in combination with other projects could have significant effects.

Whilst there is some guidance available, there has been no definitive explanation as to the scale of effect that should be regarded as significant, or how large scale an effect needs to be before it may be regarded as potentially adversely affecting the integrity of a site. In order to assist in future case work, English Nature commissioned this research report to conduct a review of previous legal judgments and Inspectors' decisions and reports in cases where the spatial scale of impacts was material to the conclusions reached.

### What was done

The researchers compiled a list of potentially relevant cases drawn from their own library of decisions, their empirical knowledge of case work and suggestions from officers in the Countryside Council for Wales (CCW), English Nature and Scottish Natural Heritage (SNH).

Each decision was examined and a summary prepared to standardise the information collated about each case. This included a description of the development and its location; the date of decision and decision maker; the area of the designated site, its habitats and sensitivities to the proposed change; the loss of habitat from the site and other relevant effects on the designated interest features; the decision and reasoning for it; whether there was considered to be a likely significant effect on the site,

**Continued.....**

an adverse effect on the integrity of the site and, where relevant, whether there were considered to be alternative solutions or imperative reasons of overriding public interest; and, finally, whether any compensatory measures were proposed. Quotations were drawn from the decision letters and Inspectors' reports and points for discussion noted.

After consideration of each case a working table summarising the findings was generated and discussed before this report was drafted. Table 1 in the report is a modified version of that Table omitting some cases that were researched but not reported, as they did not contribute to the purpose of the study. It should be noted that the report only includes the cases where the loss of small areas of habitat in the designated sites were considered to be relevant to the decision. Cases involving only larger scale losses or indirect effects such as disturbance have not been included.

## Results and conclusions

After a preliminary analysis of many cases, the study looked at thirteen cases in detail. These are summarised in Table 1 in the Summary of the report and assessed in more detail on an individual basis in Section 3.

The overall conclusion is that each case should continue to be determined on its merits, as it is rare for the Secretary of State or an Inspector to have to determine a simple case of a single, permanent land take from a site. However, it is equally clear that Secretaries of State have held that very small scale losses or changes in habitat are likely to be a significant effect. Indeed they have concluded that very small scale losses, substantially less than 1%, would be an adverse effect on integrity; or at least they could not ascertain there would be no adverse effect on integrity.

Guidelines to help decision-making in future casework are presented.

## English Nature's viewpoint

So far as English Nature is concerned this report appears to have been based on relevant examples and reaches conclusions that are in line with English Nature's current thinking.

### Further information

*English Nature Research Reports* and their *Research Information Notes* are available to download from our website: [www.english-nature.org.uk](http://www.english-nature.org.uk)

For a printed copy of the full report, or for information on other publications on this subject, please contact the Enquiry Service on 01733 455100/101/102 or e-mail [enquiries@english-nature.org.uk](mailto:enquiries@english-nature.org.uk)



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Top left: Using a home-made moth trap.  
Peter Wakely/English Nature 17,396  
Middle left: CO<sub>2</sub> experiment at Roudsea Wood and Mosses NNR, Lancashire.  
Peter Wakely/English Nature 21,792  
Bottom left: Radio tracking a hare on Pawlett Hams, Somerset.  
Paul Glendell/English Nature 23,020  
Main: Identifying moths caught in a moth trap at Ham Wall NNR, Somerset.  
Paul Glendell/English Nature 24,888



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2 November 2011

Mr R Cram  
Able UK Ltd  
Able House  
Billingham Reach Industrial Estate  
Billingham TS23 1PX

Dear Richard

**Able Marine Energy Park  
Compensation Site at Cherry Cobb Sands**

**SUMMARY**

The purpose of this letter report is to provide the reader with an understanding of the suitability of the proposed compensation site at Cherry Cobb Sands. This site is required to provide sustainable mudflat in order to compensate for the loss of mudflat caused by the development of the proposed Able Marine Energy Park (AMEP). Based on evidence available from a similar site at Paull Holme Strays and using professional judgement, we expect that the proposed 100 ha realignment site can be configured to deliver a significant area of sustainable mudflat, at least in excess of that to be lost and possibly a substantially greater area. Detailed modelling studies will be undertaken to verify this prediction and inform the detailed design of the new habitat.

**BACKGROUND**

We understand that correspondence with Natural England has established that a 110 ha intertidal Compensation Site would provide confidence that the overall coherence of the Natura 2000 network would be maintained given an initial assessment that 46 ha of mudflat habitat would be lost as a consequence of the proposed development. However, the Able UK letter of 29<sup>th</sup> September 2011 reported that further development of the quay design, and assessment of its impacts, has reduced the predicted loss of existing mudflat to 38 ha. This gives rise to the possibility that sufficient compensation might be provided within a smaller, 100 ha site. NE has requested that the ground levels of any realignment site should be engineered to maximise the amount of intertidal mudflat that would be created over the long term with the objective of compensating for mudflat loss on a ratio of 2:1 (creation : loss).

**PURPOSE OF LETTER**

This letter reviews the circumstances at the Cherry Cobb Sands site and indicates the likelihood that the area of intertidal mudflat that might be created over the long term will be considerably larger than the 48 ha after 5 years reported in Annex 32.4 of the draft AMEP Environmental Statement (ES) for the originally proposed 90 ha site.





## DISCUSSION

The main differences between the original 90 ha Compensation Site and the revised 100 ha Compensation Site lies in the location of the northern and southern boundaries of the site. The northern boundary will be further north east in the 100 ha site to enclose an additional 14 ha. The boundary of the 100 ha site runs further north alongside Cherry Cobb Sands Drain than the 90 ha site boundary and rejoins the existing flood embankment around 40 m further north than the boundary for the 90 ha site. The southern boundary of the site is moved approximately 210 m to the north reducing the area enclosed in this part of the site by about 4 ha. The location of the breach is unchanged. The excavation volume within the proposed habitat compensation site to win sufficient fill to create the new flood embankments is also similar as the length of the new flood embankment required for the 100 ha site is only slightly greater than for the 90 ha site. The new flood embankment will require approximately 300,000 m<sup>3</sup> of fill to construct.

The main opportunity for modifying the ground levels within the site to maximise the creation of intertidal mudflat arises from the distribution of the excavated volume within the site. After the fill has been won for the embankment, the ground levels within the site can be engineered to a new profile by moving the soil within the site to create the most effective profile for long term mudflat creation.

At this time modelling of potential profiles for long term mudflat creation within the 100 ha site has not been started. This letter indicates the grounds for the confidence Black & Veatch has that the desired outcome of creating considerable additional long term mudflat at the Cherry Cobb Sand site will be achieved as a result of increasing the area of the habitat creation site and by engineering of ground levels.

#### Experience from Paull Holme Strays

Annex 32.5 (section 3.1) of the AMEP draft ES finds that at the nearby Paull Holme Strays managed realignment site the growth, coverage and diversity of saltmarsh plants is extremely sensitive to level as indicated in the table below.

Initial ground level (mAOD)	Ground level after 5 years (mAOD)	Saltmarsh coverage after 5 years	Dominant saltmarsh species
1.8	2.5	1-2 %	<i>Spartina anglica</i>
2.2	2.6	30%	<i>Spartina anglica</i> / <i>Puccinellia maritima</i>
2.8	2.9	70%	<i>Puccinellia maritima</i>

The experience from Paull Holme Strays is that the rate of accretion has been sensitive to initial ground level, with areas at initially lower levels experiencing more rapid accretion than higher areas. This reduces the range of ground levels within the site over time. The experience at Paull Holme Strays is that up to a level of 2.5 mAOD the coverage of saltmarsh is less than 5% and primarily

limited to *Spartina anglica*. Once ground levels reach 2.6 mAOD the coverage and diversity of saltmarsh plants increases rapidly.

#### Implications for the Cherry Cobb Sands site

At Cherry Cobb Sands, about 7.5 km south of Paull Holme Strays, tidal conditions are very similar to those encountered at Paull Holme Strays. We therefore consider that where ground levels at Cherry Cobb Sands are below 2.5 mAOD the habitat that forms will be mudflat with occasional *Spartina anglica* plants. Once ground levels at Cherry Cobb Sands reach 2.6 mAOD the coverage of saltmarsh plants is likely to exceed 30% after five years and the habitat should be considered as saltmarsh.

The existing ground levels within the Cherry Cobb Sands site are very flat and close to 2.5 mAOD, though the excavation needed to provide material for the new flood embankment will lower average ground levels by 0.3m. These ground levels are only a little lower than the level at which saltmarsh will start to grow in this part of the Humber Estuary.

With ground levels at Cherry Cobb Sands so close to the level at which saltmarsh will grow, in order to maintain mudflat over the long term the experience from Paull Holme Strays shows that it is essential to reduce ground levels within the site and limit the accretion rate as far as possible, noting that with reduced ground levels, accretion rates tend to be greater because of the increased frequency and depth of inundation. However, there will be benefits in identifying areas within the site where the reduction in ground levels should be greater than average to encourage the maintenance of mudflat habitat over the long term.

The advantage at Cherry Cobb Sands is that the proposed site is relatively long and thin with a breach close to its narrow southern end. This has the benefit of causing high velocities within the site on the flood tide as the tidal waters flow north across the relatively narrow site to inundate the majority of the site which is some distance north of the breach. The high velocity within the site associated with a southern breach is a feature that was evident in the tests of breach layout in Annex 32.3 and unlike a northern breach where velocities within the site were generally much lower. This is because the width of the site near a northern breach is greater and the breach is closer to the centre of the site.

#### Approach to detail design studies

The objective of the detail design studies for the 100 ha site will be to utilise and where possible increase the existing predicted area of high velocity near the breach to erode the sediment that would otherwise accrete and limit the area of the site where accretion takes place. Increasing the site area from 90 to 100 ha will help in this process because it will increase the tidal volume entering the site by 11% which will increase velocities in areas close to the breach and so extend the area where accretion either does not occur or is very limited.

The modifications to the layout of the site will reduce the area south of the breach by about 4 ha and increase the area to the north of the site by 14 ha. This is designed to increase as much as possible the tidal volume needed to fill the part of the site north of the breach.

The area to the south of the breach is a low energy area where velocities will be low and accretion will be rapid and we consider this area is unlikely to support sustainable mudflat. We therefore consider that the 4 ha reduction in the area of this part of the site will not adversely affect the achievement of sustainable mudflat within the remainder of the site.

By increasing the intertidal area at the north end of the site by 14 ha, this will increase the area to the north of the breach from approximately 71 ha for the 90 ha site to 85 ha for the 100 ha site. This will increase the tidal volume flowing north on the flood tide by approximately 20% and encourage higher velocities in the part of the site to the north of the breach. The development studies will aim to shape the excavation to increase the area where high flood tide velocities occur and also encourage increased ebb tide velocities in parts of the site by directing drainage from the majority of the site into specific low ways which will pass greater flows and so experience greater velocities and shear stresses.

The ground profile tested for the 90 ha site in Annex 32.4 resulted in approximately 48 ha of the site being below 2.5 mAOD after five years and so remaining as mudflat for at least this time. There was no particular effort made to shape the ground profile considered in these tests to maximise the area of high shear stress that will have limited or no accretion. The ground profile for these tests was based on the most likely location of suitable fill for the embankment, with the remainder of the site graded to have a very mild slope directed towards the breach to help the site drain at low tide.

With the objective of creating long term mudflat, the profile of the site will be developed to provide one or more wide low channels along the length of the site with the sides of the site graded towards the channels to concentrate ebb tide drainage into these features. This will increase ebb velocities along the channels and increase shear stresses which will prevent accretion during the ebb tide and encourage material that settles at high tide to erode again. The effects this change will have on the high flood tide velocities and shear stresses found in the tests of the 90 ha site which are the principal source of erosion in this model are not so easily predicted but these high shear stresses are expected to persist with erosion more concentrated into these channels.

The overall effects of the changes proposed are intended to concentrate flows into the pre-formed channels instead of being more evenly dispersed across the site. These channels will increase the area where accretion is limited at the expense of increasing accretion rates in areas near the edges of the site.

The original 90 ha site that provided approximately 48 ha of mudflat habitat after five years is unlikely to provide the maximum amount of mudflat habitat that can be provided at the Cherry Cobb Sands site. The combination of increased site area north of the breach, increasing velocities and careful engineering of the site is likely to lead to a substantial increase in the area of mudflat that is created for the long term.

#### Model uncertainty

Using models to assess sedimentation behaviour over the long term is an uncertain process. Critical issues include the rate of accretion that might be expected in the absence of other measures. For

the Cherry Cobb Sands site, the experience at Paull Holme Strays provides good evidence of likely rates of sedimentation and how they depend on ground level. The experience from Paull Holme Strays is applied in the assessment for Cherry Cobb Sands by determining probable rates of accretion based on assumed concentrations of sediment in the water column as described in Annex 32.4 (Section 4) of the AMEP ES.

All long term predictions of sedimentation are uncertain as they cannot incorporate all the events that will happen to influence sedimentation and often, as in this case, only include the major processes. For this assessment we propose to estimate accretion rates across the site based on local ground level and how experience at Paull Holme Strays shows these rates change over time as levels change. These potential accretion rates are reduced by erosion that takes place during representative tides, grossed up to estimate erosion during a full year. The estimates of accretion and erosion for the first year are combined to estimate the change in ground level over the year.

The changes over one year are extrapolated to estimate the changes over five years taking advantage wherever possible of the experience gained from Paull Holme Strays. The estimated ground levels after five years will then be imported back into the model and tested to give revised estimates of accretion and erosion which will be used to calculate changes in ground levels between years five and ten. This will allow an estimate to be made of the amount of mudflat remaining after ten years. The change in mudflat area between years five and ten will also indicate the extent to which physical development of the site has stabilised and thus the likelihood that the type and area of habitat within the site will stabilise.

Sensitivity testing on key parameters that affect the rate of erosion or accretion will be carried out to determine the magnitude of change that would need to occur before the absolute minimum requirement for 38 ha of mudflat over the long term would be compromised. Practical difficulties, especially the unreliability of long term predictions, make it unreasonable to attempt predictions for more than 10 years, but the difference between conditions after five and ten years may provide some indication of the likely longer term stability of the predicted area of mudflat.

#### Effects of sea level rise

In a turbid estuary like the Humber, there are sufficient sediments available to fill the slow increase in 'accommodation space' that occurs if sea level rises relative to land levels. We will assume in the AMEP ES and will also assume in the design studies discussed here that the levels on the foreshore will rise in step with sea levels and that there will be no relative change in the habitat types within the Compensation Site as a result of rising sea levels.

#### CONCLUSIONS

The existing ground levels at Cherry Cobb Sands are close to the local boundary between mudflat and saltmarsh habitats in the Humber. This requires excavation to ensure the long term development of mudflat.

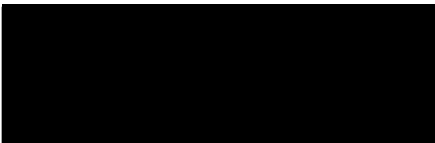
The shape of the Cherry Cobb Sands site and the location of the breach near the southern end provide an area of high shear stresses especially on the flood tide where mudflat is likely to persist

whatever ground profile is chosen. These positive benefits will be enhanced by reducing the area of the site to the south of the breach and increasing the area to the north of the breach. The breach itself will remain in the position shown during the statutory consultations.

Engineering of the ground levels within the Cherry Cobb Sands site to increase the area of high shear stresses especially on the ebb tide should increase the area where there is no, or very limited, accretion. The additional area of mudflat that the model will predict will survive for five or ten years cannot be estimated in advance but the proposed 11% increase in total site area and the 20% increase in the area north of the breach will provide an important boost to velocities in the intertidal area and is likely to increase the mudflat area significantly.

Model predictions of sedimentation are uncertain but confidence has been gained from the experience at the nearby Paul Holme Strays site where tidal conditions are similar and monitoring provides good evidence of the rates of development of physical and ecological parameters. The design objective will be to create substantially more than 38 ha after 5 years and to retain sufficient mudflat after ten years to provide a margin for design uncertainty. Sensitivity testing will indicate the margin of uncertainty available for key parameters without compromising the absolute minimum requirement for 38 ha of mudflat compensation to be provided in the long term.

Yours sincerely



DC Keiller  
**Technical Director**  
**Black & Veatch**

[REDACTED]  
Able Uk Ltd  
Able House  
Billingham Reach Industrial Estate  
Haverton Hill Road  
Billingham  
Cleveland  
TS23 1PX

**Our ref:** AN/2012/113982/01-L06  
**Your ref:** IPC-Pro-11  
**Date:** 19 June 2012

Dear Peter

**Marine Energy Park, Killingholme Marshes, North Lincolnshire  
Piling Mitigation & Compensation proposal**

Thank you for your letter dated 11 May 2012 in respect of salmon disturbance. I have shared the letter with our Defra partners (the Marine Management Organisation (MMO) and Natural England (NE)) and now provide our joint response to your mitigation proposals.

**General Mitigation**

The general construction proposals outlined in your letter are welcomed. We would like to inform you of the following detailed requirements, which we will seek to secure in respect of your general proposals:

**Soft Start**

We will be requiring that the soft-start procedure for percussive piling recommended by the Joint Nature Conservation Committee (JNCC), for a period of not less than 20 minutes is implemented. Should piling cease for a period of greater than 10 minutes, then the soft-start procedure must be repeated. This is required to allow commercial and migratory fisheries, such as herring, sole, plaice, salmon and lamprey, together with marine mammals to move away from the noise source and reduce the likelihood of exposing them to sounds which can cause injury. If you believe that the 20 minute requirement should be reduced, we will be please to review any evidence that you have to substantiate this.

**Noise Shrouds**

We note that the use of piling shrouds is only possible up to the piling gate. This technique is primarily for the protection of birds and only provides partial mitigation. However, I can confirm that this is acceptable to NE, providing full mitigation is

Environment Agency  
Waterside House, Waterside North, Lincoln, Lincolnshire, LN2 5HA.  
Customer services line: 03708 506 506  
[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

Cont/d..

implemented as soon as the pile gate is removed.

### ***Pile Pads***

The use of pile pads is welcomed.

### ***Monitoring of water temperature/dissolved oxygen***

Your proposal to cease impact piling if water temperature in the estuary exceeds 21.5°C is welcomed. The Environment Agency will also require cessation of impact piling if dissolved oxygen drops below 5mg/l. Active monitoring will be necessary to ensure compliance with this requirement.

### ***Piling restrictions***

We are satisfied that the piling restrictions proposed will provide some mitigation for the species of concern, in particular the complete cessation of piling between 7 April and 1 June for the protection of migratory salmon, elvers and river lamprey. We agree that the piling period should commence at the start of percussive piling, roll throughout (which includes any quiet periods when piles may be being placed) and cease at the end of the piling day. This is required as the expected time periods for the setting up/placing of piles, i.e. 30 minutes, is not considered an adequate period of quiet for fish to swim through the zone of potential impact before piling recommences.

### ***Compensation proposal***

We can confirm that enhancing the development of the Cherry Cobb Sands compensation site for juvenile fish is welcomed. We have evidence of similar schemes at Alkborough and Chowderness working well. We will require this work to be secured through the appropriate mechanism, together with a scheme to monitor its effectiveness. As previously discussed, it would be helpful if you could provide a monetary value for this work.

### **Development Consent Order and Deemed Marine Licence requirements**

In order to provide clarity on this issue, we provide below a schedule of requirements and conditions that we are proposing:

We recommend that a definition of “percussive piling” is included in the Interpretation section of the deemed marine licence as follows:

“percussive piling” means the driving of piles by percussive means but does not include the handling, placing and vibro-driving of piles.

We recommend that a definition of “marine piles” is included in the Interpretation section of the deemed marine licence as follows:

“marine piles” being defined as a pile that will be in the marine area.

### ***Prior to works commencing:***

#### **DCO and DML Condition 1**

No development shall be commenced until a Piling Method Statement has been submitted to and agreed in writing by the Marine Management Organisation [substitute LPA for MMO when in Requirements schedule], following consultation with the Environment Agency and Natural England. The Piling Method Statement shall include the following measures:-

- Utilisation of pile pads;
- Utilisation of pile shrouds;
- Specification of piles to be used;

- Soft-start procedures to be followed;
- Marine mammal observation;
- Implementation of the Active Monitoring Scheme.

Development shall thereafter proceed only in strict accordance with the agreed Piling Method Statement.

**Reason:** To reduce the risk to sensitive mobile receptors, including Atlantic salmon, sea trout, river and sea lamprey, eel, herring, sole, plaice and marine mammals.

### **DML Condition 2**

No development shall be commenced until an Active Monitoring Scheme has been submitted to and agreed in writing by the Marine Management Organisation, following consultation with the Environment Agency and Natural England. The Scheme shall include the following details:-

- Location of Active Monitoring Buoy(s) and depth and design of sensors;
- Full details of the frequency of measurement of temperature and dissolved oxygen in order to ascertain compliance with condition 9;
- 24 hours a day, 7 days a week monitoring of noise in order to ascertain compliance with conditions 4-7;
- Full details of when monitoring will commence and cease, which will include a 2 week period of pre and post construction monitoring in order to establish baseline conditions and the return to baseline conditions once construction activity has finished;
- A log of the number and approximate location of piling rigs which are in operation on any given day;
- Full details of how the monitored information will be accessed by or communicated to the site contractor and the Marine Management Organisation where necessary.

The Monitoring Scheme shall thereafter be implemented in accordance with the timetable approved as part of the scheme.

**Reason:** To ensure appropriate information is available to allow noise mitigation measures to be implemented and monitored. To avoid periods when water conditions will make fish more vulnerable to disturbance. To reduce the risk to fish species including Atlantic Salmon, Sea Trout, River and Sea Lamprey, Eel, Herring, Sole and Plaice.

### **DCO and DML Condition 3**

No percussive piling shall commence until a Cold Weather Construction Restriction Strategy for the months of February and March is agreed in writing with the Marine Management Organisation [substitute LPA for MMO when in Requirements schedule] in consultation with Natural England.

The strategy shall include the following elements/procedures:-

- a) No percussive piling (other than to finish driving any pile that is in the process of being driven at the point the cold weather restriction comes into force) shall take place following seven consecutive days of zero or sub zero temperatures (where the temperature does not exceed 0°C for more than 6 hours in any day or any other pre-agreed formula to define short periods of thaw);
- b) Three temperature monitoring points shall be agreed within the Humber Estuary such as Immingham, Killingholme, Grimsby, or Spurn;



- c) Full details of how the monitored information will be accessed by or communicated to the site contractor and the Marine Management Organisation [substitute LPA for MMO when in Requirements schedule] where necessary.
- d) The restrictions will be reviewed as follows:
- I. After 24 hours of above-freezing temperatures, the restrictions will be lifted on a "probationary basis", provided that the weather forecast (met office forecast location to be agreed) indicates that freezing conditions will not return within five days. If this weather forecast turned out to be wrong and freezing conditions did return, then there would have to be an immediate suspension of activity again;
  - II. After five clear days of above-freezing temperatures the restrictions will be lifted entirely and the "clock reset to zero".

The Monitoring Scheme shall thereafter be implemented in accordance with the timetable approved as part of the scheme.

**Reason:** To avoid an adverse effect on the interest features of the Humber Estuary SPA/Ramsar site.

### ***During works***

#### **DML Condition 4**

No percussive piling of piles shall take place between 7<sup>th</sup> April and 1<sup>st</sup> June inclusive in any one calendar year.

**Reason:** To reduce the risk to fish species including Atlantic Salmon, Sea Trout, River and Sea Lamprey, Eel, Herring, Sole and Plaice.

#### **DML Condition 5**

Percussive piling of piles shall be restricted in the following way:-

1. From 2<sup>nd</sup> June to 22<sup>nd</sup> July inclusive in any one calendar year, the maximum amount of percussive piling permitted within each four-week period shall be limited to:-
  - a. 101 hours where a single rig is in operation; or
  - b. A combined total of 168 hours where two or more rigs are in operation.
2. From 23<sup>rd</sup> July to 10<sup>th</sup> September inclusive in any one calendar year, the maximum amount of percussive piling permitted each week shall be limited to:-
  - a. 25 hours where a single rig is in operation; or
  - b. A combined total of 42 hours where two or more rigs are in operation.
3. From 11<sup>th</sup> September to 31<sup>st</sup> October inclusive in any one calendar year, the maximum amount of percussive piling permitted within each four-week period shall be limited to:-
  - a. 134 hours where a single rig is in operation; or
  - b. A combined total of 224 hours where two or more rigs are in operation.
4. From 1<sup>st</sup> November to 6<sup>th</sup> April inclusive in consecutive calendar years, the maximum amount of percussive piling permitted within each eight-week period shall be limited to:-
  - a. 336 hours where a single rig is in operation; or
  - b. A combined total of 560 hours where two or more rigs are in operation.

The measurement of each work block shall begin at the start of the first percussive piling strike, roll throughout the piling day, then cease at the end of the last piling strike. Measurement will begin again at the start of the next percussive piling day, on the start of the first percussive piling strike. This process will be repeated.

**Reason:** To reduce the risk to fish species including Atlantic Salmon, Sea Trout, River and Sea Lamprey, Eel, Herring, Sole and Plaice.

#### **DCO and DML Condition 6**

No piling shall take place between 22.00hours on a Saturday and 06.00hours on the following Monday.

**Reason:** To ensure periods of quiet when no percussive piling is taking place for the benefit of fish species including Atlantic Salmon, Sea Trout, River and Sea Lamprey, Eel, Herring, Sole and Plaice.

#### **DCO and DML Condition 7**

No piling shall take place between 22.00hours and 06.00hours.

**Reason:** To ensure periods of quiet when no percussive piling is taking place for the benefit of fish species including Atlantic Salmon, Sea Trout, River and Sea Lamprey, Eel, Herring, Sole and Plaice.

#### **DCO and DML Condition 8**

The maximum diameter of marine piles shall be 2.1m.

**Reason:** The impact assessment was undertaken on a maximum diameter of marine piles of 2.1m and a greater diameter pile would have a greater environmental impact.

#### **DML Condition 9**

No piling shall take place during periods when the data from the Active Monitoring Buoy(s) shows temperature to be above 21.5 degrees Celsius and/or dissolved oxygen to be below 5mg/l.

**Reason:** To reduce the risk to sensitive mobile receptors, including Atlantic salmon, sea trout, river and sea lamprey, eel, herring, sole, plaice and marine mammals.

#### **DCO and DML Condition 10**

The Licence Holder must ensure that soft-start procedures are used to ensure incremental increase in pile power over a set time period until full operational power is achieved. The soft-start duration should be a period of not less than 20 minutes. Should piling cease for a period greater than 10 minutes, then the soft start procedure must be repeated.

**Reason:** To allow mobile sensitive receptors, including salmon sea lamprey, river lamprey, eel, herring, sole, plaice and marine mammals, bird species to move away from the noise source, and reduce the likelihood of exposing the animal to sounds which can cause injury.

In order to progress with our detailed Written Representations and the joint Statement of Common Ground, it would be helpful if you could confirm your agreement to the imposition of these requirements and conditions. We will then be able to give further consideration to any residual risk remaining, following

implementation of these mitigation measures, and whether or not further compensatory works will be necessary.

Should you require any additional information, or wish to discuss these matters further, please do not hesitate to contact me on the number below.

Yours sincerely

**Ben Thornely**  
**Area Planning & Corporate Services Manager**



# EUROPEAN PROTECTED SPECIES LICENSING CONSULTATION

For European Protected Species Licensing Team  
**GREAT CRESTED NEWTS**

NATURAL  
ENGLAND

<b>Applicant / Ecologist:</b>	Applicant: ABLE UK Ltd Ecologist: Duncan Painter		
<b>Site name:</b>	Able Marine Energy Park, Rosper Road, Killingholme, Immingham, North Lincs.		
<b>Case reference number:</b>	EPSM 2012-4206A (JG) -DRAFT		
<b>Date application received by assessor:</b>	24 <sup>th</sup> February 2012	<b>Assessor's response deadline:</b>	22 <sup>nd</sup> March 2012
<b>Date re-submission received by assessor:</b>		<b>Assessor's response deadline:</b>	
<b>Date modification received by assessor:</b>		<b>Assessor's response deadline:</b>	

## The Conservation of Habitats and Species Regulations 2010

The appropriate authority shall not grant a licence under regulation 53(9)(b) unless they are satisfied that actions authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

*It should be noted that the comments provided on this form do not provide an exhaustive list of concerns that need to be addressed. The onus is on the applicant/ecologist to provide all details required for a full assessment. The method statement should be carefully checked to ensure that it follows the recommendations provided in the Great Crested Newt Mitigation Guidelines (2001). Deviations from the recommendations should be fully explained within the method statement. Please ensure the method statement, with accompanying documents, is re-submitted in its entirety.*

Please see the following documents for further advice:

- [http://www.naturalengland.org.uk/Images/wmlg04\\_tcm6-4112.pdf](http://www.naturalengland.org.uk/Images/wmlg04_tcm6-4112.pdf)
- [http://www.naturalengland.org.uk/Images/wlmsfaqs\\_tcm6-3859.pdf](http://www.naturalengland.org.uk/Images/wlmsfaqs_tcm6-3859.pdf)
- [http://www.naturalengland.org.uk/Images/wmlg05\\_tcm6-4115.pdf](http://www.naturalengland.org.uk/Images/wmlg05_tcm6-4115.pdf)
- [http://www.naturalengland.org.uk/Images/WML-G11\\_tcm6-9930.pdf](http://www.naturalengland.org.uk/Images/WML-G11_tcm6-9930.pdf)

## 1. Experience

Is the experience written in the application form and attached written references adequate for the proposed work?

Yes  No

- Experience will usually be taken as adequate if the ecologist has held or been named on a licence in the past three years for the same species and in relation to a project of a similar scale, methodology and mitigation.
- A licence to carry out survey work is not considered to be a similar licence.
- A new applicant must provide a description of their work experience with Great crested newts and include two written references, both of which must contain specific detail of the referees own experience with Great crested newts (including licence numbers) and their knowledge of relevant work carried out by the applicant. Please refer to document WMLG05 – link provided above.
- At least one of the written references must be from a person who held or been named on a licence in the past three years for the same species and in relation to a project of a similar scale, methodology and mitigation. Details of this licence must be provided.

If 'NO' please address the following:

n/a

## 2. Survey

Has an adequate and appropriate survey of the site been carried out in relation to the proposed objectives?

Yes  No

*An adequate survey will include:*

- *Details of the area and habitat that was surveyed;*
- *An appropriate scaled map(s) of:*
  - The area where the Great crested newts will be affected by the proposed work,*
  - The proposed area where mitigation will occur (if applicable), and*
  - Adjoining sites if part of a phased development or other Great crested newt mitigation licences are held in those areas;*
- *The survey methods used;*
- *The name/s of the surveyor/s who undertook the work;*
- *Dates and weather conditions when the surveys were carried out; and*
- *Clearly presented survey results (for each method used) cross-referenced to areas on the map(s).*

If 'NO' please address the following:

Further details are required before we are able to assess if the survey effort is adequate for the application.

### 2010 Survey:

The Survey dates for this survey were all very close together (4 visits within 7 days), and Natural England expects surveys to be spread across the breeding season where possible. Concentrating all surveys over a short period risks falsely concluding newts are absent, when they may be present (in low numbers) earlier or later than the survey period. In addition, many of the ponds identified within 500m of the site were not able to be surveyed due to a lack of access permission. The survey results from the 2006 Just Ecology survey have not been appended.

Given the above factors, Natural England needs assurance that the surveys are an accurate representation of the status of great crested newts (GCN) in this area, and no other ponds (other than Ponds 14 and 18) may support great crested newts. Please therefore provide the following:

- the 2006 Just Ecology survey report (as an appendix);
- written confirmation that landowner consent was sought for surveys of the ponds outside the site, and written confirmation that it was refused;
- if possible, HSI assessments or photos of ponds not able to be surveyed;
- Ponds 1,5, 15, 17, 21, 24, 25, and 27 have been deemed unsuitable for great crested newts, despite no access being possible to survey these ponds (some were viewed from a distance). Ponds should not be dismissed purely because they appear superficially poor or sub-optimal for newts, and all these ponds are potentially relevant to the impact assessment – please provide further clarification regarding the status of these ponds. If access to survey is denied, but the ponds may support great crested newts, this needs to be taken into account in the impact assessment and mitigation proposals.
- Please provide all survey results from 2010 – not just those for ponds within the development site.
- Please clarify if the drainage ditches within the site offer potential habitat for GCN? Are these freshwater habitats? If they are potentially suitable, further surveys may be required in spring 2012.

Please also only provide survey results from a single year within the Method Statement. Older survey results should be provided as an appendix.

Please ensure that the survey tables are only completed where a survey method was used – for example Pond 8 includes negative results for torch surveys, however the comments indicate this method was not used – please amend.

## 3. Impacts

Are the impacts of the development on the population fully described?

Yes  No

*Impacts of the development on the Great crested newt population should be described as if taking place in the absence of mitigation:*

- *Details of the areas and habitat types that will be lost to the development should be included;*
- *For phased developments impacts for all phases should be detailed (and a master plan provided as a separate document, please refer to WML-G11, link above); and*
- *The population must be considered in context of the local or regional population of Great crested newts.*

If 'NO' please address the following:

Map D – Please show Ponds 14 and 18, and include the 250m and 500m radii around them on this plan.

Please also provide a breakdown, either on Map D or within the text of D2, of the types and areas of habitat to be lost that are likely to be used by GCN (i.e. those up to 500m from the ponds).

D5.2 indicates 3 ponds will be lost, however the remainder of the impact assessment only refers to the loss of ponds 14 and 18 (confirmed to support GCN). Please clarify the third pond considered likely to be used by newts, and the impact of its loss. Pond 20 lies very close to Pond 18, although the HSI score indicates it is unlikely to be suitable for GCN, however Pond 13 appears to be more suitable, yet further from the known GCN ponds. Please note, table D5.1 (and D1/D2) should detail impacts on all ponds confirmed as being used by GCN *and* any likely to be used for foraging.

#### 4. Methodology

Is the proposed methodology of the work programme suitable to meet the stated objectives in the application form?

Yes  No

*Suitable methodology will include:*

- *A clear description of the licensable operations e.g. capture and exclusion, translocation;*
- *Details of the proposed methods and techniques; and*
- *A detailed timetable of the proposed works pertaining to all licensable activities and mitigation, including disturbance /destruction of Great crested newt habitat. **This should be realistic and updated for any re-submission.***

*The above must correspond with the details contained within the application form.*

If 'NO' please address the following:

n/a

#### 5. Mitigation

Is the mitigation proposed adequate with respect to the habitat which will be lost?

Yes  No

*Adequate mitigation will include details of:*

- *Habitat creation, modification and/or restoration (including areas and habitat types);*
- *Post-development habitat management;*
- *Post-development habitat maintenance;*
- *Post-development population monitoring; and*
- *Details of any mechanism in place for ensuring delivery (e.g. a Section 106 agreement).*

*It will also include scaled drawings, plans and/or maps and photographs, as appropriate.*

If 'NO' please address the following:

E3.1 – Please provide the dimensions for each of the new ponds – length, width and depth.

Map E3.1 – Please show the hedgerow planting/restoration proposed on this map.

E5.1 – Applications of this type require a Habitat Management and Maintenance Plan to be agreed and submitted as part of the licence application. No such document has been provided. Given that the success of the proposals relies heavily on the long term management and maintenance of both the newly created habitats and also the existing woodland habitats in the adjoining Fox Covert and Chase Hill Wood, a Management Plan is required that covers all these habitats. This must be agreed by all relevant parties (land owners and those carrying out the management) and submitted with the licence application.

A map is also required to show the areas referred to in the Plan and the management associated with them.

E5.3 – For developments with this level of impact, some form of legally binding agreement is required to ensure the long-term security of the receptor site and the adjoining woodland, and ensure that the habitats are managed and maintained in the future. Intentions to include the receptor site in a future LNR appear to be a laudable aim, however all agreements relating to the future security and management of the receptor site and the adjoining woodland must be in place prior to a licence being issued. In the absence of this security, it is not possible to reach a conclusion that the Favourable Conservation Status of the great crested newt population can be assured.

## 6. Conclusion in respect of regulation 53(9)(b)

Satisfied   
Not satisfied

**Assessed by:** Cressida Mansfield

**Date:** 30/03/2012

## 7. Additional Comments

Natural England requires a named person to apply for the licence, and cannot issue a licence to a company. Therefore please provide the name of the licensee for the re-submission, and ensure that the declaration at the end of the application form is signed and dated. The cover sheet of the Method Statement also needs to show the name of the licensee (not the company).

Map F1 – Please clarify what the green shaded area in the south of the site comprises. Since the method statement indicates all habitats on site will be lost, it is assumed this area is proposed for some form of development, however if this is not the case, consideration should be given to utilising the area for habitat creation and/or a receptor site for the GCN population.

Please ensure all abbreviations are explained in full – notably, it is unclear who ‘Humber INCA’ are – please explain where relevant.

*The points raised above must be addressed in a revised Method Statement before the favourable conservation status test (Regulation 53(9) (b)) can be met. Please read the comments carefully and address all of the issues raised. The resubmission should be presented in its entirety to include all maps, appendices, reports etc. All changes from the previously submitted documents must be clearly highlighted.*

*The comments below are for information, however they must be borne in mind for future applications.*

B2.2 – This section of the Method Statement indicates only 1 breeding pond will be lost, however the application form and section D5.2 of the method statement suggest 3 ponds will be lost (2 of which are confirmed as GCN ponds). Please ensure future applications are consistent on this point.

E2 – Ideally newts should be retained on site wherever possible, and the population maintained within

it's current natural range (i.e. within 500m of the known GCN ponds). Given the scale of this development, and the lack of opportunity for habitat creation within the site, the proposals to relocate the population approximately 1km from the current breeding ponds has been accepted in this instance, however this would not be the case for most mitigation applications. Please be aware that for translocations over 1km, the need for disease screening must be considered. For this application, the intention is to translocate newts to an area where newts are currently absent, and there is also a possibility that very small numbers of newts may disperse this distance from the current population. Connectivity from the receptor to the closest (non-GCN) pond is also restricted as a result of the proposed permanent amphibian fencing along Chase Hill Wood. Therefore disease screening has not been required for this case. This may not be the case for future applications however, and translocations beyond 500m from the existing GCN ponds should be avoided wherever possible.

E4 – It is unclear why only 75 pitfall traps/hectare will be used, rather than the recommended 80 traps/ha in the Great crested newt mitigation guidelines (GCNMG). Given this is a small discrepancy, and the trapping proposals shown on map E4a appear appropriate, amendment is not being required, however please bear in mind that deviation from the trapping recommendations in the GCNMG should be explained and justified for future applications.

E6a – Whilst appropriate, it is recommended that a longer period is allowed for capture of newts from the site. Given that some days between March and May are likely to be unsuitable for capture, it is recommended a longer period is included in the timetable, to avoid the need to apply for a modification in the event of prolonged periods of unsuitable weather. If relevant, please ensure that where activities may occur in the same month, a sequence of activities is specified in the comments.

**Assessor's Licence Recommendations following a 'Satisfied' decision:**

<b>Number of Great crested newts to be licensed</b>	
<b>Licensable activities</b>	<input type="checkbox"/> Capture <input type="checkbox"/> Kill <input type="checkbox"/> Transport <input type="checkbox"/> Disturb <input type="checkbox"/> Injure <input type="checkbox"/> Damage/destroy a resting place <input type="checkbox"/> Damage/destroy a breeding site
<b>Licensable methods</b>	<input type="checkbox"/> By hand <input type="checkbox"/> Hand search <input type="checkbox"/> Destructive search <input type="checkbox"/> Bottle trapping <input type="checkbox"/> Netting <input type="checkbox"/> Draining down pond/s <input type="checkbox"/> Night/torch searching <input type="checkbox"/> Pitfall trapping <input type="checkbox"/> Refugia <input type="checkbox"/> Exclusion by permanent amphibian fencing <input type="checkbox"/> Exclusion by permanent one-way amphibian fencing <input type="checkbox"/> Exclusion by temporary amphibian fencing <input type="checkbox"/> Exclusion by temporary one-way amphibian fencing <input type="checkbox"/> Drift fencing
<b>Period of Licence</b>	<b>From:</b> <b>To:</b>
<b>Compliance visit recommended?</b>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<b>Type of visit</b>	<input type="checkbox"/> Telephone <input type="checkbox"/> Visit
<b>When? E.g. time period or dates.</b>	
<b>Justification for visit and brief details of requirements</b>	



Date: 04 April 2012  
Our ref: EPSM2012 – 4206 A (JG)  
(NATIONALLY SIGNIFICANT  
INFRASTRUCTURE PROJECT – NSIP)



Jonathan Monk  
Able Marine UK Ltd

Customer Services  
Wildlife Licensing  
Natural England  
First Floor  
Temple Quay House  
2 The Square  
Bristol, BS1 6EB

*Sent by e-mail only*



Dear Mr Monk

**DRAFT NSIP EPS MITIGATION LICENCE APPLICATION – INITIAL RESPONSE**

**LEGISLATION:** CONSERVATION OF HABITATS AND SPECIES REGULATIONS 2010

**NSIP SITE:** ABLE MARINE ENERGY PARK, ROSPER ROAD, KILLINGHOME, IMMINGHAM,  
NORTH LINCOLNSHIRE

**EUROPEAN PROTECTED SPECIES:** GREAT CRESTED NEWT (*Triturus cristatus*)

Thank you for your draft great crested newt mitigation licence application in association with the above NSIP site, which was received in this office on the 20<sup>th</sup> February 2012. For NSIPs which require protected species licences, Natural England would normally review draft licence applications before the Development Consent Order (DCO) application is submitted to the National Infrastructure Division (NID), previously the Infrastructure Planning Commission. Once content that the licence applications are of the required standard, we would issue a 'letter of comfort' to the developer which could be included with the application pack to the NID. Such letters of comfort are designed to provide the NID with confidence that the competent licensing authority is satisfied that a licence can be issued, subject to the DCO being granted by the NID (please see our guidance note [http://www.naturalengland.org.uk/Images/WML-G36\\_tcm6-28566.pdf](http://www.naturalengland.org.uk/Images/WML-G36_tcm6-28566.pdf) which explains the process in more detail).

Given the above process is relatively new, we agreed in this instance to work with you and your consultant with a view to issuing the required letter of comfort as soon as possible, to help ensure that the proposals meet protected species licensing requirements. Please note that Natural England seeks to reassure the NID that our decision to undertake this, rather than follow our guidance, does not in any way set a precedent for other cases.

We have now completed our initial assessment and provide advice as detailed below on the three licensing tests, which must be 'met' before any licence can be issued. As you are aware, no final licensing decision can be made, or a licence issued, until the development obtains all necessary consents in order to proceed and any relevant conditions are discharged. We have therefore assessed your draft proposals against the legislation and have concluded that the following issues, as detailed below, need to be addressed prior to a letter of comfort being issued. In relation to an application of this nature, our advice, if adhered to, will help you achieve the outcome required on all three licensing tests. We advise that you make the necessary changes to your application and re-submit the relevant documents following guidance in the attached annex. **Please can you mark your re-submission, 'NSIP EPSM 2012-4206 – Able**

**Marine Park for the attention of Kathryn Murray and John Gordon**'. We will then review our decision/s based on the new information/evidence provided and issue a revised response within 30 working days of receipt.

Any letter of comfort issued following assessment of a re-submission (should all three tests be met) will confirm that, on the basis of the species information and proposals provided, Natural England is satisfied that the licensing tests can be met subject to the DCO being granted. Should the DCO be granted then the mitigation licence application must be formally submitted to Natural England. At this stage any modifications to the timings of the proposed works, e.g. due to ecological requirements of the species concerned, must be made and agreed before a licence is issued.

### ***Licensing decisions:***

#### **Reasoned Statement**

- **Imperative Reasons for Overriding Public Interest test (IROPI) (Purpose test) and**
- **No Satisfactory Alternative (NSA) test**

The evidence currently provided within your draft Reasoned Statement would not allow us to meet the 'Purpose test' or 'No Satisfactory Alternative' tests. The supporting evidence referenced within the 'Reasoned Statement' (Chapters 5, 6, 21 and Annex 4.4 of the Environmental Statement, submitted to the NID as part of the AMEP application package) has not been included with the licence application pack. This must be provided to verify the statements made before these tests can be considered met. Please note that, in terms of the purpose and NSA tests, it will not be possible for Natural England to consider that these tests have been **fully** met (in terms of obtaining a licence), in respect of any NSIP, unless the NID has granted the DCO.

Further details are provided in the enclosed determination report. Should you have any queries in relation to this matter then please do not hesitate to contact John Gordon or Oliver Lowe using the details provided below.

#### **Method Statement**

- **Favourable Conservation Status (FCS) Test**

The information and evidence currently provided within your draft method statement would not allow us to meet the 'FCS' test'. However, please see the enclosed FCS assessment report which indicates the areas of concern that need to be addressed in order to meet this licensing test. If there is any aspect of the FCS assessment report that is not clear to you and you wish to discuss it with the wildlife adviser who assessed the method statement, please contact Cressida Mansfield on 01245 237 682 or by email at: [cressida.mansfield@naturalengland.org.uk](mailto:cressida.mansfield@naturalengland.org.uk)

An email identifying issues in advance is helpful as it will enable Cressida to review your queries in the context of the case before discussing them with you. Like all Wildlife Advisers, Cressida does not spend all of her time in the office so there may be a short delay before she can respond to you.

Please note that Cressida does not deal with issues relating to the Purpose and Satisfactory Alternatives tests. As detailed above, should you wish to discuss any issues surrounding these two tests please contact Oliver Lowe ([oliver.lowe@naturalengland.org.uk](mailto:oliver.lowe@naturalengland.org.uk) or 0300 060 1514) or John Gordon after 17<sup>th</sup> April 2012 ([john.gordon@naturalengland.org.uk](mailto:john.gordon@naturalengland.org.uk) or 0300 060 1442). *(Please note that in order for us to be able to issue you with a 'letter of comfort' to support your application to the NID, this part of your application needs to be resubmitted as per the guidance in the Annex – Guidance for Providing Further Information).*

Although the tests cannot currently be assessed as "Satisfied", this letter and its attachments can be used as evidence to the NID that we are actively working with you to resolve the

outstanding issues, and this may help your DCO application. We would be grateful if you could keep us informed of the progress of the application to the NID.

I hope that the information detailed within this letter and its enclosures have been helpful. However, should you have any queries then please do not hesitate to contact me

Yours sincerely

A large black rectangular redaction box covering the signature area.

Dr Kathryn Murray

A black rectangular redaction box covering a line of contact information.A black rectangular redaction box covering a line of contact information.A long black rectangular redaction box covering a line of contact information.

## **Annex - Guidance for Providing Further Information.**

**Important note:** When submitting your *re-submission* please mark correspondence '*NSIP EPSM 2012-4206 – Able Marine Park for the attention of Kathryn Murray and John Gordon*'.

### **Submitting Documents.**

Documents must be sent to Customer Service Wildlife Licensing (postal and email address at the top of this letter).

### **Changes to Documents – Reasoned Statement and/or Method Statement.**

Changes must be identified using one or more of the following methods:

- underline new text/strikeout deleted text;
- use different font colour;
- block-coloured text, or all the above.

### **Reasoned Statement**

#### **Overriding Public Interest or Public Health and Safety and/or No Satisfactory Alternative.**

When submitting a revised Reasoned Statement please send us one copy on CD, or by e-mail if less than 5MB in size, or alternatively one paper copy of the complete, revised document. Please do not send the amended sections in isolation.

### **Method Statement**

#### **Favourable Conservation Status.**

When submitting a revised Method Statement please send us one copy on CD, or by e-mail if less than 5MB in size, or alternatively three paper copies. The method statement should be submitted in its entirety including all figures, appendices, supporting documents. This document forms part of the licence; please do not send the amended sections in isolation.

# Customer Feedback – EPS Mitigation Licensing

To help us improve our service please complete the following questionnaire and return to:

Customer Services Wildlife Licensing, Natural England, First Floor, Temple Quay House, 2 The Square, Bristol, BS1 6EB.

Fax: 0845 6013438 or email to [wildlife@naturalengland.org.uk](mailto:wildlife@naturalengland.org.uk)

<http://www.naturalengland.org.uk/ourwork/regulation/wildlife/default.aspx>



<b>Natural England Reference Number (optional):</b>	Please tick to indicate your role:	Consultant	<input type="checkbox"/>
		Developer (Applicant/Licensee)	<input type="checkbox"/>

## 1. How easy was it to get in contact with the Wildlife Management & Licensing team of Natural England?

*Difficult (1)* 
                         
 *OK (2)* 
                         
 *Easy (3)* 
                         
 *Very Easy (4)*

If 1 please specify who you initially contacted in relation to your issue/enquiry?

## 2. Please tell us how aware you were (BEFORE you contacted us) of wildlife legislation and what it does/does not permit in relation to your enquiry?

*Unaware (1)* 
                         
 *Very Limited Awareness (2)* 
                         
 *Partially Aware (3)* 
                         
 *Fully Aware (4)*

## 3. How would you rate the service provided by Natural England?

	<i>Poor</i> 1	<i>Fair</i> 2	<i>Good</i> 3	<i>Excellent</i> 4	<i>Not applicable</i>
Ease of completion of application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Advice provided by telephone (if applicable)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our web site (if applicable)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Clarity and usefulness of published guidance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Helpfulness and politeness of staff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Advice and clarity of explanations provided during Method Statement assessment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Advice and clarity of explanations provided during Reasoned Statement assessment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Speed of process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall service	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If 1 or 2 to any of the above please specify why:

## 4. Was your issue/enquiry resolved by the activity authorised under licence or advice provided by us?

*Fully* 
                         
 *Partially* 
                         
 *Unresolved*

If not fully resolved please state what you think could have been done instead (note legislation affects which actions can be licensed):

## 5. Was there a public reaction to any action taken under the licence or as a result of our advice?

*Positive support* 
                         
 *No reaction* 
                         
 *Negative reaction*

## 6. Would you use a fully online licensing service if it could be made available in the future?

*Definitely* 
                         
 *Possibly* 
                         
 *Unlikely* 
                         
 *No*

7. Do you have any further comments to make or suggestions for improving our service, if yes please specify (continue comments on an additional sheet if necessary). *If you are happy to be contacted at a later date to explore possible improvement options, please tick this box  and ensure your Natural England reference number is at the top of this page.*



## Suggested amendments to Table 1

	Summary of likely impacts	Comment
1	Permanent loss of intertidal mudflat habitat	The new quay, associated rock armouring and the pumping station, pipes etc will result in the permanent loss of 31.5ha of intertidal habitat from the SAC, SPA and Ramsar site.
2	Permanent loss of saltmarsh habitat	Saltmarsh is recorded on Killingholme foreshore; xha will be lost as a result of the new quay, pumping station etc. 2ha of saltmarsh will also be lost at Cherry Cobb Sands when the managed realignment breach is created. The creation of the breach for the managed realignment site may result in the erosion of saltmarsh in the adjacent areas. Further work is currently being undertaken to assess this so a final area of saltmarsh losses is yet to be defined.
3	Permanent loss of subtidal habitat	The new quay will result in the permanent loss of 13.5ha of subtidal habitat from within the SAC, SPA and Ramsar site. The subtidal is a sub-feature of the SAC and Ramsar feature 'estuary'. Natural England's advice is that the loss of subtidal habitat will not result in an LSE on the SPA or bird features of the Ramsar site.
4	Indirect loss of intertidal habitat	The construction and operation of the new quay will result in permanent disturbance to an area of 6ha of intertidal habitat within the SPA and Ramsar site.
5	Change to subtidal habitat	The berthing pocket will be over-dredged to the top of the natural bedrock and then backfilled with stone aggregate. This will result in the loss of subtidal muds.
6	Change to intertidal habitat	The new pumping station will result in a drainage channel through the intertidal – the impact of this will be scouring of a channel 25.5m in width and 12m long. 1ha of existing mudflat will be affected. Some rock armouring will also be installed on the existing intertidal mudflat.
7	Effects on intertidal and subtidal habitats and benthos from the	The capital dredge will result in the loss of intertidal and subtidal mud habitats and associated benthos. Whilst it is expected that these habitats could recover over time, this

	capital dredge	will be prevented by ongoing maintenance dredging.
8	Effects on intertidal and subtidal habitats and benthos from the maintenance dredge	Maintenance dredging will result in the loss of intertidal and subtidal mud habitats and associated benthos. Whilst it is expected that these habitats could recover over time, this will be prevented by ongoing dredging.
9	Changes in suspended sediment concentrations	The water quality of the estuary may be affected by construction activities such as piling, flooding of the compensation site and capital dredging, and operational activities such as maintenance dredging
10	Disposal of dredge arisings – capital and maintenance dredging	Disposal of dredge material from capital and maintenance dredging could result in sediment plumes and smothering of benthic communities
11	Removal of capital dredged sediment from the estuary	The use of capital dredge material to fill the quay is mentioned in the IPC submission and therefore needs to be considered
12	Changes in erosion and depositional patterns (estuary morphology)	The new quay structure will result in wider changes and modifications to flow patterns, morphology and the tidal prism of the estuary including changes to flow patterns and morphology as a result of dredge disposal and new quay structure within the estuary
13	Changes to hydrodynamics and sedimentary regime	Predicted impacts from a change in wave height, increased speeds etc may lead to increased erosion.
14	Disturbance to river and sea lamprey	The marine works will result in underwater noise disturbance during construction. The creation of the new quay will also result in the loss of intertidal habitat. These impacts may affect the migration of river and sea lamprey.
15	Disturbance to marine mammals	The marine works will result in underwater noise disturbance during construction. This may affect grey seals that utilise the estuary for feeding.
16	Disturbance to North Killingholme Haven Pits	NKHP is a key roosting site for SPA and Ramsar species and these may be affected by construction and operational disturbance.



17	Impacts on roosting function of North Killingholme Haven Pits	It is acknowledged that there is a link between species such as redshank and black-tailed godwit utilising NKHP as a roost and the adjacent foreshore as feeding habitat. Once the intertidal habitat is lost, there is a risk that these species may no longer utilise NKHP.
18	Disturbance to birds on remaining intertidal	Construction and operation of the new port facility and pumping station may result in disturbance to birds on the remaining intertidal to the north and south of the new quay.
19	Disturbance to birds on mitigation area and Rosper Road Pools LWS	Construction and operation of the new port facility may result in disturbance to birds on the mitigation area and potentially RRP LWS.
20	Disturbance to birds from lighting	Lighting may affect birds utilising the remaining intertidal, NKHP and the proposed mitigation area.
21	Loss of existing soak dyke	The proposed managed realignment site will result in the loss of a soak dyke that is located behind the existing floodbank. This is included in the designated site boundary as it includes transitional habitats from brackish to freshwater. Once the managed realignment site is flooded, this feature will be lost.
22	Loss of terrestrial high tide roosting habitat at Cherry Cobb Sands	The proposed managed realignment site will result in the loss of terrestrial habitat that is currently utilised at high tide by large numbers of curlew.
24	Disturbance to birds on intertidal areas adjacent to Cherry Cobb Sands	Cherry Cobb Sands is of high importance for many SPA/Ramsar waterbirds species and these birds may be disturbed during construction works.
25	Thermal plume from new outfall	Impacts on NKHP – entrainment within NKHP may affect the saline lagoon interest
26	Rainbowing	
27	Changes to the spatial distribution of habitats	Changes to intertidal exposure - Change to the distribution/ spatial pattern of estuary habitats caused by quay construction
28	Changes to the sediment budget	

29	Release of contaminated sediments	Further work is currently being undertaken to assess the contamination of sediments present at the compensation site and further work may be required to assess contamination in dredge arisings once final dredge and disposal plans are submitted.
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**Suggested amendments to Table 2**

Reference no from table 1	Potential impacts on the European site	SPA Interest Features					
		Internationally important populations of regularly occurring Annex I species			Internationally important migratory species		Waterfowl assemblage
		Breeding	Passage	Wintering	Passage	Wintering	
<b>Physical Loss</b>							
1	Permanent loss of intertidal mudflat habitat						
2	Permanent loss of saltmarsh habitat						
3	Permanent loss of subtidal habitat						
4	Indirect loss of intertidal habitat						
17	Impacts on roosting function of North Killingholme Haven Pits						
21	Loss of existing soak dyke						
22	Loss of terrestrial high tide roosting habitat at Cherry Cobb Sands						
23	Permanent loss of saltmarsh due to erosion						
<b>Physical Damage</b>							
5	Change to subtidal habitat						
6	Change to intertidal habitat						

Reference no from table 1	Potential impacts on the European site	SPA Interest Features					
		Internationally important populations of regularly occurring Annex I species			Internationally important migratory species		Waterfowl assemblage
		Breeding	Passage	Wintering	Passage	Wintering	
7	Effects on subtidal habitats and benthos from the capital dredge						
8	Effects on subtidal habitats and benthos from the maintenance dredge						
<b>Non-physical disturbance</b>							
14	Disturbance to river and sea lamprey						
15	Disturbance to marine mammals						
16	Disturbance to North Killingholme Haven Pits						
18	Disturbance to birds on remaining intertidal						
19	Disturbance to birds on mitigation area and Rosper Road Pools LWS						
20	Disturbance to birds from lighting						
24	Disturbance to birds on intertidal areas adjacent to Cherry Cobb Sands						
26	Rainbowing						

Reference no from table 1	Potential impacts on the European site	SPA Interest Features					
		Internationally important populations of regularly occurring Annex I species			Internationally important migratory species		Waterfowl assemblage
		Breeding	Passage	Wintering	Passage	Wintering	
<b>Effects on hydrodynamics and sedimentary regime</b>							
10	Disposal of dredge arisings – capital and maintenance dredging						
11	Removal of capital dredged sediment from the estuary						
12	Changes in erosion and depositional patterns						
13	Changes to hydrodynamics and sedimentary regime						
27	Changes to the spatial distribution of habitats						
28	Changes to the sediment budget						
<b>Water Quality</b>							
9	Changes in suspended sediment concentrations						
25	Thermal plume from new outfall						
29	Release of contaminated sediments						

**Comments on table 2 footnotes:**

**a** Species not recorded in either the WeBS data for the site over the last five years or from the 'Through the Tide Count' surveys 2010-11 (See paragraph 11.5.44 of ES Chapter 11, HRA report table 5.10);

**Agreed**

**b** More than 1% of the population of the Humber Estuary uses the Killingholme Marshes Foreshore and will be displaced (HRA table 5.7);

**Agreed**

**c** Species uses the North Haven Killingholme Pits – no habitat will be lost and there will be no disturbance from construction activities. No visual disturbance will occur during construction as North Killingholme Haven Pits are largely shielded by the existing bund which extends around the south of the Haven Pits, combined with the screen planting on top. In addition large scale construction works will be more than 200m away from the Haven Pits (ES Chapter 11). Noise levels from piling are predicted to be no higher than current base levels (ES Chapter 11, paragraphs 11.6.34-11.6.54). There will be no residual light impacts after mitigation (ES Chapter 19, paragraphs 19.3.1 - 19.8.3);

**Natural England disagrees that sufficient evidence has been provided to demonstrate that NKHP will not be disturbed by construction and/ or operational disturbance.**

**d** Only one bird recorded at Killingholme Marshes & one at North Killingholme Haven Pits – although this is more than 1% of the population for the Humber Estuary this is clearly not an important area for ruff within the estuary.

**Agreed**

**e** 2.7% of the overall wetland assemblage will be displaced by the development (HRA report 5.4.19). However some of the assemblage species are present at less than 1% of the Humber Estuary population, including dark-bellied brent goose, golden plover, grey plover, knot, oystercatcher, turnstone. Others such as scaup, goldeneye and greenshank have not been recorded at all at Killingholme Marshes foreshore or North Killingholme Haven Pits (HRA report table 5.10);

**Agreed – but this should also detail which species within the assemblage are affected, along with the percentage of the estuary population**

f More than 1% of the Humber Estuary population has been recorded on the Killingholme Marshes but the species is not dependent on the area lost and no disturbance of breeding birds is predicted at North Killingholme Haven Pits (HRA report, table 5.9);

**Agreed that loss of foraging habitat is unlikely to affect the population, however as stated above, further work is required on the potential impacts of disturbance on NKHP.**

g Two of the main onshore areas used by curlew at Killingholme Fields lie within the AMEP site (HRA report paragraph 5.4.21). Intertidal mudflats at Killingholme Marshes foreshore will also be lost;

**Agreed, however more information required. Curlew are not the only species affected and SPA/ Ramsar waterbirds are affected both within the designated site and outside, this needs to be explained in detail here.**

h The predicted effects of the change in the thermal plume in the vicinity of the outfall from the power station are insignificant so no likely significant effects on marine fauna or habitats are predicted (HRA report paragraph 5.4.24);

**We understand that further work is being undertaken to assess the potential impact of co-locating the outfalls and therefore we cannot comment at this stage.**

i Occurs at less than 1% of the Humber Estuary population (HRA report table 5.10);

**Agreed**

j Loss of intertidal mudflats at Killingholme Marshes foreshore (HRA report paragraph 5.5.4);

**Agreed**

k Operational impacts assumed to be less than construction impacts so construction impacts only assessed as representing worse case scenario (HRA report).

**Natural England disagrees with this conclusion. Whilst construction impacts may be the worst case scenario, this does not mean that operational impacts will have no impact at all. For example, the construction piling is determined to have an adverse effect on site integrity without seasonal restrictions as mitigation. The impacts of operational disturbance need to be assessed.**