ENGLISH NATURE

SOLENT
EUROPEAN MARINE SITE

comprising:

Solent Maritime candidate Special Area of Conservation
Solent and Southampton Water Special Protection Area & Ramsar Site
Chichester and Langstone Harbours Special Protection Area & Ramsar Site
Portsmouth Harbour Special Protection Area & Ramsar Site

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

18th October 2001

English Nature's advice for the Solent 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 Solent European marine site. This advice is being prepared to fulfill our obligations under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994.

The Solent European marine site comprises a candidate Special Area of Conservation (Solent Maritime SAC) and three Special Protection Areas and Ramsar sites (The Solent and Southampton Water SPA, Chichester and Langstone Harbours SPA and Portsmouth Harbour SPA) and our advice within this document is being prepared to cover the marine elements of both the SAC and SPA interests.

European marine sites are defined in the Conservation (Natural Habitats &c.) Regulations 1994 as any part of a European site covered (continuously or intermittently) by tidal waters or any part of the sea in or adjacent to Great Britain up to the seaward limit of territorial waters. European sites include Special Areas of Conservation (designated under the Habitats Directive, which support certain natural habitats and species of European importance), Special Protection Areas (designated under the Birds Directive which support significant numbers of internationally important wild birds) and Ramsar sites supporting internationally important wetlands and wetland species (designated under the Convention on Wetlands of International Importance especially as Waterfowl Habitat. 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. Regulation 33 advice for the marine components of these sites is also now included in this document.

Following the European Union's moderation exercise, an additional eight interest features have been added to the Solent Maritime cSAC citation. Four of these are marine and in accordance with the Conservation (Natural Habitats &c.) Regulations 1994, Regulation 33 advice for these four features, is now included within this document.

This 'Regulation 33 package' is structured to help relevant and competent authorities to have area based responsibilities to implement the Habitats Directive 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 the scope and nature of 'appropriate assessment' required in relation to plans and projects (Regulations 48 & 50 and by English Nature under Regulation 20). English Nature will keep this advice under review and may update it every six years or sooner, depending on the changing circumstances of the European marine site. In addition, we will provide more detailed advice to competent and relevant authorities to assess the implications of any given plan or project under the Regulations, where appropriate, at the time a plan or project is being considered.

Tim Bines, General Manager
English Nature, October 2001

Quick Finder

As the Solent European marine site is a large and complex site with many designations associated with it, the following colours have been assigned to sections throughout this document to specific geographical areas of the site in order to aid in navigation throughout the document.

Solent Maritime SAC (see figure 1 for indicative map)

Solent and Southampton Water SPA and Ramsar (see figure 2 for indicative map)

Chichester & Langstone Harbour SPA and Ramsar (see figure 2 for indicative map)

Portsmouth Harbour SPA and Ramsar (see figure 2 for indicative map)

Acknowledgements

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Contents

List of Appendices

List of Tables

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

1. Introduction

1.1 Natura 2000

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

The Habitats and Birds Directives include requirements for the designation of conservation areas. In the case of the Habitats Directive these are Special Areas of Conservation (SACs) which support certain natural habitats or species, and in the Birds Directive, Special Protection Areas (SPAs) which support wild birds of European Union interest. Also, 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[4] given the same consideration as European Sites when considering plans and projects that may affect them. Following the European Union's recent moderation exercise, additional features have been added to a number of SACs and for some features, new sites have been identified.

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

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

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

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

[4] Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention), 1971.

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.

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 of the management schemes which may be developed for these sites.

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

In addition to providing such advice, the Regulation 33 package informs on the scope and nature of 'appropriate assessment' which the Directive requires to be undertaken for plans and projects (Regulations 48 & 50 and by English Nature under Regulation 20, shown in appendix XIV and sections 10.6 and 10.7). 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 Solent 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 Important Nature Conservation (SINC), 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 sites 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[5].

[5] 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 Solent European marine site a management group has already been set up (Appendix XV) 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 candidate SAC, SPA and Ramsar status, parts of Solent 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 4, 7, 8 and 9 of this document set out the conservation objectives for the Solent 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 cause a significant effect, and for informing on the scope of appropriate assessments of plans or projects. The conservation objectives set out what needs to be achieved and thus deliver the aims of the Habitats Directive.

1.7 Role of advice on operations

The advice on operations set out in Section 10 provides the basis for discussion about the nature and extent of the operations taking place within or close to the site and which may have an impact on its interest features. It is given on the basis of the working assumption that sites were in favourable condition at the time they were identified. In the 2000-2006 reporting period an assessment of the condition of the site will be made to test this assumption, and ensure that favourable condition is achieved. 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 the management and advisory groups in the European marine site.

1.8 European marine sites

In the Regulations implementing the Habitats Directive a European marine site is described as a European site so far as it consists of marine areas. Figure 3 shows the Solent European marine site (SEMS).

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

- A special area of conservation;
- a site of community importance which has been placed on the list referred to in the third sub-paragraph of Article 4(2) of the Habitats Directive;
- a site hosting a priority natural habitat type or priority species in respect of which consultation has been initiated under Article 5(1) of the Habitats Directive, during the consultation period or pending a decision of the Council under Article 5(3);
- an area classified pursuant to Article 4(1) or (2) of the Wild Birds Directive, or;
- a site in England included in the list of sites which has been proposed by the Secretary of State and transmitted to the commission.

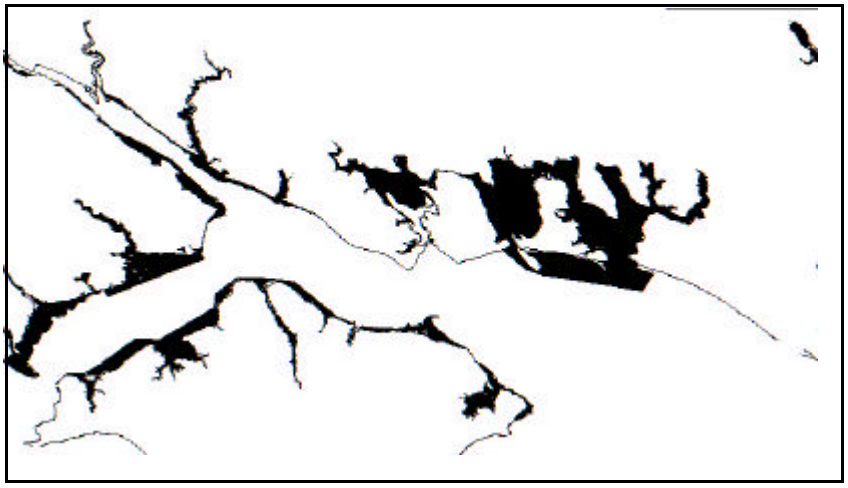

Figure 3. The Solent European marine site (SEMS, shaded black). This map is indicative and for reference only. The definitive boundaries of the SEMS can be found in Appendices II, III, IV, V and VI.

The Regulations describe marine areas as any land covered (continuously or intermittently) by tidal water, or any part of the sea, in or adjacent to Great Britain, up to the seaward limit of territorial waters. The marine areas of Solent Maritime candidate Special Area of Conservation, Solent and Southampton Water Special Protection Area and Ramsar site, Chichester and Langstone Harbour Special Protection Area and Ramsar site and Portsmouth Harbour Special Protection Area and Ramsar site are European marine sites individually. However, for simplicity, hereafter they will be described as the Solent 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 Solent European marine site is a complex cluster site encompassing a major estuarine system on the south coast of England with examples of four coastal plain estuaries (Yar, Medina, King's Quay Shore and Hamble) and examples of four bar-built estuaries (Newtown Harbour, Beaulieu, Langstone Harbour, Chichester Harbour). It has the largest number of small estuaries in the tightest cluster anywhere in Great Britain and is located in one of only a few major sheltered channels in Europe, lying between a substantial island (the Isle of Wight) and the mainland. The Solent and its inlets are unique in Britain and Europe for their complex tidal regime, with long periods of tidal stand at high and low tide, and for the complexity and particularly dynamic nature of the marine and estuarine habitats present within the area. There is a wide variety of marine sediment habitats influenced by a range of salinities, wave shelter and intensity of tidal streams, resulting in a uniquely complex site. Sediment habitats within the estuaries include extensive areas of estuarine flats, with intertidal areas often supporting eelgrass *Zostera* spp. and green algae, saltmarshes and natural shoreline transitions, such as drift line vegetation. Many of the intertidal areas within the Solent European marine site are important for a number of nesting, roosting and feeding birds.

The mudflats range from low and variable salinity in the upper reaches of the estuaries to very sheltered almost fully marine muds in Chichester and Langstone Harbours. The intertidal and shallow subtidal waters of the site support a number of important fish nursery areas. Unusual intertidal features include the presence of rare sponges in the Yar estuary and a sandy reef of the polychaete *Sabellaria spinulosa* on the steep eastern side of the entrance to Chichester Harbour. Saltmarsh forms a crucial habitat within the Solent ecosystem, including Atlantic salt meadows which contain a range of lower, mid and upper saltmarsh habitats, pioneer saltmarsh and cordgrass.

There are four species of cordgrass in the UK; *Spartina maritima* small cordgrass, *Spartina alterniflora* smooth cordgrass, *Spartina* x *townsendii* Townsend's cordgrass and *Spartina anglica* common cordgrass. The Solent is of interest as all four species are found there. The *Spartina maritima* small cordgrass is the only native species and is present within the site (with its greatest abundance in Newtown Harbour, Herbert *et al*, 1999). The Solent is also of historical interest as the site where *Spartina alterniflora* smooth cordgrass was first recorded in the UK (in 1829) and today is one of only two sites in the UK where this species is found (Jack Coughlan pers. comm). *Spartina* x *townsendii* Townsend's cordgrass and later, *Spartina anglica* common cordgrass also first occurred within the Solent. The fertile hybrid *Spartina anglica* is a naturally invasive species that may be considered damaging to pioneer marsh communities, although more research is needed. Small saline lagoons are

also present (e.g. within the Yar (West) and Newtown estuaries) which support a range of plant and animal species, contributing to the diversity of the habitats within the site.[6]

The Solent European marine site comprises the Solent Maritime candidate Special Area of Conservation (SAC) and the Solent and Southampton Water SPA and Ramsar site, Portsmouth Harbour SPA and Ramsar site and Chichester and Langstone Harbours SPA and Ramsar site. The boundaries of these European sites are illustrated in Appendices II to VI. The marine components of all seven sites qualify as European marine sites but for simplicity, and for the purposes of this advice, the SAC, SPA and Ramsar site components are treated within a single Regulation 33 package. Accordingly, the advice in this document covers the SAC habitat interests, the SPA bird interests and the Ramsar wetland interests of the European marine site. At the eastern end of the Isle of Wight, the Solent and Southampton Water Special Protection Area overlaps with the South Wight Maritime European marine site. The advice for the interests of South Wight European marine site are provided in English Nature's
Regulation 33 advice package for the South Wight Maritime European marine site. Accordingly, the advice in this document covers only the marine interests of the Solent European marine site. However, relevant authorities should have regard to the conservation objectives of such adjacent interests as they might be affected by activities taking place within, or adjacent to the site.

The coastline of the Solent Maritime European marine site is naturally dynamic. Despite the many modifications to the coast form, these dynamic processes continue and are important in maintaining the site in favourable condition. Allowing the important features of the site to adjust as processes change, such as in response to sea level rise, poses a particular challenge for conservation. In order to fulfill the requirements of the Directive to maintain a functional ecosystem it must have the capacity to change. Accommodating natural change requires a flexible approach that may involve further consideration of the importance and function of areas outside the boundary of the site.

Each of the European marine site interests (called interest features) and their associated key sub-components (called sub-features) are discussed in more detail in Sections 3, 7,8 and 9 and their habitats illustrated in Maps 1, 2 and 3 (in Appendix I) to show their distribution and extent. The boundary of the Solent European marine site is also indicated on these maps. The table below outlines the location of the maps in the document, Solent & Southampton Water is the only SPA whose boundary is not coincidental with the Ramsar.

Maps	**Appendix Number**
Solent marine habitats	Appendix I
Solent SAC boundary	Appendix II
Solent and Southampton Water SPA boundary	Appendix III
Solent and Southampton Water Ramsar boundary	Appendix IV
Chichester and Langstone Harbours SPA & Ramsar Boundary	Appendix V
Portsmouth Harbour SPA & Ramsar	Appendix VI

Table 1 is a summary table outlining the interest features under the EU Habitats Directive, EU Birds Directive and Convention on Wetlands of International Importance, as an important reference table to be used through out this document it is also available in A3 fold out format in Appendix VII

[6] A number of other lagoons within the Solent area have been designated within a separate cSAC, the Solent and Isle of Wight Lagoons cSAC. Conservation objectives for the lagoons within this candidate SAC are not contained within this Regulation 33 advice package and will be provided separately.

Table 1: A summary of all the international nature conservation designations associated with each part of the Solent Maritime together with the features that they support

			Habitats that each site supports															
Site Name	***Designation & Date***	***Qualification***	Estuaries	Annual veg	Salicornia	sand-banks	Saltmarsh	Saline Lagoons	Intertidal reefs	Cordgrass swards	Mudflats & sandflats	Boulder & cobble	Mixed sediment	Sand & shingle	Shallow coastal waters	Atlantic salt meadow	Shingle	**Total**
Solent Maritime	*cSAC 16/03/01*	*Annex 1 habitats*	_	_	_	_				_	_					_		**7**
Solent & Southampton Water	***SPA [1] 01/10/98***	***Annex 1 Species***					_				_			_	_			**4**
		Migratory species					_				_	_	_					**4**
		Assemblage species					_				_	_	_					**4**
	Ramsar 01/10/98	***Criterion 1a [4]***	_				_	_	_									**4**
		Criterion 2a [5]					_	_		_								**3**
		Criterion 3a [6]					_				_	_	_					**4**
		Criterion 3c [7]					_				_	_	_	_	_			**6**
Chichester & Langstone Harbour	***SPA [1] 28/10/87***	***Annex 1 species***												_	_			**2**
		Migratory species					_				_		_				_	**4**
		Assemblage species					_				_		_		_		_	**5**
	Ramsar 28/10/87	***Criterion 1a [4]***	_				_				_							**3**
		Criterion 3a [6]					_				_		_		_		_	**5**
		Criterion 3c [7]					_				_		_	_	_		_	**6**
Portsmouth Harbour	***SPA [2] 07/02/95***	***Migratory species***					_				_				_			**3**

			Habitats that each site supports															
Site Name	***Designation & Date***	***Qualification***	Estuaries	Annual veg	Salicornia	sand-banks	Saltmarsh	Saline Lagoons	Intertidal reefs	Cordgrass swards	Mudflats & sandflats	Boulder & cobble	Mixed sediment	Sand & shingle	Shallow coastal waters	Atlantic salt meadow	Shingle	**Total**
	Ramsar 07/02/95	***Criterion 1a*** [4]	–				–				–							**3**
		Criterion 2b [8]					–			–	–							**3**
		Criterion 3c [7]					–				–				–			**3**

1. **Qualifies under article 4.1 of the EU Birds Directive by supporting internationally important populations of regularly occurring Annex 1 bird species**
2. **Qualifies under article 4.2 of the EU Birds Directive by supporting internationally important populations of regularly occurring migratory species**
3. **Qualifies under article 4.2 of the EU Birds Directive by supporting internationally important assemblage of wintering waterfowl, including regularly occurring migratory species**
4. **Qualifies under criterion 1a of the Convention on Wetlands of International Importance by being a particularly good representative example of natural or near natural wetland characteristics of the appropriate biogeographical region**
5. **Qualifies under criterion 2a of the Convention on Wetlands of International Importance by hosting an appreciable assemblage of rare, vulnerable or endangered species or sub-species of plant or animal, or an appreciable number of any one of these species**
6. **Qualifies under criterion 3a of the Convention on Wetlands of International Importance by the site regularly supports 20,000 waterfowl**
7. **Qualifies under criterion 3c of the Convention on Wetlands of International Importance by regularly supporting 1% or more of individuals in a population of one species or a sub-species of watefowl**
8. **Qualifies under criterion 2b of the Convention on Wetlands of International Importance by the site being of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna.**

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

These following features also qualify for each designation 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 the SAC 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 site.

2.2.1 Solent Maritime

Solent Maritime cSAC also qualifies for the Annex 1 habitats **Coastal lagoons**, **Perennial vegetation of stony banks**, **Shifting dunes** along the shoreline with ***Ammophilia arenaria***[7] **(white dunes)** and ***Vertigo moulinsiana*** **(Desmoulin's Whorl Snail)**.

2.2.2 Solent & Southampton Water, Chichester & Langstone Harbour and Portsmouth Harbour SPAs.

There are a number of habitats, such as **grazing marsh** and areas of **vegetated shingle** which occur above highest astronomical tide (HAT). These features occur within the boundaries of the three SPAs and support the qualifying bird species. They do not, however, occur within the European marine site. In addition to the internationally important waterfowl, the wetland habitats within the SPA also support numbers of other wintering waterfowl and passage migrants, although these are at levels which do not qualify for the SPA. These include red-throated divers, *Gavia stellata*, black-throated divers *G. arctica*, great northern divers *G. immer*, Slavonian grebes *Podiceps auritus* (all occurring in waters off Ryde Sands, Keyhaven and in the channels of estuaries), little egrets *Egretta garzetta* (found within muddy creeks and have been reported breeding in Chichester Harbour), hen harriers *Circus cyaneus*, marsh harriers *Circus aeruginosus*, merlins *Falco columbarius*, peregrines *Falco peregrinus* and short-eared owls *Asio flammeus*.

Chichester and Langstone harbour qualifies as an SPA for supporting an assemblage of 102,000 wintering waterfowl (waders and wildfowl). These large populations of waterfowl either visit the harbours during migration or overwinter here. Many travel from breeding grounds in Greenland, Iceland, Scandinavia and Siberia. The internationally important assemblage of waterfowl not only includes the internationally important regularly occurring migratory birds but also those bird species that are present in nationally important numbers or whose populations exceed 2,000 individuals. These are: ringed plover *Charadrius hiaticula*, curlew *Numerius arquata*, bar-tailed godwit *Limosa lapponica*, turnstone *Arenaria interpres*, wigeon *Anas penelope*, pintail *Anas acuta*, shoveler *Anas clypeata* and red-breasted merganser *Mergus serrator*.

2.2.3 Solent & Southampton Water, Chichester & Langstone Harbour and Portsmouth Harbour Ramsars.

There are a number of habitats, such as **lagoons, sand and shingle spits** and **sand dunes**, within the boundaries of these three Ramsar sites designated under Criterion 1 of the Convention on Wetlands of International Importance. There are also a number of **floral and faunal Red Data Book species** designated under Criterion 2 of the Convention on Wetlands of International Importance.

[7] *Ammophilia arenaria* is commonly known as sand binding marram grass.

3. Solent Maritime cSAC interest features

The Solent European marine site includes a cluster of interest features qualifying under Annex I of the Habitats Directive. This section describes and explains the importance of each of these interest features together with their component sub-features.

3.1 Estuaries

3.1.1 Definition

Estuaries are complex and highly productive ecosystems supporting a wide range of habitats and species. They form the interface between the 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 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 estuarine ecosystems. Saltmarshes also provide essential feeding and roosting areas for waterfowl. Towards the mouth of estuaries the infaunal communities reflect the generally more saline water and coarse sediments. Where harder substrate occurs in these outer estuarine areas, a range of species more characteristic of the open sea is found. Many of the species and habitats within an estuary are interdependent and inextricably linked to the structure and functioning of others. For example microfauna and microflora are the base of the food chain and support all the other fauna in the system.

Although estuaries are highly dynamic physiographic systems, they have a natural tendency to accumulate sediment, thereby changing their form from their original Holocene morphology to a state where tidal energy is dissipated by subtidal and intertidal sediments. The width and depth of the estuary will therefore change over time towards a state of dynamic equilibrium or "most probable state". In this way, and according to a hypothesis proposed by O'Brien (1931, 1969), an estuary's cross section will evolve until it balances tidal prism, velocities, erosional/depositional thresholds and changing sea levels.

More than a quarter of the area of the north-western European estuaries are located in the UK where they cover an area of approximately 529,000 hectares (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 plants and animals. The intertidal and subtidal sediments of estuaries support biological communities that vary depending on their geographic location, sediment type, tidal currents and the salinity gradients within the estuary.

3.1.2 Importance within Solent European marine site

The Solent European marine site encompasses a major estuarine system on the south coast of England with examples of several different types of estuary. It is the only European marine site within the UK to contain more than one physiographic estuary type, comprising four bar-built estuaries (Newtown Harbour, Beaulieu, Langstone Harbour and Chichester Harbour) and four coastal plain estuaries (Yar, Medina, Kings Quay Shore and the Hamble). Together, the cluster of estuaries contain a wide range of both intertidal and subtidal habitats, with important examples of natural transitions from terrestrial to marine environments. The estuaries host a wide range of species, including the nationally rare sponge *Suberites massa*, which has been recorded in the Yar and at only three other sites in Britain (Buck, 1997). All the estuaries and harbours around the Solent are very sheltered, with complex tidal regimes. There is an unusually strong double tidal flow within the Solent with long periods of slack water at high and low tides, and in the comparatively narrow entrances to the three large eastern harbours particularly fast tidal currents develop, especially on the ebb tide. In most of the estuaries bordering the Solent, salinity is reduced and variable, although Chichester and Langstone harbours and the Yar estuary have near fully marine conditions providing a range of estuarine conditions and habitats. Many areas bordering the Solent European marine site have over the last century been developed for urban and industrialised use, with land claimed from the sea at a number of locations. This often places particular constraints on the natural morphological dynamics and sediment budgets of estuarine areas within the site.

Since the Solent is generally sheltered from prevailing south-westerly winds and drained into by a number of rivers, the finer sediment mudflats tend to be the dominant intertidal substrata within the estuaries of the site and are characterised by a rich and varied infauna, typical of sheltered areas with reduced or variable salinity. Five of the estuaries within the Solent European marine site (Newtown, Kings Quay Shore, Beaulieu, Chichester and Langstone) have eelgrass (*Zostera* spp.) beds, with the most varied and extensive being in Langstone harbour. Eelgrass beds are nationally rare and are an important habitat as they provide spawning, nursery and refuge areas for fish. They also help stabilise the sediment, contribute to primary productivity and are also an important food source for overwintering waterfowl such as dark-bellied brent geese *Branta bernicla bernicla* (Davison and Hughes, 1998).

Saltmarshes represent an extremely important component of Solent European marine site's estuarine ecology, and fall essentially into three categories: Atlantic salt meadows, cordgrass swards and *Salicornia* and other annuals (on pioneer saltmarsh) each forming a separate interest feature in their own right. The Atlantic salt meadows on the Solent, which form the second largest aggregation of salt meadows in the south and south-west, occur as a large number of separate areas across the site. In contrast to other sites in the UK, they are generally ungrazed, supporting a different range of communities to grazed saltmarsh. All three of these saltmarsh types are described separately in Sections 3.3, 3.4. and 3.5 The estuaries of Solent European marine site are also one of only two sites in the UK where cordgrass swards occur in significant quantities. All species of cordgrass present within Solent Maritime cSAC are important to the overall stability of the cordgrass (*Spartinion*) interest feature. Saltmarsh is vital and often contains important microfauna and microflora, along with the saltmarsh plants these microorganisms are important within the food chain.

Rare and unusual transitions to terrestrial and freshwater habitats such as reedswamp, alluvial woodland, coastal grassland, sand dunes and shingle habitats are also present. Annual vegetation of driftlines around the Solent tends to be concentrated on shingle beaches and often plays an integral role in the transition between intertidal and terrestrial habitats.

Subtidal sandbanks occur throughout the Solent European marine site. On the steep eastern side of the entrance to Chichester Harbour, where strong currents scour out deep channels, the seabed is dominated by large shells and cobbles stabilised by the tube building polychaete worm *Sabellaria spinulosa*, often overlying clay bedrock. At several subtidal locations in the Solent, natural beds of the native oyster *Ostrea edulis* also occur (Dixon and Moore, 1987 and Palmer, 2000). This species is now rare in the UK. The Solent hosts a large number of fish species. One hundred different species of fin fish have been recorded in the Solent area (Reay & Culley, 1980) with some 80 species from Southampton Water since 1973 (Henderson, 1989) including sand smelt, sprat, pouting, bass, great pipefish, sand goby, herring, golden mullet, flounder and whiting, and the nationally rare cucumber smelt, *Osmerus eperlanus*, (this species smells of cucumber when fresh), (Potts *et al.* 1998). Many of the intertidal areas of the estuaries within the European marine site are also important nursery grounds for fish including bass *Dicentrarchus labrax*, flatfish species and mullet *Mugil* spp. Chichester and Langstone harbours, Portsmouth Harbour, Southampton Water and The Hamble River in particular contain protected bass nursery areas (MAFF, 1990), Stanswood Bay is also a designated bass nursery area but is outside the boundary of the cSAC. It also needs to be noted that nursery grounds are not limited to intertidal areas of the estuaries but extend throughout the whole of the Solent area. Migratory fish such as salmon *Salmo salar*, sea trout *Salmo trutta* and eels *Anguilla* spp. also use the estuaries. Salmon are of particular importance within the Solent because of their migration through Southampton Water to and from their breeding/spawning grounds. Salmon are an interest feature of the adjacent River Itchen cSAC, within which they spawn.

3.1.3 Sub-features

Saltmarsh communities - This sub-feature comprises all saltmarsh communities types, including ~~the~~ pioneer, Atlantic salt meadows and cordgrass swards interest features. All three are classified under the Habitats Directive as interest features in their own right and are therefore described separately in Sections 3.3, 3.4 and 3.5 below. The Test, Hamble and Beaulieu estuaries and Hythe to Calshot and Lymington Foreshore on the mainland shore, and the Yar and Newtown estuaries on the Isle of Wight are of particular conservation interest. Saltmarshes on these estuaries have a near full range of marsh communities from low marsh on the low shore, to mid and upper marsh and transitions to freshwater reedswamp and alluvial woodland at the limits of tidal inundation. Hythe saltmarsh is notable as one of the few areas supporting the *Spartina* x *townsendii* cordgrass species (Gray *et al.* 1999).

Intertidal mudflat and sandflat communities - mud communities form in the most sheltered areas of the coast, usually where large quantities of silt derived from rivers are deposited in estuaries. The sediment may be relatively stable in intertidal mud and sand communities. These communities are dominated by from microscopic diatoms to polychaete worms and bivalve molluscs. Soft mudflats usually support very high densities of the gastropod *Hydrobia ulvae*. Sand communities occur at mid-to-low tide levels on beaches on the open coast and embayment areas around the Solent where wave action or strong tidal streams prevent the deposition of finer silt; or where the supply of silt in suspension is low. Owing to mobility of sediment and consequent abrasion, species that inhabit clean sands tend to be mobile and robust and include amphipod crustaceans, such as sandhoppers *Bathyporeia spp*., some polychaete worms and bivalve molluscs (Brown *et al.*, 1997). The abundant intertidal invertebrates in such sediments provide prey species for waders, wildfowl and marine predators such as fish.

Intertidal mixed sediment communities - Communities of muddy sediments mixed with assorted pebbles and cobbles occur at a number of locations throughout the site. They support a mixture of mud dwelling worms and bivalves, epifaunal and algal communities, the latter attached to the larger and more stable rocks. Aggregations of the mussel *Mytilus edulis* and the slipper limpet *Crepidula fornicata*, often themselves supporting epifaunal communities, may also be found attached to cobbles and pebbles, considerably increasing the diversity and richness of these habitats. The slipper limpet, although extremely widespread especially subtidally, is a non-native species and has altered the nature of the benthos on a range of sediments by producing a dense layer of dead and living shells. This mollusc species is also considered a pest of oyster beds (Fowler, 1995). The range of benthic communities supported by mixed sediments increase the marine biodiversity in those areas and also provide important feeding habitats for fish as well as feeding and roosting areas for birds.

Subtidal sediment communities - Areas of subtidal sediment are widespread within the European marine site, particularly in the large harbours. Subtidal eelgrass beds consisting of *Zostera marina*, a nationally rare habitat, are found in Langstone Harbour on sand and muddy sand. Subtidal eelgrass beds provide an important habitat for a range of marine species such as fish (for spawning and as a nursery area) and crustacea. Where strong currents scour out deep channels on the steep eastern side of the entrance to Chichester Harbour, the seabed is dominated by large shells and cobbles consolidated by the tube building polychaete worm *Sabellaria spinulosa*, often overlying clay bedrock. *S. spinulosa*, which is restricted in its UK distribution, adds to the species richness of the sediment communities in which it occurs (Holt *et al*., 1998). On subtidal mud and fine sand within the site, native oyster communities occur at various locations around the Solent European marine site. Now rare in the UK this community in the Solent may also include substantial populations of the non-native and invasive slipper limpet *Crepidula fornicata*. Considerable quantities of dead oyster shell and slipper limpets may make up a substantial portion of the substratum around the Solent, providing attachment sites for ascidians and marine algae.

3.2 Annual vegetation of drift lines

3.2.1 Definition

Approximately a third of the coastline of the UK is fringed by a shingle or sand/shingle beach, but much of this is devoid of vegetation. Sites where drift line vegetation does occur may have vegetative cover one year, but not another. Therefore, although widespread in terms of total area, sites where this habitat type is persistent are rare. The habitat is dominated by annual vegetation which grows each summer, lying at or above mean high water spring tides of shingle and sandy beaches. It is important to note that this interest feature is very dynamic. The extent and location of the vegetation depends upon the naturally occurring processes of erosion and accretion of the substrate. Therefore, mobility is an over-riding consideration, and colonising species are able to withstand periodic disturbance, which may involve the total removal of the surface by storms. (Brown *et al* 1997).

This habitat type occurs on deposits of shingle, lying at or above mean high water spring tides, but below HAT. Varying amounts of sand are interspersed in the shingle matrix and the type described here generally lies at the lower end of the size range of shingle (2-200 mm diameter). These deposits occur as fringing beaches that are subject to periodic displacement or overtopping by high tides and storms. The vegetation is therefore ephemeral, composed of annual or short-lived perennial species and is very distinctive. A number of recognisable NVC communities occur, but the vegetation is not always easy to classify because it is highly variable between sites

and from year to year at the same site. The ecology of driftline vegetation is very dynamic. This habitat type is often a precursor of more stable, perennial vegetation on substrate above HAT.

3.2.2 Importance of the feature in the Solent European marine site

The Solent has 24.7 km of vegetated drift lines, although not all of this is in the cSAC (Cox and Crowther, 2001). Driftline habitats are also known as strandline habitats and can be found on a variety of coarse substrates across the Solent, shingle beaches, shingle spits, shingle islands and chenier banks (see glossary for definition). The best examples of shingle beach vegetation can be found at Beaulieu, the southern coast of Hayling Island and Thorness Bay on the Isle of Wight. Shingle spit driftline vegetation frequently show transitions to saltmarsh in the lee of the spit e.g. Hurst and Calshot spits. Spits occur in many of the Solent's estuary mouths, such as, the Beaulieu River, Southampton Water, River Hamble, Newtown Harbour and King's Quay. Shingle islands can be found at the mouth of the Beaulieu River and in the eastern harbours of the Solent European marine site. These shingle islands also provide a suitable environment for the formation of vegetated driftlines and can be compared to the vegetation transition found on shingle spits (Cox and Crowther, 2001). Chenier banks can be found at the outer edges of saltmarsh banks. They are formed by the deposition of broken shells by wave action on the saltmarsh edge and provide suitable conditions for the development of driftline vegetation. The best examples of chenier banks with driftline vegetation can be found at Hythe Marshes in Southampton Water and to a lesser extent in the Lymington and Keyhaven Marshes. Broken shell areas and large shingle areas may be remnants of earlier sediments and geological accumulations.

Annual vegetation of drift lines supports a number of specialist plant species. A transition is found in many of the sites from vegetated shingle to saltmarsh. (See section 3.3). Two important key driftline communities can be identified.

Atriplex (Orache and Purslane) dominated annual vegetation contain two slightly different features, the first is characterised by a carpet of prostrate *Atriplex* spp. (*Atriplex prostrata*, spear-leaved orache) on the seaward edge of the shingle. Often this is the only species present, with occasional associates including *Atriplex littoralis* (grass-leaved orache) and *Beta vulgaris* sub-species *maritima* (sea beet). This feature is widespread throughout the Solent European marine site with 18 examples recorded by Cox and Crowther (2001). The second is characterised by driftline shingle vegetated with *Atriplex littoralis*, often the only species present. Other plants that may occur with *A. littoralis*, although not as frequently, are *Beta vulgaris*, *Atriplex prostrata* and rarely *Honkenya peploides* (sea sandwort). *Atriplex* dominated annual vegetation also occurs on chenier banks (Keyhaven, Lymington and Hythe marshes) and shingle (Calshot spit, Langstone Harbour, North Solent NNR and King's Quay shore) (Cox and Crowther, 2001).

Honkenya peploides -Cakile maritima (sea rocket) communities are strandline communities with perennial associations of *Tripleurospermum maritimum*, *Rumex crispus*, *Beta vulgaris*, *Silene maritima*, *Senecio viscousus* and *Glaucium flavum* (yellow-horned poppy). Occasionally this is markedly different as a result of the annual *Atriplex* species present. This vegetation type can be found at King's Quay, Thorness Bay, Gull Island in the mouth of the Beaulieu River, North Solent NNR, Lymington to Keyhaven marshes and Chichester Harbour (Cox and Crowther, 2001).

3.3 Atlantic salt meadow (*Glauco-Puccinellietalia*)

3.3.1 Definition

Atlantic salt meadow (*Glauco-Puccinellietalia*), or saltmarsh, develops 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 tidal frame (i.e. the frequency and duration of tidal inundation). 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 the 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 functioning of an estuary and operating as a source of primary production. They are a rare and specialised habitat in their own right and many of the plants which occur there survive nowhere else. Saltmarshes provide an important habitat for both marine and terrestrial microfauna and meiofauna and also serve as roosting and feeding areas for internationally important waterfowl.

3.3.2 Importance of the feature within Solent European marine site

The Solent has the second largest aggregation of Atlantic salt meadows in south and south western England, representing 33% of the marsh in this region, and almost 3% of England's total saltmarsh resource. In contrast to the Severn Estuary (the largest aggregation in south and western England), the Atlantic salt meadows of the Solent are notable as being representative of the ungrazed type and subsequently support a range of communities dominated by sea purslane *Halimione portulacoides*, common sea lavender *Limonium vulgare* and thrift *Armeria maritima*, as well as *Puccinellia* spp. Natural unbroken transitions from Atlantic salt meadows to terrestrial semi-natural habitats are increasingly rare in England. The Solent saltmarshes are as a whole, less truncated by man-made features such as sea walls than other marshes in south and western England. However, the presence of hard structures behind naturally eroding saltmarsh can lead to coastal squeeze. Transitions to semi-natural habitats are known to be present in Chichester Harbour (>50% of shoreline), the Hamble estuary (to swamp, fen, carr, ancient woodland and coastal grassland, also with grazed saltmarsh transition communities), and also on the Beaulieu estuary which has transitions to woodland and coastal grassland. On the Isle of Wight, the Yar estuary has transitions to coastal grassland, swamp and fen, the Newtown estuary to woodland, grassland and shingle, the Medina to woodland, coastal grassland, swamp and fen, and Kings Quay shore has transitions to woodland, swamp and carr. Typical Atlantic salt meadow is still widespread in the Solent, despite a long history of colonisation by cord grass *Spartina* spp. (Brown *et al*. 1997). Atlantic salt meadow within the Solent provides a valuable habitat for a range of marine and terrestrial fauna and flora, including invertebrates and birds.

3.3.3 Sub-features

Low marsh communities - The low marsh communities experience a greater number of tidal inundations than the mid or upper marsh. 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* typify low marsh.

Mid-marsh communities - the mid upper marsh is dominated by the saltmarsh rush *Juncus gerardii* with smaller areas of 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.

Upper marsh communities - 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 high marsh communities - Many areas of the upper marsh communities have gradations into transitional semi-natural communities at around extreme high water of spring tides. Within the Solent European marine site, this includes important transitions to freshwater (reedbed) habitats, alluvial woodland, and grassland, many of which are absent from many other areas in the UK due to agricultural improvements, grazing and enclosure. Where the upper marshes have been truncated by sea walls, these transitions are lost. Such truncations can also affect the succession of saltmarshes and their ability to respond to changes in sea levels. Transitional habitats such as these are often particularly valuable for invertebrates and birds.

3.4 *Salicornia* and other annuals colonising mud and sand

3.4.1 Definition

This feature is known locally as samphire or glasswort and together with the other annuals occurring on sand and mud is generally known as pioneer saltmarsh. This vegetation occurs in a large number of 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 sand and mudflats 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 sandflats 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 glasswort *Salicornia* spp. or annual sea-blite *Suaeda maritima*. Pioneer saltmarsh also provides an important feeding area and a food source for many species of waterfowl.

3.4.2 Importance of the feature in the Solent European marine site

The saltmarsh survey of Great Britain in 1989 (Burd, 1989) identified an area of approximately 90 ha of *Salicornia*/ *Suaeda* habitat within the upper, middle, and lower saltmarsh communities of the Solent area. The actual distribution of *Salicornia*/*Suaeda* habitats is concentrated in main characteristic areas or zones. The first is of greater extent and is within pioneer marsh communities along the lower marsh and at the lower limits of tidal inundation. The second are the small depressions or saltpans in the upper and middle saltmarsh, or in narrow strips running along the margins of rivulets and creeks within the saltmarsh (Cox, 2001).

Sizeable areas of *Salicornia*/*Suaeda* community are to be found in Lymington and Keyhaven Marshes, Beaulieu River and the eastern regions of Chichester Harbour and Newtown Harbour (Burd, 1989), with further areas found in Hythe to Calshot marshes, the River Hamble, Langstone Harbour, River Yar, Medina Estuary and King's Quay Shore on the Isle of Wight (Burd, 1989).Cox (2001) highlights the fact that some areas of *Salicornia/Suaeda* may not have been measured during the saltmarsh survey of Great Britain (Burd, 1989). *Salicornia* may be present in NVC communities ranging from SM6 to SM24, however when it is the dominant species this habitat warrants its own NVC classifications, SM8, annual *Salicornia* saltmarsh, and is a key component of SM9, *Suaeda maritima* saltmarsh community.

3.4.3 Sub-features

The interest feature *Salicornia* and other annuals colonising mud and sand is made up of the NVC communities SM8 and SM9 (see appendix XII).

Annual *Salicornia* saltmarsh communities - Annual *Salicornia* community SM8 is the most extensive community in the Solent Maritime cSAC and is dominated by annual species of samphire (glasswort) *Salicornia*. *Salicornia* may germinate in May from a widespread dispersion of seeds. 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. This sub-feature can form a distinct zone in the lower marsh (sometimes hundreds of metres wide), and can be separated from the main marsh by up to one hundred metres, particularly on sandy substrate (Cox, 2001). SM8 communities can also form a mosaic community with other saltmarsh communities, e.g. SM13 (*Puccinellia maritima*, common saltmarsh grass) and SM6 (*Spartina anglica*, common cordgrass). The expansion of *Spartina anglica* has often restricted the availability of lower marsh colonisation by *Salicornia* spp. (Cox, 2001).

***Suaeda maritima* saltmarsh communities** - This sub-feature is an annual pioneer community, tolerant of a wide variety of soil-types and tidal inundation regimes. Its growth appears to be dependant on nutrient supplies, especially nitrogen. SM9 communities are dominated by *Suaeda maritima* with associations from *Salicornia* and occasional *Puccinella maritima*, *Spartina anglica*, *Halimione portulacoides*, and *Aster tripolium* var. *discoideus* (sea aster). This community is characteristic of gravelly mud on the lower marsh,

forming mosaics with stands of *Salicornia* (Cox, 2001).

3.5 Cordgrass swards (*Spartinion*)

3.5.1 Definition

Cordgrass *Spartina* spp. is an important saltmarsh precursor species colonising a wide range of substrates from very soft muds to shingle, in areas sheltered from strong wave action. It occurs on the seaward fringes of saltmarshes, creek sides, and may colonise old pans in the upper marsh. The native species, *Spartina maritima* (small cordgrass) has a predominantly southern European distribution, and is rare in the UK. *Spartina alterniflora* (smooth cordgrass) is a naturalised North American species thought to have been introduced to the UK as a result of its use to protect fragile sea freight (around 1816) (Jack Coughlan pers com.), and is also rare in the UK (Gray *et al*., 1999). The sterile hybrid of small and smooth cordgrass, *Spartina x townsendii*, Townsend's cordgrass is found only in the Solent. *Spartina anglica,* common cordgrass (a fertile hybrid) is widespread.
Saltmarshes containing the rare and local hybrid *Spartina x townsendii* and *S. maritima* and *S. alterniflora*, both of which are geographically limited in the UK by climatic factors, have been considered by the UK to be the most important in relation to site selection for conservation purposes.

3.5.2 Importance of the feature within Solent European marine site

The Solent European marine site is one of only two sites in the UK where *Spartina maritima* or *Spartina alterniflora* occurs in significant quantities, with a fragmented population of *Spartina alterniflora* on Bury Marsh in the Test and significant amounts of *Spartina maritima* located at Newtown Harbour, Isle of Wight and Northney, Hayling Island. It is also one of the few remaining sites for *Spartina x townsendii* and holds extensive areas of *Spartina anglica*, all four species thus occurring here in close proximity. It has added historical and scientific interest as the site where *Spartina alterniflora* was first recorded in the UK and where *S. x townsendii* and later *S. anglica* first occurred.

3.5.3 Sub-features

Small cordgrass (*Spartina maritima*) communities - Small cordgrass, which is a rare native in the UK, has a restricted distribution around the Solent. Newtown Harbour on the Isle of Wight contains the most extensive stand of *S. maritima* in the Solent (Gray *et al*., 1999).

Smooth cordgrass (*Spartina alterniflora*) communities - Smooth cordgrass, a naturalised species also rare in the UK, occurs only at Bury Marsh within the European marine site.

Townsend's cordgrass (*Spartina* x *townsendii*) communities - Townsend's cordgrass, is a naturalised hybrid species which resulted from the crossing of the small and smooth cordgrasses. It is also rare in the UK with significant amounts at Hythe in Southampton Water.

3.6 Mudflats and sandflats not covered by seawater at low tide

3.6.1 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 along the open coast. The physical structure of the intertidal flats can range from the mobile, coarse sand beaches of wave-exposed coasts to the stable, fine sediment mudflats of estuaries and embayments. This habitat type can be divided into three broad categories: **clean sand**, **muddy sands** and **muds**, although in practice there is a continuous gradient between them. Within this range, the animal and plant communities vary according to the type of sediment, its stability and the salinity of the water.

3.6.2 Importance of the feature in the Solent European marine site.

Section 3.1.3 explains the importance of intertidal mudflats and sandflats not covered by seawater at low tide as sub-features of estuaries; intertidal mudflat communities; intertidal sandflat communities and intertidal mixed sediment communities. Mudflats and sandflats are, however, found throughout the Solent European marine site and form the predominant intertidal region. The transition to intertidal mud and sand flats is often preceded by shingle shores or saltmarsh. Intertidal mudflat and sandflat communities provide a vital food source for over wintering and local bird populations in the form of infaunal invertebrate communities and surface algal and plant growth. Mudflats and sandflats are a crucial food source and sheltered nursery area for many species of fish. Often marine predators such as crustaceans, also depend upon the ecological functioning of intertidal sediments.

3.6.3 Sub-features

Intertidal mud communities - Mudflats cover extensive areas seaward of saltmarsh and within saltmarsh creeks in all of the estuaries of the Solent. They are host to highly abundant communities of marine polychaete worms such as the *Arenicola marina* and *Manayunkia aestuarina* and crustaceans such as the woodlice-like amphipod *Corophium volutator* (sand hopper). The marine snail *Hydrobia ulvae* and the green algae *Ulva* spp. and *Enteromorpha* spp. are also abundant within this sub-feature. Intertidal mudflat communities are also host to abundant microfauna, microflora and meiofauna, these may add to the cohesion of the sediments. These marine animals and plants are important food species 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. Chichester and Langstone Harbours in particular, have extensive areas of wave sheltered mudflats characteristic of near fully marine conditions due to their low freshwater input. The mudflats of the Newtown, Yar and Beaulieu estuaries and King's Quay Shore on the Isle of Wight are particularly unspoilt, being subject to little human disturbance or pollution.

Intertidal muddy sand communities - these tend to occur at the mouths of estuaries or behind barrier islands, where sediment conditions are fairly stable. A wide range of organisms, such as lugworms *Arenicola marina* and bivalve molluscs, can colonise these sediments. Substantial beds of mussels *Mytilus edulis* may develop on the lower shore. Beds of intertidal dwarf eelgrass *Zostera noltii* or narrow leaved eelgrass *Zostera angustifolia* and common eelgrass *Zostera marina* may also occur on the lower shore.

Intertidal sand communities - Significant areas of sandflats (including areas of muddy sand) also occur within the Solent European marine site, particularly in Chichester and Langstone Harbours, supporting high numbers of polychaete worms such as *Arenicola marina*, bivalve molluscs such as the common cockle *Cerastoderma edule* and amphipod species such as *Bathyporeia* spp. and *Urothoe brevicornis*. In addition to their infaunal communities, muddy sandflats support important communities of the eelgrass *Zostera angustifolia* (Chichester and Langstone Harbours) and *Z. noltii* (Newtown Estuary, Chichester and Langstone Harbours) additional *Zostera* communities can also be found in the Hamble Estuary. Eelgrass beds are nationally rare in their own right (Stewart *et al.*, 1994) and provide an important feeding resource for overwintering waterfowl, a spawning, nursery and refuge areas for fish, and help to stabilise the sediment and contribute to primary productivity (Davison and Hughes, 1998). Infaunal communities of sandflats also provide a valuable food resource for a range of birds and fish. Waterfowl also use sandflats for roosting and resting.

Intertidal mixed sediment communities - this sub-feature is described in **section 3.1.3**.

3.7 Sandbanks which are slightly covered by seawater all the time

3.7.1 Definition

This habitat consists of soft sediment types that are permanently covered by shallow sea water, typically at depths of less than 20 metres below chart datum. The diversity and types of community associated with this habitat type are determined by sediment type and a variety of other physical factors, including geographical location, the relative exposure of the coast and differences in the depth, turbidity and salinity of the surrounding water. Typical species associated with these subtidal sandbanks include a burrowing fauna of worms,

crustaceans, bivalve molluscs and echinoderms. The mobile fauna at the surface of the sandbanks often includes shrimps, crabs and fish.

3.7.2 Importance of the feature in the Solent European marine site

These shallow sandy sediments occur around the Solent European marine site, particularly in the large harbours. Typically colonised by a burrowing fauna of worms, crustaceans, bivalve molluscs and echinoderms. Where coarse stable material is present, epifaunal attached species may include foliose algae, hydroids, bryozoans and ascidians. Mixtures of sand and associated hard substrate can lead to the presence of very rich communities. Mobile fauna at the surface of the sandbanks may include shrimps, prosobranch molluscs, crabs and fish. Shallow sandy sediments may be important nursery areas for fish and feeding grounds for seabirds. Sandeels, an important food for birds are found in these sediments. (Brown *et al.*, 1997). Subtidal sand/gravel and muddy sand form as bars/spits shaped by the predominant west to east tidal flow. These communities may be mobile and transitional to coarser or finer sediment communities.

3.7.3 Sub-features

Subtidal gravelly sand and sand - a mix of subtidal gravel and sand can be found, within Solent Maritime cSAC, along the north coast of the Isle of Wight between Yarmouth and Gurnard Ledge and on the South Hampshire coast to the west of Needs Ore in the mouth of the Beaulieu River. Subtidal sand can be found in the mouths of Langstone and Chichester Harbours, the Beaulieu River (outside Needs Ore) and off the north coast of the Isle of Wight at Thorness Bay (Velegrakis, 2000).

Subtidal muddy sand - can be found in a number of places around the Solent, in particular, the lower reaches of the River Hamble, the northern half of Langstone Harbour, ~~and~~ centrally in Chichester Harbour and also in the upper tidal reaches of the River Medina (Velegrakis, 2000).

Subtidal eelgrass *Zostera marina* beds - these can be found in patches to the west of Needs Ore, between Newtown and Gurnard point, and to the east of the mouth of the Medina River on the north coast of the Isle of Wight (Tubbs, 1999). *Z. marina* beds occur on firm sand, sometimes mixed with flint gravel and are almost constantly submerged, lying on the low water spring tidal limit. *Zostera* spp. are a major food source for the dark-bellied brent goose *Branta bernicla bernicla*.

4. Solent Maritime cSAC 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 Solent European marine site interest features are provided below and should be read in the context of other advice given in this package, particularly:

- the attached 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.

4.1 The conservation objective for estuaries

Subject to natural change, maintain the **Estuaries** in favourable condition[8], in particular:

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

4.2 The conservation objective for annual vegetation of drift lines

Subject to natural change, maintain the **Annual vegetation of drift lines** in favourable condition[8].

4.3 The conservation objective for Atlantic salt meadows (*Glauco-Puccinellietalia*)

Subject to natural change, maintain the **Atlantic salt meadows (*Glauco-Puccinellietalia*)** in favourable condition[8], in particular:

- Low marsh communities
- Mid-marsh communities
- Upper marsh communities
- Transitional high marsh communities

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

[8] For a detailed definition of how to recognise favourable condition see attached table 2

Subject to natural change, maintain the ***Salicornia* and other annuals colonising mud and sand** in favourable condition[8], in particular:

- Annual *Salicornia* saltmarsh communities (SM8)
- *Suaeda maritima* saltmarsh communities (SM9)

4.5 The conservation objective for cordgrass swards (*Spartinion*)

Subject to natural change, maintain the **cordgrass swards (*Spartinion*)** in favourable condition[8], in particular:

- Small cordgrass (*Spartina maritima*) communities
- Smooth cordgrass (*Spartina alterniflora*) communities
- Townsend's cordgrass (*Spartina x townsendii*) communities

4.6 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[8], in particular:

- Intertidal mud communities
- Intertidal muddy sand communities
- Intertidal sand communities
- Intertidal mixed sediment communities

4.7 The conservation objective for sandbanks slightly covered by seawater all the time

[8]For a detailed definition of how to recognise favourable condition see the attached table 2

Subject to natural change, maintain the **sandbanks slightly covered by seawater all the time** in favourable condition[8], in particular:

- Subtidal gravelly sand and sand
- Subtidal muddy sand
- Subtidal eelgrass *Zostera marina* beds

[8]For a detailed description of how to recognise favourable condition see the attached table 2

5. 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.

Box 1 Glossary of terms used in the favourable condition table

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

Table 2 Favourable Condition Table for SAC interest features for the Solent European marine site. NB - Many of the attributes will be able to be monitored at the same time or during the same survey. The frequency of sampling for many attributes may need to be greater during the first reporting cycle in order to characterise the site and establish the baseline. Where relevant, National Vegetation Classification codes (NVCs) and marine biotope codes are provided and then referenced in Appendices XI and XII

SOLENT MARITIME SAC INTEREST FEATURES

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
Estuaries		Extent	Area (ha) of the estuaries measured periodically during the reporting cycle (frequency to be determined).	No decrease in extent from an established baseline[10], 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^3). CS = Area of a given cross section at high water springs (m^2). 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 the 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.
		Nutrient status	Average phytoplankton concentration in summer, measured periodically during the reporting cycle (frequency to be	Average phytoplankton concentration should not deviate significantly from an established baseline, subject to natural change.	Nutrient enrichment stimulating excessive growth of phytoplankton is a common factor contributing to a reduction in water clarity. Single species-dominated phytoplankton blooms can also have harmful effects on shellfish.

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
			determined).		
Estuaries (contd.)	Saltmarsh communities	*For information on the attributes of the saltmarsh communities sub-feature see the sections of this table which relate to the following interest features: cordgrass swards and Atlantic salt meadows, pages 29 -32*			
	Intertidal mudflat and sandflat communities	*For information on the attributes of the intertidal mudflat & sandflat communities sub-feature see the sections of this table which relate to the following interest features intertidal mudflats and sandflats pages 33 - 35*			
	Intertidal mixed sediment communities	*For information on the attributes of the intertidal mixed sediment communities sub-feature see the sections of this table which relate to the following interest features: intertidal mudflats and sandflats, pages 33 - 35*			
	Subtidal sediment communities	Extent	Area (ha) of subtidal sediments, measured periodically during the reporting cycle (frequency to be determined).	No decrease in extent from an established baseline, 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.
		Range and distribution of characteristic subtidal sediment biotopes, for example: IMU biotopes (see Appendix VII)	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 subtidal biotopes is an important structural and functional aspect of the interest feature. Specific biotopes such as IMU.AphTub and IMU.NhomTub are typical of subtidal areas within Solent European marine site such as Southampton Water and in some areas support a high number of species as well as large amounts of particular species such as cockles. Subtidal Eelgrass beds (e.g. IMS.Zmar) contribute to sediment structure and stabilise foreshore sediments by reducing wave energy, they provide an important food source for birds, and are important habitats for other organisms such as fish. The subtidal biotopes demonstrate biological assemblages representative of a range of salinity conditions.
Annual vegetation of drift lines		Extent	Linear extent of annual vegetation of drift lines and the geomorphological structures that support	No decrease in linear extent of vegetation from an established baseline[10], subject to natural change.	This attribute is dependent on there being sufficient shingle available through coastal processes to maintain the form of the shingle bank in its short and long-term development . Judgements in changes to linear extent will have to take particular care to

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
			this feature, measured once per reporting cycle in late summer (July - September)	Extent must take account of natural variation of this habitat as a result of dynamic coastal processes (storm events etc.). Indicative target is for 10% of vegetation maintained seasonally over structure that could support it.	distinguish changes as a result of natural functions vs. anthropogenic actions because of the highly variable nature of this habitat. As there are likely to be significant seasonal variations in the area covered, assessment of the average width may be valuable. Where there are abrupt truncations of the feature as a result of known anthropogenic activities, these will need to be carefully assessed. The 10% is an initial estimate which may be modified as a result of monitoring.
		Mobility	Percentage of extent of substrate suitable for colonisation by annual vegetation of drift lines not immediately constrained by introduced structures, landforms or operations measured once per reporting cycle.	No increase in extent constrained by introduced structures, landforms or operations. These areas to be identified whilst undertaking baseline monitoring.	An important aspect of this habitat is its ability to modify its distribution in response to natural dynamic coastal processes. Physical constraints or operations can reduce the extent and quality of this community and affect the overall structure of the drift line communities.
		Coastal processes	Number and location of coastal defence operations within sediment cell influencing coastal processes. Measured once per reporting cycle.	Maintain sediment supply to and within the site through coastal processes to allow a balance of accretion and erosion. A net balanced sediment budget should prevail, subject to natural variation.	The gravel sediments that support many of the features of interest are mobile as a result of dynamic coastal processes and are subject to variation over time. This results in both erosion and accretion within the site and redistribution of sediments over relatively rapid timescales. Coast defence works involving shingle recycling within or outside of the site can reduce the extent of this vegetation and have the potential to disrupt the patterns of erosion and accretion that underpin the site's structure and function.
Annual vegetation of drift lines (contd.)		Substrate composition	Presence of sand/shingle in combination with surface or buried organic material	Maintain substrate composition with sufficiently low levels of human-induced disturbance to allow drift	The combination of inorganic and organic substrate is an important precursor to development of annual vegetation of drift lines. Substrate (i.e. sediment) supply should be regulated by natural coastal processes. Drift line organic materials (tidal-derived seaweed, driftwood etc.) on the surface of and in combination with the shingle matrix are important

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
				line vegetation to complete its vegetation cycle. As an indicative target, drift line organic materials should be present along at least 10% of length surveyed, with artificial (non-organic) debris not restricting or suppressing vegetation establishment and growth. Targets appropriate to site should not deviate significantly from an established baseline[10], subject to natural change.	sources of nutrients and anchoring points essential for vegetation development and survival and may play a part in maintaining a seed bank.
Annual vegetation of drift lines (contd.)		Characteristic species of annual vegetation of drift lines	Presence of characteristic species of the annual vegetation of drift lines, particularly *Atriplex prostrata*, *Atriplex littoralis*, *Beta vulgaris maritima* and *Honkenya peploides*. Assessments will need to be made during late summer (July - September) at least once per reporting cycle.	Maintain the presence and broad distribution of stands of *Atriplex prostrata*/*Beta vulgaris maritima* - dominated community and other local variants of drift line vegetation across the feature, allowing for natural variation. As these communities can be very variable, local baselines[10] will need to be established, but should not be lower than 10% of the area that could be colonised. Targets appropriate to site should not deviate	This community is found in a narrow strip at the extreme high water mark. Changes in the frequency and abundance of *Atriplex* spp. should be expected to occur seasonally as a result of natural disturbance by storm events, but the community is sensitive to disturbance by human activities. Some of these communities do not fit well into the NVC classification for strand line vegetation, but this is currently under review.

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
				significantly from an established baseline[10], subject to natural change.	
Atlantic salt meadows	Low marsh communities	Distribution and extent of low marsh communities.	Distribution and extent of low marsh communities, measured once during the reporting cycle.	Distribution and extent of low marsh communities should not deviate significantly from an established baseline, subject to natural change.	The extent of vegetation cover of the low marsh community can have a seasonal variability and may have up to 50 per cent of bare mud or algal mat cover.
Atlantic salt meadows (contd)		Species composition of characteristic low marsh communities, for example: - SM10 - SM11	Presence and abundance of constant species, measured once during the reporting cycle	Presence and abundance of constant species of characteristic low marsh communities should not deviate significantly from an established baseline, subject to natural change.	In the Solent European marine site low marsh communities can be relatively simple communities or more complex associations of species, and species composition will vary depending on geographical location and other physical factors.
	Mid-marsh communities	Distribution and extent of mid-marsh communities.	Distribution and extent of mid-marsh communities, measured once during the reporting cycle.	Distribution and extent of mid marsh communities should not deviate significantly from an established baseline, subject to natural change.	Vegetation cover of the mid-marsh community can be quite variable and may comprise a number of NVC communities, these will be determined by future surveys.

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
	Mid-marsh communities	Species composition of characteristic mid-marsh communities, for example: - SM10 - SM 13 - SM14	Presence and abundance of constant species, measured once during the reporting cycle	Presence and abundance of constant species of characteristic mid marsh communities should not deviate significantly from an established baseline, subject to natural change	In the Solent European marine site mid marsh communities can be simple communities or complex associations of specie. Species composition will vary depending on geographical location and other physical factors.
	Upper Marsh	Distribution and extent of upper marsh communities.	Distribution and extent of upper marsh communities, measured once during the reporting cycle.	Distribution and extent of upper marsh communities should not deviate significantly from an established baseline, subject to natural change.	The relative distribution of the upper marsh communities is an important structural aspect of the saltmarsh zonation.
Atlantic salt meadows (contd)		Species composition of characteristic upper marsh communities, for example: - SM15 - SM16	Presence and abundance of constant species, measured once during the reporting cycle	Presence and abundance of constant species of characteristic upper marsh communities should not deviate significantly from an established baseline, subject to natural change	In the Solent European marine site upper marsh communities can be relatively simple communities or more complex associations of species, and species composition will vary depending on geographical location and other physical factors (*e.g.* less frequent tidal inundation).
	Transitional high marsh communities	Distribution and extent of upper transitional marsh communities.	Distribution and extent of upper transitional marsh communities, measured once during the reporting cycle.	Distribution and extent of upper transitional marsh communities should not deviate significantly from an established baseline,	There are limited locations within the Solent European marine site where upper transitional communities occur. Elsewhere high marsh transitional vegetation is truncated by sea walls and sea level rise may result in habitat loss through coastal squeeze. The extent of this habitat which can migrate inland as sea levels rise is likely to be especially valuable in redressing

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
				subject to natural change.	losses incurred to the feature.
	Transitional high marsh communities	Species composition of characteristic transitional marsh communities	Presence and abundance of constant species, measured once during the reporting cycle.	Presence and abundance of constant species of characteristic transitional marsh communities should not deviate significantly from an established baseline, subject to natural change.	Sites with a complete sequence of habitats from salt meadow to coastal, terrestrial or freshwater/brackish habitats are the most valuable for nature conservation. In the Solent European marine site such habitats include sand dunes, shingle, reedbeds and woodland.
***Salicornia* and other annuals colonising mud and sand**	Annual *Salicornia/Suaeda maritima* saltmarsh communities (SM8 and SM9)	Algal mat cover.	Area (and thickness) of algal mat, measured periodically (frequency to be determined).	No increase in algal mat cover from an established baseline.	Algal mats (*e.g. Enteromorpha* and *Ulva* spp.) are often associated with pioneer and low marsh communities and are important primary producers, but can be affected by changes to water quality - eutrophication may lead to expansion and smothering of vegetation, or pollution can cause a decline which can lead to destabilisation of sediment surfaces and initiate erosion. An increase in algal cover can also indicate a decline in grazing invertebrates. *NB* a reduction in algal mat cover can indicate active erosion
***Salicornia* and other annuals colonising mud and sand (contd)**		Common cordgrass (*Spartina anglica*) community (SM6)	Distribution and extent of Common cordgrass, measured once during the reporting cycle.	No increase in extent from an established baseline, subject to natural change	Not of conservation importance in the UK but an invasive pioneer species. Could impact on intertidal pioneer and low-mid marsh communities but may be a precursor to the development of other saltmarsh communities in some circumstances.
	Annual *Salicornia/Suaeda maritima* saltmarsh communities (SM8 and SM9)	Distribution and extent	Distribution and extent of annual *Salicornia/Suaeda maritima* saltmarsh communities measured once during reporting cycle	No change in distribution and extent of annual *Salicornia* saltmarsh communities from an established baseline, subject to natural change	Annual *Salicornia* saltmarsh communities must be carefully defined for the purpose of monitoring. Species within the *Salicornia* genus have different niches and are not necessarily spatially connected.

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
Cordgrass swards	Small cordgrass communities	Distribution and extent of small cordgrass communities, for example: - SM4	Distribution and extent of small cordgrass communities, measured once during the reporting cycle.	Distribution and extent of small cordgrass communities should not deviate significantly from an established baseline, subject to natural change.	The extent and distribution of this community are important structural aspects of the saltmarsh zonation. They are associated with different levels of the intertidal region and the turbidity of the water column.
	Smooth cordgrass communities	Distribution and extent of smooth cordgrass communities, for example: - SM5	Distribution and extent of smooth cordgrass communities, measured once during the reporting cycle.	Distribution and extent of smooth cordgrass communities should not deviate significantly from an established baseline, subject to natural change.	The extent and distribution of this community are important structural aspects of the saltmarsh zonation. They are associated with different levels of the intertidal region and the turbidity of the water column.
	Townsend's cordgrass communities	Distribution and extent of Townsend's cordgrass communities, for example: - SM6	Distribution and extent of Townsend's cordgrass communities, measured once during the reporting cycle.	Distribution and extent of smooth cordgrass communities should not deviate significantly from an established baseline, subject to natural change.	The extent and distribution of this community are important structural aspects of the saltmarsh zonation. They are associated with different levels of the intertidal region and the turbidity of the water column.
Intertidal mudflats and sandflats		Extent	Area (ha) of intertidal mudflats, measured periodically during the reporting cycle(frequency to be determined).	No decrease in extent from an established baseline, 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.
		Topography	Tidal elevation and shore	Shore profile should not	In the intertidal, topography reflects the energy conditions and stability

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
			slope, measured periodically during the reporting cycle (frequency to be determined).	deviate significantly from an established baseline, subject to natural change.	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.
		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 (*e.g. Enteromorpha* and *Ulva* 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. Sediment penetrability - degree of sinking	Average measure should not deviate significantly from an established baseline, subject to natural change.	Penetrability is an indicator of sediment stability, degree of compaction indicates the shear strength of the sediment and thus the susceptibility of that sediment type to erosion. Compaction of the sediment influences the biological community within the sediment. Penetrability of the sediment is determined by a combination of grain size and water content, which may provide a surrogate index of the penetrability of the sediments.
Intertidal mudflats and sandflats (contd)		Sediment character (contd.)	3. Organic content - % carbon from sediment sample measured periodically (frequency	Average organic carbon content should not deviate significantly from an established baseline,	Organic content critically influences the infaunal community and can cause deoxygenation of the feature which can be detrimental to the boita. However, a balance needs to be struck as organic content provides a measure of the material available to detritovores. A reduction in organic

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
			to be determined)	subject to natural change.	content could lead to a reduction in detritovores, with subsequent knock on effects throughout the food chain.
			4. 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 mud communities	Range and distribution of characteristic mud biotopes, for example: LMU biotopes (see Appendix XI)	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.
Intertidal mudflats and sandflats (contd)	Intertidal muddy sand communities	Range and distribution of characteristic sand and gravel biotopes, for example: LMS biotopes (see Appendix XI)	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. Shellfish beds (e.g. LMS.Pcer),play an important role in the marine food chain. They also reduce tidal flow and encourage sedimentation in their lee, and are therefore important in indicating changes in coastal processes. Eelgrass beds (e.g. LMS.Znol) contribute to sediment structure and stabilise foreshore sediments by reducing wave energy, they provide an important food source for birds, and are important habitats for other organisms such as fish. Muddy sands dominated by the worm *Arenicola marina* (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.

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
		Extent of *Zostera* beds	Extent (m^2) of the *Zostera* 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	The extent of *Zostera* (Eelgrass) beds is a key structural component of the sediments and provides a long term integrated measure of environmental conditions across the feature, and 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.
	Intertidal mixed sediment communities	Range and distribution of characteristic intertidal mixed sediment biotopes, for example: LMX biotopes (see Appendix XI)	Range and distribution of characteristic 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. Characteristic intertidal mixed sediment communities such as LMX.Mare are typical of reduced salinity sheltered marine inlets. The substratum generally consists of sand, gravel and cobbles in varying degrees, usually with mud and silt. The presence of larger stones and cobbles on the surface often leads to the growth of fucoids and other seaweeds. The infauna, characterised by polychaetes, amphipods and snails and bivalves provide a food source for marine predators and birds.
Sandbanks which are slightly covered by seawater all the time		Extent	Area (ha) of the subtidal sandbanks measured periodically (frequency to be determined).	No decrease in extent from an established baseline, subject to natural change.	Monitoring will need to take into account the dynamic nature of the feature, but reduction in extent may indicate long term changes in the physical conditions influencing the feature.
		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	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 aries across the feature and can be sued to indicate spatial distribution of sediment types, thus reflecting the stability of the feature and the processes supporting it.

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
			measured during summer once during the reporting cycle.		
		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.
Sandbanks which are slightly covered by seawater all the time (contd)	Subtidal muddy sand communities	Extent	Area (ha) of subtidal sediments, measured periodically during the reporting cycle (frequency to be determined).	No decrease in extent from an established baseline, 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.
		Range and distribution of characteristic subtidal muddy sand biotopes, for example: IMU biotopes (see Appendix XI)	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 subtidal biotopes is an important structural and functional aspect of the interest feature. Specific biotopes such as IMU.AphTub and IMU.NhomTub are typical of subtidal areas within Solent European marine site such as Southampton Water and in some areas support a high number of species as well as large amounts of particular species such as cockles. Subtidal Eelgrass beds (e.g. IMS.Zmar) contribute to sediment structure and stabilise foreshore sediments by reducing wave energy, they provide an important food source for birds, and are important habitats for other organisms such as fish. The subtidal biotopes demonstrate biological assemblages representative of a range of salinity conditions.
	Subtidal gravelly sand and sand	Distribution and extent of characteristic range of biotopes	Distribution and extent of biotopes measured by extent once during the reporting cycle	Distribution and extent of characteristic biotopes should not deviate from an established baseline subject to natural	The distribution and extent of the biotopes listed under this sub-feature in Appendix XI, is an important structural aspect of the site. Changes in extent and distribution may indicate long term changes in the physical conditions of the subtidal sand interest feature.

Interest Feature	Sub-feature	Attribute	Measure	Target	Comments
				change	
	Subtidal eelgrass *Zostera marina* beds	Extent	Area (ha) of eelgrass bed communities measured during peak growth period twice during reporting cycle.	No decrease in extent from an established baseline, subject to natural change	The extent and distribution of seagrass beds provides a long-term integrated measure of environmental conditions.

[10] 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 Solent European marine site and may well be missed by routine monitoring

6. SPA and Ramsar interest features

The Solent European marine site also includes interest features of three SPAs qualifying under the EU Birds Directive, and the interest features of three Ramsar sites designated under the Convention on Wetlands of International Importance. This section describes and explains the importance of each of the interest features together with their component sub-features within the Solent European marine site.

The three SPAs and Ramsars within the Solent European marine site include both marine areas (ie. land covered continuously or intermittently by tidal waters) and land which is not subject to tidal influence. The marine part of the SPA is termed a European marine site. The seaward boundary of the European marine site is concurrent with that of the SPA. The landward boundary of the European marine site is the upper boundary of the SPA, or where that extends above land covered continuously or intermittently by tidal waters it is at the limit of the marine habitats.

Where SPA or Ramsar 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.

6.1 SPA 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 SPAs.

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

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

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

Attention is however, also directed to the inclusion of disturbance in the advice on operations provided in Sections 12-14 Where disturbance is highlighted in such advice, relevant authorities need to avoid damaging disturbance to qualifying species when exercising their functions under the Directive.

In recognition that bird populations may change as a reflection of national or international trends or events, this advice on the bird interests of the European marine site focuses on the condition of the habitats necessary to support the bird populations. As with SAC interest features, sub-features are identified which describe the key habitats necessary to support the birds that qualify within the Solent and Southampton Water SPA, Chichester and Langstone Harbours SPA and Portsmouth Harbour SPA. Detailed information and targets for habitat condition will be listed in the favourable condition tables in sections 7, 8 and 9.

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 these SPAs are 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 which 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 within the three SPAs that support qualifying bird species but lie landward of the point of Highest Astronomical Tide and therefore outside the European marine site. Objectives to maintain this aspect of bird interest in favourable condition are found within English Nature's conservation objectives for the relevant SSSI within the SPA 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 SPAs. 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.

6.2 Ramsar background and context

The Convention on Wetlands of International Importance especially as Waterfowl Habitats was finalised at a conference of countries concerned about wetland and waterfowl conservation in Ramsar, Iran in 1971. The broad objectives are to stem the loss and progressive encroachment on wetlands now and in the future. On becoming a signatory to the Convention on Wetlands of International Importance in 1973 (ratified in 1976), the UK Government was required to designate a wetland of international importance and has designated a further 74 sites in England. In addition, the UK Government is required to promote the conservation of a wetland habitat, but also the wise use of wetlands within their territory.

A habitat can qualify for its representation of a wetland, the plant or animal species it supports and for its role in supporting internationally important waterfowl. Interest features are identified within these Criteria. The criteria for the designation of Ramsar sites;

1. Criteria for representative or unique wetland
2. Criteria for using plants or animals to identify wetlands of importance
3. Criteria for using waterfowl to identify wetland importance
4. Specific criteria based on fish (not relevant for this European marine site)

As mentioned in section 1.1, as a matter of policy Ramsar sites must be given the same consideration as European sites. Therefore the marine component of the three Ramsar sites within the Solent European marine site are included in this Regulation 33(2) advice.

As with SPAs, English Nature's conservation objectives, provide information on maintaining the favourable condition of the habitats listed in the citation and/or the habitats used by the qualifying species. Also, as with SPAs, a review of the listed Ramsar sites led by JNCC has begun. This will document any changes to populations and/or species on Ramsar sites since the citation was issued and the site was listed. This will provide advice to Ministers on any changes required in Ramsar citations. Depending on the conclusions of the review, English Nature may review this advice.

The Ramsar site boundaries within the Solent European marine site are predominantly concurrent with the corresponding SPA boundaries. There are also a number of habitats within the three Ramsar sites that support qualifying bird species but lie landward of the point of Highest Astronomical Tide and therefore outside the European marine site. Objectives to maintain this aspect of bird, habitat and Red Data Book interest 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.

6.3 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 and Bathing Water Directives.

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

6.4 SPA and Ramsar Sub-features

Use table 1 (A3 fold out version in Appendix VII) as reference of habitat occurs in which designation

Sand and shingle - Little, Sandwich and common terns generally favour sand and shingle for nesting, with a mosaic of sparse vegetation providing protection for their chicks. They also prefer a shallow, sloping shoreline, giving the maximum protection against flooding. Common terns, which may also nest on bare scrapes in drift-line seaweed or on shell banks In Solent and Southampton Water terns mainly breed at Needs Ore Point, with a smaller colony in the Lymington/Hurst area and an occasional pair breeding on the artificial island in Newtown Harbour, on the Isle of Wight. Sandwich terns breed on coastal sand or shingle beaches, frequently in association with other tern or gull species. The main breeding colony is at Needs Ore Point at the mouth of the Beaulieu Estuary, with a smaller colony in the Lymington/Hurst area. Small numbers also breed in Newtown Harbour. Little terns also breed on coastal sand or shingle, generally in small single species colonies and in variable numbers at several locations within the site. In addition to the colony at Needs Ore Point, the Lymington/Hurst spit and Newtown Harbour (Brickfields shingle spit) areas sometimes support small colonies.

Few terns nest in Chichester Harbour, the only remaining one being a little tern nesting site at Ellanore Point. Success rates are higher in Langstone Harbour where there is a reduced risk of flooding (De Potier, 1999). Sandwich terns and common terns breed regularly in Langstone Harbour, with increasing breeding success observed through the late 1990's. On average a hundred or so little terns breed in Langstone Harbour where there is a large colony and reduced predation. In addition to the Annex I birds listed on the citation, Mediterranean gulls have bred frequently in Langstone Harbour in recent years, their numbers increasing to 14 pairs in the late 1990's.

Roseate terns ideally require ground level cracks, crevices and fissures in which to nest, almost always on small shingle islands among or below vegetation such as sea beet. They also nest colonially with other species of tern, usually common tern. Breeding success of roseate terns is generally low, possibly due to egg collection (Clark and Eyre, 1993) and as a result of overtopping of breeding habitat during storms and flooding. Mediterranean gulls however, prefer to nest colonially in short to medium swards of vegetation, sometimes on vegetated shingle islands with black-headed gulls, also nesting at Needs Ore and in the Lymington/Hurst area.

Saltmarsh - Saltmarsh provides an important food source and feeding area for certain migratory birds as well as roosting areas for overwintering and migrating birds. It also provides a habitat for the Red Data Book plant species *Eleocharis parvula* (dwarf spike-rush) found in the North Solent and Southampton water in intertidal mud. During severe winter weather intertidal saltmarsh areas become more important for example in Chichester & Langstone birds such as curlew move to the coast from inland feeding areas. Chichester Harbour in particular contains large areas of saltmarsh, which together with saltmarsh areas in Langstone Harbour, play a particularly important role in providing a food source for brent geese and teal. Flocks of teal also gather from August onwards in Solent and Southampton Water, with particularly important numbers in Lymington to Keyhaven, Beaulieu Estuary, Fawley / Calshot, Titchfield Haven, Lower Test Marshes, Yar Estuary and Newtown Harbour.

The upper marshes also provide suitable roosting habitat, offering a safe haven from the tides and predators. The main high tide roosts are in areas with little human disturbance, where large aggregations of waders arrive from their various feeding areas. On the highest spring tides, the saltmarshes are completely immersed forcing wading birds to roost on areas landward of the European marine site. Following a recent decline in eelgrass populations, other marine habitats such as saltmarsh provide increasingly important wintering areas for dark-bellied brent geese. Important upper marsh roost sites in Chichester and Langstone Harbours are at Gutner, Fishbourne, Stakes Islands and at Farlington Marshes (although the marsh is outside the European marine site), the RSPB reserve islands.

Areas of saltmarsh with the Solent and Southampton Water also provide important nesting areas for Mediterranean gulls. This species of gull first bred in Britain in 1968 at Needs Ore Point at the mouth of the Beaulieu Estuary. Since then, the numbers of pairs has varied in south-east England but has remained low at less than 20.

Mediterranean gulls also nests within colonies of black-headed gulls at Newtown Harbour on the Isle of Wight on vegetated or sparsely vegetated shingle or on the artificial scrape beside the quay. The saltmarsh also provides feeding areas for Mediterranean gulls which prey upon small fish and invertebrates such as molluscs.

Intertidal mudflats and sandflats - Estuarine sediments support rich populations of intertidal invertebrates which in turn provide an important food source for a number of migratory wildfowl. Ragworms *Hediste diversicolor*, for example, can occur at very high densities and are an important prey item for black-tailed godwits. Bivalve molluscs, such as cockles *Cerastoderma edule* and Baltic tellin *Macoma baltica* which live within the sediments are also favoured prey for this species of bird. Chichester and Langstone Harbours contain extensive areas of intertidal sediments, supporting high numbers of the prey species for a variety of internationally important migratory waterfowl. For example, small marine snails such as *Hydrobia ulvae* are the preferred food of shelduck and, eelgrass (*Zostera* spp.) and green algae supports dark-bellied brent geese which also occur in Solent and Southampton Water and Portsmouth Harbour. The Dark-bellied brent geese, arrive from western Siberia after a long migratory flight. This easily digestible, high protein food source helps the geese to rapidly regain any weight loss incurred during migration, after which they disperse to a number of areas around the Solent where their diet will include green algal mats *Enteromorpha* spp. and *Ulva lactuca* which form on the surface of the mudflats. The main roost for dark-bellied brent geese is at Pewit Island. The numbers of dark-bellied brent geese in Portsmouth Harbour (5 year peak mean 1994-1998) have fallen since the site was classified (Cranswick *et al.*, 1999).

Mediterranean gulls also feed on a range of prey which live within or on the surface of intertidal sediments. They are a generalist feeder and do not make significant use of just one habitat type. Although its feeding habits are more coastal in nature during the winter months, in the breeding season, Mediterranean gulls will increase their dependence upon freshwater habitats. Black-tailed godwit mainly overwinter on estuaries, although small numbers use inland or coastal wet grassland sites. Flocks gather from mid-July and feed on intertidal mudflats. The most important areas are Southampton Water, Lymington to Hurst, the Beaulieu Estuary and Titchfield Haven, where birds are believed to fly in from nearby Chichester and Langstone Harbours. Intertidal sediments are also important for ringed plover which pass through in the autumn and overwinter on the site, mainly in sandy coastal and estuarine areas. The most important areas for wintering ringed plover are intertidal mudflats in the north-west Solent, Beaulieu Estuary and Southampton Water, which provide feeding and roosting grounds.

The more sheltered inner reaches of the estuaries, where the sediments are finer and muddier, appear to support the highest concentrations of feeding birds (Ecosurveys, 1992). In Chichester and Langstone Harbours Dunlin feed on small invertebrates on or just below the surface of the sediment mainly on mid-shore areas, detecting prey with their bills. They feed right up into the creek heads and the heads of estuaries where worms are abundant in the more organic enriched, low salinity, fluid muds. The distribution of dunlin is closely related to the area of available mudflat, especially that which is last to flood as the tide rises, enabling longer feeding periods (Barneveld *et al.*, 1995). Chichester and Langstone Harbours each independently exceeded the qualifying threshold for internationally important numbers of dunlin in 1997-98, although numbers declined in line with national trends (Cranswick *et al*, 1999).

Redshank hunt by sight, taking similar prey items to dunlin. They are more thinly distributed in Chichester and Langstone than dunlin, mainly feeding on the upper shore. The feeding range of wintering redshank extends higher up the shore than it does for most waders and includes intertidal mudflats, saltmarsh and coastal grazing marsh, the latter being outside the European marine site. Sanderling prefer to feed on a range of invertebrate prey items on the sandy muds and fine sands of the outer estuary. They also probe through strand-line vegetation for adult, larval and pupal wrack flies (seaweed flies) and small crustacea such as sand-hoppers.

The intertidal mudflats and sandflats of Chichester and Langstone Harbours also provide important roost areas for waders and wildfowl. One of the most important roost sites in Chichester Harbour is at Pilsey, whilst in Langstone Harbour the main roost sites are at Farlington Marshes, Bakers Island, South Binness Island and the old oyster beds at Creek Point, north Hayling Island. There are a number of minor roosts (some are single species roosts) at Little Binness, North Binness, Round Knap and Long Islands, and also at the Kench. In bad weather a large number of birds roost at Farlington. Grey plover also utilise intertidal mudflats and sandflats for feeding and may fly some

distance to disturbance-free roost sites (Clark and Eyre, 1993). Movements between Chichester and Langstone are not fully understood and are the subject of continuing studies (De Potier, 1999).

Shallow coastal waters - Common, little, roseate and Sandwich terns feed in shallow coastal waters mainly on small fish (e.g. sandeel, sprats etc.) and crustacea (shrimps, prawns, and crabs etc.), as well as worms and molluscs in shallow waters overlying sediment. Common terns are foraging birds feeding over shallow water for small fish and invertebrates near to the surface of the water. Important feeding areas for this species include waters off Titchfield and Calshot, between Cowes and Wootton, Newtown Bay and between Sowley and Gillkicker. Sandwich terns feed mainly on small surface dwelling fish, in shallow coastal waters and harbours throughout the Solent. Waters between East Cowes and Bembridge, Stanswood Bay between Calshot and Lepe and also off Pennington Marsh are favoured feeding locations. These waters are also an important feeding area for migratory Sandwich tern in autumn. Little terns forage for small fish, crustaceans and invertebrates, feeding mainly in shallow waters close inshore and normally close to their breeding colonies. Mediterranean gulls also utilise the shallow coastal waters for feeding, particularly those close to the breeding sites, where they catch invertebrates and small fish (e.g. gobies).

Red-breasted mergansers occur in both Chichester and Langstone, and Portsmouth Harbours present in nationally important numbers and contribute to the internationally important waterfowl assemblage, and utilise the shallow coastal waters within the site, feeding primarily on fish and aquatic invertebrates.

Boulder and cobble shores - Ringed plover feed on areas of boulders and cobbles within the European marine site, particularly on amphipods (*Gammarus* spp.) and small marine worms. Green algae (*Enteromorpha* spp.) growing on these shores as well as on the intertidal mudflats and sandflats provide an important food source for dark-bellied brent geese. Boulder and cobble shores occur at Woodside (King's Quay) and also at Bembridge and St Helen's Ledges on the Isle of Wight.

Mixed sediment shores - There are a number of shores within the site composed of a mixture of muddy sediment and small stones. These provide an important feeding habitat for a number of bird species particularly ringed plover and turnstone, which feed on small invertebrates living within and on the substrate. Algae (*Enteromorpha* spp) on the mixed sediment shores provide an important food source for dark-bellied brent geese and shelduck. As with intertidal mudflats and sandflats, invertebrates within the muddy sediments are preyed upon by a number of the overwintering bird species. The intertidal mixed sediment shores also provide important roosting areas.

Shingle - Areas of shingle around Chichester and Langstone Harbours provide important high tide roosting sites for waders and waterfowl. The most important of these being at Ellanore and Birdham. On the highest spring tides such shingle roosts are often overtopped.

Estuaries - see section **3.1** for full definition and the importance of estuaries within the Solent and Southampton Water Ramsar site.

Saline lagoons - This sub-feature is present in the Solent and Southampton Water Ramsar site at Newtown Quay Lagoon, Borrow Dyke in Yarmouth Harbour and Stuart's Pond (at the base of Hurst Spit). Newtown Quay Lagoon is formed by the remains of an old saltworks, there is no freshwater flow, but seawater enters through a culvert. This saline habitat supports several specialised lagoonal species including the nationally rare insensible shrimp *Gammarus insensibiliss*. Borrow Dyke is a brackish lagoon-like channel in the Yar estuary. Seawater enters the lagoon by percolation and over topping. Borrow Dyke supports a population of the rare sea-starlet sea anenome *Nematostella vectensis*. Sturt's Pond is a lagoon supplied with sea water through a narrow channel with a low sill. This sub-feature also provides a habitat for the Red Data Book (RDB) invertebrate species *Paracymus aeneus* (water beetle) and the RDB non-flowering species *Lamprothamnium papulosum* (foxtail stonewort).

Intertidal reefs - These are present in the Solent and Southampton Water Ramsar site at Bembridge ledges. This part of the Ramsar site also overlaps with the South Wight Maritime cSAC, for which reefs are an interest feature. (An important point to note, in contrast to the South Wight Maritime cSAC, is that the Solent and Southampton

Water Ramsar site does not go below mean low water. Therefore, only the rocky shore communities comprise this sub-feature).

Bembridge Ledges are the most easterly example of extensive hard limestone shores in the English Channel and has been described in detail by Collins *et al.*, (1990). The upper shore supports some rare species, such as the gastropod mollusc *Paludinella littorina.* The considerable interest of Bembridge Ledges, arises from the presence of large and slowly draining pools between the extensive gently shelving ledges. These are host to a great variety of species, including many, more commonly found in the sublittoral. At Bembridge, and elsewhere within the site, littoral pools support *Zostera* (eelgrass) species (Jones, 1999) and a number of rare or unusual seaweeds such as the shepherd's purse seaweed *Gracilaria bursa-pastoris* (Bunker, 2000). The limestone reefs have eroded to form a complex of roughly rectangular crevices, characteristic of limestone pavements which is readily bored into by rock dwelling organisms, thus supporting a more diverse fauna than harder rocks. On the upper shore, these are dominated by the bladder wrack *Fucus vesiculosus.* In the middle and lower shore this gives way to extensive mats of toothed wrack *Fucus serratus,* punctuated by pools in the wider rock crevices in which algal species including *Padina pavonica* occur, the latter at its eastern limit of distribution in Britain.

Cordgrass swards -Cordgrass *Spartina* spp. is an important saltmarsh precursor species colonising a wide range of substrates from very soft muds to shingle, in areas sheltered from strong wave action. It occurs on the seaward fringes of saltmarshes, creek sides, and may colonise old pans in the upper marsh. The native species, *Spartina maritima* (small cordgrass) has a predominantly southern European distribution, and is rare in the UK. *Spartina alterniflora* (smooth cordgrass) is a naturalised North American species thought to have been introduced to the UK as a result of its use to protect fragile sea freight (around 1816) (Jack Coughlan pers com.), and is also rare in the UK (Gray *et al*., 1999). The sterile hybrid of small and smooth cordgrass, *Spartina x townsendii,* Townsend's cordgrass is found only in the Solent. *Spartina anglica,* common cordgrass (a fertile hybrid) is widespread. Saltmarshes containing the rare and local hybrid *Spartina x townsendii* and *S. maritima* and *S. alterniflora,* both of which are geographically limited in the UK by climatic factors, have been considered by the UK to be the most important in relation to site selection for conservation purposes. The Solent European marine site is one of only two sites in the UK where *Spartina maritima* or *Spartina alterniflora* occurs in significant quantities, with a fragmented population of *Spartina alterniflora* on Bury Marsh in the Test and significant amounts of *Spartina maritima* located at Newtown Harbour, Isle of Wight and Northney, Hayling Island. It is also one of the few remaining sites for *Spartina x townsendii* and holds extensive areas of *Spartina anglica,* all four species thus occurring here in close proximity. It has added historical and scientific interest as the site where *Spartina alterniflora* was first recorded in the UK and where *S. x townsendii* and later *S. anglica* first occurred.

7. Solent and Southampton Water SPA and Ramsar Conservation objectives and favourable condition tables.

7.1 The Solent and Southampton Water SPA interest features

7.1.1 The conservation objective for the internationally important populations of the regularly occurring Annex 1 species

Subject to natural change, maintain in favourable condition[8] the habitats for the **internationally important populations of the regularly occurring Annex 1 species**, in particular:

- Sand and shingle
- Saltmarsh
- Intertidal mudflats and sandflats
- Shallow coastal waters

Numbers of bird species using these habitats are given in table 3a.

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

Subject to natural change, maintain in favourable condition[8] the habitats for the **internationally important populations of the regularly occurring migratory species**, in particular:

- Saltmarsh
- Intertidal mudflats and sandflats
- Boulder and cobble shores
- Mixed sediment shores

Numbers of bird species using these habitats are given in table 3a.

[8] For a detailed description of how to recognise favourable condition see the attached table 4

7.1.3 The conservation objective for the internationally important assemblage of waterfowl

Subject to natural change, maintain in favourable condition[8] the habitats for the **internationally important assemblage of waterfowl**, in particular:

- Saltmarsh
- Intertidal mudflats and sandflats
- Boulder and cobble shores
- Mixed sediment shores

Numbers of bird species using these habitats are given in table 3a.

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 these SPA's across Europe.

Table 3a Information on populations of bird species qualifying under the Birds Directive using those parts of the Solent and Southampton Water SPAs lying within the Solent European marine site at the time the SPAs was classified*

The Solent and Southampton Water SPA

Internationally important populations of regularly occurring Annex 1 species	
Species	**Breeding population (5 year mean)**
Mediterranean gull	2 pairs (8.2-13.9 % of British population) (1994-1998)
Sandwich tern	231 pairs (1.7 % of British population) (1993-1997)
Common tern	267 pairs (2.2 % of British population) (1993-1997)
Little tern	49 pairs (2 % of British population) (1993-1997)
Roseate tern	2 pairs (3.1 % of British population) (1993-1997)

Internationally important populations of regularly occurring migratory species[9]	
Species	**Wintering population (5 year peak mean 1992/93 - 1996/97)**

[8]For a detailed description of how to recognise favourable condition see the attached table 4

Dark-bellied brent goose	7,506 individual birds (2.5 % of Western Siberian/Western European population)
Teal	4,400 individual birds (1.1 % of North-west European population)
Ringed plover	552 individual birds (1.1 % of European/North-west African population)
Black-tailed godwit	1,125 individual birds (1.6 % of Icelandic population)

Internationally important assemblage of waterfowl	
Importance	**Wintering population (5 year peak mean 1992/93 - 1996/97)**
Wintering waterfowl assemblage	51,361 individual birds (21,401 wildfowl, 29,960 waders)

***** SPA citations held on the Register of European sites

7.2 Solent and Southampton Water Ramsar conservation objectives

7.2.1 Criterion 1a: Conservation objectives for internationally important wetland characteristic of the Atlantic biogeographical region

Subject to natural change, maintain the **internationally important wetland characteristic of the Atlantic biogeographical region** in favourable condition[8], in particular:

- Estuaries
- Saline lagoons
- Saltmarsh
- Intertidal reefs

[8] For a detailed description of how to recognise favourable condition see the attached table 5

7.2.2 Criterion 2a: Conservation objectives for internationally important wetland hosting an assemblage of rare, vulnerable or endangered species

Subject to natural change, maintain the **wetland hosting an assemblage of rare, vulnerable or endangered species** in favourable condition[8], in particular:

- Saline lagoons
- Saltmarsh
- Cordgrass swards (*Spartinon* spp.)

Names of species using these habitats is given in table 3b.

7.2.3 Criterion 3a: Conservation objective for internationally important wetland regularly supporting 20,000 waterfowl species.

Subject to natural change, maintain the **wetland regularly supporting 20,000 waterfowl species** in favourable condition[8], in particular:

- Saltmarshes
- Intertidal mudflats and sandflats
- Boulder and cobble shores
- Mixed sediment shores

Bird species and their numbers are given in table 3b.

7.2.4 Criterion 3c: Conservation objective for 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 waterfowl species** in favourable condition[8], in particular:

- Saltmarshes
- Sand and shingle
- Shallow coastal waters
- Intertidal mudflats and sandflats
- Boulder and cobble shores
- Mixed sediment shores

Bird species and their numbers are given in table 3b.

[8] For a detailed description of how to recognise favourable condition see the attached table 5

Note: The Ramsar conservation objectives for **criterion 2** 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 conservation objectives for **criterion 3** 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.

Table 3b Information on populations of bird species qualifying under the Ramsar Criteria 3a and 3c and Red Data Book Species under Ramsar Criterion 2a, using those parts of the Solent and Southampton Water Ramsar site lying within the Solent European marine site at the time the Ramsar site was classified

Criterion 2a: Internationally important wetland hosting an assemblage of rare, vulnerable or endangered species
British Red Data Book plants
Eleocharis parvula - the dwarf spike-rush
Lamprothamnium papulosum - foxtail stonewort
Spartina alterniflora - smooth cordgrass
British Red Data Book invertebrates
Paracymus aeneus - water beetle

Criterion 3a: Internationally important wetland regularly supporting 20,000 waterfowl species	
Importance	**Wintering population (5 year peak mean 1992/93 - 1996/97)**
Wintering waterfowl assemblage	51,361 individual birds (21,401 wildfowl, 29,960 waders)

Criterion 3c: Internationally important wetland regularly supporting 1% or more of the individuals in a population of one species or sub-species of waterfowl	
Species	**5yr peak mean from 1992/93 - 1996/97**
Dark-bellied brent goose	7506 individuals
Teal	4400 individuals
Ringed plover	552 individuals
Black-tailed godwit	1125 individuals
Sandwich tern	231 pairs
Common tern	267 pairs
Little tern	49 pairs
Roseate tern	2 pairs

Table 4 Favourable Condition Table for Solent and Southampton Water SPA interest features.

Background to the favourable condition table for reference is on p 24 NB - Many of the attributes will be able to be monitored at the same time or during the same survey. The frequency of sampling for many attributes may need to be greater during the first reporting cycle in order to characterise the site and establish the baseline. Where relevant, National Vegetation Classification codes (NVCs) and marine biotope codes are provided and then referenced in Appendices XI and XII

Feature	Sub-feature	Attribute	Measure	Target	Comments
Internationally important populations of regularly occurring Annex 1 species		Disturbance	Reduction or displacement of birds measured periodically (frequency to be determined).	No significant reduction in numbers or displacement of birds from an established baseline[10], subject to natural change.	Significant disturbance attributable to human activities such as trampling of nests and disturbance of adults on and off their nests can result in reduced food intake and/or increased energy expenditure and failure of egg clutches. Five year mean information on populations will be used as the basis for assessing whether disturbance is damaging. Productivity (number of successfully fledged young), together with other measures will also be used to monitor disturbance.
		Absence of obstructions to view lines	Openness of terrain unrestricted by obstructions measured periodically (frequency to be determined).	No increase in obstructions to existing bird view lines from an established baseline.	Terns and gulls prefer open nest sites and require unrestricted views whilst roosting and feeding to allow for early detection of predators.
	Sand and shingle	Extent and distribution of habitat	Area (ha) measured once during reporting cycle.	No decrease in extent from an established baseline, subject to natural change.	An important nesting habitat for common, little, Sandwich and roseate terns and Mediterranean gulls. The extent and distribution of this sub-feature are important to maintain the populations in favourable condition.
		Vegetation characteristics	Range of vegetation heights and presence of bare ground measured periodically (frequency to be determined).	Vegetation height and density throughout areas used for nesting should not deviate significantly from an established baseline, subject to natural change.	Mediterranean gulls require short to medium sward heights of between 10-30 cm in nesting areas, whilst common, little, Sandwich and roseate terns require relatively bare sand and shingle beaches with sparse/short vegetation of < 3 cm and bare surfaces with areas of longer vegetation providing cover.
Internationally important populations of	Saltmarsh	Extent and distribution of habitat	Area (ha) measured once during reporting cycle measured	No decrease in extent from an established baseline, subject to	Saltmarsh provides an important nesting habitat for Mediterranean gulls and, to a lesser extent, common and roseate terns. The extent and distribution of this sub-feature are important to maintain the

Feature	Sub-feature	Attribute	Measure	Target	Comments
regularly occurring Annex 1 species (contd).		habitat	cycle measured periodically (frequency to be determined).	baseline, subject to natural change.	and distribution of this sub-feature are important to maintain the populations in favourable condition.
		Vegetation characteristics	Range of vegetation heights and presence of bare ground measured periodically (frequency to be determined).	Sward height and density throughout areas used for nesting should not deviate significantly from an established baseline, subject to natural change.	Mediterranean gulls require short to medium sward heights of between 10-30 cm in nesting areas, whilst common, little, Sandwich and roseate terns require relatively bare sand and shingle beaches withe sparse/short vegetation of < 3 cm and bare surfaces with areas of longer vegetation providing cover.
		Food availability	Presence and abundance of suitable prey species, measured periodically (frequency to be determined).	Presence and abundance of suitable prey species should not deviate significantly from an established baseline, subject to natural change.	Mediterranean gulls in particular forage in saltmarsh areas for small fish, and invertebrates such as worms, snails, and insects.
	Intertidal mudflats and sandflats	Extent and distribution of habitat	Area (ha) measured once during reporting cycle.	No decrease in extent from an established baseline, subject to natural change.	Intertidal sediment areas provide important feeding areas for Mediterranean gulls. All the Annex 1 species will roost on intertidal sediment areas. The extent and distribution of this sub-feature are important to maintain the populations in favourable condition.
		Food availability	Presence and abundance of suitable prey species, measured periodically (frequency to be determined).	Presence and abundance of suitable prey species should not deviate significantly from an established baseline, subject to natural change.	Mediterranean gulls in particular forage over mudflat and sandflat areas for small fish, and invertebrates such as worms, snails and crustaceans.
Internationally important	Shallow coastal waters	Food availability	Presence and abundance of suitable	Presence and abundance of	The four tern species and Mediterranean gulls forage over shallow coastal waters feeding on small fish such as sandeels and sprats,

Feature	Sub-feature	Attribute	Measure	Target	Comments
populations of regularly occurring Annex 1 species (contd).	waters		prey species, measured periodically (frequency to be determined).	suitable prey species should not deviate significantly from an established baseline, subject to natural change.	as well as invertebrates within the water column. The Clupeidae fish species are a very important food source for little, common, Sandwich and roseate terns.
Internationally important waterfowl assemblage, including the internationally important regularly occurring migratory species		Disturbance	Reduction or displacement of birds measured periodically (frequency to be determined).	No significant reduction in numbers or displacement of wintering birds 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. Five year peak mean information on populations will be used as the basis for assessing whether disturbance is damaging.
		Absence of obstruction to view lines	Openness of terrain unrestricted by obstructions measured periodically (frequency to be determined).	No increase in obstructions to existing bird view lines from an established baseline.	Waders including ringed plover and black-tailed godwit require views greater than 200 m and brent geese require views greater than 500 m to allow early detection of predators when feeding and roosting.
	Saltmarsh	Extent and distribution of habitat	Area (ha) measured once during reporting cycle.	No decrease in extent from an established baseline, subject to natural change.	Saltmarsh provides feeding and roosting areas for a range of overwintering bird species. The extent and distribution of this sub-feature are important to maintain the populations in favorable condition.
		Vegetation characteristics	Range of vegetation heights measured periodically (frequency to be determined).	Sward height and density throughout areas used for roosting should not deviate significantly from an established baseline, subject to natural change.	Roosting waders such as ringed plover and black-tailed godwit require vegetation of less than 10 cm in height. Dark-bellied brent geese generally require sward heights less than 10 cm through areas used for feeding.
Internationally important waterfowl	Saltmarsh	Food availability	Presence and abundance of suitable prey species and	Presence and abundance of prey species and	*Aster trifolium, Spergularia, Puccinellia, Triglochin, Plantago*, and *Salicornia* spp. are important food plants for dark-bellied brent geese. Soft-leaved and seed-bearing plants such as

Feature	Sub-feature	Attribute	Measure	Target	Comments
assemblage, including the internationally important regularly occurring migratory species (contd)			suitable saltmarsh food plants measured periodically (frequency to be determined).	saltmarsh food plants should not deviate significantly from an established baseline, subject to natural change.	*Salicornia* spp. and Atriplex are important food plants for teal. A number of overwintering and passage birds feed on invertebrates and small fish within the saltmarsh communities.
	Intertidal mudflats and sandflats	Extent and distribution of habitat	Area (ha) measured once during reporting cycle.	No decrease in extent from an established baseline, subject to natural change.	Intertidal sediments are an important feeding and roosting habitat for overwintering and passage waterfowl. The extent and distribution of this sub-feature are important to maintain the populations in favourable condition.
		Food availability	Presence and abundance of suitable prey species, measured periodically (frequency to be determined).	Presence and abundance of suitable prey species should not deviate significantly from an established baseline, subject to natural change.	Most of the waders and waterfowl within the assemblage, including the internationally important regularly occurring migratory birds feed on invertebrates within and on the sediments. Black-tailed godwit for example, feed primarily on bivalve molluscs such as *Macoma*, *Cardium* and annelid worms such as *Nereis* whereas small isopods such as *Gammarus* and *Tubifex* worms are important prey species for ringed plover. Wigeon and brent geese however graze on green algae (*Enteromorpha* and *Ulva* spp.), the latter preferring eelgrass (*Zostera* spp.) which grows on the sediment.
Internationally important waterfowl assemblage, including the internationally important regularly occurring migratory species (contd)	Boulder and cobble shores	Extent and distribution of habitat	Area (ha) measured once during reporting cycle.	No decrease in extent from an established baseline, subject to natural change.	Boulder and cobble shores provide feeding and roosting habitat for overwintering and migrating waterfowl. The extent and distribution of this sub-feature are important to maintain the populations in favourable condition.
		Food availability	Presence and abundance of suitable prey species and suitable algae. Measured periodically (frequency to be determined).	Presence and abundance of prey species and algae should not deviate significantly from an established baseline, subject to natural change.	Green algae such as *Enteromorpha* spp. and *Ulvae* spp. which grow on the cobbles and boulders are an important food source for grazing brent geese and wigeon. Boulder and cobble shores also support a range of invertebrates which provide a food source for ringed plover. In early winter periods, eelgrass beds are preferentially grazed by brent geese.

Feature	Sub-feature	Attribute	Measure	Target	Comments
	Mixed sediment shores	Extent and distribution of habitat	Area (ha) measured once during reporting cycle.	No decrease in extent from an established baseline, subject to natural change.	Mixed sediment shores provide feeding and roosting habitat for overwintering and migrating waterfowl. The extent and distribution of this sub-feature are important to maintain the populations in favourable condition.
		Food availability	Presence and abundance of suitable prey species and suitable algae. Measured periodically (frequency to be determined).	Presence and abundance of prey species and algae should not deviate significantly from an established baseline, subject to natural change.	Mixed sediment shores support a range of invertebrates (e.g. annelid worms, bivalve molluscs, marine snails, crustacea) which provide a food source for a number of waders and waterfowl. Green algae such as *Enteromorpha* spp. and *Ulvae* spp. which grow on the sediment, particularly on the larger stones, are an important food source for grazing brent geese and teal.

[10] 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 Solent European marine site and may well be missed by routine monitoring

Table 5 Favourable Condition Table for Solent and Southampton Water Ramsar interest features. Background to the favouable condition table for reference is on p 24 NB - Many of the attributes will be able to be monitored at the same time or during the same survey. The frequency of sampling for many attributes may need to be greater during the first reporting cycle in order to characterise the site and establish the baseline. Where relevant, National Vegetation Classification codes (NVCs) and marine biotope codes are provided and then referenced in Appendices XI & XII

Feature/ Criteria	Sub-feature	Attribute	Measure	Target	Comments
Criterion 1a: see table 1 for definition	Estuaries	For **estuary** favourable condition tables see Solent Maritime cSAC favourable condition table (estuaries) pages 25 - 26			
	Saline Lagoons	Extent	Area (ha) of lagoon basin, measured once during reporting cycle	No decrease in extent from an established baseline, subject to natural change	Extent is an attribute on which reporting is required by the Habitats Directive. The lagoons in Newtown Harbour and the Yar estuary are relatively small, therefore heightening the importance of extent.
		Salinity	Changes in salinity to be measured periodically throughout the reporting period	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, determining the stratification of the water and the species composition. Attention should be paid to natural fluctuations that occur according to year on year variations in rainfall.
		Water depth	Average water depth within lagoon basin at low tide, measured at least once during the reporting cycle, measured at the same time of year (preferably in late winter/early spring and	Average water depth should not deviate significantly from an established baseline, subject to natural change	The majority of saline lagoons in England are shallow. The influence of depth is a balance between sufficiently shallow to enable light penetration, and therefore photosynthesis, and sufficiently deep to submerge vegetation (and thereby affect oxygenation, food resource, habitat diversity and colonization by lagoonal fauna), determinating temporal duration of stratification, and buffering against environmental change, particularly dehydration.
		Isolating barrier - presence and nature	Most appropriate measure of integrity and nature of barrier, measured at least once during the reporting cycle.	No change in measure from established baseline, subject to natural change.	The presence of an isolating barrier is fundamental to the structure and function of a saline lagoon (indeed the nature of the barrier and degree of separation from the sea defines the type of lagoon) The key factor determining input/output of seawater is the height of the bottom of the inlet bed relative to ambient low water levels to allow retention of the majority of the lagoonal water at low tide. Generally, the level should be a little below high water neap tides.
Criterion 1a:	Saline Lagoons	Species composition	Presence and abundance of composite species,	Presence and abundance of composite species	Composite species are important contributors to the structure of the saline lagoon habitat. The community will reflect to varying degrees

Feature/ Criteria	Sub-feature	Attribute	Measure	Target	Comments
see table 1 for definition			measured at least once during the reporting cycle, measured at the same time of year.	should not deviate significantly from the established baseline, subject to natural change.	the structure and function of the habitat as a whole. In particular the Gamaridae shrimp (when present) should be monitored to ensure the survival of this rare lagoon crustacean.
		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 increases in amounts of suspended organic/inorganic matter.
	Saltmarsh	For **saltmarsh** favourable condition tables see Solent & Southampton Water SPA favourable condition table page 52			
	Intertidal reefs	Extent	Area (ha) of reef, measured once during reporting cycle	No decrease in extent of reef from an established baseline, subject to natural change	Extent is an attribute on which reporting is required by the Habitats Directive. Reefs off the east coast of the Isle of Wight fall within the Solent and Southampton Water SPA at Bembridge ledges. Additional advice on reefs can also be found in the South Wight Maritime European marine site regulation 33 advice.
		Water temperature and salinity	Average water temperature and salinity measured periodically throughout the reporting period (frequency to be determined)	Average temperature and salinity should not deviate significantly from an established baseline, subject to natural change	The temperature and salinity of the water overlying the reef 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 biogeographic range and non-native species.
		Water clarity	Average light attenuation measured periodically during the reporting period (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 extent and density of algal dominated communities, such as kelp forest, and thus the structure of the reef interest feature. The clarity of the water may decrease as a result of increases in levels of suspended matter and this may reduce light penetration through the water column. Siltation of suspended material may also lead to damage of the benthos, causing a reduction in feeding efficiency and colonisation.
Criterion 1a: see table 1	Reefs	Characteristic species *e.g.* rocky shore	Range and distribution of characteristic biotopes. Measured during summer,	Range and distribution of characteristic biotopes should not deviate	The range and distribution of those biotopes (particulary those listed in appendix XI) are an important structural aspect of the sub-feature and therefore the reef. Changes in extent and distribution may indicate

Feature/ Criteria	Sub-feature	Attribute	Measure	Target	Comments
for definition		communities	once during reporting cycle	significantly from an establis hed baseline subject to natural change	long term changes in the physical condition of the site.
Criterion 2a: see table 1 for definition	Saline lagoons	For **saline lagoon** favourable condition tables see Solent and Southampton Water Ramsar (Criterion 1a) favourable condition table page 56			
	Saltmarsh	For **saltmarsh** favourable condition tables see Solent & Southampton Water SPA favourable condition table page 52			
	Cordgrass swards	For **cordgrass** favourable condition tables see Solent Maritime cSAC favourable condition table page 32			
Criterion 3a: and Criterion 3c: see table 1 for definition	Saltmarsh	For **saltmarsh** favourable condition tables see Solent & Southampton Water SPA favourable condition table page 52			
	Intertidal mudflats and sandflats	For **intertidal mudflats and sandflats** favourable condition tables see Solent and Southampton Water SPA favourable condition table page 52			
	Boulder and cobble shores	For **boulder and cobble shore** favourable condition tables see Solent and Southampton Water SPA favourable condition table page 55			
	Mixed sediment shores	For **mixed sediment shores** favourable condition tables see Solent and Southampton Water SPA favourable condition table page 55			
Criterion 3c: see table 1 for definition	Sand and shingle	For **sand and shingle** favourable condition tables see Solent and Southampton Water SPA favourable condition table page 51			
	Shallow coastal waters	For **shallow coastal waters** favourable condition tables see Solent and Southampton Water SPA favourable condition table page 53			

[10] 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 Solent European marine site and may well be missed by routine monitoring

8. Chichester and Langstone SPA and Ramsar Conservation objectives and favourable condition tables.

8.1 Chichester and Langstone Harbours SPA interest features

8.1.1 The conservation objective for the internationally important populations of the regularly occurring Annex 1 species

Subject to natural change, maintain in favourable condition the habitats for the **internationally important populations of the regularly occurring Annex 1 species**, in particular:

- Sand and shingle
- Shallow coastal waters

Numbers of bird species using these habitats are given in table 6a

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

Subject to natural change, maintain in favourable condition[99] the habitats for the **internationally important populations of the regularly occurring migratory species**, in particular:

- Shingle
- Saltmarsh
- Intertidal mudflats and sandflats
- Mixed sediment shores

[9]For a detailed description of how to recognise favourable condition see the attached table 7

Numbers of bird species using these habitats are given in table 6a

8.1.3 The conservation objective for the internationally important assemblage of waterfowl

Subject to natural change, maintain in favourable condition[10] the habitats for the **internationally important assemblage of waterfowl**, in particular:

- Shingle
- Saltmarsh
- Intertidal mudflats and sandflats
- Mixed sediment shores
- Shallow coastal waters

Numbers of bird species using these habitats are given in table 6a.

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

[10] For a detailed description of how to recognise favourable condition see the attached table 7

population and distribution trends, to assess whether this SPA is continuing to make an appropriate contribution to the Favourable Conservation Status of these SPA's across Europe.

Table 6a Information on populations of bird species qualifying under the Birds Directive using those parts of the Chichester and Langstone Harbour SPAs lying within the Solent European marine site at the time the SPAs was classified*

Internationally important populations of regularly occurring Annex 1 species	
Species	**Breeding population**
Sandwich tern	>1%of GB population
Common tern	>1%of GB population
Little tern	>1%of GB population

Internationally important populations of regularly occurring migratory species[9]	
Species	**Wintering population**
Grey Plover	3.9% of west European population
Sanderling	3.1%of west European population
Dunlin	2.6%of west European population
Redshank	1.4%of west European population
Dark-bellied brent goose	12%of west European population
Shelduck	4%of west European population
Teal	1%of west European population

Internationally important assemblage of waterfowl	
Importance	**Wintering population (average waterfowl count)**
Waterfowl Assemblage	102,000 individual birds

Nationally important populations of regularly occurring migratory species[9]	
Species	**Wintering population**
Ringed plover	>1%of GB population
Curlew	>1%of GB population
Bar-tailed godwit	>1%of GB population
Turnstone	>1%of GB population
Wigeon	>1%of GB population
Pintail	>1%of GB population
Shoveler	>1%of GB population
Red-breasted merganser	>1%of GB population

8.2 Chichester and Langstone Harbour Ramsar conservation objectives

8.2.1 Criterion 1a: Conservation objective for internationally important wetland characteristic of the Atlantic biogeographical region

Subject to natural change, maintain the **internationally important wetlands characteristic of the Atlantic biogeographical region** in favourable condition[11], in particular:

- Estuaries
- Saltmarshes
- Intertidal mudflats and sandflats

[11]For a detailed description of how to recognise favourable condition see the attached table 8

8.2.2 Criterion 3a: Conservation objective for internationally important wetland regularly supporting 20,000 waterfowl

Subject to natural change, maintain the **wetland regularly supporting 20,000 waterfowl** in favourable condition[10], in particular:

- Shingle
- Saltmarsh
- Intertidal mudflats and sandflats
- Mixed sediment shores
- Shallow coastal waters

Bird species and their numbers are given in table 6b

8.2.3 Criterion 3c: The conservation objective for wetland 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 supporting 1% or more of the individuals in a population of waterfowl species** in favourable condition[8], in particular:

- Saltmarsh
- Intertidal mudflats and sandflats
- Mixed sediment shores
- Shingle
- Sand and shingle
- Shallow coastal waters

Bird species and their numbers are given in table 6b

Note: The Ramsar conservation objectives for **criterion 3** 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.

[10]For a detailed description of how to recognise favourable condition see the attached table 8

Table 6b Information on populations of bird species qualifying under the Ramsar Criteria 3a and 3c, using those parts of the Chichester and Langstone Harbour Ramsar site lying within the Solent European marine site at the time the Ramsar site was classified

Criterion 3a: Internationally important wetland regularly supporting 20,000 waterfowl	
Importance	
Wintering waterfowl assemblage	> 20,000 waterfowl

Criterion 3c: Internationally important wetland supporting 1% or more of the individuals in a population of one species or sub-species of waterfowl	
Species	**Wintering population**
Grey Plover	3.9% of the western European population
Sanderling	3.1% of GB population
Dark-bellied brent goose	12% of GB population
Dunlin	>20,000 individuals (2.6% of GB population)
Redshank	1.4% of GB population
Shelduck	4% of GB population
Teal	1% of GB population
Sandwich tern	>1%of GB population
Common tern	>1%of GB population
Little tern	>1%of GB population

Table 7 Favourable Condition Table for Chichester and Langstone Harbour SPA interest features. Background to the favouable condition table for reference is on p 24 NB - Many of the attributes will be able to be monitored at the same time or during the same survey. The frequency of sampling for many attributes may need to be greater during the first reporting cycle in order to characterise the site and establish the baseline. Where relevant, National Vegetation Classification codes (NVCs) and marine biotope codes are provided and then referenced in Appendices XI & XII

Feature	Sub-feature	Attribute	Measure	Target	Comments
Internationally important populations of regularly occurring Annex 1 species		Disturbance	Reduction or displacement of birds, measured periodically (frequency to be determined).	No significant reduction in numbers or displacement of wintering birds from an established baseline[10], subject to natural change.	Significant disturbance attributable to human activities can result in reduced food intake and/or increased energy expenditure. Five year mean information on populations will be used as the basis for assessing whether disturbance is damaging. Productivity (number of successfully fledged young), together with other measures will also be used to monitor disturbance.
		Absence of obstructions to view lines	Openness of terrain unrestricted by obstructions measured periodically (frequency to be determined).	No increase in obstructions to existing bird view lines from an established baseline.	Terns require unrestricted views when nesting, roosting and feeding to allow early detection of predators.
	Sand and Shingle	Extent and distribution of habitat	Area (ha) measured once during reporting cycle.	No decrease in extent from an established baseline, subject to natural change.	An important nesting habitat for common, little and Sandwich terns. The extent and distribution of this sub-feature are important to maintain the populations in favourable condition.
		Vegetation characteristics	Range of vegetation heights and presence of bare ground measured periodically (frequency to be determined).	Vegetation height and density throughout areas used for nesting should not deviate significantly from an established baseline, subject to natural change.	Common, little and Sandwich terns require relatively bare sand and shingle beaches withe sparse/short vegetation of < 3 cm and bare surfaces with areas of longer vegetation providing cover.
	Shallow coastal waters	Food availability	Presence and abundance of suitable prey species, measured periodically (frequency to be	Presence and abundance of suitable prey species should not deviate significantly from an	The three tern species forage over shallow coastal waters feeding on small fish such as sandeels and sprats, as well as invertebrates within the water column. The Clupeidae fish species are a very important food source for little, common and Sandwich terns.

Feature	Sub-feature	Attribute	Measure	Target	Comments
			determined).	established baseline, subject to natural change.	
Internationally important waterfowl assemblage, including the internationally important regularly occurring migratory species		Disturbance	Reduction or displacement of birds measured periodically (frequency to be determined).	No significant reduction in numbers or displacement of wintering birds 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. Five year peak mean information on populations will be used as the basis for assessing whether disturbance is damaging.
		Absence of obstructions to view lines	Openness of terrain unrestricted by obstructions measured periodically (frequency to be determined).	No increase in obstructions to existing bird view lines from an established baseline.	Ringed plover, bar-tailed godwit, redshank, curlew, turnstone and sanderling require views over greater than 200 m and brent geese require views greater than 500 m to allow early detection of predators when feeding and roosting.
	Shingle	Extent and distribution of habitat	Area (ha) measured once during reporting cycle	No decrease in extent from an established baseline, subject to natural change	Shingle provides roosting habitat for overwintering and migrating waterfowl.
	Saltmarsh	Extent and distribution of habitat	Area (ha) measured once during reporting cycle.	No decrease in extent from an established baseline, subject to natural change.	Important for feeding and roosting waterfowl. The extent and distribution of this sub-feature are important to maintain the populations in favourable condition.
		Vegetation characteristics	Range of vegetation heights measured periodically (frequency to be determined).	Sward height and density throughout areas used for roosting should not deviate significantly from an established baseline, subject to natural change.	Roosting waders such as ringed plover and bar-tailed godwit require vegetation of less than 10 cm in height. Dark-bellied brent geese generally require sward heights less than 10 cm and wigeon require heights less than 5 cm through areas used for feeding.
		Food availability	Presence and abundance of suitable prey species and	Presence and abundance of prey species and	*Aster trifolium*, *Spergularia*, *Puccinellia*, *Triglochin*, *Plantago*, and *Salicornia* spp. are important food plants for dark-bellied brent geese. Soft-leaved and seed-bearing plants such as

Feature	Sub-feature	Attribute	Measure	Target	Comments
			suitable saltmarsh food plants measured periodically (frequency to be determined).	saltmarsh food plants should not deviate significantly from an established baseline, subject to natural change.	*Salicornia* spp. and *Atriplex* are important food plants for teal. Wigeon feed on the saltmarsh plants *Agrostis stolonifera*, *Puccinellia maritima and Salicornia* spp. A number of overwintering and passage birds feed on invertebrates within the saltmarsh communities.
Internationally important waterfowl assemblage, including the internationally important regularly occurring migratory species (contd)	Intertidal mudflats and sandflats	Extent and distribution of habitat	Area (ha) measured once during reporting cycle.	No decrease in extent from an established baseline, subject to natural change.	Intertidal sediments are an important feeding and roosting habitat for overwintering and migrating waterfowl. The extent and distribution of this sub-feature are important to maintain the populations in favourable condition.
		Food availability	Presence and abundance of suitable prey species and food plants, measured periodically (frequency to be determined).	Presence and abundance of suitable prey species and food plants should not deviate significantly from an established baseline, subject to natural change.	Most of the waders and waterfowl within the assemblage, including the internationally important regularly occurring migratory birds feed on invertebrates within and on the sediments. Bar-tailed godwit for example, feed primarily on annelid worms such as *Nereis* spp. and *Arenicola* spp., and bivalve molluscs such as *Macoma* and *Cardium*. Ringed plover however prefer small isopods such as *Gammarus* spp. and Tubifex worms. Dunlin prefer molluscs such as *Macoma* and the marine snails *Hydrobia* spp. as well as small crabs and other crustaceans. Sanderling has a preference for small isopods and wrack flies. Wigeon and brent geese graze on green algae (*Enteromorpha* and *Ulva* spp.), the latter preferring eelgrass (*Zostera* spp.) which grows on the sediment.
	Mixed sediment shores	Extent and distribution of habitat	Area (ha) measured once during reporting cycle.	No decrease in extent from an established baseline, subject to natural change.	Mixed sediment shores provide feeding and roosting habitat for overwintering and migrating waterfowl. The extent and distribution of this sub-feature are important to maintain the populations in favourable condition.
		Food availability	Presence and abundance of suitable prey species and suitable algae. Measured periodically (frequency to be determined).	Presence and abundance of prey species and algae should not deviate significantly from an established baseline, subject to natural	Mixed sediment shores support a range of invertebrates (e.g. annelid worms, bivalve molluscs, marine snails, crustacea) which provide a food source for a number of waders and waterfowl. Green algae such as *Enteromorpha* spp. and *Ulvae* spp. which grow on the sediment, particularly on the larger stones, are an important food source for grazing brent geese and wigeon, although in early winter brent geese prefer eelgrass. Turnstone

Feature	Sub-feature	Attribute	Measure	Target	Comments
				change.	forage over the stony sediment feeding on invertebrates such as barnacles, small mussels and winkles attached to stones and rocks, small crabs and isopods which hide under stones. Turnstone also predate upon flies and their larvae.
Internationally important waterfowl assemblage (this sub-feature is not included for the internationally important regularly occurring migratory species)	Shallow coastal waters	Food availability	Presence and abundance of suitable prey species, measured periodically (frequency to be determined).	Presence and abundance of prey species should not deviate significantly from an established baseline, subject to natural change.	Red-breasted merganser which only qualify for the internationally important assemblage feed in shallow coastal waters on small fish such as gobies, flatfish and herring fry, as well as shrimps and annelid worms.

[10] 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 Solent European marine site and may well be missed by routine monitoring

Table 8 Favourable Condition Table for Chichester and Langstone Harbour Ramsar interest features. Background to the favouable condition table for reference is on p 24 NB - Many of the attributes will be able to be monitored at the same time or during the same survey. The frequency of sampling for many attributes may need to be greater during the first reporting cycle in order to characterise the site and establish the baseline. Where relevant, National Vegetation Classification codes (NVCs) and marine biotope codes are provided and then referenced in Appendices XI & XII

Feature/Criteria	Sub-feature	Attribute	Measure	Target	Comments
Criterion 1a: see table 1 for definition	Estuaries	For **estuary** favourable condition tables see Solent Maritime cSAC favourable condition table (Atlantic saltmeadows, cordgrass swards and *Salicornia*) pages 25 - 32			
	Saltmarsh	For **saltmarsh** favourable condition tables see Solent Maritime cSAC favourable condition table pages 29 - 32			
	Intertidal mudflats and sandflats	For **intertidal mudflat and sandflat** favourable condition tables see condition tables see Chichester and Langstone Harbours SPA favourable condition table page 66			
Criterion 3a:	Shingle	For **shingle** favourable condition tables see Chichester and Langstone Harbours SPA favourable condition table page 64			
and	Saltmarsh	For **saltmarsh** favourable condition tables see Chichester and Langstone Harbours SPA favourable condition table page 65			
Criterion 3c: see table 1 for definition	Intertidal mudflats and sandflats	For **intertidal mudflats and sandflats** favourable condition tables see Chichester and Langstone Harbours SPA favourable condition table page 66			
	Mixed sediment shores	For **mixed sediment shores** favourable condition tables see Chichester and Langstone Harbours SPA favourable condition table page 66			
	Shallow coastal waters	For **saltmarsh** favourable condition tables see Chichester and Langstone Harbours SPA favourable condition table page 65			
Criterion 3c: see table 1 for definition	Sand and shingle	For **sand and shingle** favourable condition tables see Chichester and Langstone Harbours SPA favourable condition table page 64			

[10] 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 Solent European marine site and may well be missed by routine monitoring

9. Portsmouth Harbour SPA and Ramsar Conservation objectives and favourable condition tables.

9.1 Portsmouth Harbour SPA interest features

9.1.1 The conservation objective for the nationally and internationally important populations of the regularly occurring migratory species

Subject to natural change, maintain in favourable condition[11] the habitats for the **nationally and internationally important populations of the regularly occurring migratory species**, in particular:

- Saltmarsh
- Intertidal mudflats and sandflats
- Shallow coastal waters

Numbers of bird species using these habitats are given in table 9a

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 these SPA's across Europe.

[11] For a detailed description of how to recognise favourable condition see the attached table 10

Table 9a Information on populations of bird species qualifying under the Birds Directive using those parts of the Portsmouth Harbour SPA lying within the Solent European marine site at the time the SPAs was classified*

Internationally important populations of regularly occurring migratory species[9]	
Species	**Wintering population**
Dark-bellied brent goose	2,290 individual birds (1.3 % of North-west European population)

Nationally important populations of regularly occurring migratory species[11]	
Species	**Wintering population**
Red-breasted merganser	100 (1 % of British population)
Black-tailed godwit	70 (over 1 % of British population)
Dunlin	8,010 (over 1 % of British population)

9.2 Portsmouth Harbour Ramsar conservation objectives

9.2.1 Criterion 1a: Conservation objective for internationally important wetland characteristic of the Atlantic biogeographical region

Subject to natural change, maintain the **internationally important wetland characteristic of the Atlantic biogeographical region** in favourable condition[12], in particular:

- Estuaries
- Saltmarsh
- Intertidal mudflats and sandflats

9.2.2 Criterion 2b: Conservation objective for internationally important wetland of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna

Subject to natural change, maintain the **wetland supporting genetically and ecologically diverse flora and fauna** in favourable condition[8], in particular:

- Saltmarsh
- Cordgrass swards
- Intertidal mudflats and sandflats

Examples are given in table 9b.

[12] For a detailed description of how to recognise favourable condition see the attached table 11

9.2.3 Criterion 3c: The conservation objective for wetland 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 supporting 1% or more of the individuals in a population of waterfowl** in favourable condition[12], in particular:

- Saltmarsh
- Shallow coastal waters
- Intertidal mudflats and sandflats

Bird species and their numbers are given in Table 9b.

Note: The Ramsar conservation objectives for **criterion 2** 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 conservation objectives for **criterion 3** 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.

Table 9b Information on populations of bird species qualifying under the Ramsar Criterion 3c and Red Data Book Species under Ramsar Criterion 2b, using those parts of the Portsmouth Harbour Ramsar site lying within the Solent European marine site at the time the Ramsar site was classified

Criterion 2b: Internationally important wetlands of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna
Eelgrass - *Zostera angustifolia* and *Z.noltii*
Mud-snail - *Hydrobia ulvae*
Cord grass - *Spartina anglica*
Green algae - *Enteromorpha* spp.
Sea lettuce - *Ulva lactuca*

Sea purslane - *Halimone portulacoides*

Criterion 3c: Internationally important wetlands supporting 1% or more of the individuals in a population of one species or sub-species of waterfowl	
Species	**5yr peak mean from 1991/92 - 1995/96**
Dark-bellied brent goose	2,290 individual birds (1.3 % of North-west European population)
Dunlin	8,010 (over 1 % of British population)
Black-tailed godwit	70 (over 1 % of British population)
Red-breasted merganser	100 (over 1 % of British population)

Table 10 Favourable Condition Table for Portsmouth Harbour SPA interest features. Background to the favouable condition table for reference is on p 24 NB - Many of the attributes will be able to be monitored at the same time or during the same survey. The frequency of sampling for many attributes may need to be greater during the first reporting cycle in order to characterise the site and establish the baseline. Where relevant, National Vegetation Classification codes (NVCs) and marine biotope codes are provided and then referenced in Appendices XI and XII

Feature	Sub-feature	Attribute	Measure	Target	Comments
Internationally important regularly occurring migratory species (according to the citation, this also includes the nationally important regularly occurring migratory	All sub-features	Disturbance	Reduction or displacement of birds measured periodically (frequency to be determined).	No significant reduction in numbers or displacement of wintering birds from an established baseline[10], subject to natural change.	Significant disturbance attributable to human activities can result in reduced food intake and/or increased energy expenditure. Five year peak mean information on populations will be used as the basis for assessing whether disturbance is damaging.
		Absence of obstructions to view lines	Openness of terrain unrestricted by obstructions measured periodically (frequency to be determined).	No increase in obstructions to existing bird view lines from an established baseline.	Black-tailed godwit and dunlin require views greater than 200 m and brent geese require views greater than 500 m to allow early detection of predators when feeding and roosting.

Feature	Sub-feature	Attribute	Measure	Target	Comments
species)	Saltmarsh	Extent and distribution of habitat	Area (ha) measured once during reporting cycle.	No decrease in extent from an established baseline, subject to natural change.	Important for feeding and roosting waterfowl. The extent and distribution of this sub-feature are important to the structure and function of the interest feature.
		Vegetation characteristics	Range of vegetation heights measured periodically (frequency to be determined).	Sward height and density throughout areas used for roosting should not deviate significantly from an established baseline, subject to natural change.	Roosting waders such as ringed plover and black-tailed godwit and dunlin require vegetation of less than 10 cm in height. Dark-bellied brent geese generally require sward heights less than 10 cm through areas used for feeding.
		Food availability	Presence and abundance of suitable prey species and suitable saltmarsh food plants, measured periodically (frequency to be determined).	Presence and abundance of prey species and saltmarsh food plants should not deviate significantly from an established baseline, subject to natural change.	*Aster trifolium*, *Spergularia*, *Puccinellia*, *Triglochin*, *Plantago*, and *Salicornia* spp. are important food plants for dark-bellied brent geese. Black-tailed godwit and dunlin will feed on invertebrates such as annelid worms within the saltmarsh communities.
Internationally important regularly occurring migratory species (according to the citation, this also includes the nationally important regularly occurring	Intertidal mudflats and sandflats	Extent and distribution of habitat	Area (ha) measured once during reporting cycle.	No decrease in extent from an established baseline, subject to natural change.	Important for feeding and roosting waterfowl. The extent and distribution of this sub-feature are important to the structure and function of the interest feature.
		Food availability	Presence and abundance of suitable prey species and eelgrass beds, measured periodically (frequency to be determined).	Presence and abundance of prey species and eelgrass should not deviate significantly from an established baseline, subject to natural change.	Eelgrass *Zostera* spp. is an important food plant for dark-bellied brent geese. Black-tailed godwit and dunlin will feed on invertebrates such as annelid worms within the intertidal mudflat and sandflat communities.

Feature	Sub-feature	Attribute	Measure	Target	Comments
migratory species)	Shallow coastal waters	Food availability	Presence and abundance of suitable prey species, measured periodically (frequency to be determined).	Presence and abundance of prey species should not deviate significantly from an established baseline, subject to natural change.	Red-breasted merganser which only qualify for the internationally important assemblage feed in shallow coastal waters on small fish such as gobies, flatfish and herring fry, as well as shrimps and annelid worms.

Table 11 Favourable Condition Table for Portsmouth Harbour Ramsar interest features. Background to the favouable condition table for reference is on p 24 NB - Many of the attributes will be able to be monitored at the same time or during the same survey. The frequency of sampling for many attributes may need to be greater during the first reporting cycle in order to characterise the site and establish the baseline. Where relevant, National Vegetation Classification codes (NVCs) and marine biotope codes are provided and then referenced in Appendices XI and XII

Feature/Criteria	Sub-feature	Attribute	Measure	Target	Comments
Criterion 1a: **see table 1 for definition**	Estuaries	For **estuary** favourable condition tables see Solent Maritime cSAC favourable condition table pages 25 -26			
Criterion 1a: **Criterion 2b:** **Criterion 3c:** **see table 1 for definition**	Saltmarsh	For **saltmarsh** favourable condition tables see Portsmouth Harbour SPA favourable condition table page 72			
	Intertidal mudflats and sandflats	For **intertidal mudflats and sandflats** favourable condition tables see see Portsmouth Harbour SPA favourable condition table page 73			
Criterion 3c: **see table 1 for definition**	Shallow coastal waters	For **shallow coastal waters** favourable condition tables see Portsmouth Harbour SPA favourable condition table page 73			

[10] 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 Solent European marine site and may well be missed by routine monitoring

10. 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 10.2 and on how it may be reviewed and updated in the future, in Section 10.4.

The advice is provided in summary form in Table 12 with more detail in the Tables in appendix VIII and IX and in Sections 11 to 14 including advice in relation to specific interest features and their sub-features.

10.1 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 Solent 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.

10.2 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).

10.2.1 Sensitivity assessment

The sensitivity assessment used is an assessment of the relative sensitivity of the interest features or the component sub-features of the Solent 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 increases in turbidity of the surrounding water. This reduces the light penetration which in turn prevents adequate photosynthesis.

The sensitivity assessments of the interest features or their component sub-features of the Solent European marine site are based primarily upon a number of UK Marine SACs *Life* Project Task Reports (Davison and Hughes, 1998; Elliott *et al*., 1998; Cole *et al*., 1999, ABP, 1999, Fowler, 1999, Gubbay and Knapman, 1999, Jones *et al*., 2000) as well as Natura 2000 Forms.

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).

10.2.2 Exposure assessment

This has been undertaken for the Solent European marine site by assessing the relative exposure of the interest features or their component sub-features on the site to the effects of broad categories of human activities currently occurring on the site (as at August 2000). For example, the exposure of interest features within the site to changes in the thermal regime as a result of human activities is negligible, but exposure of some of the interest features to nutrient enrichment is high. These assessments were made on the best available advice.

10.2.3 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). For example mudflat communities may be sensitive to changes in the thermal regime, but it may not be currently vulnerable within the Solent European marine site due to limited exposure of the features to activities which may result in changes to water temperature. The process of deriving and scoring relative vulnerability is provided in Appendix X.

10.3 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 the Tables in appendix VIII and IX provide relevant authorities with a context against which to consider an assessment of 'significant effect' of any plans or projects which may affect the site and a basis to inform on the scope and nature of appropriate assessments required in relation to plans and projects (see Appendices XIV). 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 formally consult English Nature over individual plans and projects where required to do so under the Regulations.

10.4 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 Solent European marine site. English Nature expects that the information on current activities and patterns of usage (which was used to derive Table 4) will be refined as part of the process of developing the management scheme and through further discussion with the relevant authorities. The option of zoning this information may be appropriate. As such, it is important that future consideration of this advice by relevant authorities and others takes account of changes in the usage patterns that have occurred at the site, over the intervening period, since the advice was issued. In contrast, the information provided in this advice on the sensitivity of interest features or sub-features (Table 5) is relatively stable and will only change as a result of an improvement in our scientific knowledge, which will be a relatively long term process. Advice for sites will be kept under review and may be periodically updated through discussions 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.

10.5 A summary of advice on operations for the SAC, SPA and Ramsar interest features

Table 12 is a summary of advice on operations for the SAC, SPA and Ramsar interest features. In pursuit of the conservation objectives for all the interest features in the European marine site, the relevant and competent authorities are advised to manage human activities within their remit such that they do not result in deterioration or disturbance of the habitats.

10.6 Plans and Projects

Under Regulation 48(1) of the Conservation (Natural Habitats, &c.) Regulations 1994, an appropriate assessment needs to be undertaken in respect of any plan or project which:

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

An appropriate assessment is required by law for all European Sites (Regulation 48). A European Site is described in Section 1.8. It should be noted, however, that amendments to the Habitats Regulations for England are now in force which result in a statutory requirement for Appropriate Assessments to be conducted for candidate SACs before they become Sites of Community Importance.

The Tables in appendix VIII and IX of this Regulation 33 advice package 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. English Nature's guidance note HRGN1 'The Appropriate Assessment (Regulation 48)' is at Appendix XIV for further information.

10.7 Review of consents

Regulation 50 of the Conservation (Natural Habitats, &c.) Regulations 1994 requires competent authorities to undertake a review of all existing consents and permissions affecting the European site, as soon as possible after the site officially becomes a Site of Community Importance. 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 12: Summary of operations which may cause deterioration or disturbance to the Solent European marine site interest features at current levels of use[11]

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

Standard list of categories of operations which may cause deterioration or disturbance	SAC interest features							Solent and Southampton Water SPA		
	Estuaries	Annual vegetation of drift lines	Atlantic salt meadows	*Salicornia* and other annuals	Cordgrass swards	Mudflats and sandflats not covered by seawater all the time	Sandbanks covered by seawater all the time	Annex 1 birds	Wintering migratory birds	Waterfowl assemblage
Physical Loss										
• Removal (e.g. land claim, coastal development)	_	_	_	_	_	_	_	_	_	_
• Smothering (e.g. coastal development)	_	_	_	_	_	_	_	_	_	_
Physical Damage										
• Siltation (e.g. dredging, outfalls, coastal development)	_					_	_			
• Abrasion (e.g. land-based recreation, coastal development, bait collection)	_	_	_	_	_	_	_	_	_	_
• Selective extraction (e.g. aggregate extraction)										
Non-physical disturbance										
• Noise (e.g. land/water-based recreation, marine traffic, coastal development)								_	_	_

Standard list of categories of operations which may cause deterioration or disturbance	SAC interest features							Solent and Southampton Water SPA		
	Estuaries	**Annual vegetation of drift lines**	**Atlantic salt meadows**	***Salicornia* and other annuals**	**Cordgrass swards**	**Mudflats and sandflats not covered by seawater all the time**	**Sandbanks covered by seawater all the time**	**Annex 1 birds**	**Wintering migratory birds**	**Waterfowl assemblage**
• Visual presence (e.g. land/water-based recreation, marine traffic, coastal development)								–	–	–
Toxic contamination										
• Introduction of synthetic compounds (e.g. domestic/industrial effluent outfalls)	–		–	–	–	–	–	–	–	–
• Introduction of non-synthetic compounds (e.g. domestic/industrial effluent outfalls, anti-fouling paints)	–	–	–	–	–	–	–	–	–	–
• Introduction of radionuclides (e.g. industrial discharges)										
Non-toxic contamination										
• Changes in nutrient loading (e.g. agricultural run-off, domestic/industrial effluent outfalls)	–	–	–	–	–	–	–	–	–	–
• Changes in organic loading (e.g. domestic/industrial effluent outfalls)	–	–	–	–		–	–	–	–	–
• Changes in thermal regime (e.g. power station discharges)										

Standard list of categories of operations which may cause deterioration or disturbance	SAC interest features							Solent and Southampton Water SPA		
	Estuaries	**Annual vegetation of drift lines**	**Atlantic salt meadows**	***Salicornia* and other annuals**	**Cordgrass swards**	**Mudflats and sandflats not covered by seawater all the time**	**Sandbanks covered by seawater all the time**	**Annex 1 birds**	**Wintering migratory birds**	**Waterfowl assemblage**
• Changes in turbidity (e.g. domestic/industrial effluent outfalls, dredging, dredged spoil disposal) • Changes in salinity (e.g. water abstraction, domestic/industrial effluent outfalls)	–					–	–	–		
Biological disturbance • Introduction of microbial pathogens (e.g. domestic/industrial effluent outfalls)										
• Introduction of non-native species and translocation (e.g. *Sargassum muticum*, ballast water	–					–	–			
• Selective extraction of species (e.g. commercial fishing and commercial or recreational rod and line fishing, bait collection)	–					–	–	–	–	–

Standard list of categories of operations which may cause deterioration or disturbance	Solent and Southampton Water interest features				Chichester and Langstone Harbours interest features						Portsmouth Harbour interest features			
	Ramsar				SPA			Ramsar			SPA	Ramsar		
	Criteria 1 (habitats)	Criteria 2 (species)	Criteria 3a (birds)	Criteria 3c (birds)	Annex 1 birds	Wintering migratory birds	Waterfowl assemblage	Criteria 1 (habitats)	Criteria 3a (birds)	Criteria 3c (birds)	Wintering migratory birds	Criteria 1 (habitats)	Criteria 2 (species)	Criteria 3 (birds)
Physical Loss														
• Removal (e.g. land claim, coastal development)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
• Smothering (e.g. coastal development)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Physical Damage														
• Siltation (e.g. dredging, outfalls, coastal development)	–	–												
• Abrasion (e.g. land-based recreation, coastal development, bait collection)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
• Selective extraction (e.g. aggregate extraction)														
Non-physical disturbance														
• Noise (e.g. land/water-based recreation, marine traffic, coastal development)			–	–	–	–	–		–	–	–			–
• Visual presence (e.g. land/water-based recreation, marine traffic, coastal development)			–	–	–	–	–		–	–	–			–
Toxic contamination														
• Introduction of synthetic compounds (e.g. domestic/industrial effluent outfalls)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
• Introduction of non-synthetic compounds (e.g. domestic/industrial effluent outfalls, anti-fouling paints)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
• Introduction of radionuclides (e.g. industrial discharges)														

Standard list of categories of operations which may cause deterioration or disturbance	Solent and Southampton Water interest features				Chichester and Langstone Harbours interest features						Portsmouth Harbour interest features			
	Ramsar				SPA			Ramsar			SPA	Ramsar		
	Criteria 1 (habitats)	Criteria 2 (species)	Criteria 3a (birds)	Criteria 3c (birds)	Annex 1 birds	Wintering migratory birds	Waterfowl assemblage	Criteria 1 (habitats)	Criteria 3a (birds)	Criteria 3c (birds)	Wintering migratory birds	Criteria 1 (habitats)	Criteria 2 (species)	Criteria 3 (birds)
Non-toxic contamination														
• Changes in nutrient loading (e.g. agricultural run-off, domestic/industrial effluent outfalls)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
• Changes in organic loading (e.g. domestic/industrial effluent outfalls)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
• Changes in thermal regime (e.g. power station discharges)														
• Changes in turbidity (e.g. domestic/industrial effluent outfalls, dredging, dredged spoil disposal)	–			–	–		–		–	–	–			–
• Changes in salinity (e.g. water abstraction, domestic/industrial effluent outfalls)	–	–			–	–	–	–	–	–				
Biological disturbance														
• Introduction of microbial pathogens (e.g. domestic/industrial effluent outfalls)														
• Introduction of non-native species and translocation (e.g. *Sargassum muticum*, ballast water	–	–						–				–	–	
• Selective extraction of species (e.g. commercial fishing and commercial or recreational rod and line fishing, bait collection)	–		–	–		–	–	–	–	–	–	–		–

11 This advice has been developed using best available scientific information and informed scientific interpretation and judgement. 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 Table 5. The advice is indicative only, and is given to guide relevant authorities and others on particular operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species for which the site has been designated.

The precise impact of any category of operation occurring on the site will be dependent 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 the management scheme by the management group and 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 August 2000. As such, it is important that future consideration of this advice by relevant authorities, and others, takes account of changes in usage patterns that have occurred at the site over the intervening period. Advice for sites will be kept under review and may be periodically updated through discussions with relevant authorities, and others, to reflect significant changes in our understanding of sensitivity together with the potential effects of plans or projects on the marine environment. The provision of the statutory advice given here, on operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species, for which the site has been designated, under Regulation 33(2), is provided without prejudice to specific advice given under Regulation 48 (3) or Regulation 50 on individual operations that qualify as plans or projects within the meaning of Article 6 of the Habitats Directive.

11. Detailed operations advice for the Solent Maritime cSAC interest features

- **Estuaries**
- **Mudflats & sandflats**
- **Sandbanks**
- **Annual vegetation of drift lines**
- **Saltmarsh (Atlantic salt meadows, cordgrass swards and *Salicornia* and other annuals colonising mud and sand)**

The following sections provides information to help relate general advice to each of the above specific interest features for the Solent European marine site.

This advice relates to the vulnerability of the interest features and sub-features of the Solent European marine site as summarised in Table 12 and detailed in the Tables in appendix VIII and IX. Further explanation of the sensitivity of the interest features or sub-features follows with examples 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 Sections 3 and 6.

1)Physical loss

- The Solent European marine site comprises a complex of estuarine systems with a wide range of estuary types providing an important diversity of habitats. These support a variety of marine communities, many of which are dependent upon the ecological functioning of other communities. Physical loss through either removal or smothering could jeopardise the survival of some of these communities and would therefore be detrimental to the favourable condition of the estuaries interest feature. As a consequence of these factors, all the estuaries sub-features are therefore considered to be highly sensitive to removal and smothering.

- Most of the estuaries sub-features are currently considered to have a medium exposure to removal and smothering. This may occur as a result of one-off developments such as infrastructure construction and modification, coastal protection works, capital dredging and land claim which can result in the loss of part of one or more of the sub-features and this may be higher on particular parts of the site. Physical loss may also result from the cummulative effects of ongoing activities such as maintenance dredging. Developments and activities may also indirectly cause the removal of estuarine habitats through the changes in morphology, modification of coastal processes and subsequent habitat erosion. The estuary systems are further compromised by hard frontages such as embankments and quays which constrain the upper shore boundary preventing landward migration of the intertidal sub-features as a response to rising sea levels. The intertidal mudflat and mixed sediment sub-features within the European marine site are considered to have a higher exposure to smothering than intertidal sandflat communities and saltmarsh communities in light of the higher intensity of one-off developments that occur on them. Using the assessment matrix in Appendix X and the exposure and sensitivity scores in the appendicies, all the estuaries sub-features are therefore considered vulnerable to removal and smothering.

- Driftlines are highly sensitive to physical loss. This can occur mostly through one-off developments such as infrastructure construction and modification involving land claim but also as a result of coastal squeeze. Changes to coastal processes may also affect the sediment budget of estuaries and reduce the supply of sediment to areas of driftline vegetation. Given the extent of barriers around the European marine site which will affect the landward movement of annually vegetated driftlines, the potential for loss through coastal squeeze is high, making annual vegetation of driftlines highly vulnerable to removal and moderately vulnerable to smothering by coastal development.

- The aspect of the seed dynamics on shingle foreshores has been little studied. Seeds are dispersed around the shingle by water movement in the autumn after seed fall. It is likely that only a limited amount of seed will be deposited by natural means in the shingle extraction areas until after the growing season when autumn storms reach that area of the beach and introduce seeds. Little germination occurs in the autumn - most occurs after April/May. There is evidence to suggest that the highest level of germination occurs at depths of 2 to 5 cm - at greater depths, germination is significantly lower. Removal of surface layers of shingle in winter will be very likely to also remove deposited seed. This will also impact on the recolonisation by annual vegetation.

- Saltmarshes, cordgrass and *Salicornia* are highly sensitive to physical loss. This can occur mostly through one-off developments such as infrastructure construction and modification involving land claim but also as a result of coastal squeeze, a process by which coastal features such as saltmarshes and *Salicornia* are drowned as they become trapped between man-made structures such as sea defences and rising sea levels. Where this occurs on saltmarshes, it may result in the replacement of mid-marsh communities by pioneer saltmarsh communities. Under natural circumstances, the saltmarsh zones would respond where possible by migrating landward. Changes to coastal processes may also affect the sediment budget of estuaries and reduce the supply of sediment to saltmarsh, *Salicornia* and cordgrass areas. Given the extent of barriers around the European marine site to the landward movement of saltmarsh, potential loss through developments and the high sensitivity scores, Atlantic salt meadows, cordgrass swards and *Salicornia* are currently considered to be highly vulnerable to removal and moderately vulnerable to smothering.

ii) Physical damage

- Most estuarine communities are not considered highly sensitive to siltation, being naturally silty environments. However, in parts of the Solent European marine site, such as on the north coast of the Isle of Wight and within Langstone and Chichester Harbours, areas of sand and gravel are present and the marine communities which inhabit these substrates are sensitive to excessive inputs of fine material. Silt in the water column can smother or block the feeding and respiratory organs of marine animals, it can effect recruitment processes of both marine fauna and flora and can contribute to a reduction in light penetration through the water column (Elliot *et al*., 1998). The latter being particularly important for the healthy functioning of eelgrass beds. For these reasons, intertidal sandflat communities are considered moderately sensitive to siltation, whilst the saltmarsh and mud communities, which generally experience higher natural siltation, have a low sensitivity. Siltation of estuarine features can arise from a range of one-off developments such as infrastructure construction and modification as well as ongoing activities such as effluent outfalls, maintenance dredging and dredged spoil disposal, which occurs at various locations within the Solent European marine site. Although the exposure to siltation varies across the site, in general, estuarine sub-features are considered to have a medium exposure to siltation.

- All the sub-features are moderately sensitive to abrasion which can physically damage individual marine organisms and plants as well as causing deterioration to the structure of saltmarsh and sediment communities. Intertidal mudflats and sandflats particularly, are naturally dynamic and many of the organisms inhabiting them have adaptations to morphological change. However, if local damage is intensive or persistent this may be detrimental to the favourable condition of the estuaries interest feature in relation to its structure and functioning. Particular communities, such as microfauna, may be exposed when present as epifauna or near surface infauna. Exposure to abrasion varies across the site, arising from a range of one-off developments and from a number of different ongoing activities, both land-based and water-based. In general however, it is considered to be high for most of the estuarine sub-features. Consequently all the sub-features of the estuaries are considered to be vulnerable to physical damage by abrasion

- Driftlines are highly vulnerable to physical damage by abrasion. This may result from a wide range of activities including recreational usage (both land-based and water-based) which may damage individual

areas of annual vegetated driftline through direct contact or physical damage caused by the effects of pollution (e.g. smothering by oil).

- Saltmarshes, cordgrass swards and *Salicornia* are moderately vulnerable to physical damage by abrasion. This may result from a wide range of activities including recreational usage (both land-based and water-based) which may damage individual saltmarsh plants or areas of saltmarsh through direct contact, shipping and boating which indirectly can increase saltmarsh erosion caused by their wash, inappropriate grazing of the saltmarsh, or physical damage caused by the effects of pollution (e.g. smothering by oil). Localised damage of parts of the saltmarsh can potentially impact upon the ecological structure and function of larger areas of the saltmarsh interest features and if unable to recover, may ultimately lead to physical loss of the habitat.

iii) Toxic contamination

- Many estuarine species and communities are highly sensitive to toxic contamination through the introduction of synthetic compounds such as pesticides, polychlorinatedbiphenyls (PCBs) and biocides (e.g. tributyltin (TBT)), and moderately sensitive to non-synthetic compounds such as heavy metals and hydrocarbons. Marine organisms such as algae, macrophytes, 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 (particularly to invertebrate larvae) and capable of high levels of bioaccumulation within many benthic organisms, particularly those such as molluscs which are poor at regulating the uptake of contaminants. Such compounds may then be compounded (or biomagnify) up the food chain if these organisms are predated upon. Whilst the effects of individual synthetic compounds on the many species found within these sub-features is 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 varies according to the state and availability of the compound and the characteristics of the receiving environment. Where the effects are lethal, removal of individual species may result in the loss of key grazers or predators, and a dominance of pollution tolerant organisms. Sub-lethal effects however, may affect the healthy functioning of organisms such as its reproduction, physiology or genetics, which may ultimately reduce the organism's fitness for survival. Faunal communities within sediment communities, which primarily consist of species relying on larval dispersal for recruitment, are particularly recognised as being sensitive to toxic contamination. In sheltered low energy areas such as estuaries where muddy sediments can act as a contaminant 'sink', synthetic and non-synthetic compounds bind to fine sediments but may then be released if the sediment is disturbed (for example by capital dredging) making them bio-available and potential pollutants.

- Oil contamination can also cause deterioration of communities in intertidal and shallow subtidal systems 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. Consequently, procedures to respond to oil spill incidents within and adjacent to the European marine site need to be kept under review.

- All the sub-features therefore have a medium exposure to synthetic and non-synthetic toxic contamination which can enter the European marine site from a number of point and non-point sources ranging from land-based discharges (licensed and un-licenced), run-off (*e.g*. roads), water-based discharges (e.g. oil from ships and metal compounds such as anti-fouling paints) to atmospheric deposition.

- Oil or chemical spills could have a direct impact on this low growing vegetation which occurs at the top of the shore. The dispersants which are sometimes used in oil spills would also be likely to cause damage to growth and recovery rates. The presence of bunkering and transfer facilities in the European marine site provides a potential risk to the annual vegetation of driftlines as they are highly vulnerable to the introduction of non-synthetic compounds.

- Atlantic salt meadows, cordgrass swards and *Salicornia* occur on the Solent European marine site are considered to have a high sensitivity and a high vulnerability to toxic contamination by synthetic compounds and a moderate sensitivity and moderate vulnerability to non-synthetic compounds. Although saltmarsh plants may be reasonably tolerant of certain synthetic substances, they can bioaccumulate toxic compounds and act as sinks for them (Holt *et al*., 1995). This could have implications for wildfowl which feed on saltmarsh plants.

- Saltmarsh interest features are also sensitive to oil and oil products, even at relatively low levels (Holt *et al*., 1995). This is mainly by virtue of their ability to trap sediments. Acute events, such as oil spills, can be particularly damaging to saltmarsh plants. Dispersants used to treat oil spills can also have toxic effect on saltmarsh plants, sometimes to a greater degree than the spilled oil itself. Saltmarshes have been reported to recover from chronic oil pollution, where denuded of vegetation, within 10 years, although recovery depends largely on the degree to which oil is retained in the sediment and the clean up procedures used.

iv) Non-toxic contamination

- Certain contaminants can have non-toxic but nevertheless harmful effects on estuarine sub-features, mainly because they can enter the environment in large quantities, such as organic material and nutrients. Sewage effluents, industrial effluents, riverine input and agricultural run-off are major sources of both such contaminants.

- Elevated nutrient (phosphate and nitrate) levels can contribute to the stimulation of phytoplankton growth (eutrophication) and the subsequent deoxygenation of the water column, particularly in areas of limited or reduced water circulation, and the localised growth of ephemeral opportunistic algae such as *Enteromorpha* spp. and *Ulva lactuca* on the foreshore, which can cause smothering and deoxygenation of sediment communities (Cole *et al*., 1999). Langstone Harbour is considered to be eutrophic and is designated as a Sensitive Area (Eutrophic) under the EC Urban Waste Water Treatment Directive. Both the Medina Estuary and the Hamble Estuary can suffer from non-persistent algal blooms during the summer months and the Solent area in general has been described as hyper-nutrified although it is not considered to be eutrophic. Given the moderate exposure of sub-features to nutrient enrichment, arising from sources within and from outside the Solent area, all the sub-features are therefore vulnerable to nutrient enrichment.

- Those sub-features which are primarily composed of sediments and the lower parts of the saltmarsh are considered to be moderately vulnerable to organic enrichment. Increased levels of organic compounds can lead to a localised depletion of oxygen levels due to the increased activity of anaerobic bacteria which break down the organic material. A good supply of oxygen within the sediments and the water column is important for the healthy functioning of most marine species and elevated levels of organic matter can alter this natural balance, potentially causing changes to the species composition and distribution within sediment and saltmarsh communities, caused primarily by the increased growth of opportunistic invertebrate species (Cole *et al*., 1999).

- Exposure of the sub-features to organic enrichment is also considered to be medium for all sub-features. However, the exposure varies temporally and spatially across the interest features and the exposure score reflects the localised areas of high organic input, particularly from domestic effluent outfalls. The intertidal sandflat communities are also moderately vulnerable to changes in turbidity.

- Vegetation of driftlines is highly vulnerable to changes in nutrient loading and moderately vulnerable to changes in organic loading. Changes in nutrient and organic availability could reduce the ability of this type of vegetation to compete with more vigorous plant growth of other, more common, species

- Studies in North America suggest that saltmarshes are unlikely to be particularly sensitive to changes in water quality due to nutrient enrichment (Holt *et al.*, 1995). However, increased growth of algal plants, as a result of eutrophication, may cause local smothering and has been known to have a detrimental effect on glasswort (*Salicornia* spp.) in low marsh communities. A moderate sensitivity rating has therefore been given for the low marsh sub-features of Atlantic salt meadows and a high exposure score due to the high levels of nutrients to the Solent European marine site..

22) Biological disturbance

- The estuarine sub-features within the Solent European marine site are sensitive to biological disturbance through the introduction, translocation and/or spread of non-native species. Such introduced species may thrive at the expense of native species, resulting in a change in the biological composition, structure and functioning of estuarine habitats.

- There are a number of non-native species within the Solent European marine site and potential sources of further introductions, which contribute to the medium exposure score assigned to all the estuary sub-features. Some, such as the barnacles, molluscs and ascidians are likely to have arrived from overseas on the hulls of ships, others within ships ballast water whilst some were deliberately introduced. The most important of the introduced species which may pose a threat to elements of the interest features are the hard shell clam *Mercenaria mercenaria*, the dense japweed *Sargassum muticum* and the slipper limpet *Crepidula fornicata* (Fowler, 1995). Given the exposure and sensitivity ratings to this form of biological disturbance, the introduction of non-natives should be kept under surveillance.

- Sediment sub-features within the estuaries are exposed to a number of activities which may result in the selective extraction of species. These include activities such as bait digging, wildfowling and commercial shellfish collection. The unsustainable removal of particular species from estuarine habitats may effect the ecological balance of the marine communities and predator species such as birds and fish that may rely upon the presence of particular organisms as a food source. Guidelines for the collection of bait and other shoreline animals within European marine sites have been produced by Fowler (1999) and studies are currently being conducted to investigate the likely effects of bait collection within the Solent area.

12. Detailed operations advice for Solent and Southampton Water SPA and Ramsar interest features

- **Internationally important populations of regularly occurring Annex 1 species**
- **An internationally important assemblage of waterfowl including internationally important populations of regularly occurring migratory species**
- **Criterion 1a: Internationally important wetland characteristic of the Atlantic biogeographical region**
- **Criterion 2a: Internationally important wetland hosting an assemblage of rare, vulnerable and endangered species.**
- **Criteria 3a and 3c: Internationally important wetland regularly supporting 20,000 waterfowl and 1% or more of the individuals in a population of waterfowl**

1)Physical loss

- The Solent and Southampton Water SPA provides important nesting and feeding habitats for four species of tern, Mediterranean gulls and for an internationally important assemblage of waterfowl, including internationally important populations of several regularly occurring migratory species. Loss by removal or smothering of any of the habitats on which they depend could result in the loss of roost sites and/or the reduction of the food resource and would consequently be detrimental to the favourable condition of the interest feature. The breeding strategy of some tern species is to nest in a few large colonies which leaves them vulnerable to events such as extreme high tides which can flood out nests and shortages of food. 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 coastal squeeze, may affect the ability of the European marine site to support the qualifying bird populations.

  Saltmarshes and intertidal sediment areas are particularly vulnerable due to their inability in many circumstances to naturally migrate landward in response to rising sea levels. Many of the habitats within the Solent and Southampton Water that support internationally important birds are subject to considerable pressure both on the shore and at sea from recreational and commercial uses in what is currently a busy developed area. **For physical loss in estuaries and saltmarsh advice see section 11 part i).**

  Saline lagoons are highly vulnerable to removal and moderately vulnerable to smothering. Intertidal reefs are highly vulnerable to both removal and smothering and exposure may occur primarily as a result of one-off developments such as coastal protection works, infrastructure construction and modification, which may indirectly cause the removal of reef habitat through the modification of coastal processes and subsequent coastal erosion. The rocky shores within the European marine site are considered to have a high exposure to removal and smothering in light of the intensity of one-off developments which occur there.

ii) Physical damage

- Intertidal mudflats and sandflats, saltmarsh and sand and shingle are all considered vulnerable to physical damage by abrasion. Sand and shingle which supports nesting terns is highly vulnerable to abrasion and moderately vulnerable to the selective extraction of habitat in light of the higher sensitivity of this breeding habitat. Eggs which are often laid on small scrapes on the gravelly sand can be easily damaged by human activity, which may for example result from land-based and water-based recreation and one-off developments and its associated activity.

All sub-features of the internationally important assemblage and migratory waterfowl are moderately vulnerable to physical damage through abrasion. Saltmarshes and boulder and cobble communities are particularly sensitive to physical damage, although the level of exposure to activities and one-off developments that may cause abrasion is slightly higher for intertidal mudflats, sandflats and mixed sediment communities. Repeated or permanent damage can adversely affect the ability of the habitats to recover and may ultimately lead to loss.

Saline lagoons are moderately vulnerable to siltation. Intertidal reefs are moderately vulnerable to both siltation and abrasion. Siltation of fine sediment on intertidal reefs can smother or block the feeding and respiratory organs of marine animals and can effect recruitment processes of both marine fauna and flora. **For physical damage of estuaries saltmarsh advice and cordgrass swards see section 11 part ii).**

iii) Non-physical disturbance

- Nesting and feeding terns and Mediterranean gulls are highly sensitive to noise and visual disturbance. Little terns in particular have suffered greatly from predation and human disturbance on nesting grounds and the breeding success of terns is largely dependent on the levels of disturbance and predation by foxes and scavenging birds. Much of the site is accessible to the public and there are high levels public activity particularly during the spring and summer months, when the terns are nesting. The site is also easily accessible from the water. For this reason a medium exposure rating to non-physical disturbance has been given. Disturbance causes birds to expend energy at a time when they often require more energy to breed and forage for food. Consequently, all sub-features have a high or moderate vulnerability rating. Noise and visual presence may also result from commercial activity and developments taking place within the site.

As with Annex 1 birds, wildfowl and waders are highly sensitive to non-physical disturbance by noise and visual presence during the winter, when they are present. Roosting and feeding waterfowl can be disturbed by unpredictable movements of objects and increases in noise disturbance. This can have the effect of displacing birds from their roosting or feeding grounds. Disturbance can cause birds to cease feeding or fly away and in response they could a) increase their energy requirements at their present (disturbed) feeding sites, or b) move to an alternative less favoured feeding or roosting site. Such a response affects energy budgets and thus survival, with particular consequences for overwintering and passage wading birds such as ringed plover. Noise and visual disturbance may result from a wide range of activities including recreation and traffic (both water and land-based), wildfowling, as well as developments within the site.

iv) Toxic contamination

- Inputs of toxic contaminants from sources such as effluent outfalls, shipping activity, atmospheric deposition, remobilisation of historically contaminated sediments etc. across the site, can build up in the food chain and may have toxic effects on birds and their prey. These contaminants include heavy metals such as copper, zinc, mercury, cadmium, radionuclides, and synthetic organic compounds (e.g. dieldrin, TBT, PCBs (polychlorinated biphenyls)) and these can have lethal and sub-lethal effects on marine invertebrates and fish which are predated on by birds. Specialist feeders may be affected by the loss of a particular prey species, while generalist feeders could benefit from an abundance of opportunistic prey species. This may create an ecological imbalance and ultimately may affect the ability of the habitats within the site to support qualifying internationally important bird populations. Sub-lethal effects on prey species reduce their overall fitness by affecting their

reproduction, genetics, physiology and general health which may ultimately reduce the prey populations. Birds feeding on contaminated food sources are also directly at risk from substances which have the potential to biomagnify in the food chain. All sub-features therefore have moderate to high vulnerability to toxic contamination by synthetic and non-synthetic compounds.

- Large oil and chemical spills affecting intertidal and shallow coastal water habitats can have a detrimental effect on bird populations. Deterioration of invertebrate and small fish populations in saltmarsh and intertidal sediments can have a significant impact on important food sources. Acute oil spills on saltmarsh would render food sources unpalatable and birds alighting can become oiled and contaminated. Oil on the surface of the water column would present a threat to diving and feeding seabirds. Dispersants used to disperse the oil may also be harmful to the saltmarshes, mudflat communities and birds.

- All the sub-features that support the regularly occurring migratory birds and the waterfowl assemblage are highly vulnerable to synthetic toxic contamination and moderately vulnerable to non-synthetic toxic contamination. The exposure routes for such compounds to birds include ingestion of water and sediment and via their food. The primary uptake route for toxic substances is likely to be via the food. Consequently, the substances that pose the greatest hazard are those that have the potential to bioaccumulate and that are toxic to invertebrates and fish (the main food sources of birds within this qualifying category) and possibly also those identified as having potential endocrine disrupting effects (Cole *et al.*, 1999). 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.

- The exposure to a range of toxic contaminants varies across the Solent and Southampton Water SPA. The main sources include effluent outfalls (both industrial and domestic) and disturbance of historically contaminated sediments. Oil pollution originating from ships, boats, ports, marinas and harbours may be a concern within the Solent and its sub-estuaries, and organotin has consistently exceeded required environmental quality standards. Levels of TBT associated with seabed sediments are several orders of magnitude greater than levels in the water column (Solent Forum, 1997). The implications of this for feeding birds is unclear at present and may require further investigation.

- Saline lagoons are highly vulnerable to the introduction of synthetic compounds and moderately vulnerable to the introduction of non-synthetic compounds. Intertidal reefs are moderately vulnerable to the introduction of synthetic compounds. Marine organisms such as algae, macrophytes, 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 (particularly to invertebrate larvae) and capable of high levels of bioaccumulation within many benthic organisms, particularly those such as molluscs which are poor at regulating the 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 on the many species found within these sub-features is poorly understood, there is evidence of high levels of toxicity to some groups of species such as crustaceans. The potential effects of toxic pollutants also varies according to the state and availability of the compound and the characteristics of the receiving environment. Where the effects are lethal, removal of individual species may result in the loss of key grazers or predators, such as limpets or dogwhelks on rocky shores, and a dominance of pollution tolerant organisms. Sub-lethal effects however, may affect the healthy functioning of organisms such as its reproduction, physiology or genetics, which may ultimately reduce the organism's fitness for survival. **For toxic contamination of estuaries saltmarsh and cordgrass swards see section 11 part iii).**

v) Non-toxic contamination

- As mentioned previously, there are high nutrient levels in a number of areas within the Solent European marine site both the Medina and Hamble Estuaries can suffer from algal blooms during the summer months. This may affect qualifying Annex 1 birds and can severely diminish the potential feeding areas for many waterfowl through the proliferation of blanketing algae (*Enteromorpha* spp.) on intertidal sediments, which may reduce water exchange between the sediment and the water column, resulting in deoxygenation of the sediment. This can lead to a change in the infaunal benthic community and, in severe cases, the death of many benthic invertebrate species (Cole *et al.*, 1999) on which the birds often feed, although wildfowl such as brent geese and wigeon feed on green algae, their preferred food source is eelgrass Eutrophication of shallow coastal waters can also have a detrimental effect on the small fish and invertebrates in the water column on which terns and gulls feed,

- Inputs of organic material, such as sewage effluent discharges, may organically enrich the sediments benefitting invertebrate prey species that can tolerate low oxygen levels such as opportunistic marine worms (oligochaetes). These opportunists thrive in such conditions often at the expense of other species. While it may appear that birds benefit under these circumstances because large numbers visit such areas to feed, it could indicate opportunism by a limited number of bird species. In the absence of such organically enriched areas, birds may be more widely dispersed within the site. Intertidal mudflats and sandflats and shallow coastal waters are rated as vulnerable to organic enrichment because of the potential to cause a reduction in the diversity of prey species.

- Shallow coastal waters are indicated as being vulnerable to changes in turbidity as decreases in the clarity of the water can reduce the ability of terns and Mediterranean gulls to catch small fish and invertebrates, which may themselves be affected by impaired water quality. The Solent area contains a number of fish nursery areas and water quality is an important factor for their survival.

- Intertidal sediment and boulder and cobble communities are moderately vulnerable to organic enrichment and this may have an impact on the assemblages of birds which depend upon them for feeding. Organic enrichment, primarily of intertidal sediments, can stimulate increases in the populations of opportunistic worm species with a subsequent reduction in the species diversity of benthic communities. This can have adverse consequences for bird populations, both specialist and non-specialist species (Cole *et al.*, 1999).

- Saline lagoons are highly vulnerable to changes in nutrient loading and moderately vulnerable to both changes in organic loading and changes in salinity. Intertidal reefs are moderately vulnerable to changes in nutrient and organic loading as well as changes in salinity. Elevated nutrient (phosphate and nitrate) levels can contribute to the stimulation of algal growth (eutrophication) and deoxygenation of the water column, although water movement around the intertidal reef is likely to inhibit pronounced eutrophication (Cole *et al.*, 1999). The effects of nutrient enrichment are likely to be restricted to the localised growth of ephemeral opportunistic algae and localised eutrophication in large pools on the foreshore, with the greatest potential effects on algal communities (Hill *et al.*, 1998). **For non toxic contamination of estuaries saltmarsh and cordgrass swards see section 11 part iv).**

vi) Biological disturbance

- The selective extraction of target species through activities such as bait collection and fishing can result in the depletion of prey, destruction of non-target species, or habitat and community change of prey species. The potential effects of the collection of bait and other shoreline animals within European marine sites has been documented by Fowler (1999). Further studies are currently being undertaken to investigate the effects of bait collection on birds within the Solent area.

- Intertidal reef is considered moderately sensitive to the introduction of non-natives and the translocation of species to the reefs. This is because introduced species can out-compete native species and result in an altered community structure of the reef (Hill *et al*., 1998). Currently, the rocky shore communities are considered. **For biological disturbance of estuaries saltmarsh and cordgrass swards see section 11 part v).**

13. Detailed operations advice for Chichester and Langstone Harbour SPA and Ramsar interest features

- **Internationally important populations of regularly occurring Annex 1 species**
- **An internationally important assemblage of waterfowl including internationally important populations of regularly occurring migratory species**
- **Criterion 1a: Internationally important wetland characteristics of the Atlantic and biogeographical region**
- **Criteria 3a and 3c: Internationally important wetland regularly supporting 20,000 waterfowl and 1% or more of the individuals in a population of waterfowl**

1)Physical loss

- Chichester and Langstone Harbours SPA comprise two large sheltered estuarine basins, Langstone being fringed by urban and industrial development whereas Chichester is surrounded mainly by high grade farmland. Loss of intertidal habitat as a result of coastal squeeze is a significant threat to the long-term maintenance of habitat diversity and structural integrity within these harbours, and therefore the ability of the habitats to support qualifying birds. Loss may result principally from developments but also from the combined and cumulative effects of ongoing activities.

- As with regularly occurring Annex 1 birds, the habitats that support the internationally important assemblage and the regularly occurring migratory birds of the two harbours are sensitive and currently exposed to operations that may cause physical loss of habitat. The pressures of the effects of coastal squeeze and further development are particularly important for saltmarsh and intertidal sediment habitats, which support feeding and roosting waterfowl. **For physical of estuaries, intertidal mudflats and sandflats and saltmarshes see section 11 part i)**

ii) Physical damage

- Nesting areas of Annex 1 terns within the SPA are highly sensitive to physical damage by abrasion. Human activities such as recreation, lack of vegetation control on shingle islands and nests being flooded out by higher spring tides pose significant threats to the tern breeding populations

- All the sub-features of the assemblage and migratory waterfowl, except shallow coastal waters, are moderately and highly vulnerable to physical damage by abrasion. Eelgrass growing on muddy sand are the preferred food of brent geese. Eelgrass within the harbours has declined in recent years and any physical damage to remaining areas should be particularly avoided. **For physical damage of estuaries, intertidal mudflats and sandflats and saltmarshes see section 11 part ii)**

iii) Non-physical disturbance

- The site is subject to considerable recreational pressures, especially during the summer months and this together with a number of other activities and developments within the harbours contribute to a medium exposure score to noise and visual presence. Nesting birds are particularly sensitive to disturbance whilst on and around their nests.

- Roosting and feeding waterfowl can be disturbed by unpredictable movements of objects on or close to the foreshore and increases in noise disturbance. This can have the effect of displacing birds from their

roosting or feeding grounds. Disturbance can cause birds to cease feeding or fly away and in response they could a) increase their energy requirements at their present (disturbed) feeding sites, or b) move to an alternative feeding or roosting site. Such a response affects energy budgets and thus survival, with particular consequences for overwintering birds such as ringed plover. Noise and visual disturbance may result from a wide range of activities in or around the site including recreation (both water and land-based) *e.g.* wildfowling.

iv) Toxic contamination

- The shallow coastal waters, which are used for feeding by qualifying tern species are both sensitive and currently exposed to synthetic and non-synthetic toxic contaminants, which may enter the harbour via effluent outfalls (domestic and industrial), from waste disposal sites, from land run-off, from historically polluted sediments and from illegal discharges from both onshore and from boats. Toxic contaminants can have lethal and sub-lethal effects on the food supply of birds and their food chain.

- Toxic contaminants entering the harbours can also affect the migratory and assemblage population, either directly through the ingestion of contaminated food, or indirectly through changes caused to the biological assemblages of marine habitat communities. Marine invertebrates such as molluscs and worms, the preferred food source of many of the wintering waterfowl, are known to bioaccumulate toxic substances such as heavy metals within their bodies (Cole *et al*., 1999). The potential and actual biomagnification effects on birds are however, not clearly understood. **For toxic contamination of estuaries, intertidal mudflats and sandflats and saltmarshes see section 11 part iii)**

v) Non-toxic contamination

- Langstone and Chichester Harbours are considered to be eutrophic and are designated as a Sensitive Area (Eutrophic) under the EC Urban Waste Water Treatment Directive (91/271/EEC). Effluent discharges and agricultural run-off can lead to localised eutrophication problems although recent studies by the Environment Agency have shown that elevated nutrient levels are maintained by inputs from coastal waters. The main potential effects on qualifying Annex 1 species are the reduction in water quality and its ability to support the preferred food source of the birds (i.e. small fish). Water clarity can also be impeded, reducing the ability of terns to locate prey.
- Organic enrichment which can be closely linked to nutrient enrichment can also affect the ability of the shallow coastal waters to support the food source of the terns. Activities that may contribute to elevated organic carbon levels include domestic and effluent discharges, agricultural run-off, illegal sewage discharges from boats and algal blooms as a result of eutrophication.
- As with areas of the Solent and Southampton Water SPA, nutrient enrichment can adversely affect the feeding habitats of wintering waterfowl and assemblage populations and because of this, the high levels of nutrients in Langstone Harbour and the extensive use of its intertidal areas and shallow coastal waters for feeding give cause for concern. **For non toxic contamination of estuaries, intertidal mudflats and sandflats and saltmarshes see section 11 part iv)**

vi) Biological disturbance

- Intertidal sediment sub-features within the harbours are considered moderately vulnerable to the effects of the selective extraction of species. This may result from activities such as bait collection, shellfishing and wildfowling. Reductions in numbers of prey species can be detrimental to feeding success of waders. Wildfowling may involve selective extraction of a component part of the interest feature. **For biological disturbance of estuaries, intertidal mudflats and sandflats and saltmarshes see section 11 part v).**

14. Detailed operations advice for Portsmouth Harbour SPA and Ramsar interest features

- **Internationally and nationally important populations of regularly occurring migratory species**
- **Criterion 1a: Internationally important wetland characteristic of the Atlantic and biogeographic region**
- **Criterion 2b: Internationally important wetland of special value for maintaining the genetic and ecological diversity of the region because of the quality and peculiarities of its flora and fauna**
- **Criterion 3c: Internationally important wetland regularly supporting 1% or more of the individuals in a population**

1)Physical loss

- Portsmouth Harbour is fringed largely by urban development and the ability for the natural landward migration of intertidal habitats as a response to sea level rise is impeded. Coastal squeeze, along with further development pressure and potential habitat loss, is therefore a significant threat to the long-term maintenance of habitat diversity and structural integrity within the harbour and the ability of the intertidal sub-features to support qualifying populations of migratory birds. **For physical loss of estuaries, intertidal mudflats and sandflats, saltmarsh and cordgrass swards see section 11 part i)**

ii) Physical damage

- Eelgrass beds, which are the preferred food source of brent geese, is particularly sensitive to physical damage through abrasion. In light of the current exposure of intertidal areas to activities and developments that may cause abrasion, intertidal mudflats and sandflats and saltmarsh are currently considered to be moderately vulnerable to abrasion. **For physical damage of estuaries, intertidal mudflats and sandflats, saltmarsh and cordgrass swards see section 11 part ii)**

iii) Non-physical disturbance

- Portsmouth Harbour experiences high levels of land-based and water-based recreational usage, which can have non-physical disturbance effects during sensitive overwintering periods. Noise and visual presence may also result from commercial activity and developments taking place within the harbour. If disturbed, brent geese may fly off and settle on the water expending valuable energy reserves and reducing the periods of time available for feeding.

iv) Toxic contamination

- As mentioned previously, toxic contaminants can have direct and indirect effects on wintering waterfowl. Within Portsmouth Harbour, accidental pollution from shipping and heavy industrial activities and ongoing industrial discharges contribute to the medium exposure score. TBT is also known to exceed its Environmental Quality Standard in areas of Portsmouth Harbour. Sources of TBT include vessels over 20 m in length, naval vessels and associated port and harbour activities.

  For toxic contamination of estuaries, intertidal mudflats and sandflats, saltmarsh and cordgrass swards see section 11 part iii)

v) Non-toxic contamination

- Portsmouth Harbour has shown some indications of eutrophication and is presently being monitored by the Environment Agency for a review under the EC Nitrates Directive (91/676/EEC). Current thinking is that the majority of nutrients are supplied from the Solent system, through the harbour mouth.

- Organic enrichment which may result principally from effluent discharges into the harbour, from riverine input and from agricultural run-off, can potentially affect the environmental quality of the sediments and shallow coastal waters and the subsequent ability of those habitats to support feeding birds. **For non-toxic contamination of estuaries, intertidal mudflats and sandflats, saltmarsh and cordgrass swards see section 11 part iv)**

vi) Biological disturbance

- As with the previous two SPAs, the selective extraction of species, either within the habitat supporting the birds or the birds themselves may adversely affect the condition of the interest feature. **For biological disturbance of estuaries, intertidal mudflats and sandflats, and saltmarsh see section 11 part v).**

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16. Glossary

Abrasion	**The process of scraping or wearing down by friction**
Advisory Group	**The body of representatives from local interests, user groups and conservation groups, formed to advise the management group**
Algal bloom	**A massive reproduction and growth of algae, often free-floating, in response to the presence of higher than normal levels of nutrients.**
Annex 1 birds	**Birds 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.**
Annex I habitat type(s)	**A natural habitat(s) listed in Annex I of the Habitats Directive for which Special Areas of Conservation can be selected.**
Annex II species	**A species listed in Annex II of the Habitats Directive for which Special Areas of Conservation can be selected.**
Annex V	**The listing, in the Habitats Directive, of the animal and plant species whose taking in the wild and exploitation may be subject to management measures.**
Anthropogenic	**Produced by human activity.**
Assemblage	**A collection of plants and/or animals characteristically associated with a particular environment but not necessarily interdependent.**
Attribute	**Characteristic of an interest feature/sub-feature which provides an indication of the condition of the feature or sub-feature to which it applies.**
BAP	**Biodiversity Action Plan.**
Baseline	**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.**
Benthos	**Those organisms attached to, or living on, in or near, the seabed, including that part which is exposed by tides.**
Bioaccumulation	**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.**
Biodegradation	**Breakdown or decomposition by bacteria or other biological means.**

Biodiversity	**The total variety of life on earth. This includes diversity within species, between species and of ecosystems.**
Biogeographic region	**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.**
Biomagnification	**Increasing concentrations of a substance in successive trophic levels of a food chain.**
Biomass	**The total quantity of living organisms in a given area.**
Biotope	**The physical habitat with its biological community; a term which refers to the combination of physical environment and its distinctive assemblage of conspicuous species.**
Bioturbation	**The mixing of a sediment by the burrowing, feeding or other activity of living organisms.**
Characteristic	**Special to, or especially abundant in, a particular situation or biotope. Characteristic species should be immediately conspicuous and easily identified.**
Chenier banks	**Chenier banks are formed by the deposition of broken shells by wave action on the saltmarsh edge.**
Circalittoral	**The rocky subtidal zone dominated by animals and below that which is dominated by algae (Animal dominated subtidal zone).**
Community	**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.**
Competent authority	**Any Minister, government department, public or statutory undertaker, public body or person holding a public office that exercises legislative powers.**
Conservation objective	**A statement of the nature conservation aspirations for a site, expressed in terms of the favourable condition that we wish to see the species and/or habitats for which the site has been selected to attain. Conservation objectives for European marine sites relate to the aims of the Habitats Directive.**
Crustaceans	**A class of invertebrates which include crabs, shrimps and barnacles.**
Diversity	**The richness of different types in a location, including the number of different biotopes and numbers of species.**

Epifauna	**Animals living on the surface of sediments or hard substrates**
Eulittoral	**The main part of the intertidal zone characterised by limpets, barnacles, mussels, fucoid algae and with red algae often abundant on the lower part.**
European marine site	**A European site (SAC or SPA) which consists of, or in so far as it consists of, marine areas.**
Eutrophication	**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.**
Exposure	**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.**
Fauna	**Animal life in an area.**
Favourable conservation status	**A range of conditions for a natural habitat or species at which the sum of the influences acting upon that habitat or species are not adversely affecting its distribution, abundance, structure or function throughout the biogeographic region in the long term. The condition in which the habitat or species is capable of sustaining itself on a long-term basis.**
Favourable condition	**A range of conditions for a natural habitat or species at which the sum of the influences acting upon that habitat or species are not adversely affecting its distribution, abundance, structure or function within an individual Natura 2000 site in the long term. The condition in which the habitat or species is capable of sustaining itself on a long-term basis.**
Geomorphology	**The description and interpretation of the structure, origin and development of land forms.**
Habitat	**The place in which a plant or animal lives.**
Habitats Directive	**The abbreviated term for *Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora.* It is the aim of this Directive to promote the conservation of certain habitats and species within the European Union.**
Halophytic	**Plants which thrive in, or tolerate the presence of saline conditions.**
Highest Astronomical Tide	**The highest tidal level which can be predicted to occur under average meteorological conditions and in any combination of astronomical conditions**

Hydrodynamic regime	**The particular conditions of water movement at one particular site, including wave action, tidal streams and residual currents.**
Infauna	**Benthic animals which live within the seabed.**
Infralittoral	**The subtidal zone in which upward facing rocks are dominated by erect algae, typically kelps.**
Interest feature	**A natural or semi-natural feature for which a European site has been selected. This includes any Habitats Directive Annex I habitat, or any Annex II species and any population of a bird species for which an SPA has been designated under the Birds Directive.**
Littoral	**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.**
Macrofauna/macroflora	**Animals/plants which are retained by a 2.0 - 0.5 mm sieve**
Maintain	**The action required for an interest feature when it is considered to be in favourable condition.**
Management group	**The body of relevant authorities formed to manage the European marine site.**
Management scheme	**The framework established by the relevant authorities at a European marine site under which their functions are exercised to secure, in relation to that site, compliance with the requirements of the Habitats Directive.**
Meiofauna/meioflora	**Animals/plants which are not retained in a 2.0 - 0.5 mm sieve, but are retained in a 0.04 - 0.1 mm sieve when the sediment is sieved through.**
Microfauna/microflora	**Animals/plants which pass through a 0.04 - 0.1 mm sieve.**
Molluscs	**Soft-bodied unsegmented invertebrate animals usually with shells which include cockles, whelks, limpets, oysters and snails.**
Nationally scarce/rare	**For marine purposes, these are regarded as species of limited national occurrence**
Natura 2000	**The European network of protected sites established under the Birds Directive and the Habitats Directive**
Natural change	**Changes in the condition of features that result wholly from natural causes.**
Non-synthetic contamination	**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).
Notable species	**A species that is considered to be notable due to its importance as an indicator, and may also be of nature conservation importance, and which is unlikely to be a 'characteristic species'.**
Operations which may cause deterioration or disturbance	**Any activity or operation taking place within, adjacent to, or remote from a European marine site that has the potential to cause deterioration to the natural habitats for which the site has been designated, or disturbance to the species and its habitats for which the site was designated**
Opportunistic species	**A species which is able to rapidly exploit changes in habitat conditions or circumstances to its own advantage.**
Plan or project	**Any proposed development that is within a relevant authority's function to control, or over which a competent authority has a statutory function to decide on applications for consents, authorisations, licences or permissions.**
Ramsar site	**A site listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat, which was agreed at Ramsar, Iran.**
Relevant authority	**The specific competent authority which has powers or functions which have, or could have, an impact on the marine environment, or adjacent to, a European marine site.**
Restore	**The action required for an interest feature when it is not considered to be in a favourable condition.**
Sensitivity	**The intolerance of a habitat, community or individual species to damage, or death, from an external force.**
Sub-feature	**An ecologically important sub-division of an interest feature.**
Sublittoral	**The zone of the shore below low water exposed to air only at its upper limit by the lowest spring tides.**
Synthetic contamination	**Synthetic compounds are those materials that have been manufactured artificially by chemical reaction. Examples of some synthetic compounds are; antifoulant paints, detergents, pesticides (Polychloronatedbiphenyls or PCBs) and biocides (tributyltin or TBT).**
Turbidity	**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.**
Typical species	**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.**