



PLYMOUTH SOUND AND ESTUARIES

European marine site

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

14 January 2000

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

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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 Plymouth Sound and Estuaries 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 Plymouth Sound and Estuaries European marine site is part of a candidate Special Area of Conservation. It is Government policy that such sites should be protected as if they were already designated and, where appropriate, it is desirable to establish voluntary management schemes at an early stage, before the formal statutory obligations apply, and to act in the spirit of the Directive in the meantime (DETR & The Welsh Office, 1998). In light of this policy, we have worked with many of you to develop this advice in advance of statutory obligations applying.

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 under the Habitats Directive, which support certain natural habitats and species of European importance, and Special Protection Areas under the Birds Directive which support significant numbers of internationally important wild birds. In many instances, as in the case of the Plymouth Sound and Estuaries European marine site, these designations may coincide and our advice is being prepared to cover both the SAC and SPA interests.

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

- C understand the international importance of the site, underlying physical processes and the ecological requirements of the habitats and species involved;
- C develop a management scheme to ensure that the ecological requirements of the site's interest features are met; and
- C set the standards against which the condition of the site's interest features can be determined and compliance monitoring undertaken to establish whether they are in favourable condition.

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

Tim Bines
English Nature

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English Nature's advice for Plymouth Sound and Estuaries 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 Habitats¹ and Birds² Directives 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 status³. The Birds Directive protects all wild birds and their habitats within the European Union, especially migratory birds and those that are considered rare or vulnerable.

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

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

1.2 English Nature's role

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

This document is English Nature's advice for the Plymouth Sound and Estuaries 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

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.

English Nature local office.

In addition to providing such advice, the Regulation 33 package will inform 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). In the future, 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 relevant 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 Plymouth Sound and Estuaries European marine site will provide the framework through which this will be done and it should be based on the advice in this package. In this respect, relevant authorities must, within their areas of jurisdiction, have regard to both direct and indirect effects on an interest feature of the site. This may include consideration of issues outside the boundary of the European marine site.

Relevant authorities should ensure that all 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 management plans, local and national BAP plans and sustainable development strategies for estuaries. This must occur to ensure that there is only a single management scheme through which all relevant authorities exercise their duties under the Conservation (Natural Habitats &c.) Regulations 1994.

Relevant authorities also need to have regard to changing circumstances of the SAC and SPA 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 concerned in the long term. 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) 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 causes⁴. This also applies if the changes, although causing deterioration or disturbance to the interest features, are the result of human or natural events outside their control. Having issued Regulation 33 advice for European marine sites, English Nature will work with relevant authorities and others to agree, within a defined time frame, a protocol for evaluating all observed changes to

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

baselines and to develop an understanding of natural change and provide further guidance as appropriate and possible. On the Plymouth Sound and Estuaries European marine site a SAC Management Group (The Tamar Estuaries Consultative Forum, TECF) has already been set up and should be used to alert English Nature 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 Steering Group.

1.5 Responsibilities under other conservation designations

In addition to its candidate SAC and SPA status, parts of Plymouth Sound and Estuaries are also designated and subject to agreements under other conservation legislation (eg. 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

Section 5 of this document sets out the conservation objectives for the Plymouth Sound and Estuaries European marine site. They are the starting point from which management schemes and monitoring programmes are to be developed as they provide the basis for determining what is likely to 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 and Birds Directives.

1.7 Role of advice on operations

The advice on operations set out in Section 7 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 have been generally presumed to have been in favourable condition at the time they were identified. This assumption will be tested during the 2000 - 2006 reporting period. 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, when issued, will need to be supplemented through further detailed discussions with the management and advisory groups in formulating and agreeing a management scheme, where required, to agreed timescales for the European marine site.

2 Identification of interest features under the EU Habitats and Birds Directives

2.1 Introduction

Plymouth Sound and its associated tributaries comprises a complex site of marine inlets. The ria systems entering Plymouth Sound (St John's Lake and parts of the Tavy, Tamar and Lynher), the large bay of the Sound itself, Wembury Bay, and the ria of the River Yealm are of international marine conservation importance because of their wide variety of salinity conditions and sedimentary and reef habitats. The high diversity of habitats and conditions gives rise to communities both representative of ria systems and some very unusual features, including abundant southern Mediterranean-Atlantic species rarely found in Britain. Examples of species at the site rarely recorded or near the limit of their distribution are the scarlet and gold star coral *Balanophyllia regia*, the carpet coral *Hoplania durotrix*, the crevice dwelling brittlestar *Ophiopsila aranea*, the nationally rare sea-slug *Okenia elegans*, the soft coral *Parerythropodium coralloides* and the pink sea fan *Eunicella verrucosa*.

The Plymouth Sound and Estuaries are a candidate Special Area of Conservation (SAC) and the Tamar Estuaries Complex is classified a Special Protection Area (SPA), the boundaries of which are illustrated in Appendices I and II. The marine components of both sites qualify as European marine sites but for simplicity, and for the purposes of this advice, both the SAC and SPA components are treated as a single European marine site - the Plymouth Sound and Estuaries European marine site. Accordingly, the advice in this document covers both the SAC habitat interests and the SPA bird interests of the European marine site.

Each of these European marine site interests (called interest features) and their associated key sub-components (called sub-features) are discussed in more detail below and are mapped in Figures 1, 2, 3 and 4 to show their distribution and extent.

2.2 Interest features under the EU Habitats Directive

Plymouth Sound and Estuaries qualifies as a SAC for the following Annex I habitats as listed in the EU Habitats Directive:

- C Large shallow inlets and bays**
- C Estuaries**
- C Sandbanks which are slightly covered by seawater all the time**

Plymouth Sound and Estuaries SAC also qualifies for the Annex II species shore dock *Rumex rupestris*. This does not however occur within the European marine site, and therefore within this document, as it occurs above Highest Astronomical Tide. Objectives to maintain shore dock *Rumex rupestris* in favourable condition are found within English Nature's conservation objectives for the relevant SSSI within the SAC boundary and will be dealt with through procedures outlined in the Conservation (Natural Habitats &c.) Regulations 1994. Relevant authorities need to have regard to such adjacent European interests, as they might be affected by activities taking place within, or adjacent to the European marine site.

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2.3 Interest features under the EU Birds Directive

The Tamar Estuaries Complex qualifies as a SPA for the following nationally important populations of the regularly occurring species listed on Annex 1 of the Birds Directive:

- C avocets *Recurvirostra avosetta*
- C little egrets *Egretta garzetta*

The Tamar Estuaries Complex SPA was classified in June 1997 and it is this citation on which this advice is based.

3. SAC interest features

This section describes and explains the importance of the SAC and SPA interest features of the Plymouth Sound and estuaries European marine site.

3.1 Large shallow inlets and bays

3.1.1 Definition

These are large indentations of the coast where, in contrast to estuaries, the influence of freshwater is generally limited. These shallow indentations are generally sheltered from wave action and contain a great diversity of sediments and substrates with a well developed zonation of benthic communities. These communities have generally a high biodiversity. The diversity of habitats and species within these interest features varies according to their geographic location, size, form and geology.

3.1.2 Physiographic features

Of the twelve rias in England, Plymouth Sound and Estuaries is the largest of only two sites being proposed as candidate SACs for large shallow inlets and bays (the other being the Fal and Helford). The site supports a wide diversity of habitats and species because of a number of factors:

- C the variety of wave exposures from open to sheltered coast, providing the differing environments required by a range of habitats and species;
- C the different rate of tidal flow within both the embayment and estuaries, contributing to the variety of marine environments;
- C the south western location, with seawater temperature allowing species to occur that are usually more southern in their distribution;
- C the differing geology, with soft limestone to the north and primarily slates to the south, with a variety of subtidal sediments. This variety of substrates provides the habitat requirements for many different communities; and
- C the varying topography, with vertical faces, overhangs, gullies and rockpools all increasing habitat and community diversity over uniform areas of rock.

3.1.3 Key sub-features

Intertidal rock and boulder shore communities - Rocky shore communities are highly productive and are an important source of food and nutrients. The rocky shores surrounding Plymouth Sound support a variety of rich marine communities. Of particular importance are the littoral limestone reefs running along the northern shore from west Hoe to Batten Bay, which are one of only two areas in the southwest with coastal Devonian limestone. This is a marine substrate important for its conservation value because the limestone rock is extensively bored by the polychaete worm *Myxicola aesthetica*, the bivalve mollusc *Hiatella arctica* and spionid worms *Polydora* spp. and harbours a rich fauna. The rarely recorded lower shore gully, overhang and cave community dominated by the sea squirt *Dendrodoa grossularia* is also found across this northern shore from Devil's Point to Batten Bay (Hiscock and Moore, 1986).

Other important habitats include rockpools which support many plants, animals and rare red algal species. A nationally uncommon sponge, sea squirt and red algae community is found on the tide-swept lower shores at Wembury, Penlee, Hooe Lake Point and the mouth of the Yealm. The lower shore under boulder communities to the south of Jennycliff are also of note for their species richness. These various shore communities are particularly diverse due to the variation in wave exposures and tidal streams across the site.

Subtidal rocky reef communities - These are important areas for animal dominated habitats including fragile and rare species of soft corals, sea fans, anemones, sponges, hydroids (sea fans) and bryozoans (sea mats). The limestone reef around the northern shore arises from the subtidal where the steep-sided limestone channels are dominated by a dense hydroid and bryozoan turf with anthozoan and ascidian communities, which are dependent on the tide-scoured hydrodynamic regime. Another rarely recorded habitat with uncommon species including the rare sea slug *Okenia elegans*, the kelp *Laminaria ochroleuca* and the trumpet anemone *Aiptasia mutabilis* occurs on the shallow subtidal limestone of Batten Bay (Hiscock and Moore, 1986). In the subtidal, circalittoral rocky reefs occur predominately in the outer Sound, with key areas off Wembury, the Mew Stone, Penlee Point and south of the Breakwater. Where the reefs are of creviced slate, the rare but locally abundant brittle star *Ophiopsila arenea* occurs (Devon Wildlife Trust, 1993). These creviced and overhang areas, particularly on the eastern side of the Sound, are species rich with dead man's fingers *Alcyonium digitatum*, bryozoa and a variety of erect hydroids. In deeper water and widespread in the approaches to Plymouth Sound, abundant populations of the slow growing, long lived, nationally important sea fan *Eunicella verrucosa* occur (Davies, 1991).

Kelp forest communities - Kelp forests are highly productive ecosystems, found in the shallow subtidal and are the major primary producers in the coastal waters of the UK. They have been compared with rainforests in terms of their productivity and species richness. Kelp forests also have considerable conservation value because they harbour a very high diversity of organisms, confined to a narrow coastal fringe. For example, a single kelp holdfast may be home to several thousand small animals and the habitat plays a significant role as nursery areas for a wide variety of species, including commercial species such as crab and lobster. They are therefore key structural and functional components of this embayment and several different types can be found. Kelp forest dominated by *Laminaria hyperborea* is found on the infralittoral reefs in the outer sound with vertical faces possessing a wide variety of often dense red algae and sponges. Bedrock areas, more sheltered from strong wave action, also support kelp forest, including the south western *Laminaria ochroleuca* in areas off Batten Bay (Hiscock and Moore, 1986).

Subtidal mixed cobble and gravel communities - The mixed substrata of pebbles, cobbles, gravel and occasional boulders that occur at varying depths are subjected to a variety of tidal streams around the Sound. Less is known of the dynamics of this habitat type in general but the species are well adapted to the characteristic periodic disturbance. Algal communities, characteristic of tide-swept areas of cobbles and pebbles support ephemeral red seaweeds which form open glades. A good example of this habitat is to be found around the Duke Rock Buoy and includes the rare species of red algae *Gracilaria multipartita* (Hiscock and Moore, 1986).

Subtidal mud communities - There is a particularly high biomass of organisms to the north of the Plymouth Breakwater. The shelter afforded by the breakwater allows mud to accumulate on its

northern side. These soft mud plains are burrowed by the angular crab *Goneplax rhomboides*. The anemone *Edwardsia claparedii*, brittlestars *Ophiura* spp., the opisthobranch mollusc *Philine aperta* and sea pen *Virgularia mirabilis* are also evident (Moore *et al.*, 1999). The presence of the large burrowing shrimps *Callinassa subterranea*, *Upogebia delturna* and *U. Stellata* is of interest (Reay, 1998).

Subtidal sandbank communities - Subtidal sandbanks occur in the area but are classified in the Directive as an interest feature in their own right and are therefore described separately below. See section 3.3.

3.2 Estuaries

3.2.1 Definition

Estuaries are the interface between freshwater and the marine environment and extend from the upper limit of tidal influences to the open sea. Unlike large shallow inlets and bays, there is generally a substantial freshwater influence within these coastal inlets. The mixing of freshwater and seawater and the reduced current flows in the shelter of the estuary lead to deposition of fine sediments, often forming extensive intertidal sandflats and mudflats. Where rock occurs, there are restricted communities characteristic of brackish flowing water, consisting of sparse furoid algae and species of barnacle and hydroids. Towards the mouth of the estuary, the water gradually becomes more saline. The silt content of the sediment also decreases. Here the animal communities of the sediments are dominated by invertebrates such as polychaete worms and bivalve molluscs.

3.2.2 Physiographic features

A wide variety of estuarine habitats are represented in the rias, from large expanses of mudflats, saltmarsh and reedbed on the largest rivers of the Tamar and Lynher to the large sand bar at the mouth of the Yealm. The upper part of the Tamar and Lynher estuaries also include a very well developed estuarine gradient which has not been modified by the construction of locks or weirs. As a consequence, they exhibit one of the finest examples of salinity graded communities in the UK. Rocky reefs in low salinity estuarine conditions far inland on the Tamar are very unusual, supporting rarities such as the hydroid *Cordylophora caspia*. The Yealm is almost entirely natural with a wide diversity of habitats, communities and species and in contrast to the Tamar, is characteristic of low freshwater input. Natural beds of the native oyster *Ostrea edulis* also occur on these estuaries, a species now rare in the UK. Parts of the estuary are also designated as a bass *Dicentrarchus labrax* nursery area. The importance of this estuarine complex can be summarised as follows:

- C the variety and extent of different habitat types;
- C the size and relative naturalness of geomorphological processes;
- C the contrasts between salinity gradient and low freshwater input;
- C the presence of nationally rare species and communities;
- C the largely unimpeded tidal regime and physiographic processes that maintain the habitat structures and overall functioning of the estuaries; and
- C the quality of the water.

3.2.3 Key sub-features

Intertidal mud communities - The extensive mudflats present throughout the complex are a highly productive system forming a critical part of the food chain. The mudflats contain extensive and varied infaunal communities, rich in bivalves and other invertebrates, and provide important feeding grounds for internationally important numbers of waterfowl. St John's Lake in particular, supports notably diverse sediment communities, unusual for estuarine systems.

Subtidal mud communities - In the subtidal, muddy sediments are important as feeding grounds for fish such as juvenile sole *Solea solea*. These muddy sediments are even more productive than intertidal mud communities and contribute significantly to the overall functioning of the system. They are also integral to maintaining the intertidal areas.

Intertidal mixed muddy sediment communities - The mixed intertidal muddy sediments of the estuaries provide a habitat for different communities, primarily bivalves such as cockles *Cerastoderma edule* and native oysters *Ostrea edulis*. These can be found on the substrata containing more gravel and slates. The native oyster is also the subject of a UK BAP species action plan and relevant authorities should ensure that account is taken of this in preparing the management scheme.

Subtidal mixed muddy sediment communities - Filamentous algae, including some rarities, are abundant on cobbles, shells and muddy sediments off the Ballast Pound (Hiscock & Moore, 1986). The rare hydroid *Hartlaubella gelatinosa* for example, forms clumps on upper estuarine mixed substrata. The community structures of these subtidal communities are different to the intertidal communities outlined above, due primarily to the more mixed substrate providing niches for different plants and animals.

Estuarine bedrock, boulder and cobble communities - Although dominated by muddy soft substrata there are also important areas of bedrock and boulders in the upper Tamar, unusual so far up the estuary. High densities of the nationally rare hydroid *Cordylophora caspia*, (Hiscock & Moore, 1986) a species tolerant of low salinity, makes this area particularly noteworthy. In contrast, the fully marine lower reaches of the Yealm are predominantly rocky and support a wide variety of species including the nationally uncommon community dominated by the orange peel sponge *Hymeniacidon perleve* and the peacock worm *Sabella pavonina* on the extreme lower shore. Large erect sponges can be found on the hard substrata near the Tamar Bridge. Subtidal rock communities are typical of sheltered estuarine areas. The animal communities are dominated by the breadcrumb sponge *Halichondria panicea* with a high abundance of the barnacle *Balanus crenatus* and abundant shore crabs *Carcinus maenas*.

Subtidal sandbank communities - As an interest feature in its own right, this feature is described in more detail in section 5. However, it should be noted that the primary area of subtidal sandbanks within the estuaries is at the mouth of the Yealm, notable for its extensive eelgrass bed. Areas of sand, free from eelgrass, are particularly rich in burrowing species. Fauna evident on the surface include the sea potato *Echinocardium cordatum*, razor shells *Ensis ensis*, the netted dogwhelk *Hinia reticulata* and gobies *Pomatoschistus* spp. The sand bar and subtidal sandbanks of the Yealm contribute significantly to the structure and function of the estuary, providing shelter and an estuarine

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habitat not found elsewhere within the site.

Saltmarsh and reedbed communities - There are extensive and important areas of saltmarsh present, particularly on the Lynher, with natural transitions to reedbed and fringing woodland. Saltmarsh is a scarce habitat in the south west and provides important roosting areas for birds, the saltmarsh fringes act as nursery areas for juvenile bass *Dicentrarchus labrax* and other fish species. Reedbeds are nationally scarce, with many of these sites being small. The extensive reedbeds of the Tamar are therefore a very important area for this habitat. The triangular club rush *Schoenoplectus triqueter* is on the very edge of its range in the UK, with the Tamar having the only known population in England. The reedbeds in the upper Tamar surround the estuary and are inundated at high water providing nursery areas for fish. These habitats are of great importance to the structure and function of the estuaries, their dynamic nature and interdependence with the intertidal mudflat communities. The benefit they provide in the form of natural sea defences should also not be overlooked.

3.3 Sandbanks which are slightly covered by seawater all the time

3.3.1 Definition

This habitat consists of soft sediment seabeds which are covered by shallow seawater all the time. Shallow in this context is identified within the Directive as seldom more than 20 m below Chart Datum. Key features of these subtidal areas are the range of invertebrate animals and seaweeds that colonise the seabed or which live in the seabed sediment. Shallow sandy sediments are typically colonised by a burrowing fauna of worms, crustaceans, bivalve molluscs and echinoderms. Mobile species at the surface of the sandbanks include shrimps, crabs and fish. Some shallow sandy sediments are known to be important nursery areas for fish and feeding grounds for seabirds.

3.3.2 Physiographic features

Within the Plymouth Sound and Estuaries area a full range of sublittoral sediments is found, from rich muddy sediments in lower ria areas to fine clean sands and shell gravels in the outer bay. The importance of the subtidal sandbanks can be summarised as follows:

- C the size and naturalness of geomorphological processes;
- C the unimpeded tidal regime; and
- C the presence of a wide variety of mobile and stable sediment types and diversity of communities. Subtidal sediments elsewhere are generally homogeneous.

3.3.3 Key sub-features

Eelgrass bed communities - Subtidal eelgrass *Zostera marina* beds and their rich associated flora and fauna are found in the fine sand and muddy sand areas in the Yealm entrance, Cawsand Bay, to the north of Drakes Island and in Firestone Bay. Eelgrasses provide an important source of attachment for many small animals and plants. Animals commonly found here include anemones, swimming crabs, hermit and shore crabs, heart urchins, brittle stars, cuttlefish and more unusually seahorses. Eelgrasses were once abundant and widespread around the British coasts, but serious declines have occurred, in particular as a consequence of a severe outbreak of 'wasting disease' in the early 1930s. Recovery of eelgrass beds since the 1930s has been slow and patchy and this habitat is now considered a nationally scarce habitat in the UK, with the southwest now providing an important stronghold.

Gravel and sand communities - The sand with shell gravel and pebbles at the entrance of the Yealm and Cellars Beach has a high diversity of polychaete worms, bivalves and heart urchins. Coarser sediments of sand and shell gravel also occur subtidally in the Yealm and consist of diverse communities of algae (Hiscock & Moore, 1986). Off Bovisand Bay, coarse shell sand supports a diverse community, dominated by the bivalves *Spisula elliptica*, *Dosinia lupinus*, *Gari tellinella*, *Glycera lapidum* and polychaetes *Pisione remota* and *Polygordius lacteus*, the only site within Plymouth Sound where these species are known to occur, adding to the diversity of a habitat often marked for its impoverished communities. The medium to fine grained clean sand with low silt content in Cawsand Bay provides a relatively stable habitat for the heart urchin *Echinocardium cordatum*.

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Muddy sand communities - Particularly rich habitats include the muddy sands in Jennycliff Bay and Cawsand Bay. The infauna of Jennycliff Bay is characterised by high numbers of the polychaete *Melinna palmata* and the bivalves *Abra alba*, *Chamelea gallina* and *Thyasira flexuosa*. The muddy sand in Cawsand Bay also supports both a high biomass and a species-rich fauna (Moore *et al.*, 1999).

4 SPA interest features

4.1 Background and context

A major aim of the Birds Directive is to take special measures to conserve the habitats of Annex 1 and migratory birds in order to ensure their survival and reproduction within the European Union. A key mechanism in achieving this is the classification by Member States of the most suitable sites as SPAs.

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

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

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

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

Attention is, however, also directed to the inclusion of disturbance in the advice on operations provided in section 7. Where disturbance is highlighted in such advice, relevant authorities need to avoid damaging disturbance to qualifying species when exercising their functions under the Directive.

4.2 Definition

The Tamar Estuaries Complex SPA, the boundary of which is shown in Appendix II, qualifies under Article 4.1 of the EU Birds Directive by supporting nationally important numbers of little egrets *Egretta garzetta* and avocets *Recurvirostra avosetta*. These species are listed within Annex 1 of this Directive, which means they are in danger of extinction, are rare, or are considered vulnerable within the European Union.

Numbers of little egrets *Egretta garzetta* on the site have increased dramatically in recent years, reaching a peak of 102 birds in October 1995 (more than 20% of the British population). During the four year period 1990/91 to 1993/94 the site supported a peak mean of 194 avocet *Recurvirostra avosetta* in winter, representing 19.4% of the British population. Details on population size and qualifying thresholds are given in Table 1. 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 within the European marine site necessary to support the birds that qualify within the Tamar Estuaries Complex SPA. These are detailed below in Section 4.3.

The Tamar Estuaries Complex SPA comprises several estuaries bordering Devon and Cornwall and, in addition to little egrets *Egretta garzetta* and avocets *Recurvirostra avosetta*, the intertidal sandflats, mudflats, areas of saltmarsh and brackish marsh also support nationally important numbers of wintering and passage waterfowl which are below those necessary for qualification under the SPA. These include shelduck (four year peak mean for 1990/91 to 1993/94 was 842 birds, representing 1.1% of the British population) and black-tailed godwit *Limosa limosa* (four year peak mean for 1990/91 to 1993/94 was 95 birds, representing 1.3% of the British population). Nationally important numbers of whimbrel *Numenius phaeopus* also occur in autumn (four year peak mean was 74 birds, representing 1.5% of the British passage population). In addition the site supports wintering dunlin *Calidris alpina*, curlew *Numenius arquata*, and redshank *Tringa totanus* in numbers that approach, and, in some years exceed levels of national importance (SPA citation January 1996).

4.2 Key habitat requirements

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 an intertidal area and different prey species. Changes in the habitat may therefore affect their food distribution and availability. The important bird populations therefore require a functional estuarine regime which is capable of supporting intertidal habitat for feeding and areas for roosting. Important factors include:

- C current extent and distribution of suitable feeding and roosting habitat (e.g. saltmarsh and mudflats);
- C sufficient food availability (e.g. small fish, crustaceans and worms);
- C minimal levels of disturbance;
- C water quality (including salinity and minimal pollution) necessary to maintain intertidal plant and animal communities; and
- C water quantity and salinity gradients necessary to maintain saltmarsh conditions suitable for bird feeding and roosting.

4.3 Key sub-features

Intertidal mud and mixed muddy sediment communities - Intertidal mudflats on the site support high densities of invertebrates important as food for wintering and passage waterfowl. The mudflats contain extensive and varied infaunal communities, rich in bivalves and other invertebrates, and

provide important feeding grounds for internationally important numbers of waterfowl. St John's Lake in particular, supports notably diverse sediment communities, unusual for estuarine systems. On the Tamar Estuary the sediment invertebrate communities north from Weir Quay are particularly well developed and demonstrate the changes in species composition and richness associated with variations in salinity. The areas of the Tamar close to Weir Quay and Kingsmill Lake are by far the most important areas for avocet, although they are also regularly recorded on the Tavy and Lynher Estuaries (Reay & Geary, 1994).

Saltmarsh communities - Saltmarsh on the site provides important feeding and roosting areas for large numbers of wintering and passage waterfowl. The variety of saltmarsh communities range from pioneer stands of Townsend's cord-grass *Spartina townsendii*, common cord-grass *S. anglica* and sea aster *Aster tripolium*, through lower mid-marsh with common saltmarsh grass *Puccinellia maritima* and sea-purslane *Halimione portulacoides*, to mid-upper marsh and the transition to freshwater inundation communities (Burd, 1989). Avocets roost on saltmarsh or mudflats and move out to feed on adjacent mudflats as the tide falls. Shevioc Wood on the Lynher and Kingsmill Lake on the Tamar, are two very important night roosts within the SPA for little egrets. During the day the birds disperse to feed on saltmarshes throughout the estuary complex, usually roosting individually at high tide.

5 Conservation objectives for all interest features

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

- C the attached maps showing the extent of the various interest features and sub-features;
- C summary information on the interest of each of the features; and
- C the favourable condition table, providing information on how to recognise favourable condition for each of the features and which will act as a basis from which the monitoring programme will be developed.

5.1 The conservation objective for large shallow inlets and bays is:

Subject to natural change, maintain the **large shallow inlets and bays** in favourable condition⁵, in particular:

- C Intertidal rock and boulder shore communities
- C Subtidal rocky reef communities
- C Kelp forest communities
- C Subtidal mixed cobble and gravel communities
- C Subtidal mud communities
- C Subtidal sandbank communities

5.2 The conservation objective for estuaries is:

Subject to natural change, maintain the **estuaries** in favourable condition⁵, in particular:

- C Intertidal mud communities
- C Subtidal mud communities
- C Intertidal mixed muddy sediment communities
- C Subtidal mixed muddy sediment communities
- C Estuarine bedrock, boulder and cobble communities
- C Subtidal sandbank communities
- C Saltmarsh communities
- C Reedbed communities

⁵ For a detailed definition of how to recognise favourable condition see table 2 (Section 6)

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5.3 The conservation objective for sandbanks which are slightly covered by seawater all the time is:

Subject to natural change, maintain the **sandbanks which are slightly covered by seawater all the time** in favourable condition⁵, in particular:

- C Eelgrass bed communities
- C Gravel and sand communities
- C Muddy sand communities

5.4 The conservation objective for the SPA features is:

Subject to natural change, maintain in favourable condition⁵ the habitats of the **nationally important populations of the regularly occurring Annex 1 species**, with particular reference to:

- C Intertidal mudflats
- C Intertidal mixed muddy sediments
- C Saltmarsh communities

Numbers of birds using these habitats are given in Table 1

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

⁵ For a detailed definition of how to recognise favourable condition see table 2 (Section 6)

Table 1 - Information on populations of nationally and internationally important species of birds under the EU Birds Directive that use the Tamar Estuaries SPA at the time it was classified*.

Bird Species	Qualifying status	Population (as at June 1997)
Little egret <i>Egretta garzetta</i>	Internationally important breeding population of Annex 1 species	102 (Autumn 1995) (representing 20% of British population)
Avocet <i>Recurvirostra avosetta</i>	Internationally important breeding population of Annex 1 species	194 (Five year peak mean 1990/1-1993/4) (representing 19.4% of the British population)

*** SPA designated June 1997**

6 Favourable condition table

The favourable condition table is supplied as an integral part of English Nature's Regulation 33 advice package. It is intended to supplement the conservation objectives only in relation to management of established and ongoing activities and future reporting 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 far less about habitat condition and find it difficult to predict what favourable condition may look like. 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.

Detailed scientific information on the marine biotopes and saltmarsh vegetation which form the basis of the favourable condition table can be found in Appendices IV and V respectively.

Box 1 Glossary of terms used in the favorable condition table

Feature	The habitat or species for which the site has been selected.
Sub-feature	An ecologically important sub-division of the 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 the Plymouth Sound and Estuaries 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.

FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Large shallow inlet and bay		Extent	Area (ha) of the large shallow inlet and bay, measured periodically (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. The extent of the large shallow inlet and bay will not change significantly over time unless due to some human activity but nevertheless needs to be measured periodically.
		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.	Water clarity is important for maintaining extent and density of algal and plant dominated communities, such as kelp forests and eelgrass beds, and thus the structure of the feature. Clarity decreases through increases in amounts of suspended organic/inorganic matter that may arise from activities within the site and in the surrounding catchment area.
		Water density - temperature - salinity	Regular measurement of water temperature and salinity in the subtidal periodically throughout the reporting cycle.	Average temperature/ salinity should not deviate significantly from the baseline, subject to natural change.	Temperature and salinity are characteristic of the overall hydrography of the area. Changes in temperature and salinity influences 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.

FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Large shallow inlet and bay (cont.)	Intertidal rock and boulder shore communities	Distribution of characteristic rocky shore communities	Distribution of intertidal rocky shore communities measured using littoral extent (in particular those biotopes listed at Appendix IV). Measured during summer, once during the reporting cycle.	No decrease in littoral extent of range of rocky shore communities from an established baseline value, subject to natural change.	The relative distribution of the biotopes listed under this sub-feature in Appendix IV is an important structural aspect of the site. Changes in extent and distribution may indicate long term changes in the physical conditions at the site.
		Species composition of low-shore boulder communities	Presence and abundance of composite species from biotope MLR.Fser.Fser.Bo. Measured during summer, twice during reporting cycle..	Presence and abundance of composite species should not deviate significantly from an established baseline, subject to natural change..	The presence and relative abundance of characterising species gives an indication of the quality of MLR.Fser.Fser.Bo (<i>Fucus serratus</i> and under-boulder fauna on lower eu littoral boulders) and change in composition may indicate cyclic change/trend in rocky shore communities. Change in composition may also indicate changes in hydrography, salinity and or siltation.
		Species composition of rockpool communities	Presence and abundance of composite species and percentage cover of <i>Sargassum muticum</i> (Japweed) from a representative series of rockpools, measured during summer twice during reporting cycle.	Presence and abundance of composite species should not deviate significantly from an established baseline, subject to natural change. Average percentage cover of <i>Sargassum</i> should not increase from an established baseline.	Composite species of rockpools include many southwestern species, their relative abundance gives an indication of the quality of the rockpools and are key structural components of the intertidal rocky shores. Increased <i>Sargassum</i> is believed to compete with native species and would thus be detrimental to favourable condition.

FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Large shallow inlet and bay (cont.)	Subtidal rocky reef communities	Distribution of characteristic biotopes	Distribution of the limestone biotopes SubSoAs and AlcByH.Hia. Measured during summer, once during reporting cycle.	Average distribution should not deviate significantly from an established baseline, subject to natural change.	The biotopes SubSoAs and AlcByH.Hia are key structural components of the subtidal limestone and are of particular nature conservation importance due to the unusual physical conditions. These biotopes have species rich communities which contribute to the structure of the subtidal rocky reef communities.
		Species composition of characteristic biotopes	Presence and abundance of composite species from biotopes, AlcByH.Hia, AlcTub, ErS.Eun, SubSoAs. Measured during summer, once during reporting cycle.	Presence and abundance of composite species should not deviate significantly from an established baseline, subject to natural change.	Species composition is an important contributor to the structure of the biotope and thus of the reef as a whole. The presence and relative abundance of characterising species gives an indication of the quality of the biotopes and changes in composition may indicate cyclic change/trend in communities. One of the characterising species is <i>Eunicella</i> , which is a long-lived and nationally important species.
	Kelp forest communities	Algal species composition	Presence and abundance of composite of algal species from kelp zone. Measured during summer, twice during reporting cycle.	Presence and abundance should not deviate significantly from an established baseline, subject to natural change.	Changes in the floral composition within the kelp forests may serve as long-term indicators of change in water clarity, temperature or wave exposure. Red algae act as an indicator of reductions in entire algal population.

FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Large shallow inlet and bay (cont.)	Kelp forest communities	Characteristic species - <i>Laminaria hyperborea</i> & <i>L. ochroleuca</i> - population size	Relative proportions and density of each species in kelp forests at representative series of sites. Measured during summer, twice per reporting cycle.	Average ratio of <i>Laminaria hyperborea</i> : <i>L. ochroleuca</i> should not deviate significantly from an established baseline, subject to natural change. Average density of each species should not deviate significantly from an established baseline, subject to natural change.	<i>L. ochroleuca</i> is a south-western species, the relative proportion of this species to <i>L. hyperborea</i> , may also be indicative of long-term changes in water temperature, clarity or wave exposure. Both species contribute to the productivity and structure of the feature.
		Characteristic species - <i>Distomus variolosus</i> population size	Average abundance on kelp stipes (percentage of stipe length over which present and density of cover) measured twice during reporting cycle.	Average percentage cover and density should not deviate significantly from an established baseline, subject to natural change.	This is a South-western species of colonial tunicate and is indicative of the supporting processes as it is sensitive to deviations in salinity and siltation.
	Subtidal mixed cobble and gravel communities	Species composition of characteristic biotope EphR	Abundance and composition of algal species biotope EphR, measured during summer twice per reporting cycle.	Species composition and abundance should not deviate significantly from an established baseline, subject to natural change.	The presence of characteristic algal species is indicative of the unusual combination of light attenuation, tidal regime and lack of siltation conditions.

FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Large shallow inlet and bay (cont..)	Subtidal mud communities	Species composition of biotope IMU.PhiVir	Presence and abundance of composite species from biotope IMU.PhiVir. Measured during summer, once during reporting cycle.	Presence and abundance should not deviate significantly from an established baseline, subject to natural change.	Species composition is an important contributor to the structure of IMU.PhiVir. The presence and relative abundance of characterising species gives an indication of the quality of and change in composition may indicate cyclic change/trend in sediment communities.
	Subtidal sandbank communities	Attributes and targets for this sub-feature are listed under the 'Subtidal sandbanks' interest feature covered in other sections of this table.			
Estuaries		Extent	Area (ha) of the estuaries measured periodically (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. The extent of the estuaries will not change significantly over time unless due to some human activity but nevertheless needs to be measured periodically.
		Morphological equilibrium	Intra- and inter-estuarine Tidal Prism/Cross-Section ratio (TP/CS ratio), measured periodically (frequency to be determined).	Intra- and inter- estuarine TP/CS ratio should not deviate significantly from an established baseline, subject to natural change.	TP = Tidal Prism = total volume of water crossing a given profile during the flood tide (m ³). CS = Cross-sectional area of a given profile (location) at high water springs in m ² . The relationship between TP & CS provides a measure of the hydrodynamics of the estuary which are fundamental to the way the estuary adjusts to tidal energy reflected in rates of deposition and erosion. Substantial changes in this relationship may indicate that anthropogenic factors are taking effect and this would trigger more detailed evaluation of potential problems.

FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Estuaries (cont.)		Morphological equilibrium	Long term trend in horizontal boundary of the saltmarsh/mudflat interface.	Horizontal boundary of the saltmarsh/mudflat interface should not deviate significantly from the long-term trend, subject to natural change.	Monitoring the saltmarsh boundary is a practical means of securing data which indicate changes in the TP/CS relationship. Deviation from long-term trends would act as a trigger for a second tier response involving detailed bathymetric survey and evaluation of changes in the TP/CS relationship. In the absence of saltmarsh, vertical change in mudflat position can act as a surrogate for saltmarsh (it may be used as well).
		Nutrient status	Average phytoplankton concentration in summer, measured annually.	No significant deviation 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.
	Intertidal mud communities	Extent	Area (ha) of intertidal mud communities, measured periodically (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 mud communities is likely to be detrimental to the structure of the 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 feature.
	Intertidal mixed muddy sediment communities	Extent	Area (ha) of intertidal mixed muddy sediment communities, measured periodically (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 mixed muddy sediment communities is likely to be detrimental to the structure of the 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 feature.

FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Estuaries (cont.)	Subtidal mud communities	Extent	Area (ha) of subtidal mud communities, measured periodically (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 mud communities is likely to be detrimental to the structure of the feature, e.g. leading to associated loss of intertidal sediments, and may indicate long term changes in the physical conditions of the feature.
	Subtidal mixed muddy sediment communities	Extent	Area (ha) of subtidal mixed muddy sediment communities, measured periodically (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 mixed sediment communities is likely to be detrimental to the structure of the feature, e.g. leading to associated loss of intertidal sediments, and may indicate long term changes in the physical conditions of the feature.
		Extent and distribution of characteristic biotopes (CuSH, HarCon as identified at Appendix IV)	Extent and distribution of biotopes (CuSH, HarCon), measured once during reporting cycle.	Extent and distribution of biotopes should not deviate significantly from an established baseline, subject to natural change.	The extent of these biotopes and their relative distribution is an important structural aspect of the feature. Changes in their extent and distribution may indicate long term changes in the physical conditions of the estuarine complex.
	Estuarine bedrock, boulder and cobble communities	Extent and distribution of characteristic biotopes (SIR.Cor.Ele - LsacRS.FiR as identified at Appendix IV)	Extent and distribution of biotopes (SIR.Cor.Ele - LsacRS.FiR) Measured during summer, once during reporting cycle.	Extent and distribution of Cor.Ele and LsacRS.FiR should not deviate significantly from an established baseline, subject to natural change.	The extent and distribution of these biotopes contributes to the structure of the estuaries, and changes in distribution may indicate long term changes in the physical conditions of the estuarine complex, such as changes in salinity gradients or siltation patterns.

FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Estuaries (cont.)	Subtidal sandbank communities	Attributes and targets for this sub-feature are listed under the 'Subtidal sandbanks' interest feature covered in other sections of this table.			
	Saltmarsh communities	Extent	Area (ha) of saltmarsh communities measured once during the reporting cycle.	No decrease in extent of saltmarsh communities from an established baseline, subject to natural change.	Monitoring will need to take account of the dynamic nature of some of these habitats. A reduction in extent could be further indicated by ground survey to assess for signs of erosion-toppled vegetated blocks; stepping of saltmarsh edge; signs of stress/damage to plants. Extent needs to be measured at low tide.
		Creek patterns	Creek density and morphology measured periodically during reporting cycle (frequency to be determined).	No alteration of creek patterns from an established baseline, subject to natural change.	Creeks absorb tidal energy and assist with the delivery of sediment into saltmarshes. The efficiency of this process depends on creek pattern. Density is controlled by vegetation cover, suspended sediment load and tidal influence. Creeks allow pioneer vegetation to be established along their banks higher into the saltmarsh system.
		Range and distribution of characteristic saltmarsh communities (NVC communities listed in Appendix V)	Range and distribution of characteristic saltmarsh communities measured once per reporting cycle.	Range and distribution of characteristic saltmarsh communities should not deviate significantly from an established baseline, subject to natural change.	Sites with the greatest range of community types considered typical for the site from low, mid to upper saltmarsh and transition to other habitats are in most favourable condition.

FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Estuaries (cont.)	Saltmarsh communities (cont.)	Characterising species of characteristic saltmarsh communities (NVC communities listed in Appendix V)	Frequency and abundance of characteristic species of characteristic communities measured once during reporting cycle	Frequency and abundance of characteristic species should not deviate significantly from an established baseline, subject to natural change.	Species composition of characteristic saltmarsh communities is an important indicator of favourable condition of this sub-feature.
	Reedbed communities	Extent	Area (ha) of reedbed communities measured once every reporting cycle.	No decrease in extent of reedbed plant communities from an established baseline, subject to natural change.	Important transitional habitat, loss of which will have impacts on other species, including juvenile fish and birds such as the little egret.
Subtidal sandbanks		Extent	Area (ha) of subtidal sandbank communities measured periodically (frequency to be determined).	No decrease in extent from an established baseline, subject to natural change.	Extent of the feature is a reporting requirement of the Habitats Directive. Monitoring will need to take account of the dynamic nature of the feature but reduction in extent may indicate long term changes in the physical conditions influencing the feature.

FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Subtidal sandbanks (cont.)		Sediment character	Particle size analysis (PSA). Parameters include percentage sand/silt/gravel, mean and median grain size, and sorting coefficient, used to characterise sediment type. Sediment character to be measured during summer, once during reporting cycle.	Average PSA parameters should not deviate significantly from an established 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.
		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 a major influence on the distribution of communities throughout.
	Eelgrass bed communities	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.
		Water clarity	Average light attenuation measured periodically throughout the reporting cycle (frequency to be determined).	Average light attenuation should not decrease significantly from an established baseline, subject to natural change.	Water clarity is important for maintaining the eelgrass beds, and thus the structure of the feature. Clarity decreases through increases in amounts of suspended organic/inorganic matter. Water clarity is already being measured in the shallow inlets and bays feature, but has to be measured on all eelgrass beds.

FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Subtidal sandbanks (cont.)	Eelgrass bed communities (cont.)	Characteristic species- density of <i>Zostera marina</i>	Average density, measured during peak growth period twice during reporting cycle	Average density should not deviate significantly from an established baseline, subject to natural change.	An early indicator of seagrass under stress is a reduction in biomass, i.e. the number and length of leaves. Density is preferred as a surrogate for biomass, being less destructive, based on baseline survey to establish the relationship between density and biomass at a site.
		Characteristic species - epiphytic community	Presence and abundance of epiphytic species measured during summer twice during reporting cycle.	Presence and abundance of epiphytic species should not deviate significantly from an established baseline, subject to natural change.	The occurrence and frequency of epiphytes is indicative of the structure of the eelgrass bed communities. It gives an indication of their quality and changes in epiphytic composition may indicate cyclic change/trend in the host biotope or the subtidal sandbank communities as a whole.
		Nutrient status - green algal mat	Extent across whole or parts of site, measured during peak growth period every 3 years during reporting cycle.	No increase in extent of green algal mats from an established baseline, subject to natural change.	Nutrient status is a key functional factor that influences the sub-feature as opportunistic macroalgae compete with seagrass and affect the associated species. Increase in filamentous green algae may be a related natural phenomenon or may indicate eutrophication.
	Gravel and sand communities	Species composition of characteristic biotopes	Presence and abundance of composite species from biotopes IGS.Sell & IMS.EcorEns. Measured during summer, once during reporting cycle.	Presence and abundance of composite species should not deviate significantly from an established baseline, subject to natural change.	Species composition is an important contributor to the structure of IGS.Sell & IMS.EcorEns. The presence and relative abundance of characterising species gives an indication of the quality of the biotopes and change in composition may indicate cyclic change/trend in subtidal sandbank communities.

FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Subtidal sandbanks (cont.)	Muddy sand communities	Species composition of characteristic biotope	Presence and abundance of composite species from biotope IMS.MacAbr. Measured during summer, one during reporting cycle.	Presence and abundance of composite species should not deviate significantly from an established baseline, subject to natural change.	Species composition is an important contributor to the structure of IMS.MacAbr. The presence and relative abundance of characterising species gives an indication of the quality of and change in composition may indicate cyclic change/trend in subtidal sandbank communities.
Nationally important Annex 1 bird populations (avocet <i>Recurvirostra avosetta</i>)	Intertidal mudflat communities and mixed muddy sediment communities	Extent	Area (ha) of intertidal mudflat communities and mixed muddy sediment communities, measured periodically (frequency to be determined).	No decrease in extent of intertidal sediment communities from an established baseline, subject to natural change.	Important feeding areas
		Presence and abundance of prey species	Presence and abundance of 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.	Important prey species include insects, crustaceans, small fish or worms found in clear water, on mud surfaces or in soft sediments. Suitable prey size upto 15mm (or larger for thin worms).
	Saltmarsh communities	Extent	Area (ha) of saltmarsh communities, measured periodically (frequency to be determined).	No decrease in extent of saltmarsh from an established baseline, subject to natural change.	Important roosting areas.

FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Nationally important Annex 1 bird populations (avocet <i>Recurvirostra avosetta</i>) (cont.)	Saltmarsh communities (cont.)	Disturbance in feeding and roosting areas	Reduction or displacement of birds measured using 5 year peak mean information	No significant reduction in numbers or displacement of 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.
Nationally important Annex 1 bird populations (little egret <i>Egretta garzetta</i>)	Intertidal mudflat communities and intertidal mixed muddy sediment communities	Extent	Area (ha) of intertidal mudflat communities and intertidal mixed muddy sediment communities, measured periodically (frequency to be determined).	No decrease in extent of intertidal sediment from an established baseline, subject to natural change.	Important feeding areas.
		Presence and abundance of prey species	Presence and abundance of 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.	Important prey species include fish, amphibians and/or large aquatic insects. Suitable prey size less than 15cm.
	Saltmarsh communities	Extent	Area (ha) of saltmarsh communities, measured periodically (frequency to be determined).	No decrease in extent of saltmarsh from an established baseline, subject to natural change.	Important feeding and roosting areas.

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FEATURE	SUB-FEATURE	ATTRIBUTE	MEASURE	TARGET	COMMENTS
Nationally important Annex 1 bird populations (little egret <i>Egretta garzetta</i>) (cont.)	Saltmarsh communities (cont.)	Presence and abundance of prey species	Presence and abundance of 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.	Important prey species include fish, amphibians and/or large aquatic insects. Suitable prey size less than 15cm.
		Disturbance in feeding and roosting areas	Reduction or displacement of birds measured using 5 year peak mean information	No significant reduction in numbers or displacement of 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.

NB Extreme events (such as storms reducing or increasing salinities, exceptionally cold winters or warm summers) also need to be recorded as they may be critical in influencing ecological issues in Plymouth Sound and Estuaries European marine site and may well be missed by routine monitoring

7 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 7.2, and on how it may be reviewed and updated in the future, in Section 7.4.

The advice is provided in summary form in Table 3 and Section 7.5 and with more detail in Tables 4 & 5 and section 7.6, including advice in relation to specific interest features and their sub-features.

7.1 Purpose of advice

The aim of this advice is to enable 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 Plymouth Sound and Estuaries 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 to be given subsequently under Regulation 48 or Regulation 50 on operations that qualify as plans or projects within the meaning of Article 6 of the Habitats Directive.

7.2 Methods for assessment

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

- C an assessment of the **sensitivity** of the interest features or their component sub-features to operations;
- C an assessment of the **exposure** of each interest feature or their component sub-features to operations; and
- C 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 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).

7.2.1 Sensitivity assessment

The sensitivity assessment used is an assessment of the relative sensitivity of the interest features or the component sub-features of the Plymouth Sound and Estuaries 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 or biotope to damage, or death, from an external factor (Hiscock, 1996). As an example, seagrass 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 Plymouth Sound and Estuaries European marine site are based primarily upon a series of UK Marine SACs *Life Project Task Reports* 'An overview of dynamic and sensitivity characteristics for conservation and management of marine SACs' (Birkett *et al.*, 1998; Davison & Hughes, 1998; Elliott *et al.*, 1998; Hartnoll, 1998; and Hill, *et al.*, 1998).

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).

7.2.2 Exposure assessment

This has been undertaken for the Plymouth Sound and Estuaries 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 (see Table 4). 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.

7.2.3 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 [i.e. human activity] to which it is sensitive (Hiscock, 1996). For example a *subtidal sandbank* may be sensitive to abrasion by benthic fishing gear, but it may not be currently vulnerable within Plymouth Sound and Estuaries due to the limited benthic fishing taking place and existing management controls. The process of deriving and scoring relative vulnerability is provided in Appendix III.

7.3 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:

- C 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;

- C 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
- C 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 Table 5 provides 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. 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.

7.4 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 Plymouth Sound and Estuaries European marine site. English Nature expects that the information on current activities and patterns of usage (which was used to derive table 5) will be supplemented as part of the process of developing the management scheme 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.

7.5 Summary of advice on operations

7.5.1 Large shallow inlets and bays

In pursuit of the conservation objective for the large shallow inlets and bays (Section 5.1), the relevant and competent authorities for the Plymouth Sound and Estuaries European marine site are advised to manage human activities within their remit such that they do not result in deterioration or disturbance through any of the following:

- C Removal of embayment habitats
- C Increased abrasion and/or siltation of the seabed
- C Increased synthetic and/or non-synthetic toxic contamination
- C Nutrient/organic enrichment and/or increases in turbidity

- C Biological disturbance through the introduction of non-native species and/or translocation

7.5.2 Estuaries

In pursuit of the conservation objective for estuaries (Section 5.2), the relevant and competent authorities for the Plymouth Sound and Estuaries European marine site are advised to manage human activities within their remit such that they do not result in deterioration or disturbance through any of the following:

- C Removal of estuarine habitats
- C Increased siltation of the estuary bed or intertidal communities
- C Abrasion of the estuarine habitats
- C Increased synthetic and/or non-synthetic toxic contamination
- C Nutrient/organic enrichment and/or increases in turbidity
- C Biological disturbance through the selective extraction of species

7.5.3 Sandbanks which are slightly covered by seawater all the time

In pursuit of the conservation objective for the sandbanks (Section 5.3), the relevant and competent authorities for the Plymouth Sound and Estuaries European marine site are advised to manage human activities within their remit such that they do not result in deterioration or disturbance through any of the following:

- C Removal of subtidal sandbank habitats
- C Physical damage resulting from siltation or abrasion
- C Increased synthetic and/or non-synthetic toxic contamination
- C Nutrient/organic enrichment and/or increases in turbidity

7.5.4 SPA interest features

In pursuit of the conservation objective for 'habitats supporting nationally important populations of Annex 1 species' (Section 5.4), the relevant and competent authorities for the Plymouth Sound and Estuaries European marine site are advised to manage human activities within their remit such that they do not result in deterioration or disturbance through any of the following:

- C Removal or loss of estuarine habitats
- C Noise and/or visual disturbance
- C Increased synthetic and/or non-synthetic toxic contamination
- C Nutrient and/or organic enrichment
- C Biological disturbance through selective extraction of species

Table 3 showing operations which may cause deterioration or disturbance to the Plymouth Sound and Estuaries European marine site interest features at current levels of use⁸

The advice below is not a list of prohibitions but rather a checklist of operations for the management group, 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 **U** 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	Large shallow inlet and bay	Sandbanks which are slightly covered by seawater at all times	Estuaries	Nationally important Annex 1 birds (avocet, little egret)
Physical Loss Removal (e.g. land claim, coastal development) Smothering (e.g. by artificial structures, disposal of dredge spoil, marine litter)	U	U	U	U
Physical Damage Siltation (e.g. dredging, outfalls, dredge spoil) Abrasion (e.g. boating, anchoring, trampling) Selective extraction (e.g. aggregate dredging, entanglement, bait digging)	U U	U U	U U	
Non-physical disturbance Noise (e.g. boat activity) Visual presence (e.g. recreational activity)				U U

Standard list of categories of operations which may cause deterioration or disturbance	Large shallow inlet and bay	Sandbanks which are slightly covered by seawater at all times	Estuaries	Nationally important Annex 1 birds (avocet, little egret)
Toxic contamination Introduction of synthetic compounds (e.g. TBT, PCBs, endocrine disruptors) Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons) Introduction of radionuclides	U U	U U	U U	U U
Non-toxic contamination Nutrient enrichment (e.g. agricultural run-off, outfalls) Organic enrichment (e.g. mariculture, outfalls) Changes in thermal regime (e.g. outfalls, power stations) Changes in turbidity (e.g. dredging, outfalls, agricultural run-off) Changes in salinity (e.g. water abstraction, outfalls)	U U U	U U U	U U U	U U
Biological disturbance Introduction of microbial pathogens Introduction of non-native species and translocation Selective extraction of species (e.g. bait digging, wildfowling, commercial & recreational fishing)	U		U	U

⁸ This advice has been developed using best available scientific information and informed scientific interpretation and judgement (as at November 1999). This process has used a coarse grading of relative sensitivity, exposure and vulnerability of each interest feature to different categories of operation based on the current state of our knowledge and understanding of the marine environment. This is shown in the sensitivity and vulnerability matrices at Table 5. The advice is indicative only, and is given to guide relevant authorities and others on particular operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species for which the site has been designated.

The 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

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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 November 1999). 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.

7.6 Interest feature and sub-feature specific advice on operations

This section provides information to help relate general advice to each of the specific interest features of the Plymouth Sound and Estuaries European marine site.

This advice relates to the vulnerability of the interest features and sub-features of the Plymouth Sound and Estuaries European marine site as set out in Table 5 and summarised in Table 3. An explanation of the sensitivity of the interest features or sub-features follows with an explanation of their exposure and therefore their vulnerability to damage or disturbance from the listed categories of operations. This enables links between the categories of operation and the ecological requirements of the European marine site's interest features, as set out in Section 3, to be made. The assessment of the sensitivity and exposure used to determine the relative vulnerability of the interest features or sub-features to the categories of operation can be found in Tables 4 and 5.

7.6.1 Large shallow inlet and bay

i) Physical loss

- C Plymouth Sound and Estuaries is the largest of the two rias in England selected for large shallow inlets and bays and supports a wide diversity of habitats and species, including abundant southern Mediterranean-Atlantic species rarely found in Britain. The loss of the inlet and bay or parts of it could jeopardise the survival of some of these habitats and species and would therefore be detrimental to favourable condition.
- C All the sub-features of the embayment are sensitive to loss of any of the marine plant and animal communities, through direct removal or smothering, and is of concern, due to their long recovery times and their international importance. Many communities are also interdependent upon the ecological functioning of others and this link must not be overlooked when the potential impact of removal or smothering is considered.
- C Deterioration or disturbance by physical removal or smothering can be the result of either one-off events such as development involving habitat loss or the cumulative effect of continuous activities.

ii) Physical damage

- C All the sub-features of the embayment are sensitive to physical damage. The subtidal sediments are the main communities considered moderately vulnerable and are discussed further at 7.6.3 below. The subtidal rocky reef communities are also indicated as moderately vulnerable to physical damage resulting from siltation.

ii) Toxic contamination

- C Heavy metals are known to occur at varying concentrations across the site, primarily due to historic mining practices (Environment Agency, 1996). Synthetic compounds such as tributyl tin (TBT) from shipping activity and various ship and boat cleaning operations also occur at varying concentrations across the site. These compounds including Polychlorinated biphenols (PCBs) are known to have toxic effects even in low concentrations and to be capable of high levels of bioaccumulation. All sub-features are therefore both sensitive and considered highly vulnerable to the effects of these toxins. Many of the compounds are bound within sediments and any re-suspension of them within the water column is to be avoided or mitigated against, as it could compound the problem (i.e. physical disturbance could increase levels of contaminants in the water).
 - C The toxic effects of TBT on molluscs, especially the dog whelk *Thyas lapillus*, are well documented (Bryan *et al.*, 1987). An impact on a particular species within a rocky shore community, such as an important predator like the dog whelk, can potentially affect the structure of the whole community.
 - C As a sub-feature of subtidal sandbanks, eelgrasses can readily take up heavy metals and tributyl tin (TBT) but damage has, to date, not been observed (Davidson & Hughes, 1998). However, bioaccumulation of antifoulants is known to occur and as eelgrasses provide a habitat for a host of invertebrate communities such higher trophic levels could be adversely affected by such contamination. Eelgrasses are also sensitive to hydrocarbon releases and again their associated communities may be more vulnerable to oil pollution than the seagrass beds themselves.
 - C Some sediment species display a tolerance of heavy metal contamination, but the larval and juvenile stages can be very sensitive (Davidson & Hughes 1998).
 - C As mentioned, communities are also sensitive to acute events, such as oil spills, due to both their toxicity and smothering effects. Whilst some of the more robust species such as the kelps may be relatively insensitive to oil pollution, other faunal elements of the habitat may be seriously damaged. For example, oil is known to interfere with the ability of lobsters to detect the sex pheromone that triggers mating, and with the normal feeding behaviour of sea-anemones (Beveridge *et al.*, 1997).
- iv) Non-toxic contamination
- C Nutrient enrichment can lead to eutrophication and reduce the diversity of communities. Some species may be tolerant of the effects of eutrophication with the result that they thrive at the expense of the more sensitive species and the community composition is altered. Some of the more sheltered areas, due to their low flushing capacity, are sensitive to increased effluent discharge,

agricultural run-off, or increases in freshwater input, which encourage the growth of ephemeral green algae.

- C As a sub-feature of subtidal sandbanks, eelgrass beds are highly sensitive to nutrient and organic enrichment which can lead to phytoplankton blooms, increased turbidity, increased growth of blanketing, floating or attached algae and lack of light penetration (Davidson & Hughes, 1998).

v) Biological disturbance

- C Many species and communities are sensitive to the introduction of non-native species, which can out-compete native species for space, light and/or food. The non-native Japweed *Sargassum muticum* is known to occur in rock pools and the shallow subtidal, including amongst the eelgrass beds, across the site. Whilst there is a fear that it has the ability to replace native species there is currently no evidence that this is occurring within Plymouth Sound. However, it is an issue which should receive continued surveillance.

7.6.2 Estuaries

i) Physical loss

- C The estuarine complexes are characterised by their size, naturalness, extent and variety of habitats, including nationally rare species and communities. The loss or removal of estuarine habitat or parts of it would therefore be detrimental to favourable condition.
- C All estuarine habitats are considered highly or moderately vulnerable to physical loss. More particularly, loss of habitat through land development can lead to change in the physical processes within an estuary which may exacerbate any direct loss. This, together with sea level rise, results in coastal squeeze which may lead to loss of important intertidal habitats, which themselves are natural sea defences and which contribute significantly to the reduction of tidal and wave energy.

ii) Physical damage

- C Most estuarine communities are not considered highly sensitive to siltation, being naturally fairly turbid or silty environments. However the Yealm Estuary is an exception due to its fully marine and sandy sediment conditions in its lower reaches. The Yealm would therefore be sensitive to any activity which could cause increased siltation, since this could have a major effect on a wide variety of communities within the estuary. All areas are also considered moderately vulnerable to the effects of siltation arising from activities such as dredging, which could result in the resuspension of contaminants as discussed above (at 7.6.1 (iii)).

- C Eelgrass can be easily dislodged and uprooted from the sediment during physical disturbances such as anchoring or use of mobile fishing gear. Once damaged or removed in this way eelgrasses have difficulty in re-establishing or colonising the area, due to broken or damaged rhizomes and/or the removal of seeds or seed which have been buried too deeply for successful germination (Davidson & Hughes, 1998). The vulnerability of the eelgrass present on the subtidal sand in the Yealm is considered moderate and work to monitor the potential impact will continue.
- C Digging for bait disturbs the sediment allowing for the transport of fine sediment and previously buried contaminants to take place at the surface. Additionally the effect of collection on the shore means that previously undisturbed sediments are trampled. The vulnerability of the Plymouth Sound and Estuaries, particularly to peeler crab collection, has been frequently highlighted (Godden, 1995; Fowler, 1999)
- iii) Toxic contamination
 - C All sub-features are considered to be sensitive to toxic contamination and are also moderately vulnerable to them for the reasons already stated at 7.6.1 above.
- iv) Non-toxic contamination
 - C Activities which result in diffuse sources or chronic input, and that significantly alter the physical and chemical regime of the waters of the estuaries, have the potential to disrupt their characteristic community structures and species diversity and would therefore be detrimental to favourable condition.
 - C Nutrient enrichment can lead to eutrophication and reduce the diversity of communities. Some species may tolerate eutrophication with the result that they thrive at the expense of the more sensitive species and the community composition is altered. Some sediment communities are also sensitive to organic enrichment which can result in excessive blanketing of green algae. The role of sediments and their associated communities in nutrient cycling processes is complex and differs for the various nutrients and sediment communities. Some sediment communities can act as nutrient sinks, trapping nutrients within the sediments and if they are subsequently disturbed these nutrients can then be released back into the system. This in turn could lead to elevated nutrient loadings in the water column and subsequent eutrophication. However, some estuarine sediments and their communities also play an important role in the denitrification process and therefore in the reduction of nitrogen levels.
 - C Studies have shown that the Lynher Estuary and possibly the Tamar have a

tendency towards being eutrophic (Parr & Wheeler, 1996) and are therefore considered moderately vulnerable to nutrient enrichment. Improvements will be brought about through South West Water's Clean Sweep programme. However, diffuse sources such as agricultural run-off will need to continue to be targeted.

v) Biological disturbance

- C Bait digging and peeler crab collection result in the selective extraction of species from the intertidal area, the impacts of this activity are unclear at present. The placing of crab shelters on intertidal sediments introduces hard substrata for colonisation by rocky shore species and may change sediment characteristics by affecting water and oxygen exchange and sedimentation rates. The vulnerability of the Plymouth Sound and Estuaries, particularly to peeler crab collection, has been frequently highlighted. (Godden, 1995; Fowler, 1999).

7.6.3 Sandbanks which are slightly covered by seawater at all times

i) Physical loss

- C Plymouth Sound and Estuaries encompasses a wide range of subtidal sediment communities all of which are sensitive to physical loss. Loss of any one or more biotopes through removal of sediment habitat would decrease the diversity of the site and could have direct or indirect impacts on the functioning of adjacent habitats.

C

ii) Physical damage

- C All the sub-features of the subtidal sandbanks are considered moderately vulnerable to physical damage. This may be through increased siltation from dredging for example, or as a result of abrasion from anchoring at particularly sensitive sites where eelgrass occurs, as it can be easily dislodged and uprooted from the sediment during physical disturbances.

iii) Toxic contamination

- C All sub-features are considered to be sensitive to toxic contamination and are also moderately vulnerable to them for the reasons already stated at 7.6.1 above. Although subtidal sandbanks will be less vulnerable to the risk of oil spills, unless dispersants are used in clean-up operations, or if wave action allows sediment mobility and thus oil to be incorporated into the sediments.

iv) Non-toxic contamination

- C Eelgrass beds are highly sensitive to nutrient and organic enrichment which

can lead to phytoplankton blooms increasing turbidity, increased growth of blanketing, floating or attached algae and lack of light penetration. The eelgrass beds, off Drake's Island, the Yealm and Cawsand Bay are considered moderately vulnerable to elevated nutrient levels and increased turbidity.

7.6.4 SPA interest features

i) Physical loss

- C The Tamar estuaries complex provides roosting and feeding habitats for nationally important numbers of avocets and little egrets. Activities or developments resulting in the reduction of food and roosting habitat availability should be avoided.

ii) Physical damage

- C The estuarine habitats of the Tamar complex and their associated food supplies, support the avocet and little egret populations. Therefore, any operations or activities that would adversely affect these habitats should be avoided. However, whilst the intertidal and saltmarsh habitats are sensitive to damaging activities such as trampling they are not considered vulnerable to them at current levels of use. Waterfowl also have the potential to become entangled in litter or fishing gear, but again current levels of use do not appear to present a threat at this site.

iii) Non-physical disturbance

- C Waterfowl are disturbed by unpredictable movements of objects and increases in noise disturbance. This can have the effect of displacing the birds from their roosting or feeding grounds. Disturbance can cause birds to cease feeding or fly away and in response they could either a) increase their energy intake at their present (disturbed) feeding sites when undisturbed, or b) move to an alternative feeding site. Such a response affects energy budgets and thus survival, with particular consequences for overwintering wading birds, such as the avocet (Davidson & Rothwell, 1993). Current patterns of human use are well documented (TECF, 1999). Bird counts in recent years show upward trends (Rankine & Carter, 1996) and it would therefore appear that current patterns of human use in this respect are in the main sustainable. However, there are isolated incidents reported of high speed and noisy craft which will require ongoing assessment, along with careful assessment of increased usage or development proposals.

iv) Toxic contamination

- C Waterfowl are subject to the accumulation of toxic contaminants through the

food chain or through direct contact with toxic substances when feeding.

Their ability to feed can also be affected by changes in the palatability of prey items caused by toxic contamination. There is no evidence to show that this is occurring or likely to occur within this site, but this is an issue which requires ongoing assessment.

v) Non-toxic contamination

- C Organic or nutrient enrichment can reduce the availability of food for birds by increasing growth of algal mats on the intertidal area. It can also cause a reduction in water clarity, thereby reducing the visibility of prey items. As stated above, there are known increasing trends in nutrient loadings on this site which will need ongoing assessment.

vi) Biological disturbance

- C Bait digging and peeler crab collection result in the selective extraction of species from the intertidal area. This may result in the reduction of food availability for feeding birds. The impacts of bait collection are unclear at present. However, the levels of activity, particularly peeler crab collection, are high (Fowler, 1999) and the SPA interest features are therefore, considered moderately vulnerable.

7.7 Plans and Projects

Under Regulation 48(1), 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.

A European Site is any classified SPA and any SAC from the point where the European Commission and the Government agree the site as a Site of Community Importance. Appropriate assessment is also required, as a matter of Government policy, for potential SPAs, candidate SACs and listed Ramsar Sites for the purpose of considering development proposals affecting them. (PPG 9 paras 13 and C7).

English Nature's guidance note HRGN1 'The Appropriate Assessment (Regulation 48)' is at Appendix VI for further information.

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

7.8 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 SAC and SPA, 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 4 Assessment of the relative exposure of interest features and sub-features of the Plymouth Sound and Estuaries European marine site to different categories of operations. Relative exposure (this table) and sensitivity scores (table 5) when combined are used to derive relative vulnerability using the table in Appendix III.

Key

High	High exposure
Med	Medium exposure
Low	Low exposure
None	No current exposure

Categories of operations which may cause deterioration or disturbance	Large shallow inlets and bays				
	Intertidal rock & boulder shores	Kelp forest communities	Subtidal rocky reef communities	Subtidal mixed cobble and gravel communities	Subtidal sandbank communities
Physical Loss Removal (e.g. land claim, coastal development)	None	None	None	None	(For sensitivity and vulnerability information for this sub-feature see the section of this table which relate to the interest feature <i>Sandbanks which are slightly covered by seawater all the time</i>)
Smothering (e.g. by artificial structures, disposal of dredge spoil, marine litter)	None	None	None	None	
Physical Damage Siltation (e.g. run-off, channel dredging, outfalls)	Low	Low	Med	Med	
Abrasion (e.g. boating, anchoring, trampling)	None	None	None	None	
Selective extraction (e.g. aggregate dredging, entanglement, bait digging)	Low	Low	Low	Low	
Non-physical disturbance Noise (e.g. boat activity)	None	None	None	None	

Visual presence (e.g. recreational activity)	None	None	None	None	
Categories of operations which may cause deterioration or disturbance	Large shallow inlets and bays				
	Intertidal rock & boulder shores	Kelp forest communities	Subtidal rocky reef communities	Subtidal mixed cobble and gravel communities	Subtidal sandbank communities
Toxic contamination					
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs, endocrine disruptors)	Med	Med	Med	Med	
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	Med	Med	Med	Med	
Introduction of radionuclides	Med	Med	Med	Med	
Non-toxic contamination					
Nutrient enrichment (e.g. agricultural run-off, outfalls)	High	Med	Med	Med	
Organic enrichment (e.g. mariculture, outfalls)	Med	Med	Med	Med	
Changes in thermal regime (e.g. outfalls, power stations)	Low	Low	Low	Low	
Changes in turbidity (e.g. agricultural run-off, dredging, outfalls)	Low	Low	Low	Med	
Changes in salinity (e.g. water abstraction, outfalls)	Low	Low	Low	Low	
Biological disturbance					
Introduction of microbial pathogens	Low	Low	Low	Low	
Introduction of non-native species & translocation	Med	Med	Med	Med	
Selective extraction of species (e.g. bait digging, wildfowling, commercial & recreational fishing)	Low	Low	Low	Low	

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Categories of operations which may cause deterioration or disturbance	Estuaries					
	Intertidal & subtidal mud communities	Intertidal & subtidal mixed muddy sediment communities	Estuarine bedrock, boulder & cobble communities	Subtidal sandbank communities	Saltmarsh communities	Reedbed communities
Physical Loss						
Removal (e.g. land claim, coastal development)	Med	Med	Low	(For sensitivity and vulnerability information for this sub-feature see the section of this table which relate to the interest feature <i>Sandbanks which are slightly covered by seawater all the time</i>)	Med	Low
Smothering (e.g. by artificial structures, disposal of dredge spoil, marine litter)	Low	Low	Low		None	None
Physical Damage						
Siltation (e.g. dredging, outfalls, dredge spoil)	High	High	Low		Low	Low
Abrasion (e.g. boating, anchoring, trampling)	Low	Low	Low		Low	Low
Selective extraction (e.g. aggregate dredging, entanglement, bait digging)	Low	Low	Low		Low	Low
Non-physical disturbance						
Noise (e.g. boat activity)	None	None	None		None	None
Visual presence (e.g. recreational activity)	None	None	None		None	None

Categories of operations which may cause deterioration or disturbance	Estuaries					
	Intertidal & subtidal mud communities	Intertidal & subtidal mixed muddy sediment communities	Estuarine bedrock, boulder & cobble communities	Subtidal sandbank communities	Saltmarsh communities	Reedbed communities
Toxic contamination						
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs, endocrine disruptors)	Med	Med	Med		Med	Med
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	Med	Med	Med		Med	Med
Introduction of radionuclides	Med	Med	Med		Med	Med
Non-toxic contamination						
Nutrient enrichment (e.g. agricultural run-off, outfalls)	Med	Med	High		High	High
Organic enrichment (e.g. mariculture, outfalls)	High	Med	Med		Med	Med
Changes in thermal regime (e.g. outfalls, power stations)	Low	Low	Low		Low	Low
Changes in turbidity (e.g. agricultural run-off, dredging, outfalls)	Low	Low	Low		Low	Low
Changes in salinity (e.g. water abstraction, outfalls)	Low	Low	Low		Low	Low
Biological disturbance						
Introduction of microbial pathogens	Low	Low	Low		Low	Low
Introduction of non-native species & translocation	Low	Low	Low		Low	Low
Selective extraction of species (e.g. bait digging, wildfowling, commercial & recreational fishing)	High	High	Low		Low	Low

Categories of operations which may cause deterioration or disturbance	Sandbanks which are slightly covered by seawater all the time		
	Eelgrass bed communities	Gravel and sand communities	Muddy sand communities
Physical Loss			
Removal (e.g. land claim, coastal defence, aggregate extraction)	None	Low	Low
Smothering (e.g. by artificial structures, disposal of dredge spoil, marine litter)	None	Low	Low
Physical Damage			
Siltation (e.g. dredging, outfalls, dredge spoil)	Med	Med	Med
Abrasion (e.g. boating, anchoring, trampling)	Low	Low	Low
Selective extraction (e.g. aggregate dredging, entanglement)	None	None	None
Non-physical disturbance			
Noise (e.g. boat activity)	None	None	None
Visual presence (e.g. recreational activity)	None	None	None

Categories of operations which may cause deterioration or disturbance	Sandbanks which are slightly covered by seawater all the time		
	Eelgrass bed communities	Gravel and sand communities	Muddy sand communities
Toxic contamination			
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs, endocrine disruptors)	Med	Med	Med
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	Med	Med	Med
Introduction of radionuclides	Low	Low	Low
Non-toxic contamination			
Nutrient enrichment (e.g. agricultural run-off, outfalls)	Med	Med	Med
Organic enrichment (e.g. mariculture, outfalls)	Med	Med	Med
Changes in thermal regime (e.g. outfalls, power stations)	Low	Low	Low
Changes in turbidity (e.g. agricultural run-off, dredging, outfalls)	Low	Low	Low
Changes in salinity (e.g. water abstraction, outfalls)	Low	Low	Low
Biological disturbance			
Introduction of microbial pathogens	Low	Low	Low
Introduction of non-native species & translocation	Low	Low	Low
Selective extraction of species (e.g. bait digging, wildfowling, commercial & recreational fishing)	Low	Low	Low

Categories of operations which may cause deterioration or disturbance	Nationally important populations of regularly occurring Annex I bird species		
	Intertidal mudflats	Intertidal mixed muddy sediments	Saltmarsh communities
Physical Loss			
Removal (e.g. land claim, coastal defence)	Med	Med	Med
Smothering (e.g. by artificial structures, disposal of dredge spoil)	Low	Low	None
Physical Damage			
Siltation (e.g. dredging, outfalls, dredge spoil)	Low	Low	Low
Abrasion (e.g. boating, anchoring, trampling)	Low	Low	Low
Selective extraction (e.g. aggregate dredging, entanglement, bait digging)	Low	Low	Low
Non-physical disturbance			
Noise (e.g. boat activity)	Low	Low	Med
Visual presence (e.g. recreational activity)	Low	Low	Med

Categories of operations which may cause deterioration or disturbance	Nationally important populations of regularly occurring Annex I bird species		
	Intertidal mudflats	Intertidal mixed muddy sediments	Saltmarsh communities
Toxic contamination			
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs, endocrine disruptors)	Med	Med	Med
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	Med	Med	Med
Introduction of radionuclides	Med	Med	Med
Non-toxic contamination			
Nutrient enrichment (e.g. agricultural run-off, outfalls)	Med	Med	Med
Organic enrichment (e.g. mariculture, outfalls)	Med	Med	Med
Changes in thermal regime (e.g. outfalls, power stations)	Low	Low	Low
Changes in turbidity (e.g. agricultural run-off, dredging, outfalls)	Low	Low	Low
Changes in salinity (e.g. water abstraction, outfalls)	Low	Low	Low
Biological disturbance			
Introduction of microbial pathogens	Low	Low	Low
Introduction of non-native species & translocation	Low	Low	Low
Selective extraction of species (e.g. bait digging, wildfowling, commercial & recreational fishing)	High	High	Low

This table of current exposure is provided in light of what English Nature knows about current activities and patterns of usage at the Plymouth Sound and Estuaries European marine site (as at November 1999). English Nature expects that the information on current activities and patterns of usage to be refined further as a part of the process of developing the management scheme through further discussion with the relevant authorities. As such it is important that future consideration of English Nature's operations advice by relevant authorities takes account of changes in usage patterns (relative exposure) that have occurred on the site since the advice was issued.

Table 5. Assessment of the relative vulnerability of interest features and sub-features of the Plymouth Sound and Estuaries European marine site to different categories of operations. Categories of operations to which the features or sub-features of the site are highly or moderately vulnerable are indicated by shading. This table also incorporates relative sensitivity scores used in part to derive vulnerability.

Key

	High vulnerability	zzzz	High sensitivity
	Moderate vulnerability	zzz	Moderate sensitivity
		zz	Low sensitivity
		z	No detectable sensitivity

Categories of operations which may cause deterioration or disturbance	Large shallow inlets and bays				
	Intertidal rock & boulder shores	Kelp forest communities	Subtidal rocky reef communities	Subtidal mixed cobble and gravel communities	Subtidal sandbank communities
Physical Loss					(For sensitivity and vulnerability information for this sub-feature see the section of this table which relate to the interest feature <i>Sandbanks which are slightly covered by seawater all the time</i>)
Removal (e.g. land claim, coastal development)	zzzz	zzzz	zzzz	zzzz	
Smothering (e.g. by artificial structures, disposal of dredge spoil, marine litter)	zzz	zzzz	zzzz	zzz	
Physical Damage					
Siltation (e.g. dredging, outfalls, dredge spoil)	zzz	zzz	zzz	zzz	
Abrasion (e.g. boating, anchoring, trampling)	zzz	zzz	zzzz	zzz	
Selective extraction (e.g. aggregate dredging, entanglement, bait digging)	zzz	zz	zz	zz	
Non-physical disturbance					
Noise (e.g. boat activity)	z	z	z	z	
Visual presence (e.g. recreational activity)	z	z	z	z	

Categories of operations which may cause deterioration or disturbance	Large shallow inlets and bays				
	Intertidal rock & boulder shores	Kelp forest communities	Subtidal rocky reef communities	Subtidal mixed cobble and gravel communities	Subtidal sandbank communities
Toxic contamination					
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs, endocrine disruptors)	z z z z	z z z z	z z z z	z z z z	
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	z z z	z z z	z z z	z z z	
Introduction of radionuclides	z z	z z	z z	z z	
Non-toxic contamination					
Nutrient enrichment (e.g. agricultural run-off, outfalls)	z z	z z	z z	z z	
Organic enrichment (e.g. mariculture, outfalls)	z z	z z	z z	z z	
Changes in thermal regime (e.g. outfalls, power stations)	z z z	z z z	z z z	z z z	
Changes in turbidity (e.g. agricultural run-off, dredging, outfalls)	z z	z z z	z z	z z z	
Changes in salinity (e.g. water abstraction, outfalls)	z z z	z z z	z z z	z z z	
Biological disturbance					
Introduction of microbial pathogens	z	z	z	z	
Introduction of non-native species & translocation	z z z	z z	z z	z z	
Selective extraction of species (e.g. bait digging, wildfowling, commercial & recreational fishing)	z z z	z z z	z z z	z z z	

Categories of operations which may cause deterioration or disturbance	Estuaries					
	Intertidal & subtidal mud communities	Intertidal & subtidal mixed muddy sediment communities	Estuarine bedrock, boulder & cobble communities	Subtidal sandbank communities	Saltmarsh communities	Reedbed communities
Physical Loss						
Removal (e.g. land claim, coastal development)	z z z z	z z z z	z z z z	(For sensitivity and vulnerability information for this sub-feature see the section of this table which relate to the interest feature <i>Sandbanks which are slightly covered by seawater all the time</i>)	z z z z	z z z z
Smothering (e.g. by artificial structures, disposal of dredge spoil, marine litter)	z z z	z z z	z z z		z z z z	z z z z
Physical Damage						
Siltation (e.g. dredging, outfalls, dredge spoil)	z z	z z	z z z		z z	z z
Abrasion (e.g. boating, anchoring, trampling)	z z z	z z z	z z z		z z z	z z z
Selective extraction (e.g. aggregate dredging, entanglement, bait digging)	z z	z z	z z		z z	z z
Non-physical disturbance						
Noise (e.g. boat activity)	z	z	z		z	z
Visual presence (e.g. recreational activity)	z	z	z		z	z

Categories of operations which may cause deterioration or disturbance	Estuaries					
	Intertidal & subtidal mud communities	Intertidal & subtidal mixed muddy sediment communities	Estuarine bedrock, boulder & cobble communities	Subtidal sandbank communities	Saltmarsh communities	Reedbed communities
Toxic contamination						
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs, endocrine disruptors)	z z z z	z z z z	z z z z		z z z z	z z z z
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	z z z	z z z	z z z		z z z	z z z
Introduction of radionuclides	z z	z z	z z		z z	z z
Non-toxic contamination						
Nutrient enrichment (e.g. agricultural run-off, outfalls)	z z z	z z z	z z		z z	z z
Organic enrichment (e.g. mariculture, outfalls)	z z	z z z	z z		z z	z z
Changes in thermal regime (e.g. outfalls, power stations)	z z z	z z z	z z z		z z z	z z z
Changes in turbidity (e.g. agricultural run-off, dredging, outfalls)	z z	z z	z z		z z	z z
Changes in salinity (e.g. water abstraction, outfalls)	z z z	z z z	z z z		z z z	z z z
Biological disturbance						
Introduction of microbial pathogens	z	z	z		z	z
Introduction of non-native species & translocation	z z	z z	z z		z z	z z
Selective extraction of species (e.g. bait digging, wildfowling, commercial & recreational fishing)	z z z	z z z	z z z		z z z	z z z

Categories of operations which may cause deterioration or disturbance	Sandbanks which are slightly covered by seawater all the time		
	Eelgrass bed communities	Gravel and sand communities	Muddy sand communities
Physical Loss			
Removal (e.g. land claim, coastal development)	z z z z	z z z z	z z z z
Smothering (e.g. by artificial structures, disposal of dredge spoil, marine litter)	z z z z	z z z	z z z
Physical Damage			
Siltation (e.g. dredging, outfalls, dredge spoil)	z z z	z z z	z z z
Abrasion (e.g. boating, anchoring, trampling)	z z z z	z z z	z z z
Selective extraction (e.g. aggregate dredging, entanglement, bait digging)	z z z z	z z z z	z z z
Non-physical disturbance			
Noise (e.g. boat activity)	z	z	z
Visual presence (e.g. recreational activity)	z	z	z

Categories of operations which may cause deterioration or disturbance	Sandbanks which are slightly covered by seawater all the time		
	Eelgrass bed communities	Gravel and sand communities	Muddy sand communities
Toxic contamination			
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs, endocrine disruptors)	z z z z	z z z z	z z z z
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	z z z	z z z	z z z
Introduction of radionuclides	z z	z z	z z
Non-toxic contamination			
Nutrient enrichment (e.g. agricultural run-off, outfalls)	z z z z	z z z	z z z
Organic enrichment (e.g. mariculture, outfalls)	z z z	z z z	z z z
Changes in thermal regime (e.g. outfalls, power stations)	z z z	z z z	z z z
Changes in turbidity (e.g. agricultural run-off, dredging, outfalls)	z z z z	z z	z z
Changes in salinity (e.g. water abstraction, outfalls)	z z z	z z z	z z z
Biological disturbance			
Introduction of microbial pathogens	z	z	z
Introduction of non-native species & translocation	z z z	z z	z z
Selective extraction of species (e.g. bait digging, wildfowling, commercial & recreational fishing)	z z z	z z z	z z z

Categories of operations which may cause deterioration or disturbance	Nationally important populations of regularly occurring Annex I bird species		
	Intertidal mudflats	Intertidal mixed muddy sediments	Saltmarsh communities
Physical Loss			
Removal (e.g. land claim, coastal development)	z z z z	z z z z	z z z z
Smothering (e.g. by artificial structures, disposal of dredge spoil, marine litter)	z z z	z z z	z z z
Physical Damage			
Siltation (e.g. dredging, outfalls, dredge spoil)	z z	z z	z z
Abrasion (e.g. boating, anchoring, trampling)	z z z	z z z	z z z
Selective extraction (e.g. aggregate dredging, entanglement, bait digging)	z z	z z	z z
Non-physical disturbance			
Noise (e.g. boat activity)	z z z z	z z z z	z z z
Visual presence (e.g. recreational activity)	z z z z	z z z z	z z z

Categories of operations which may cause deterioration or disturbance	Nationally important populations of regularly occurring Annex I bird species		
	Intertidal mudflats	Intertidal mixed muddy sediments	Saltmarsh communities
Toxic contamination			
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs, endocrine disruptors)	z z z z	z z z z	z z z z
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	z z z	z z z	z z z
Introduction of radionuclides	z z	z z	z z
Non-toxic contamination			
Nutrient enrichment (e.g. agricultural run-off, outfalls)	z z z	z z z	z z
Organic enrichment (e.g. mariculture, outfalls)	z z z	z z z	z z
Changes in thermal regime (e.g. outfalls, power stations)	z z	z z	z z
Changes in turbidity (e.g. agricultural run-off, dredging, outfalls)	z z	z z	z z
Changes in salinity (e.g. water abstraction, outfalls)	z z z	z z z	z z z
Biological disturbance			
Introduction of microbial pathogens	z	z	z
Introduction of non-native species & translocation	z z	z z	z z
Selective extraction of species (e.g. bait digging, wildfowling, commercial & recreational fishing)	z z z	z z z	z z z

English Nature's advice on operations is derived from an assessment combining relative sensitivity of the features or sub-features with information on human usage of the site (as at November 1999), to identify relative vulnerability to categories of operations. In accordance with Government policy guidance this advice is provided in the light of current activities and patterns of usage at the site. It is important therefore that future consideration of this advice by relevant authorities, and others, takes account of changes in the usage patterns at the site. In contrast, the sensitivity of interest features, or sub-features, is relatively stable with alterations reflecting improvement in our scientific knowledge and understanding. To this end, information on sensitivity has been included in this table to assist the management and advisory groups with the future management of the site.

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9 Glossary

Advisory Group	The body of representatives from local interests, user groups and conservation groups, formed to advise the management group
Annex I habitat type(s)	A natural habitat(s) listed in Annex I of the Habitats Directive for which Special Areas of Conservation can be selected.
Annex II species	A species listed in Annex II of the Habitats Directive for which Special Areas of Conservation can be selected.
Annex V	The listing, in the Habitats Directive, of the animal and plant species whose taking in the wild and exploitation may be subject to management measures.
Assemblage	A collection of plants and/or animals characteristically associated with a particular environment.
Attribute	Characteristic of an interest feature/sub-feature which most economically provides an indication of the condition of the feature or sub-feature to which it applies.
BAP	Biodiversity Action Plan.
Benthos	Those organisms attached to, or living on, in or near, the seabed, including that part which is exposed by tides.
Biotope	The physical habitat with its biological community; a term which refers to the combination of physical environment and its distinctive assemblage of conspicuous species.
Biodiversity	The total variety of life on earth. This includes diversity within species, between species and of ecosystems.
Characteristic	Special to or especially abundant in a particular situation or biotope. Characteristic species should be immediately conspicuous and easily identified.
Circalittoral	The rocky subtidal zone below that 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.
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.
Favourable conservation status	A range of conditions for a natural habitat or species at which the sum of the influences acting upon that habitat or species are not adversely affecting its distribution, abundance, structure or function throughout the EC in the long term. The condition in which the habitat or species is capable of sustaining itself on a long-term basis.
Favourable condition	A range of conditions for a natural habitat or species at which the sum of the influences acting upon that habitat or species are not adversely affecting its distribution, abundance, structure or function within an individual Natura 2000 site in the long term. The condition in which the habitat or species is capable of sustaining itself on a long-term basis.
Habitat	The place in which a plant or animal lives.
Habitats Directive	The abbreviated term for <i>Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora</i> . It is the aim of this Directive to promote the conservation of certain habitats and species within the European Union.
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 specific component of their fauna and flora, or any Annex II species and any population of a bird species for which and SPA has been designated under the Birds Directive. Any habitat of a species for which a site has been selected, or typical species of an Annex I habitat are also considered to be interest features.
Maintain	The action required for an interest feature when it is considered to be in favourable condition.
Management group	The body of relevant authorities formed to manage the European marine site
Management scheme	The framework established by the relevant authorities at a European marine site under which their functions are exercised to secure, in relation to that site, compliance with the requirements of the Habitats Directive.
Nationally scarce/rare	For marine purposes, these are regarded as species of limited national occurrence
Natura 2000	The European network of protected sites established under the Birds Directive and the Habitats Directive
Notable species	A species that is considered to be notable due to its importance as an indicator, and may also be of nature conservation importance, and which is unlikely to be a 'characteristic species' (<i>qv</i>)
Operations which may cause deterioration or disturbance	Any activity or operation taking place within, adjacent to, or remote from a

European marine site that has the potential to cause deterioration to the natural habitats for which the site was designated or disturbance to the species and its habitats for which the site was designated.

Plan or project	In general, any operation which requires an application to be made for specific statutory consent, authorisation, licence or other permission. Specifically, 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.
Relevant authority	The specific competent authority which has powers or functions which have, or could have, an impact on the marine environment, or adjacent to, a European marine site.
Restore	The action required for an interest feature when it is not considered to be in a favourable condition.
Sensitivity	The intolerance of a habitat, community or individual species to damage from an external force.
Subfeature	An ecologically important sub-division of an interest feature.
Vulnerability	The exposure of a habitat, community or individual of a species to an external factor to which it is sensitive.
WeBs	Wetland Bird Survey: a collaborative national surveillance scheme of the UK's waterfowl based on counts undertaken once per month outside of the breeding season

Appendix III Matrix of relative vulnerability

The relative vulnerability of an interest feature or sub-feature is determined by multiplying the scores for relative sensitivity and exposure, and classifying the total into categories of relative vulnerability.

		Relative sensitivity of the interest feature			
		High (3)	Medium (2)	Low (1)	None detectable (0)
Relative exposure of the interest feature	High (3)	9	6	3	0
	Medium (2)	6	4	2	0
	Low (1)	3	2	1	0
	None (0)	0	0	0	0

Categories of relative vulnerability

High	6 - 9
Medium	3 - 5
Low	1 - 2
None detectable	0

Appendix IV

Summary of key biotopes (Connor *et al.* 1997)- reference Favourable Condition Table

Interest Feature	Sub-feature	Biotope code	Biotope description
Large shallow inlet and bay	Intertidal rock and boulder shores	LR.Cor	<i>Corallina officinalis</i> and coralline crusts in shallow eulittoral rockpools. These 'coralline' pools have a striking appearance as they are dominated predominantly by red algae.
		LR.Cor.Bif	In the south-west the brown alga <i>Bifurcaria bifurcata</i> (Cor.Bif) or
		LR.Cor.Cys	<i>Cystoseira</i> spp. (Cor.Cys) can be dominant.
		LR.FK	Fucoids and kelps in deep eulittoral rockpools.
		MLR.Fser.Fser.Bo	These deep pools often contain a community characterised by <i>Fucus serratus</i> and <i>Laminaria digitata</i> , with a wide variety of filamentous and foliose algae occurring beneath this brown algal canopy.
		ELR.Him	<i>Fucus serratus</i> and under-boulder fauna on lower eulittoral boulders. The shaded sides of the boulders are often colonised by a variety of red algae and where space is available beneath the boulders a rich assemblage of animals also occur.
		MLR.FvesB	<i>Himanthalia elongata</i> on exposed lower eulittoral rock
		SLR.FserX.T	<i>Fucus vesiculosus</i> and barnacle mosaics on moderately exposed mid eulittoral rock
LR.SR (in part)	<i>Fucus serratus</i> , red algae and sponges on fully marine lower eulittoral tide-swept mixed substrata		
MLR.Fser.Pid	<i>Balanus perforatus</i> on lower mid shore vertical bedrock		
LR.SByAs	<i>Fucus serratus</i> and piddocks on lower eulittoral soft rock. Beneath the algae dense aggregations of rock-boring piddocks, the bivalve <i>Hiatella arctica</i> and rock boring worms, <i>Polydora</i> spp. occur, with the empty holes providing refuge of other species such as hydroids and anemones.		
			Sponges, bryozoans and ascidians of deeply overhanging lower shore bedrock

Interest feature	Sub-feature	Biotope code	Description
Large shallow inlet and bay	Kelp forest communities	EIR.LhypFa & MIR.Lhyp.Ft EIR.LhypR.Loch	Upper infralittoral bedrock with dense <i>Laminaria hyperborea</i> forest Moderately exposed infralittoral rock with <i>Laminaria hyperborea</i> forest Mixed <i>Laminaria hyperborea</i> and <i>Laminaria ochroleuca</i> forest on exposed infralittoral rock
	Subtidal rocky reef communities	EIR.CC.BalPom (in part) EIR.SCAs.ByH ECR.AlcTub (in part) ECR.AlcMas (in part) MCR.ErSEun SCR.SubSoAs IR.AlcByH.Hia	Encrusting sponges, bryozoa and <i>Pomatoceros</i> spp. in surge gullies <i>Morchellium argus</i> , sponges and foliose red algae on infralittoral vertical bedrock <i>Alcyonium digitatum</i> , <i>Caryophyllia smithii</i> and <i>Corynactis viridis</i> on wave exposed to sheltered circalittoral rock <i>Alcyonium digitatum</i> , large <i>Cliona celata</i> and <i>Pachymatisma johnstonia</i> and <i>Nemertesia antennina</i> on moderately tide-swept exposed circalittoral rock Erect sponges, <i>Eunicella verrucosa</i> and <i>Pentapora foliacea</i> on slightly tide-swept moderately exposed circalittoral rock Sponges and ascidians on upward-facing moderately exposed circalittoral chalk and limestone Hydroids, anemones and rock-boring fauna on wave sheltered circalittoral limestone bedrock
	Subtidal mixed cobble and gravel communities	MIR.EphR	Ephemeral red algae
	Subtidal mud communities	IMU.PhiVir	Infralittoral mud with the opisthobranch mollusc <i>Philine aperta</i> and the seapen <i>Virgularia mirabilis</i>

Interest feature	Sub-feature	Biotope code	Description
Estuaries	Intertidal mud communities	LMS.MacAre LMU.HedScr LMU.HedOL	<i>Macoma balthica</i> and <i>Arenicola marina</i> in intertidal muddy sand <i>Scrobicularia plana</i> and <i>Hediste diversicolor</i> in upper shore mud <i>Hediste diversicolor</i> in lower and mid shore low salinity mud
	Subtidal mixed muddy sediment communities	SIR.Har Con ECR.CuSH	<i>Hartlaubella gelatinosa</i> and <i>Conopeum reticulum</i> on upper estuarine sublittoral mixed substrata Cushion sponges, hydroids and ascidians
	Estuarine bedrock, boulder and cobble communities	SIR.CorEle SLR.FserX.T SIR.LsacRS.FiR	<i>Cordylophora caspia</i> on circalittoral upper estuarine bedrock <i>Fucus ceranoides</i> on upper estuarine eulittoral rock Filamentous red algae <i>Halichondra</i> and <i>Hymeniacion</i> on estuarine infralittoral rock
	Saltmarsh communities	SM8 SM10 SM13 SM14 SM15 SM16 SM18 SM24	Annual <i>Salicornia</i> saltmarsh Transitional low marsh vegetation with <i>Puccinellia maritima</i> , annual <i>Salicornia</i> species and <i>Suaeda maritima</i> <i>Puccinellia maritima</i> saltmarsh <i>Halimione portulacoides</i> saltmarsh <i>Juncus maritimus</i> - <i>Tiglochlin maritima</i> saltmarsh <i>Festuca rubra</i> saltmarsh <i>Juncus maritimus</i> saltmarsh <i>Elymus pycnanthus</i> saltmarsh
Subtidal sandbanks	Eelgrass bed communities	IMS.Zmar	<i>Zostera marina</i> in infralittoral muddy sands
	Gravel and sand communities	IGS.Sell IMS.EcorEns	Sand with high number of bivalves with <i>Spisula elliptica</i> Medium to fine grained sand with <i>Echinocardium cordatum</i>
	Muddy sand communities	IMS.MacAbr	Muddy sand with polychaetes and bivalves <i>Abra alba</i>

Appendix V

Saltmarsh National Vegetation Classification (NVC) communities occurring within the Plymouth Sound and Estuaries European marine site (according to The Saltmarsh Survey of Great Britain, Burd 1989) - reference Favourable Condition Table

MAIN ZONE	NCC (BURD 1989)	NVC COMMUNITIES	SALTMARSH PLANT SPECIES
PIONEER MARSH	2a <i>Salicornia/Suaeda</i>	SM8	Annual glasswort (Annual <i>Salicornia</i> saltmarsh)
LOW MARSH	3a <i>Puccinellia</i>	SM10	Common saltmarsh grass (Transitional low marsh vegetation with <i>Puccinellia maritima</i> , annual <i>Salicornia</i> species and <i>Suaeda maritima</i>)
	3b <i>Halimione (Atriplex)</i>	SM14	Sea Purslane (<i>Halimione portulacoides</i> saltmarsh)
UPPER MARSH	4a <i>Limonium/Armeria</i>	SM13	Sea lavender or Sea thrift (<i>Puccinellia maritima</i> saltmarsh)
	4b <i>Puccinellia/Festuca</i>	SM16	Red-fescue (<i>Festuca rubra</i> saltmarsh)
	4c <i>Juncus gerardii</i>	SM16	Saltmarsh rush (<i>Festuca rubra</i> saltmarsh)
	4d <i>Juncus maritimus</i>	SM15 SM18	Sea rush (<i>Juncus maritimus - Tiglochin maritima</i> saltmarsh) (<i>Juncus maritimus</i> saltmarsh)
DRIFTLINE	5a <i>Agropyron (Elytrigia)</i>	SM24	Sea couchgrass (<i>Elymus pycnanthus</i> saltmarsh)

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Appendix VII Relevant authorities for the Plymouth Sound and estuaries European marine site

<p>Associated British Ports Port Office Millbay Docks Plymouth PL1 3EF</p>	<p>Caradon District Council Luxstowe House Liskeard Cornwall PL14 3DZ</p>
<p>Cattewater Harbour Commission 2 The Barbican Plymouth Devon PL1 2LR</p>	<p>Cornwall County Council County Hall Truro Cornwall TR1 3AY</p>
<p>Countryside Agency Bridge House Sion Place Bristol BS8 4AS</p>	<p>Devon County Council County Hall Topsham Road Exeter EX2 4QW</p>
<p>Devon Sea Fisheries Committee Office No 9 Fish Market Brixham TQ5 8AW</p>	<p>English Nature The Old Mill House 37 North Street Okehampton EX20 1AR</p>
<p>Environment Agency Sir John Moore House Victoria Square Bodmin PL31 1EB</p>	<p>Ministry of Agriculture, Fisheries & Food Fish Quay Sutton Harbour Plymouth PL4 0LH</p>
<p>Plymouth City Council Civic Centre Plymouth Devon PL1 2EW</p>	<p>Queen's Harbour Master Longroom Port Control Station Stonehouse Barracks Plymouth Devon PL1 3RT</p>
<p>South Hams District Council Follaton House Plymouth Road Totnes Devon TQ9 5NE</p>	<p>South West Water Peninsula House Rydon Lane Exeter Devon EX2 7HR</p>

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Sutton Harbour Company Harbour Office Sutton Harbour Plymouth PL4 0ES	West Devon Borough Council Kilworthy Park Tavistock Devon PL19 0BZ
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