The Severn Estuary / Môr Hafren candidate Special Area of Conservation

European marine site

Natural England & the Countryside Council for Wales' advice given under Regulation 33(2)(a) of the Conservation (Natural Habitats, &c.) Regulations 1994, as amended.

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Preface

The Severn Estuary is the largest coastal plain estuary in the UK with extensive mudflats and sandflats, rocky shore platforms, shingle and islands. Saltmarsh fringes the coast, backed by grazing marsh with freshwater and occasionally brackish ditches. The estuary's classic funnel shape is a factor causing the Severn to have the second highest tidal range in the world (after the Bay of Fundy in Canada) at more than 12 metres. This tidal regime results in plant and animal communities typical of the extreme physical conditions of strong flows, mobile sediments, changing salinity, high turbidity and heavy scouring. As with many other estuaries in England and Wales, the Severn Estuary has long provided a focus for human activity, a location for settlement, a source of food, water and raw materials and a focus for trade and exploration. The Estuary and its coastal hinterland support major cities including Cardiff, Bristol, Newport and Gloucester. The Severn Estuary ports are very important to the regional and, in some cases, national economy. The Estuary's beaches and undeveloped coastline, with low-lying levels, freshwater wetlands, and cliff scenery, provide an important focus for recreation and appreciation of the Estuary's wildlife.

In August 2007 the Severn Estuary was submitted by the UK Government to the European Commission as a candidate Special Area of Conservation (cSAC) under Article 4 of the EC Habitats and Species Directive in recognition of its importance to Biodiversity conservation at a European level.

This document contains the joint advice of Natural England and the Countryside Council for Wales (CCW) to the other relevant authorities for the Severn Estuary / Môr candidate cSAC, as to the conservation objectives for the cSAC. That advice is provided in fulfilment of our obligations towards the cSAC, as a European marine site, under Regulation 33(2)(a) of the Conservation (Natural Habitats, &c.) Regulations 1994, as amended (the Habitats Regulations).

The extent of the Severn Estuary / Môr Hafren candidate SAC is shown in Figure 1. European marine sites are defined in the Habitats Regulations 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 (SACs) and candidate SACs designated under the 1992 Habitats Directive[1], which support natural habitats and species of European importance, and Special Protection Areas (SPAs) classified under the 1979 Birds Directive[2], which support internationally important wild bird populations.

The Severn Estuary is also classified as a Special Protection Area (SPA) under the EC Birds Directive. The Severn Estuary European marine site includes the majority of the Severn Estuary SPA and the whole of the Severn Estuary / Môr cSAC. CCW and Natural England's predecessor English Nature, issued their advice under Regulation 33(2)(a) and 33(2)(b) in relation to the SPA in February 2005.[3]

[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] English Nature and CCW (2005) *The Severn Estuary Special Protection Area European marine site: English Nature & the Countryside Council for Wales' advice for the Severn Estuary Special Protection Area given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994.* (http://naturalengland.communisis.com/NaturalEnglandShop/product.aspx?ProductID=4ea1651b-a908-4432-aa81-cdf24d68e6e2)

The Severn Estuary is also designated as a 'Ramsar site' under the Convention on Wetlands of International Importance especially as Waterbird Habitat, because it supports internationally important wetlands and wetland species. According to UK and Welsh Assembly Government policy, Ramsar sites should receive the same level of protection as European sites.[4]

Under Regulation 33(2)(b) of the Habitats Regulations, Natural England and CCW are required 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 Severn Estuary / Môr Hafren cSAC has been selected. Natural England and CCW will provide that advice at a later date.

This document:

- is designed to help relevant and competent authorities responsible for complying with the requirements of the Habitats Directive to understand the international importance of the site and the underlying physical and ecological processes supporting the habitats and species for which the cSAC is selected.

- is intended to assist the relevant authorities to develop, if considered appropriate, a management scheme under Regulation 34 of the Habitats Regulations, under which they shall exercise their functions in accordance with the requirements of the Directive;

- contains Natural England and CCW's advice to competent authorities as to the conservation objectives of the cSAC, for the purpose of considering plans and projects in accordance with Article 6 of the Habitats Directive and Parts IV and IVa of the Habitats Regulations. Natural England and CCW will provide more detailed advice to competent authorities to assess the implications of particular plans or projects, where appropriate, at the time those plans or projects are being considered.

The advice in this document is subject to review by Natural England and CCW, for example to:

- add further advice on monitoring requirements in order to assess the degree to which the conservation objectives are being achieved in future;
- add advice on operations likely to damage the features for which the cSAC is selected (under Habitats Regulation 33(2)(b));
- take account of new information about the European site or its features, or any future changes to the designation.

Rhagair

Môr Hafren yw'r aber gwastadedd arfor mwyaf yn y DU, a cheir yno wastadeddau tywod a gwastadeddau llaid mawr, llwyfannau glannau creigiog, graean bras ac ynysoedd. Ceir morfa heli'n ymylu ar yr arfordir, ac yn cefnu arno ceir cors bori dŵr croyw ac ambell ffos hallt. Mae ffurf twmffat yr aber, sy'n unigryw i'r DU, yn rhywbeth sy'n peri i'r Hafren fod efo'r

[4] Office of the Deputy Prime Minister (2005) *Planning Policy Statement 9: Biological and Geological Conservation,* Welsh Assembly Government (2006*) Draft Revised Technical Advice Note 5 Nature Conservation and planning,* DETR (2000) *Ramsar sites in England*, National Assembly for Wales (2001) *Ramsar sites in Wales*.

amrediad llanw uchaf ond un drwy'r byd (ar ôl Bae Fundy, Canada) – uwch na 12 metr. Mae'r drefn lanwol hon yn arwain at gymunedau planhigion ac anifeiliaid sy'n nodweddiadol o amodau eithafol sy'n gysylltiedig â llif cryf, gwaddodion symudol, halwynedd cyfnewidiol, llawer o gymylogrwydd a llawer o sgwrio. Fel gyda nifer o aberoedd eraill yng Nghymru a Lloegr, mae Môr Hafren wedi bod yn ganolbwynt i weithgareddau dyn, yn lleoliad i aneddiadau, yn ffynhonnell ar gyfer bwyd, dŵr a deunyddiau crai, ac yn ganolbwynt i fasnach a gwaith archwilio. Mae'r aber a'i gyffiniau arfordirol yn cynnal dinasoedd mawrion, gan gynnwys Caerdydd, Bryste, Casnewydd a Chaerloyw. Mae porthladdoedd Môr Hafren yn bwysig iawn i'r economi ranbarthol ac, mewn rhai achosion, i'r economi genedlaethol. Mae'r traethau a'r arfordir annatblygedig, efo'r gwastadeddau isel, y gwlyptiroedd dŵr croyw a'r golygfeydd o'r clogwyni, yn cynnig canolbwynt pwysig i weithgareddau hamdden a'r modd y caiff bywyd gwyllt yr aber ei werthfawrogi.

Ym mis Awst cafodd Môr Hafren ei gyflwyno gan Lywodraeth y DU i'r comisiwn Ewropeaidd fel ymgeisydd am Ardal Cadwraeth Arbennig (yACA) dan Erthygl 4 Cyfarwyddeb Cynefinoedd a Rhywogaethau'r CE er mwyn cydnabod ei bwysigrwydd o ran gwarchod bioamrywiaeth ar lefel Ewropeaidd.

Mae'r ddogfen hon yn cynnwys y cyngor a gyflwynir ar y cyd gan Natural England a Chyngor Cefn Gwlad Cymru i awdurdodau perthnasol eraill ymgeisydd am ACA Severn Estuary / Môr Hafren parthed amcanion cadwraethol yr yACA. Caiff y cyngor hwn ei gynnig er mwyn cyflawni ein hymrwymiadau i'r yACA, fel safle morol Ewropeaidd, dan Reoliad 33(2)(a) y Conservation (Natural Habitats, &c.) Regulations 1994, fel y'u diwygiwyd (y Rheoliadau Cynefinoedd).

Caiff maint ymgeisydd am ACA Severn Estuary / Môr Hafren ei ddangos yn Atodiad 1. Mae safleoedd morol Ewropeaidd yn cael eu diffinio yn y Rheoliadau Cynefinoedd fel unrhyw ran o safle Ewropeaidd a orchuddir (yn barhaol neu'n ysbeidiol) gan ddyfroedd llanwol neu unrhyw ran o'r môr yn, neu gerllaw, Prydain Fawr hyd at derfyn atfor y dyfroedd tiriogaethol. Mae safleoedd Ewropeaidd yn cynnwys Ardaloedd Cadwraeth Arbennig (ACA) ac ymgeiswyr am Ardaloedd Cadwraeth Arbennig (yACA) a ddynodwyd dan Gyfarwyddeb Cynefinoedd 1992[5], sy'n cynnal rhywogaethau a chynefinoedd naturiol o bwysigrwydd Ewropeaidd, ac Ardaloedd Gwarchodaeth Arbennig (AGA) a ddosbarthwyd dan Gyfarwyddeb Adar 1979[6], sy'n cynnal poblogaethau o adar gwyllt rhyngwladol bwysig.

Hefyd, caiff Môr Hafren ei ddosbarthu fel Ardal Gwarchodaeth Arbennig (AGA) dan Gyfarwyddeb Adar y CE. Mae safle morol Ewropeaidd Môr Hafren yn cynnwys y rhan fwyaf o AGA Severn Estuary ac yACA Severn Estuary / Môr Hafren yn ei gyfanrwydd. Cyhoeddodd y Cyngor Cefn Gwlad a rhagflaenydd Natural England, sef English Nature, eu cyngor dan Reoliad 33(2)(a) a 33(2)(b) mewn perthynas â'r AGA fis Chwefror 2005.[7]

Yn ogystal, mae Môr Hafren wedi ei ddynodi yn 'safle Ramsar' dan y Convention on Wetlands of International Importance especially as Waterbird Habitat, gan ei fod yn cynnal rhywogaethau gwlyptiroedd, ynghyd â gwlyptiroedd rhyngwladol bwysig. Yn ôl polisïau'r

[5] Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.
[6] Council Directive 79/409/EEC on the conservation of wild birds.
[7] English Nature and CCW (2005) *The Severn Estuary Special Protection Area European marine site: English Nature & the Countryside Council for Wales' advice for the Severn Estuary Special Protection Area given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994.* (http://naturalengland.communisis.com/NaturalEnglandShop/product.aspx?ProductID=4ea1651b-a908-4432-aa81-cdf24d68e6e2)

DU a Llywodraeth Cynulliad Cymru, fe ddylai safleoedd Ramsar gael eu gwarchod yn yr un modd â safleoedd Ewropeaidd.[8]

Yn ôl Rheoliad 33(2)(b) y Rheoliadau Cynefinoedd, mae'n ofynnol i Natural England a'r Cyngor Cefn Gwlad gynnig cyngor i awdurdodau perthnasol ynghylch unrhyw waith a allai arwain at ddirywiad yn y cynefinoedd naturiol neu yng nghynefinoedd y rhywogaethau sy'n sail i yACA Severn Estuary / Môr Hafren, neu darfu ar y rhywogaethau hyn. Fe fydd Natural England a'r Cyngor Cefn Gwlad yn cyflwyno'r cyngor hwn yn nes ymlaen.

Dyma rywfaint o wybodaeth am y ddogfen hon:

- Ei diben yw cynorthwyo awdurdodau perthnasol a chymwys sy'n gyfrifol am gydymffurfio efo gofynion y Gyfarwyddeb Cynefinoedd i ddeall pwysigrwydd rhyngwladol y safle a'r prosesau ffisegol ac ecolegol sy'n cynnal y cynefinoedd a'r rhywogaethau sy'n sail i'r yACA.

- Ei bwriad yw cynorthwyo'r awdurdodau perthnasol i ddatblygu cynllun rheoli, os yw hynny'n briodol, dan Reoliad 34 y Rheoliadau Cynefinoedd, gan gyflawni'u swyddogaethau'n unol â gofynion y gyfarwyddeb.

- Mae'n cynnwys y cyngor y mae Natural England a'r Cyngor Cefn Gwlad yn ei gyflwyno i awdurdodau cymwys o safbwynt amcanion cadwraethol yr yACA, fel y gellir ystyried cynlluniau a phrosiectau'n unol ag Erthygl 6 y Gyfarwyddeb Cynefinoedd a Rhannau IV a IVa y Rheoliadau Cynefinoedd. Pan fo hynny'n briodol, fe fydd Natural England a'r Cyngor Cefn Gwlad yn cynnig cyngor manylach i awdurdodau cymwys er mwyn asesu goblygiadau cynlluniau neu brosiectau arbennig, a hynny pan fydd y cynlluniau neu'r prosiectau'n cael eu hystyried.

Bydd Natural England a'r Cyngor Cefn Gwlad yn adolygu'r cyngor a geir yn y ddogfen hon, er enghraifft er mwyn:

- ychwanegu cyngor pellach ynghylch gofynion monitro er mwyn asesu i ba raddau y caiff amcanion cadwraethol eu cyflawni yn y dyfodol;
- ychwanegu cyngor yn ymwneud â gwaith sy'n debygol o niweidio'r nodweddion sy'n sail i'r yACA (dan Reoliad Cynefinoedd 33(2)(b));
- ystyried gwybodaeth newydd am y safle Ewropeaidd neu ei nodweddion, neu unrhyw newidiadau a all ddigwydd i'r dynodiad yn y dyfodol.

[8] Office of the Deputy Prime Minister (2005) *Planning Policy Statement 9: Biological and Geological Conservation,* Welsh Assembly Government (2006*) Draft Revised Technical Advice Note 5 Nature Conservation and planning,* DETR (2000) *Ramsar sites in England*, National Assembly for Wales (2001) *Ramsar sites in Wales*.

1. Introduction

1.1 Natura 2000

The European Union Habitats[9] Directive is an international obligation which sets out a number of actions to be taken for nature conservation. The Habitats Directive aims to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements, and sets out measures to maintain or restore, natural habitats and species of European Union interest at favourable conservation status[10].

The Habitats Directive includes requirements for the designation of Special Areas of Conservation (SAC) which support certain natural habitats or species.

SAC, along with Special Protection Areas (SPA) designated under the Birds Directive[11] are known in Great Britain as European Sites and will form a network of conservation areas to be known as 'Natura 2000'. Where SAC or SPA consist of marine areas they are referred to as European marine sites.[12]

There are various sources of guidance on the legal framework for European sites and European marine sites.[13]

1.2 The role of Natural England and the Countryside Council for Wales

The Conservation (Natural Habitats &c.) Regulations 1994, as amended transpose the Habitats Directive into law in Great Britain. The give Natural England and the Countryside Council for Wales a statutory responsibility to advise relevant authorities as to the conservation objectives for European marine sites in England and Wales and to any operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species for which the sites have been designated. This information will be a key component of any management scheme that may be developed for this site. It will also aid competent authorities in defining the scope and nature of 'appropriate assessment' which the Habitats Directive requires to be undertaken for 'plans and projects' having a significant effect on the European site (Habitats Regulations 20, 48, 50 and 85B). Note that Natural England and the Countryside Council for Wales will also advise competent authorities on individual plans and projects as they arise. Natural England and the Countryside Council for Wales are also competent and relevant authorities under the Habitats Regulations.

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

[10] 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.

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

[12] "Marine areas" are defined in the Habitats Regulations as 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."

[13] *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* (DETR & The Welsh Office, 1998), Office of the Deputy Prime Minister (2005) *Planning Policy Statement 9: Biological and Geological Conservation,* Welsh Assembly Government (2006*) Draft Revised Technical Advice Note 5 Nature Conservation and planning,* CCW (undated) *Natura 2000: European wildlife sites.*

1.3 The role of other competent and relevant authorities

The Conservation (Natural Habitats &c.) Regulations 1994 require competent authorities to exercise their functions so as to secure compliance with the requirements of the Habitats Directive. The term "competent authority" includes all public bodies and statutory undertakers. The Regulations identify a number of competent authorities as "relevant authorities", with particular functions in relation to European marine sites. In addition to their duties as competent authorities, under Regulation 34 the relevant authorities may establish a management scheme for a European marine site under which they shall exercise their relevant functions. Such a management scheme should be guided by the information contained in this document. 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, Sites of Special Scientific Interest management plans, local Biodiversity Action 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 cSAC, 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 requirement for relevant authorities to take any actions outside their statutory functions. For the purposes of this document the term 'interest feature' refers to any of the habitat types or species for which the cSAC has been identified.

Under certain circumstances, where another relevant authority is unable to act for legal reasons, or where there is no other relevant authority, Natural England and the Countryside Council for Wales are empowered to use their bylaw-making powers under Habitats Regulation 36.

1.4 Responsibilities under other conservation designations

In addition to its candidate SAC status, the Severn Estuary is also a Special Protection Area (SPA) and designated and subject to agreements under other conservation legislation. Parts of it are notified as Sites of Special Scientific Interest (SSSIs) under the 1981 Wildlife and Countryside Act. The Estuary is also a Wetland of International Importance ("Ramsar site") under the 1971 Ramsar Convention and Bridgwater Bay is also a National Nature Reserve. The obligations of relevant authorities and other organisations under such designations are not directly affected by the advice contained in this document.

1.5 Role of the conservation objectives

The role of the conservation objectives for a European (marine) site is to define the nature conservation aspirations for the features of interest, thus representing the aims and requirements of the Habitats and Birds Directives in relation to that site.

The Habitats Directive requires that:

- measures taken under it are designed to maintain or restore habitats and species of European importance at "favourable conservation status" (FCS). According to the Directive, a habitat will be at FCS when its range and area are stable or increasing, the specific structure and functions necessary for its long term maintenance exist and are likely to continue to exist, and the conservation status of its typical species is favourable;
- appropriate steps are taken in SAC to avoid the deterioration of habitats and significant disturbance of species;
- any plan or project not directly connected with or necessary to the management of the site (for nature conservation) but likely to have a significant effect on it, is subject to appropriate assessment in view of the site's conservation objectives.

Therefore, the conservation objectives for the Severn Estuary cSAC represent Natural England and the Countryside Council for Wales' current judgement of the appropriate contribution of the site to the achievement of the favourable conservation status of the habitats and species for which the cSAC has been identified. The conservation objectives in this document are intended to guide relevant and competent authorities in the exercise of their functions to comply with the requirements of the Directives outlined above.

In relation to the Severn Estuary cSAC, Natural England and the Countryside Council for Wales use the term "favourable condition" for the condition represented by the achievement of the conservation objectives, in other words the desired condition for a designated habitat or a species on an individual site.

On many terrestrial European sites, we know sufficient about the required condition of qualifying habitats to be able to define favourable condition with confidence. In contrast understanding the functioning of large, varied, dynamic marine and estuarine sites, which experience a variety of pressures resulting from historic and current activities, is much more difficult, consequently it is much harder to define favourable condition so precisely in such sites. In general the conservation objectives provided are based on a *working* assumption that the *current* condition of the features is favourable for most attributes. Nevertheless there are certain instances where the assumption does not apply, in particular some of the intertidal habitats of the Severn are subject to coastal squeeze. In such instances, where existing problems *have* been identified, the relevant objectives reflect this.

If it becomes evident that the condition of other features is significantly degraded, and is therefore unfavourable, then restorative management actions will need to be undertaken to return the interest feature to favourable condition. In future revisions of our advice under Regulation 33, NE and CCW will keep our assumption under review in light of ongoing and future monitoring and our developing understanding of the features and the factors affecting them.

More detailed information regarding the measures and targets that will be used during site monitoring to determine whether favourable condition is being achieved in practice is in preparation and will be issued at a later date.

1.6 Advice as to operations

Natural England and CCW's advice under Regulation 33(2)(b) is in preparation and will be issued at a later date.

2. Description of the site

The Severn Estuary is the largest example of a coastal plain estuary in the United Kingdom and one of the largest estuaries in Europe with an area of 73,678 ha (see Appendices 1 and 2). It lies in the broad Severn Vale, with most of the sediments on the margins of the estuary having accumulated since the last ice age. As with many other estuaries in England and Wales, it has been a focus for human activity, a location for settlement, a source of food, water and raw materials and a gateway for trading and exploration. The Estuary and its coastal hinterland support the cities of Cardiff, Bristol, Newport and Gloucester. Today, major industries are sited around the Estuary's shores. There are modern port installations, chemical processing companies and nuclear power stations among others.

Exploitation of the natural resources includes commercial shrimp fishing and fishing for salmon using putchers, lave nets, draught nets and bag nets. The Severn supports an important eel fishery. Aggregate extraction also occurs within the estuary.

Human activity has increasingly influenced the character of the marginal wetland mudflats and marshes, with extensive land claim occurring during and since the Roman period. Sediment flows and fluxes affecting the estuary are of particular importance for estuarine processes and ecology and the morphology of the estuary is constantly changing due to the complex hydrodynamics. Sediment deposits provide essential material to maintain the mudflats, sandflats and saltmarsh. Estuary-wide fluctuations in the wind-wave climate over recent centuries have led to major movements of the high-tide shoreline, and some reclaimed lands have been lost (Allen, 1990).

Alongside all these competing activities, the Estuary also supports a wide array of habitats and species of international importance for nature conservation.

The Severn Estuary is important for its immense tidal range, which affects both the physical environment and the diversity and productivity of the biological communities. The tidal range is the second largest in the world, reaching 12.3 m at Avonmouth. This macrotidal environment is partly due to a funnel shape which concentrates the tidal wave as it moves up the Bristol Channel. Tidal currents are also amplified and exceed 7 metres per second close to Avonmouth (British Geological Survey, 1996). There are several major rivers, including the Taff, Usk, Wye, Severn, Avon and Parrett which feed into the estuary causing changes in salinity which varies from brackish to fully saline, depending on the season and rainfall. Together these rivers tend to produce a marked east-west salinity gradient. Fine sediments from erosion of the intertidal zone and suspended sediments in river water entering the estuary create high turbidity, which has its highest average level between Avonmouth and the outer part of Bridgwater Bay (British Geological Survey, 1996). The strong tidal currents create a highly dynamic environment and the resultant scouring of the seabed and high turbidity give rise to low diversity communities. The Severn has an extreme type of hydrodynamic and sedimentary regime which distinguishes it from other estuaries and which dominates the whole system. It is estimated that the estuary carries 10 million tons of suspended sediments on spring tides. Such conditions were initiated by the start of sea-level rise in late glacial times, with some evidence for steady sedimentation persisting for at least 5000 years, during which there has been a steady rise in sea level of 5 m, a trend continuing at present at a rate of 0.3 mm per year (British Geological Survey, 1996).

The extreme hydrodynamic and sedimentary conditions determine the type of habitats and species present and result in characteristic animal and plant communities. The Severn Estuary

comprises many different habitats including saltmarsh, intertidal and subtidal mud and sand, mixed mud and sand, rock outcrops, boulder and shingle shores as well as biogenic reefs. There are sandy beaches on the southern shores in the outer part of the estuary, backed by sand dunes. The predominant unconsolidated sediments are muds and sands.

The intertidal habitats include saltmarsh, mud and sandflats, mixed mud and sand, rock outcrops, boulder and shingle shores. The intertidal zone of mudflats, sandbanks, rocky platforms and saltmarsh is one of the largest and most important in Britain. The extensive intertidal mudflats and sandflats cover an area of 20,271 ha, the fourth largest area in a UK estuary. Whilst the diversity of species is often low, in places the mudflats and sandflats support dense populations of marine invertebrate species, which provide a food source for the large populations of waterfowl and the many species of fish.

There are areas of rocky shore consisting of boulders, rock, mussel/cobble scars, rocky pools and shingle covering 1,500 ha in total which are also highly productive and diverse areas biologically and provide valuable feeding and roosting sites for birds. Beds of eelgrass (*Zostera* spp.), the largest in Wales, occur on some of the more sheltered areas around the Welsh side of the Second Severn Crossing. Both species of eelgrass, *Zostera marina*, and *Z. noltei* have been recorded in the estuary. These are of restricted distribution in British estuaries. It is unusual to have both species in one location. The estuarine fauna includes internationally important populations of waterfowl, important invertebrate populations and large populations of fish.

The Severn Estuary is fringed by saltmarsh and holds the largest aggregation of saltmarsh in the south and south-west of the UK. It covers approximately 1,400 ha, representing about 4% of the total area of saltmarsh in the UK (Dargie, 2000). Some of the saltmarshes show a sequence of saltmarsh cliffs related to past cycles of accretion and erosion. Recent monitoring has identified that there is a complicated present day pattern of erosion and accretion of the saltmarshes throughout the estuary and some parts appear to be exhibiting the effects of coastal squeeze. The Severn Estuary saltmarshes are generally grazed by sheep and/or cattle, a significant factor in determining the plant communities found within them.

The huge tidal range in the Severn Estuary has led to extensive saltmarsh community development with expanded zonation. This includes upper marsh transitions to terrestrial and freshwater habitats that support rare or uncommon species. Another important feature is a series of micro-cliffs or steps that have developed as a result of past cycles of erosion and deposition. These add diversity to the saltmarsh by initiating new patterns of species zonation.

Saltmarshes and mudflats have an important role to play in estuarine processes, both through the recycling of nutrients within the estuary and through their role as soft sea defences, dissipating wave energy. They are highly productive biologically, providing organic material that support other features within the marine ecosystem. They also have an important physical role, acting as a sediment store to the estuary as a whole and in providing feeding and roosting sites for waders and wildfowl particularly at high tide.

The subtidal sediments of the Severn Estuary, including the sandbanks, vary from gravely to muddy sediments and are influenced by the strong tidal currents. The mobility of these sediments means that they only support animals that can tolerate the shifting seabed and scouring action of suspended sand. The communities therefore reflect the high turbidity and strong tidal streams of the Severn Estuary. The sand banks of the Middle and Welsh Grounds are relatively permanent sandbank features in the Severn Estuary, along with other

long established sandbank features at Cardiff Grounds and in Bridgwater Bay. The tops of these banks are intertidal. More ephemeral sandbanks also occur in the estuary, including areas offshore from Avonmouth and at English Grounds (near Clevedon).

The subtidal area supports honeycomb worm reefs, composed of tubes built by small worms (*Sabellaria* spp.) that use sand particles to build honeycomb-like structures. *Sabellaria alveolata* is predominantly an intertidal species but the Severn Estuary is one of the few places in the UK where *S. alveolata* occurs extensively in the subtidal, as well as the intertidal. There are patches of intertidal *S. alveolata* reef throughout the Estuary, although it tends to be more common on the English side. The subtidal *S. alveolata* tends to be in the outer parts of the Estuary, southwest of Clevedon and Newport. These biogenic reefs tend to increase habitat diversity for other species, leading to higher species diversity within *Sabellaria* reefs compared to the surrounding sediment or rock

The fish fauna of the Severn Estuary is very diverse (Potts & Swaby 1994, Bird 2008). More than 110 species of fish have been identified, which include seven different species of migratory fish, more than any other British estuary. The estuary is one of the most important British estuaries for several rare species, including river lamprey *Lampetra fluviatilis*, sea lamprey *Petromyzon marinus and* twaite shad *Alosa fallax*. The river and sea lamprey are a primitive type of fish having a distinctive suckered mouth but no jaws. Although numbers of lamprey have declined over the last 100 years, the UK is still one of their strongholds. Sea and river lampreys spend their adult life in the sea or estuaries but spawn and spend the juvenile phase in rivers. They use the Severn Estuary as a migratory passage to and from their spawning and nursery grounds in the rivers. Allis and twaite shad are the only two members of the herring family found in fresh water in the UK. Both look like large herring and were formerly eaten in this country before numbers declined and the fisheries collapsed. In the middle of the 19th Century, the value of shad rivalled that of salmon, and in the River Severn, shad made up about one-third of all catches. Three of the four confirmed UK spawning populations of twaite shad are in the rivers Severn, Usk and Wye respectively. The major part of the spawning population of Twaite shad consists of fish that have spawned and passed up and down through the estuary more than once.The shad enter estuaries in spring and move up into the rivers to spawn. The estuary serves as a nursery area for juvenile shad where they feed on plankton. The Severn Estuary also supports an important run of migratory salmon. These fish pass through the estuary on their way to and from their spawning grounds in the upper reaches of the rivers and the open sea. The Severn Estuary also has the largest eel run in Great Britain.

Many estuaries in the UK are of great importance to migratory and wintering wildfowl and waders. The Severn Estuary forms part of the complex chain of estuary sites along the western coast of the UK that provide habitats for migratory waterfowl. The relatively mild winter weather conditions found here compared to continental Europe at similar latitudes can be of additional importance to the survival of wintering waterfowl during periods of severe weather. It is especially important when there is severe weather affecting other sites further north and on the east coast of Britain. The Severn Estuary ranks amongst the top ten British estuaries for the size of visiting waterfowl populations that it supports over winter (Musgrove *et. al*., 2001). Outside of this period, it is of particular importance as a staging area in autumn and spring for migratory waterfowl species as it lies on the East Atlantic Flyway route.

3. Qualifying interest features of the Severn Estuary / Môr Hafren candidate SAC

The Severn Estuary has been submitted to the European Commission as a candidate SAC on the basis that it supports occurrences of habitat types and species listed in Annexes I and II respectively of the Habitats Directive that are considered important in a European context and meeting the criteria in Annex III of the Directive. These are the interest features of the cSAC and are listed in the Table below. Each interest feature has a conservation objective in Section 4 of this document.

Common name	**Scientific term**[10]	**EU Code**[14]
Annex I habitat types		
estuaries	estuaries	1130
subtidal sandbanks	sandbanks which are slightly covered by seawater all the time	1110
intertidal mudflats and sandflats	mudflats and sandflats not covered by seawater at low tide	1140
Atlantic salt meadows	Atlantic salt meadows (*Glauco puccinellietalia maritimae)*	1330
reefs	reefs	1170
Annex II species		
River lamprey	*Lampetra fluviatilis*	1099
Sea lamprey	*Petromyzon marinus*	1095
Twaite shad	*Allosa fallax*	1103

[14] European Commission (2007) Interpretation Manual of EU Habitats EUR27 July 2007, and Natura 200-Standard Data Form Explanatory Notes, Appendix C.

4. Conservation objectives for the Severn Estuary / Môr Hafren candidate SAC

The protection and management of the cSAC in accordance with Article 6 of the Habitats Directive, including in particular the consideration of plans and projects under Article 6(3) and 6(4), should be carried out in view of the conservation objectives in this section.

All the conservation objectives are subject to review by Natural England and the Countryside Council of Wales.

4.1 Interest feature 1: Estuaries

The conservation objective for the "estuaries" feature of the Severn Estuary cSAC is to maintain the feature in favourable condition, as defined below:

The feature will be considered to be in favourable condition when, subject to natural processes[1], each of the following conditions are met

i. the total extent of the estuary[2] is maintained;

ii. the characteristic physical form (tidal prism/cross sectional area) and flow (tidal regime)of the estuary is maintained;

iii. the characteristic range and relative proportions of sediment sizes and sediment budget[3] within the site is maintained;

iv. the extent, variety and spatial distribution[4] of estuarine habitat communities[5] within the site is maintained[6];

v. the extent, variety, spatial distribution[4] and community composition of notable communities[5(v)] is maintained;

vi. the abundance of the notable estuarine species assemblages[7] is maintained or increased;

vii. the physico-chemical characteristics[8] of the water column[9] support the ecological objectives described above;

viii. Toxic contaminants in water column[9] and sediment are below levels which would pose a risk to the ecological objectives described above.

The meaning of terms [1-9] above is explained in **section 4.1.1**.

Figure 2 shows the extent of the "estuaries" feature within the Severn Estuary cSAC European Marine Site.

4.1.1 Explanatory information for the "estuaries" conservation objective

[1] Natural processes

Each feature may be subject to both natural processes and human influence. Human influence on the interest features is acceptable provided that it is proved to be / can be established to be compatible with the achievement of the conditions set out under the definition of favourable condition for each interest feature. A failure to meet these conditions, which is entirely a result of natural process will not constitute unfavourable condition, but may trigger a review of the definition of favourable condition.

Dynamic physical process within estuaries can stem from variable weather conditions including one off storm events, and result in changes in wave exposure, riverine floods or tidal surges. These events can move large quantities of sediments and alter channel morphology, which affect current patterns and sediment transport within the estuary.

Where these processes occur without significant anthropogenic influence they fall under the umbrella of 'natural change'. Because estuaries are dynamic systems we can expect the amount and gross distribution of habitats to change in the future. In general estuarine communities and their supporting habitats are intrinsically more dynamic over short timescales when compared to other marine and terrestrial habitats. Some estuarine communities occur in cycles dependant upon the prevailing physical conditions. Features should not necessarily be considered in unfavourable condition caused by to the short term disappearance of a particular community due to natural processes.

An important example of natural processes occurring over a longer timescale is that estuaries have a natural tendency to accumulate sediment, thereby changing their form from their original glacial morphology to a state where tidal energy is dissipated by sediment banks and other features such as saltmarsh. This, with other forces of natural change, will therefore cause the width and depth of the estuary to change over time, moving towards a state of dynamic equilibrium or 'most probable state'. As part of this process, the location and extent of saltmarshes and mudflats may change, provided there is capacity to accommodate readjustment. Future developments should aim to avoid impact on the future evolution of the system as where this process is constrained by human influence, the capacity of habitats to accommodate readjustment may be affected.

[2] Extent of the estuary

The landward limit of the estuary feature is the limit of highest astronomical tide, except where the landward limit is defined as straight lines across the mouths of rivers entering the estuary. The seaward limit is as shown in the map in Figure 1. Where other Habitats Directive Annex I habitat types occur within the estuary, they also form part of the estuary feature. In addition, there are areas of the estuary which do not form part of other Annex I habitat types.

[3] Sediment budget

The sediment budget refers to the total amount of sediment within the Severn Estuary taking into account the balance of sediment inputs and outputs.

[4] Spatial distribution

Spatial distribution of estuarine communities refers to the macro spatial pattern in which communities are distributed around the estuary. This statement does not require micro-distribution of communities e.g. the exact mapped positions of specific communities to be maintained.

[5] Estuarine habitat communities

> ***Note:*** *sections i – iv below list the habitat types which are also features of the Severn Estuary cSAC in their own right as well as being 'sub-features' of the estuary feature. The detailed definitions of favourable conservation status for these features are provided under their respective conservation objectives.*

i. Subtidal sandbanks *(see section 4.2 for the conservation objective for this feature)*
   - Sublittoral Sands and Muddy Sands

- Sublittoral cohesive mud and sandy mud communities

ii. Intertidal mudflats and sandflats (*see section 4.3 for the conservation objective for this feature)*
   - Intertidal gravel and clean sands
   - Intertidal muddy sands
   - Intertidal muds

iii. Atlantic saltmeadows (*see section 4.4 for the conservation objective for this feature)*
   - Low – mid marsh communities
   - Mid – upper marsh communities
   - Transitional high marsh communities
   - Pioneer marsh communities

iv. Reefs of *Sabellaria alveolata (see section 4.5 for the conservation objective for this feature)*
   - *Sabellaria alveolata* on variable salinity sublittoral mixed sediment (subtidal)
   - *Sabellaria alveolata* reefs on sand-abraded eulittoral rock (contiguous subtidal and intertidal)

v. Notable communities
   - *Sabellaria alveolata reefs on sand-abraded eulittoral rock* (MLR.Sab Salv)
   - *Hydroids, ephemeral seaweeds and Littorina littorea in shallow eulittoral mixed substrata pools.* **(**LR.RkpH)
   - *Balanus crenatus and Tubularia indivisa on extremely tide-swept circalittoral rock.* (ECR.BS.BalTub) *Fucus serratus* and piddocks on lower eulittoral soft rock (MLR.Fser.Pid)
   - *Mytilus edulis* and piddocks on eulittoral firm clay (MLR.MytPid)
   - *Balanus crenatus, Halichondrea panicea* and *Alcyonidium diaphanum* on extremely tide-swept sheltered circalittoral rock (ECR.BalHpan)
   - *Sertularia cupressina and Hydrallmania falcate* on tide-swept sublittoral cobbles or pebbles in coarse sand (IGS.ScupHyd).
   - Peat and clay exposures
   - *Corralina officinalis* and coralline crusts in shallow eulittoral rockpools (LR.Cor)
   - Eel grass (*Zostera*) beds
   - Any other notable hard substrata communities that may be identified.

[6] Maintained

Since the late 1990s Natural England's condition assessment has identified that parts of the saltmarsh within the Severn Estuary appear to be exhibiting the effects of coastal squeeze. For this reason NE and CCW do not consider it sufficient simply to seek to maintain the existing saltmarsh resource, rather it is our advice that measures will be required which seek to recreate the approximate extent of saltmarsh habitat present within the estuary in 1995 (the year the Severn Estuary was first identified as a proposed SAC); whilst at all times working within the framework of seeking a sustainable estuary form. N.B. This is based upon a site specific consideration of the state of habitats within the Severn Estuary, and should not be extended to other sites on the basis of this advice.

[7] Notable estuarine species assemblages

i. Assemblage of fish species:
   - Migratory species
     - River and Sea Lamprey and Twaite shad (Annex 1 species) and Allis shad
     - Sea trout, salmon, eel,
   - Estuarine species
     - Species typically occurring and breeding in estuaries (Bird, 2008)
     - Marine species occurring in large numbers in estuaries (Bird, 2008)
   - Marine species
     - Predominantly marine species occurring infrequently in the Severn (Bird, 2008)
   - Freshwater species
     - Species typically occurring and breeding in freshwater and recorded within the Severn cSAC (Bird, 2008)

ii Assemblage of waterfowl species (refer also to the Regulation 33 advice for the Severn Estuary SPA):
   - Regularly occurring Annex 1 species - Bewicks' swan
   - Regularly occurring migratory species - dunlin, redshank, shelduck, European white-fronted goose
   - Nationally important bird populations - wigeon, teal, pintail, pochard, tufted duck, ringed plover, grey plover, curlew, whimbrel and spotted redshank

iii. Assemblage of vascular plant species:
   - Salt marsh species (refer to notes 5 and 6 in section 4.4.1 - explanatory information on the conservation objective for the Atlantic salt meadows feature)
   - Eel grass *(Zostera)* species.

[8] Physical and chemical characteristics

These include nutrients, oxygen, turbidity, temperature and salinity.

[9] Water column

Water column should be read to include contributory water flows into the estuary including surface flows over mudflats and saltmarsh.

4.2 Interest feature 2: Subtidal sandbanks which are covered by sea water all the time (subtidal sandbanks)

The conservation objective for the "subtidal sandbanks" feature of the Severn Estuary cSAC is to maintain the feature in favourable condition, as defined below:

The feature will be considered to be in favourable condition when, subject to natural processes[1], each of the following conditions are met:

i. the total extent of the subtidal sandbanks[2] within the site is maintained;

ii. the extent and distribution[3] of the individual subtidal sandbank communities[4] within the site is maintained;

iii. the community composition[5] of the sub tidal sandbank feature within the site is maintained;

iv. the variety and distribution[3] of sediment types across the subtidal sandbank feature is maintained;

v. the gross morphology (depth, distribution and profile) of the subtidal sandbank feature within the site is maintained.

The meaning of terms [1-5] above is explained in **section 4.2.1**.

Figure 3 shows the extent of the "subtidal sandbanks" feature within the Severn Estuary cSAC European Marine Site.

4.2.1 Explanatory information for the "subtidal sandbanks" conservation objective

[1] Natural processes

The meaning of 'natural processes' is explained in **section 4.1.1**.

[2] Extent of subtidal sandbanks

The subtidal sandbanks in the Severn Estuary change their shape over time and many are ephemeral in nature, although some are relatively stable and long established. The extent of the Annex 1 habitat is considered to include both the actual sandbanks and their associated sediments. Areas of associated sediments have been defined by using the sediment environments of the Bristol Channel Marine Aggregates Resources and Constraints project, commissioned by the National Assembly for Wales (Posford Duvivier and ABP, 2000) Associated sediments have been defined as any area of of subtidal sand-sized sediment within the same sediment environment as a subtidal sandbank. Mobile sediments that form temporary sandbanks are considered to be associated sediments that should be retained in the system, but their location may change. Areas of holocence valley infill (relict sediment) are not mobile under present day estuarine conditions. Therefore, where Holocence infill is exposed, it is not considered to form part of the associated sediments. However, any mobile sand deposited over the infill does contribute to the associated sediments.

[3] Distribution

Distribution of sandbank communities and sediments refers to the macro spatial pattern in which these are distributed around the estuary. This statement does not require micro-distribution of communities or sediments e.g. the exact mapped positions of specific communities or sediments to be maintained.

The sand banks of the Middle and Welsh Grounds are relatively permanent sandbank features in the Severn Estuary, along with other long established sandbank features at Cardiff Grounds and in Bridgwater Bay. The tops of these banks are intertidal, and the permanently submerged parts of the banks are considered to contribute to the subtidal sandbanks habitat.

There are other areas of subtidal sandbank habitat within the Estuary, again sometimes the top of the bank may be exposed at low tide, with the submerged sections contributing to the subtidal sandbanks habitat. These banks are more ephemeral in nature, but are still considered part if the feature, and reflect the dynamic nature of the Severn Estuary. The areas where ephemeral subtidal sandbanks are known to occur include areas offshore from Avonmouth and at English Grounds (near Clevedon).

The macro-scale distribution of the subtidal sandbanks should be maintained, and there should be continued presence of ephemeral subtidal sandbanks in the Estuary.

[4] Subtidal sandbank communities

There are two groups of communities comprising the 'sub-features' of the subtidal sandbanks feature:

- Sublittoral Sands and Muddy Sands:

i. Infralittoral mobile sand in variable salinity (estuaries)
ii. Infralittoral mobile clean sand with sparse fauna
iii. *Nephtys cirrosa* and *Macoma balthica* in variable salinity infralittoral mobile sand
iv. *Neomysis integer* and *Gammarus* spp. in fluctuating low salinity infralittoral mobile sand

- Sublittoral cohesive mud and sandy mud communities:

i. *Capitella capitata* in enriched sublittoral muddy sediments
ii. *Nephtys hombergii* and *Tubificoides* spp. in variable salinity infralittoral soft mud
iii. *Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment*
iv. *Nephtys hombergii* and *Macoma balthica* in infralittoral sandy mud*

(* these records have a lower degree of confidence than the other communities listed, i.e. the biotope assessor was uncertain regarding precisely which biotope should be recorded).

[5] Community composition

Species typical of the subtidal sandbank communities:

Aricidea minuta
Capitella capitata
Diastylis rathkei typica
Eurydice pulchra
Gammarus salinus

Harpinia pectinata
Mediomastus fragilis
Nephtys cirrosa
Nephtys hombergii
Oligochaeta
Pygospio elegans
Pontocrates arenarius
Pseudocuma longicornis
Retusa obtusa
Tubificoides amplivasatus

4.3 Interest feature 3 : Mudflats and sandflats not covered by seawater at low tide (mudflats and sandflats)

The conservation objective for "mudflats and sandflats" feature of the Severn Estuary cSAC is to maintain the feature in favourable condition, as defined below:

The feature will be considered to be in favourable condition when, subject to natural processes[1], each of the following conditions are met:

i. The total extent of the mudflats and sandflats feature[2] is maintained;

ii. the variety and extent of individual mudflats and sandflats communities[3] within the site is maintained;

iii. the distribution[4] of individual mudflats and sandflats communities[3] within the site is maintained;

iv. the community composition[5] of the mudflats and sandflats feature within the site is maintained;

v. the topography of the intertidal flats and the morphology (dynamic processes of sediment movement and channel migration across the flats) are maintained.

The meaning of terms [1-5] above is explained in **section 4.3.1.**

Figure 4 shows the extent of the "mudflats and sandflats" feature within the Severn Estuary cSAC European Marine Site.

4.3.1 Explanatory information for the "mudflats and sandflats" conservation objective

[1] Natural processes

The meaning of 'natural processes' is explained in **section 4.1.1.**

[2]Extent of the intertidal mudflats and sandflats

The extent of the feature is defined using intertidal Phase 1 survey information, which gives the seaward limit of the feature as the low water mark of spring tides (MLWS) because that is in practice the lower limit to which Phase 1 survey is possible. The feature does not include other intertidal habitats which are not mudflats and sandflats, such as intertidal reefs and rocky shores. This is the basis on which the feature is shown in the map in Figure 4, the total extent being 20,271 ha. However in addition there will be some areas of intertidal mudflat and sandflat seaward of MLWS and down to Lowest Astronomical Tide, which is the absolute seaward limit of this habitat type.

[3] Mudflat and sandflat communities

There are three groups of communities comprising the "sub-features" of the "Mudflats and sandflats not covered by seawater at low tide" feature:

• Intertidal gravel and clean sand communities

i. Barren coarse sand shores;
ii. Burrowing amphipods and *Eurydice pulchra* in well drained clean sand shores;
iii. Burrowing amphipods and polychaetes in clean sand shores.
iv. Talitrid amphipods in decomposing seaweed on the strandline
v. Dense *Lanice conchilega* in tide-swept lower shore sand
vi. Barren shingle or gravel shores

• Intertidal muddy sand communities :
i. Polychaetes and *Cerastoderma edule* in fine sand or muddy sand shores
ii. *Bathyporeia pilosa* and *Corophium spp.* in upper shore slightly muddy fine sand shores
iii. *Macoma balthica* and *Arenicola marina* in muddy sand shores.
iv. *Arenicola marina, Macoma balthica* and *Mya arenaria* in muddy sand shores.
v. *Echinocardium cordatum* and *Ensis sp.* in lower shore or shallow sublittoral muddy fine sand

• Intertidal mud communities:
i. *Hediste diversicolor* and *Macoma balthica* in sandy mud shores:
ii. *Hediste diversicolor, Macoma balthica* and *Arenicola marina* in muddy sand or sandy mud shores
iii. *Hediste diversicolor, Macoma balthica* and *Mya arenaria* in sandy mud shores.
iv. *Hediste diversicolor* and *Scrobicularia plana* in reduced salinity mud shores
v. *Hediste diversicolor* and oligochaetes in low salinity mud shores

[4] Distribution

The distribution of mudflats and sandflats communities refers to the macro spatial pattern in which these communities are distributed around the estuary. This statement does not require micro-distribution of communities e.g. the exact mapped positions of specific communities to be maintained.

[5] Community composition

Species typical of the mudflat and sandflat communities:

Aphelochaeta marioni
Arenicola marina
Bathyporeia pelagica
Corophium volutator
Enchytraeidae
Eurydice pulchra
Hediste diversicolor
Hydrobia ulvae
Macoma balthica
Nephtys cirrosa
Nephtys hombergii
Oligochaeta indet.
Pygospio elegans
Scoloplos armiger
Scrobicularia plana
Streblospio shrubsolii
Tubificoides benedii

4.4 Interest feature 4: Atlantic salt meadow

The conservation objective for the "Atlantic salt meadow" feature of the Severn Estuary cSAC is to maintain the feature in favourable condition, as defined below:

The feature will be considered to be in favourable condition when, subject to natural processes[1], each of the following conditions are met:

i. the total extent of Atlantic salt meadow and associated transitional vegetation communities[2] within the site is maintained[3];

ii. the extent and distribution[4] of the individual Atlantic salt meadow and associated transitional vegetation communities[2] within the site is maintained;

iii. the zonation of Atlantic salt meadow vegetation communities and their associated transitions[2] to other estuary habitats is maintained;

iv. the relative abundance of the typical species[5] of the Atlantic salt meadow and associated transitional vegetation communities[2] is maintained;

v. the abundance of the notable species[6]of the Atlantic salt meadow and associated transitional vegetation communities[2] is maintained.

vi. the structural variation of the salt marsh sward (resulting from grazing) is maintained within limits sufficient to satisfy the requirements of conditions iv and v above and the requirements of the Ramsar and SPA features[7]

vii. the characteristic stepped morphology of the salt marshes and associated creeks, pills, drainage ditches and pans, and the estuarine processes that enable their development, is maintained.

viii Any areas of *Spartina anglica* salt marsh (SM6) are capable of developing naturally into other saltmarsh communities.[8]

The meaning of terms [1-8] above is explained in **section 4.4.1.**

Figure 5 shows the extent of Atlantic salt meadow and its associated transitional vegetation communities within the Severn Estuary cSAC European Marine Site.

4.4.1 Explanatory information for the "Atlantic salt meadow" conservation objective

[1] Natural processes

The meaning of 'natural processes' is explained in **section 4.1.1**.

[2] Atlantic salt meadow and associated transitional vegetation communities

The vegetation communities comprising the Atlantic Salt Meadow feature can be grouped into four 'sub-features', namely:

(a) low to mid marsh communities

(b) mid to upper marsh communities
(c) transitional high marsh communities
(d) pioneer saltmarsh communities

The communities in each of these sub-features are listed below.

Sub-features (a) and (b) contain the National Vegetation Classification (NVC) communities which fall within the definition of Atlantic Salt Meadow in the EU Interpretation Manual. The extent of these two sub-features within the cSAC is currently estimated at 656 ha. The communities in (c) and (d) do not fall within the Atlantic Salt Meadow definition, but are considered to be important components of this feature as they represent its landward and seaward transitions to other habitat types, namely non-saline vegetation and pioneer salt marsh respectively. Atlantic salt meadow is a naturally dynamic habitat and these transitional communities are considered to be an integral part of the Atlantic Salt Meadow feature and essential elements of its structure and function. The total extent of all four of the above sub-features in the cSAC is estimated to be 1400 ha, distributed in the cSAC as shown in Figure 5.

(a) Low to mid marsh communities:

i. Transitional low saltmarsh with *Puccinellia maritima*, annual *Salicornia* sp. and *Suaeda maritima* SM10
ii. *Aster tripolium* (rayed) saltmarsh SM12
iii. *Puccinellia maritima* saltmarsh SM13
    - *Puccinellia maritima* sub-community SM13a
    - *Glaux maritima* sub-community SM13b
    - *Limonium vulgare - Armeria maritima* sub-community SM13c
    - *Plantago maritima - Armeria maritima* sub-community SM13d
    - *Plantago maritima–Triglochin maritima* sub-community SM13x (provisional)
    - *Spartina anglica* sub-community SM13y (provisional)
iv. *Atriplex portulacoides* saltmarsh SM14
    - *Atriplex portulacoides* sub-community SM14a
v. *Juncus maritimus - Triglochin maritima* saltmarsh SM15

(b) Mid to upper marsh communities:

i. *Festuca rubra* salt-marsh SM16
    - *Puccinellia maritima* sub-community SM16a
    - *Juncus gerardii* sub-community SM16b
    - *Glaux maritima* sub-community SM16c
    - *Festuca rubra* sub-community SM16d
    - *Leontondon autumnalis* sub-community SM16e
    - *Aster tripolium* sub-community SM16x (provisional)
ii. *Artemisia maritima* saltmarsh SM17
iii. *Juncus maritimus* salt-marsh SM18
    - *Festuca arundinacea* sub-community SM18c

(c) Transitional high marsh communities:

i. *Spergularia marina - Puccinellia distans* saltmarsh SM23
ii. *Elytrigia atherica* saltmarsh SM24
iii. *Elytrigia repens* saltmarsh SM28
iv. *Festuca rubra - Agrostis stolonifera - Potentilla anserina* inundation grassland MG11
v. *Festuca arundinacea* coarse grassland MG12

vi. *Agrostis stolonifera - Alopecurus geniculatus* inundation grassland MG13 vii. *Phragmites australis* reedbed S4
    - *Phragmites australis* sub-community S4a

xiii. *Bolboshoenus maritimus* swamp S21
    - *B. maritimus* sub-community S21a

Agrostis stolonifera sub-community S21c

(d) Pioneer saltmarsh communities:
i. Annual *Salicornia* saltmarsh SM8
ii. *Suaeda maritima* saltmarsh SM9

[3] Maintained

Since the late 1990s Natural England's condition assessment has identified that parts of the saltmarsh within the Severn Estuary appear to be exhibiting the effects of coastal squeeze. For this reason NE and CCW do not consider it sufficient simply to seek to maintain the existing saltmarsh resource, rather it is our advice that measures will be required which seek to recreate the approximate extent of saltmarsh habitat present within the estuary in 1995 (the year the Severn Estuary was first identified as a proposed SAC); whilst at all times working within the framework of seeking a sustainable estuary form. N.B. This is based upon a site specific consideration of the state of habitats within the Severn Estuary, and should not be extended to other sites on the basis of this advice.

[4]Distribution

The distribution salt meadow communities refers to the macro spatial pattern in which these are distributed around the estuary. This statement does not require micro-distribution of communities e.g. the exact mapped positions of specific communities to be maintained.

[5] Typical species of the Atlantic salt meadow

Festuca arundinacea
Festuca rubra
Juncus gerardii
Triglochin maritimum
Carex extensa
Agrostis stolonifera
Juncus maritimus
Oenanthe lachenalii
Puccinellia maritima,
Salicornia spp.
Suaeda maritima
Aster tripolium
Glaux maritima
Plantago maritima
Armeria maritima
Elytrigia atherica
Atriplex prostrata
Phragmites australis
Spartina anglica
Spergularia media
Puccinellia distans

Cochlearia anglica
Cochlearia officinalis
Limonium vulgare
Atriplex portulacoides
Seriphidium maritimum
Plantago coronopus
Beta vulgaris maritima

[6] Notable Atlantic salt meadow vegetation species

Alopecurus bulbosus
Althaea officinalis
Bupleurum tenuissimum
Hordeum marinum
Puccinellia rupestris
Trifolium squamosum
Lepidium latifolium
Allium oleraceum
Petroselinum segetum

[7] Severn Estuary SPA Conservation Objectives

For the requirements of the bird species of the Severn Estuary SPA refer to the English Nature (now Natural England) and Countryside Council for Wales advice given under Regulation 33 (2) of the Conservation (Natural Habitats &c.) Regulations 1994 issued in 2004 (http://naturalengland.communisis.com/NaturalEnglandShop/product.aspx?ProductID=4ea1651b-a908-4432-aa81-cdf24d68e6e2)

[8] *Spartina anglica* SM6

Spartina in the Severn is considered to be an invasive species and these conservation objectives do not seek the maintenance of the extent or condition of this habitat type. However, SM6 is considered to be a transitional salt marsh community and the conservation objectives seek to protect the ability of areas of *Spartina* to develop into other Atlantic Salt Meadow or transitional communities.

4. 5 Interest feature 5: Reefs

The conservation objective for the "reefs" feature of the Severn Estuary cSAC is to maintain the feature in a favourable condition, as defined below:

The feature will be considered to be in favourable condition when, subject to natural processes[1], each of the following conditions are met:

i. the total extent and distribution[2] of *Sabellaria* reef [3] is maintained;

ii. the community composition[4] of the *Sabellaria* reef is maintained;

iii. the full range of different age structures of *Sabellaria* reef are present;

iv. the physical[5]and ecological processes[6] necessary to support *Sabellaria* reef are maintained.

The meaning of terms [1 – 6] above is explained in **section 4.5.1** below.

Figure 6 shows the extent of the "reef" feature within the Severn Estuary cSAC European Marine Site.

4.5.1 Explanatory information for the "reefs" conservation objective

[1] Natural processes

The meaning of 'natural processes' is explained in section **4.1.1**

[2] Distribution

The distribution of reefs refers to the macro spatial pattern in which the reefs are distributed around the estuary. This statement does not require micro-distribution of the reefs e.g. the exact mapped positions of specific reefs to be maintained.

[3]*Sabellaria* reef

Little is known about the nature of the *Sabellaria alveolata* reef in the Severn Estuary, especially in the subtidal. However, at other sites *S. alveolata* is known to have a very variable recruitment and the cover in any one area may vary greatly over a number of years. *S. alveolata* reefs also cycle through different phases, from newly settled worms through vigorous fast growing reef to older hummocks. It is likely that subtidal *S. alveolata* reef in the Severn Estuary will exhibit reduced growth forms (lower elevation) in comparison to the intertidal reef habitat. The easiest of these phases to identify is the fast growing reef and for the purposes of these conservation objectives this is defined as a dense aggregation of worms (over 1000 per m^2, as a rough guide), generally forming a thick (2 cm or more) crust of tubes. The area covered by the habitat would generally exceed 25 m^2 although there could be patchiness within this area. The other phases of growth are also important and are encompassed in point iii of the objective.

The *S. alveolata* reef biotopes recorded in the Severn Estuary are SS.SBR.PoR.SalvMx *Sabellaria alveolata on variable salinity sublittoral mixed sediment* and LS.LBR.Sab.Salv *Sabellaria alveolata reefs on sand-abraded eulittoral rock.*

[4] Community composition

Species associated with dense aggregations of *Sabellaria alveolata* in the Severn estuary:

Subtidal

Sabellaria alveolata
Eulalia tripunctata
Mediomastus fragilis
Typosyllis armillaris
Ampharete grubei
Harpinia pectinata
Melinna cristata
Pygospio elegans
Scoloplos armiger
Nemertea
Nucula nitidosa
Nucula nucleus
Tubificoides amplivasatus
Golfingia vulgaris vulgaris
Gammarus salinus
Tubificoides
Arenicola marina
Sphenia binghami
Eumida sanguinea
Nephtys hombergii
Autolytus prolifera
Harmothoe impar
Nematoda
Polycirrus
Dodecaceria concharum
Harmothoe
Syllidae
Enchytraeidae

Intertidal

Sabellaria alveolata,
Actinia equina
Cancer pagurus
Elminius modestus
Littorina saxatilis
L.littorea
L.obtusata
Pholas dactylus
Pomatocerus lamarcki
Porcellana platycheles
Semibalanus balanoides
Halichondrea sp

Corallina officinalis
Enteromorpha sp.
Fucus serratus
Fucus vesiculosus
Pelvetia canaliculata
Porphyra sp
Ulva sp

[5]Physical processes

- abundance of suitable coarse sediments to support reef growth (tube building)
- the availability of suitable substrates where *Sabellaria* has been known to occur in the past

[6]Ecological Processes

- supply of *Sabellaria* larvae (within the water column)
- abundance of food (suspended detritus material) within the water column to support feeding

4.6 Interest feature 6 : River lamprey *Lampetra fluviatilis*

The conservation objective for the river lamprey *Lampetra fluviatilis* feature of the Severn Estuary cSAC is to maintain the feature in a favourable condition, as defined below:

The feature will be considered to be in favourable condition when, subject to natural processes[1], each of the following conditions are met:

i. the migratory passage of both adult and juvenile river lamprey through the Severn Estuary between the Bristol Channel and any of their spawning rivers is not obstructed or impeded by physical barriers, changes in flows, or poor water quality;

ii the size of the river lamprey population in the Severn Estuary and the rivers which drain into it, is at least maintained and is at a level that is sustainable in the long term;

iii. the abundance of prey species[2] forming the river lamprey's food resource within the estuary, is maintained.

vi. Toxic contaminants in the water column[3] and sediment are below levels which would pose a risk to the ecological objectives described above.

The meaning of terms [1-3] above is explained in **section 4.6.1**.

Note : The river lamprey population of the Severn depends on habitat in the adjacent River Usk SAC, River Wye SAC and River Severn. The habitats in these rivers, including spawning and nursery areas, are essential for the fulfilment of the species' lifecycle and therefore the Severn Estuary river lamprey feature can only be in favourable condition if the conservation objectives pertaining to the River Usk SAC and River Wye SAC river lamprey feature are also met in full and there is a continued recorded presence of this species in the River Severn.

4.6.1 Explanatory information for the river lamprey *Lampetra fluviatilis* conservation objective

[1]Natural processes

River lamprey population:

The size of the population is subject to non anthropogenic factors relating to natural fluctuations of external factors such as food / host availability in the Bristol Channel and more widely and breeding success in the River Severn and other rivers draining into the Severn Estuary.

Supporting habitats
The general meaning of 'natural processes' with respect to the supporting habitats of river lamprey within the estuary is explained in **section 4.1.1**.

[2] Prey species

Sea trout *Salmo trutta*, shad *Alosa fallax/Alosa alosa*, herring *Clupea harengu*s, sprat *Sprattus sprattu*s, flounder *Platichthys flesu*s and small gadoids such as whiting *Merlangius merlangu*s and pout *Trisopterus luscu*s are all potential prey species for the river lamprey found within the Severn Estuary (Bird 2008).

[3]Water column

Water column should be read to include contributory water flows into the estuary including surface flows over mudflats and saltmarsh.

4.7 Interest feature 7: The conservation objective for sea lamprey *Petromyzon marinus*

The conservation objective for the sea lamprey *Petromyzon marinus* feature of the Severn Estuary cSAC is to maintain the feature in a favourable condition, as defined below:

The feature will be considered to be in favourable condition when, subject to natural processes[1], each of the following conditions are met:

i. the migratory passage of both adult and juvenile sea lamprey through the Severn Estuary between the Bristol Channel and any of their spawning rivers is not obstructed or impeded by physical barriers, changes in flows, or poor water quality;

ii. the size of the sea lamprey population in the Severn Estuary and the rivers which drain into it, is at least maintained as is at a level that is sustainable in the long term;

iii. the abundance of prey species[2] forming the sea lamprey's food resource within the estuary, is maintained.

vi. Toxic contaminants in the water column[3] and sediment are below levels which would pose a risk to the ecological objectives described above.

The meaning of terms [1-3] above is explained in **section 4.7.1**.

Note : The sea lamprey population of the Severn depends on habitat in the adjacent River Usk SAC, River Wye SAC and River Severn. The habitats in these rivers, including spawning and nursery areas, are essential for the fulfilment of the species' lifecycle and therefore the Severn Estuary sea lamprey feature can only be in favourable condition if the conservation objectives pertaining to the River Usk SAC and River Wye SAC sea lamprey shad feature are also met in full and there is a continued recorded presence of this species in the River Severn.

4.7.1 Explanatory information for the sea lamprey *Petromyzon marinus* conservation objective

[1] Natural processes

Sea lamprey population:
The size of the population is subject to non anthropogenic factors relating to natural fluctuations of external factors such as food / host availability in the Bristol Channel and more widely and breeding success in the River Severn and other rivers draining into the Severn Estuary.

Supporting habitats:
The general meaning of 'natural processes' with respect to the supporting habitats of sea lamprey within the estuary is explained in **section 4.1.1**.

[2]Prey species

Eel *Anguilla anguilla*, cod *Gadus morhua*, and haddock *Melanogrammus aeglefinus* are all potential prey species for the sea lamprey found within the Severn Estuary (Bird 2008)

[3]Water column

Water column should be read to include contributory water flows into the estuary including surface flows over mudflats and saltmarsh.

4.8 Interest feature 8: The conservation objective for twaite shad *Alosa fallax*

The conservation objective for the twaite Shad *Alosa fallax* feature of the Severn Estuary cSAC is to maintain the feature in a favourable condition, as defined below:

The feature will be considered to be in favourable condition when, subject to natural processes[1], each of the following conditions are met:

i. the migratory passage of both adult and juvenile twaite shad through the Severn Estuary between the Bristol Channel and their spawning rivers is not obstructed or impeded by physical barriers, changes in flows or poor water quality;

ii. the size of the twaite shad population within the Severn Estuary and the rivers draining into it is at least maintained and is at a level that is sustainable in the long term.

iii. the abundance of prey species[2] forming the twaite shad's food resource within the estuary, in particular at the salt wedge[3], is maintained.

iv. Toxic contaminants in the water column[4] and sediment are below levels which would pose a risk to the ecological objectives described above.

The meaning of terms[1-4] above is explained in **section 4.8.1**.

Note : The twaite shad population of the Severn depends on habitat in the adjacent River Usk SAC, River Wye SAC and River Severn. The habitats in these rivers, including spawning and nursery areas, are essential for the fulfilment of the species' lifecycle and therefore the Severn Estuary twaite shad feature can only be in favourable condition if the conservation objectives pertaining to the River Usk SAC and River Wye SAC twaite shad feature are also met in full and there is a continued recorded presence of this species in the River Severn.

4.8.1 Explanatory information for the Twaite shad *Alosa fallax* conservation objective

[1] Natural processes

Twaite shad population:
The size of the population is subject to non anthropogenic factors relating to natural fluctuations of external factors such as food availability in the Bristol Channel and more widely and breeding success in the River Severn and other rivers draining into the Severn Estuary.

Supporting habitats:
The general meaning of 'natural processes' with respect to the supporting habitats of twaite shad within the estuary is explained in **section 4.1.1**.

[2] Prey species

Small custaceans, especially mysids and copepods, small fish, especially sprats and anchovies, and fish eggs (Maitland, P.S. & Hatton-Ellis 2003).

[3] Salt wedge

This the area within the estuary where fresh and saline water meet and where the abundance of prey species is particularly important to the twaite shad population. The actual position varies according to the state of the tide and volume of freshwater input to the estuary.

[4] Water column

Water column should be read to include contributory water flows into the estuary including surface flows over mudflats and saltmarsh.

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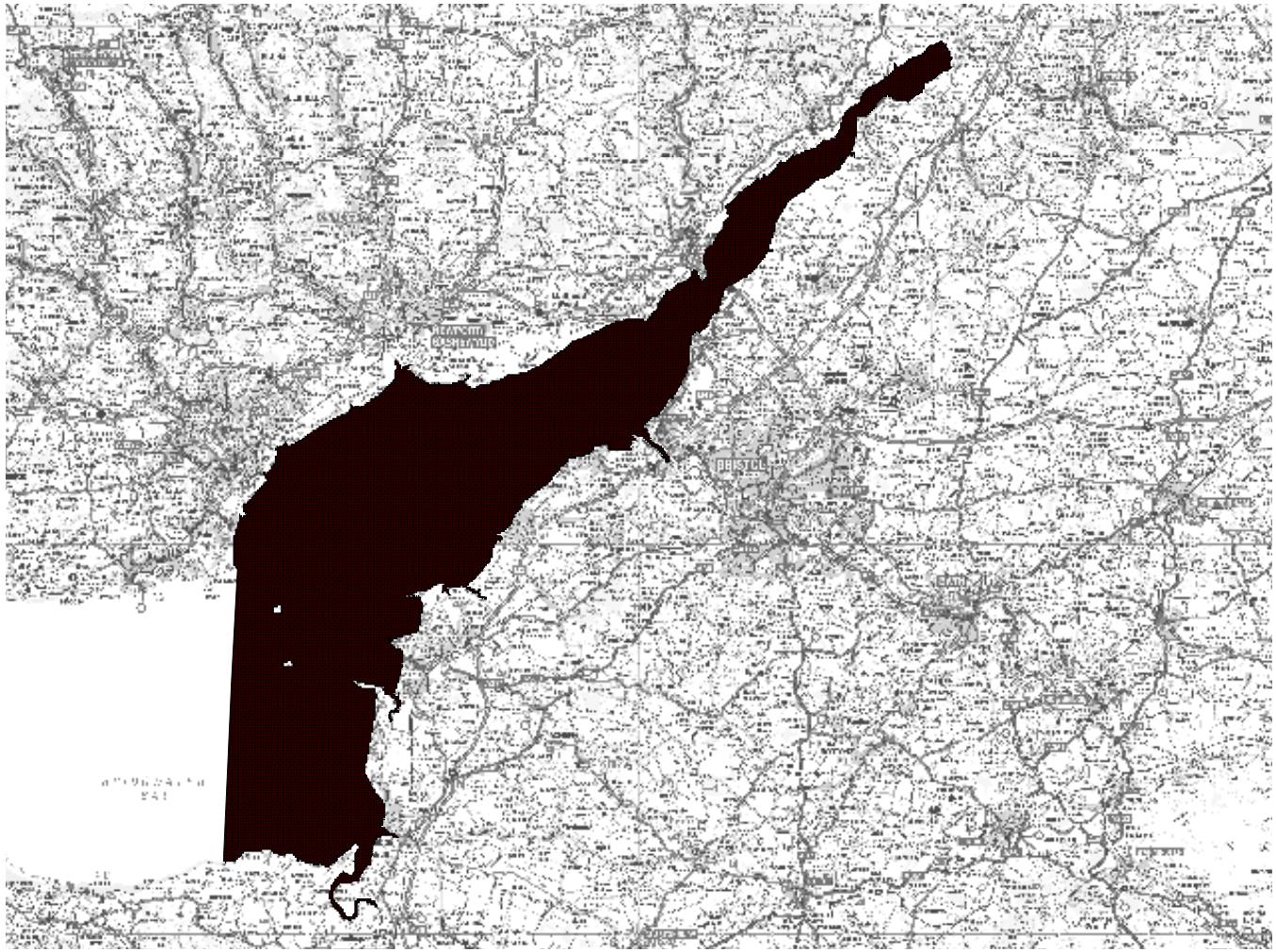
Figure 1 : Map showing the extent of the Severn Estuary cSAC European Marine Site

Severn Estuary / Môr Hafren Candidate Special Area of Conservation : European Marine Site

A European Marine Site is defined in the Conservation (Natural Habitats &c.) Regulations 1994 as a Special Area of Conservation or Special Protection Area which is covered (continuously / intermittently) by tidal waters.



Scale

5 km

N

The extent of the cSAC is shown in red shading. The landward boundary of the cSAC is generally Highest Astronomical Tide although there are some small areas included that lie landward of HAT.

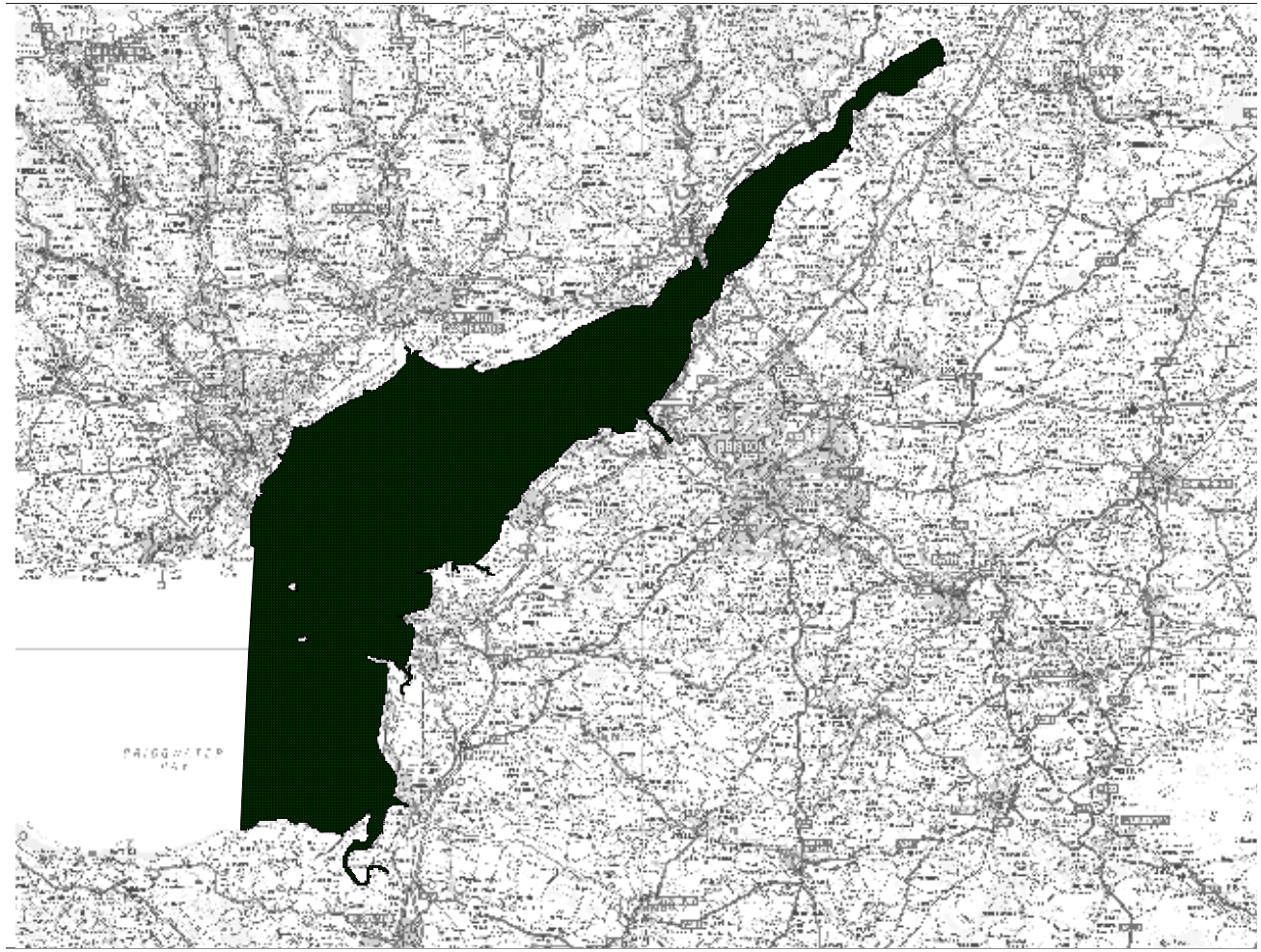
This map is for illustrative purposes only - definitive maps of the cSAC boundary can be obtained from Natural England and the Countryside Council for Wales.

Map produced by Natural England (C Pagendam), June 2008
Map reference : cSAC/01

Figure 2 : Map showing the extent of the "estuary" feature of the Severn Estuary cSAC European Marine Site

Severn Estuary / Môr Hafren Candidate Special Area of Conservation : European Marine Site

A European Marine Site is defined in the Conservation (Natural Habitats &c.) Regulations 1994 as a Special Area of Conservation or Special Protection Area which is covered (continuously / intermittently) by tidal waters.



Scale

5 km

N

The extent of the estuary feature is shown in green shading. The landward extent of the estuary feature is Highest Astronomical Tide

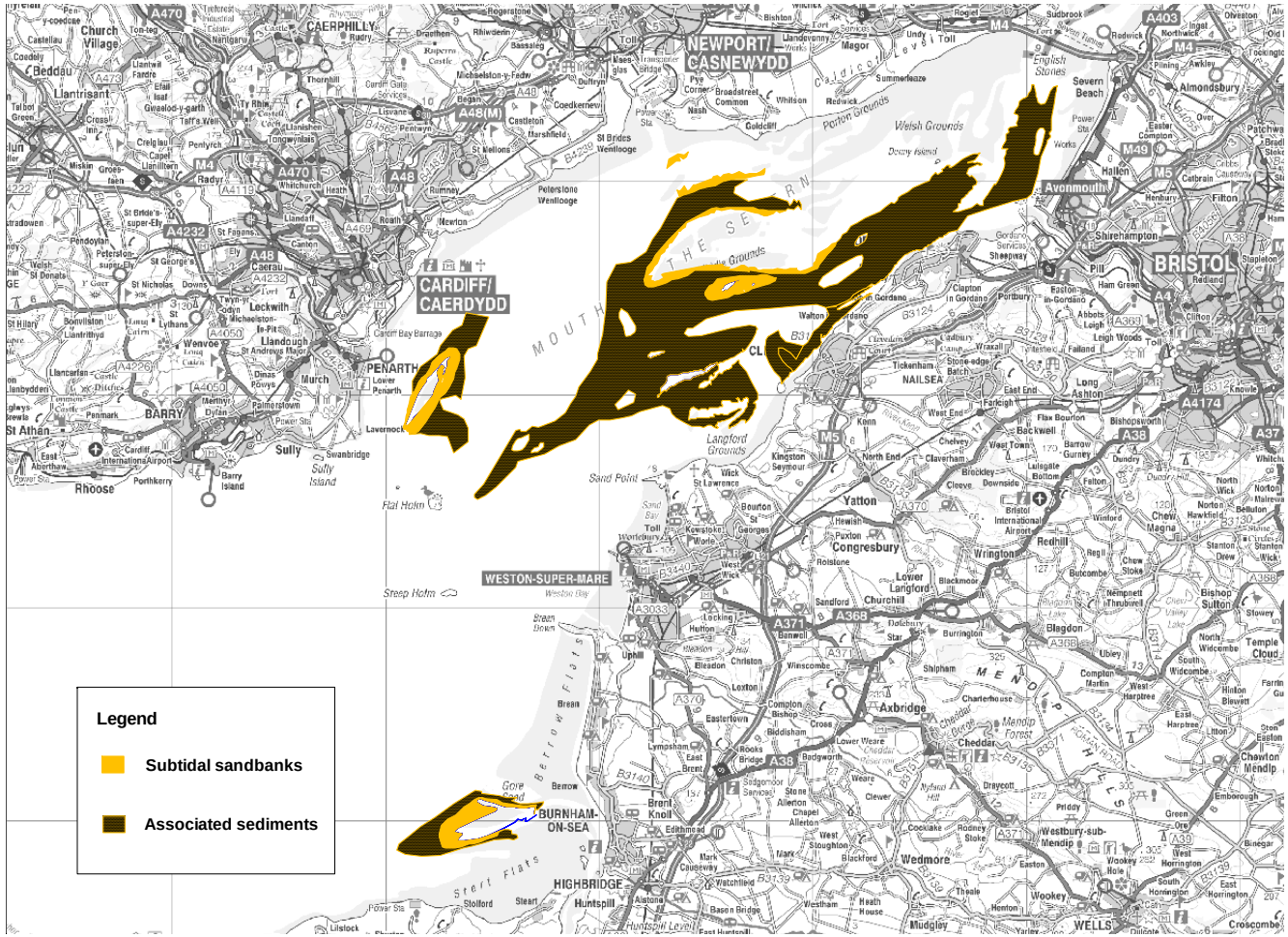
This map is indicative only and subject to review in the light of further information

Map produced by Natural England (C Pagendam), June 2008
Map reference : cSAC/02

Figure 3 : Map showing the extent of the “subtidal sandbanks” feature of the Severn Estuary cSAC European Marine Site

Severn Estuary / Môr Hafren Candidate Special Area of Conservation : European Marine Site

A European Marine Site is defined in the Conservation (Natural Habitats &c.) Regulations 1994 as a Special Area of Conservation or Special Protection Area which is covered (continuously / intermittently) by tidal waters.



Scale

5 km

N

The areas shown as subtidal sandbanks are relatively long-established sandbanks. The areas marked as associated sediments are linked to the sandbanks by sediment transport processes and are also considered to be an integral part of the sandbanks feature.

This map represents as snapshot in time based in the 1994 Admiralty Charts and BGS data. "

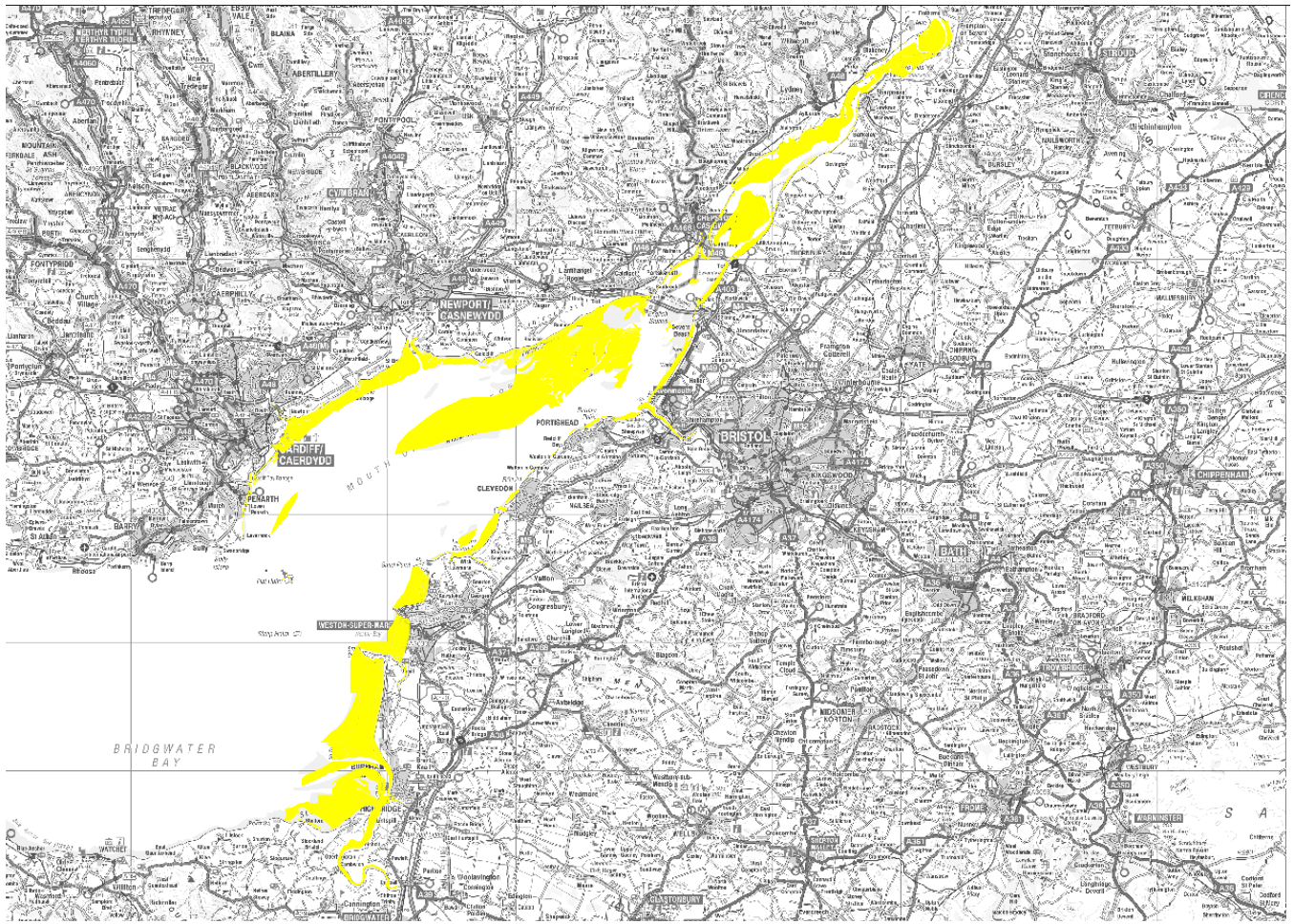
This map is indicative only and subject to review in the light of further information

Map produced by Natural England (C Pagendam), June 2008
Map reference : cSAC/03

Figure 4: Map showing the extent of the "mudflats and sandflats" feature of the Severn Estuary cSAC European Marine Site

Severn Estuary / Môr Hafren Candidate Special Area of Conservation : European Marine Site

A European Marine Site is defined in the Conservation (Natural Habitats &c.) Regulations 1994 as a Special Area of Conservation or Special Protection Area which is covered (continuously / intermittently) by tidal waters.



Scale

5 km

N

This map shows the extent of mudflat and sandflat habitats as defined by the Intertidal Biotope Surveys which were undertaken in a range of low spring tide conditions. Further work is ongoing to identify areas of mudflats and sandflats that occur down to the level of Lowest Astronomical Tide.

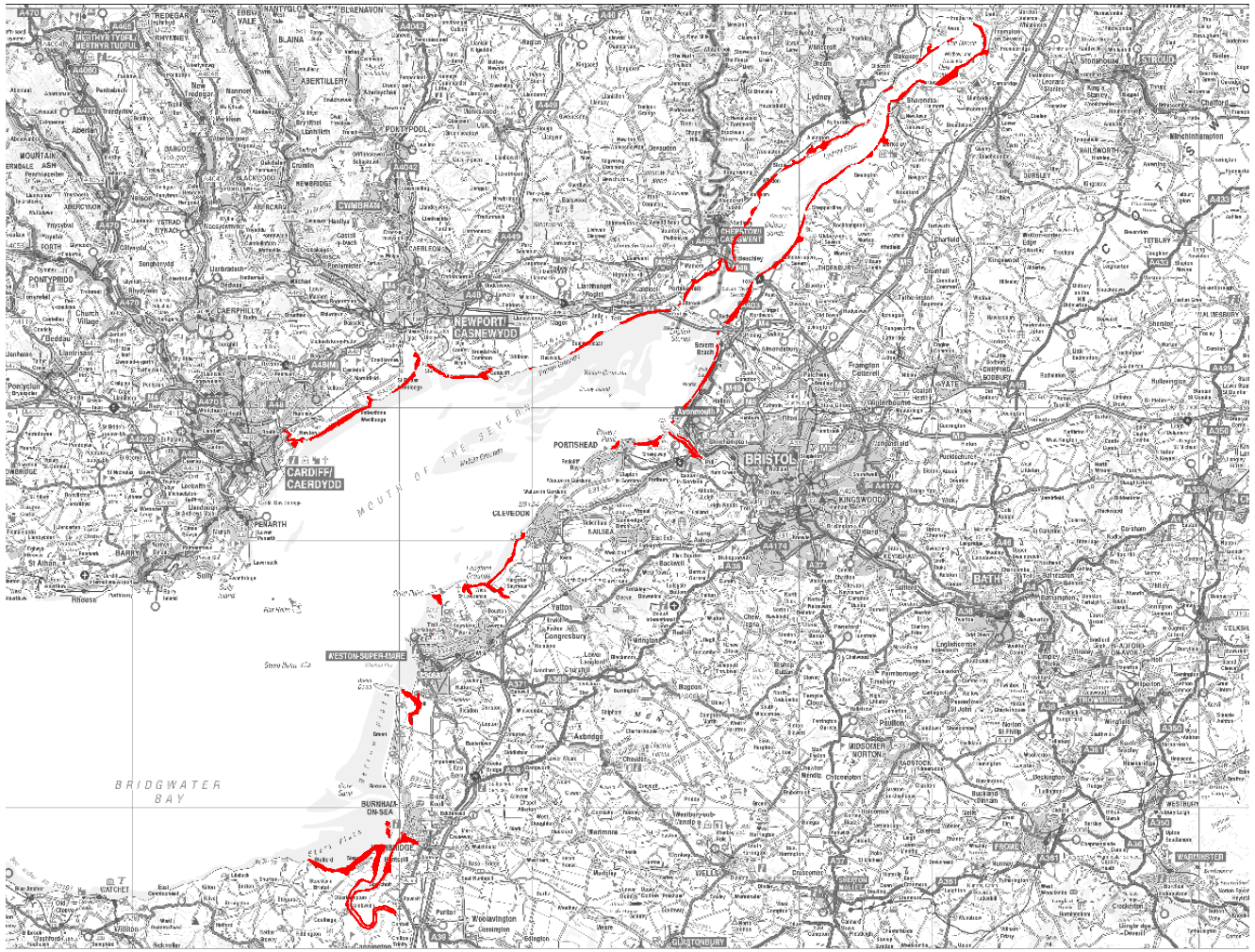
This map is indicative only and subject to review in the light of further information

Map produced by Natural England (C Pagendam), June 2008
Map reference : cSAC/04

Figure 5 : Map showing the extent of the "Atlantic salt meadow" feature of the Severn Estuary cSAC European Marine Site

Severn Estuary / Môr Hafren Candidate Special Area of Conservation : European Marine Site

A European Marine Site is defined in the Conservation (Natural Habitats &c.) Regulations 1994 as a Special Area of Conservation or Special Protection Area which is covered (continuously / intermittently) by tidal waters.



Scale

5 km

N

This map shows the extent of all communities, including transition communities, included in the Atlantic salt meadows feature (refer to section 4.6 of the conservation objectives) and is based on the 1998 NVC Survey.

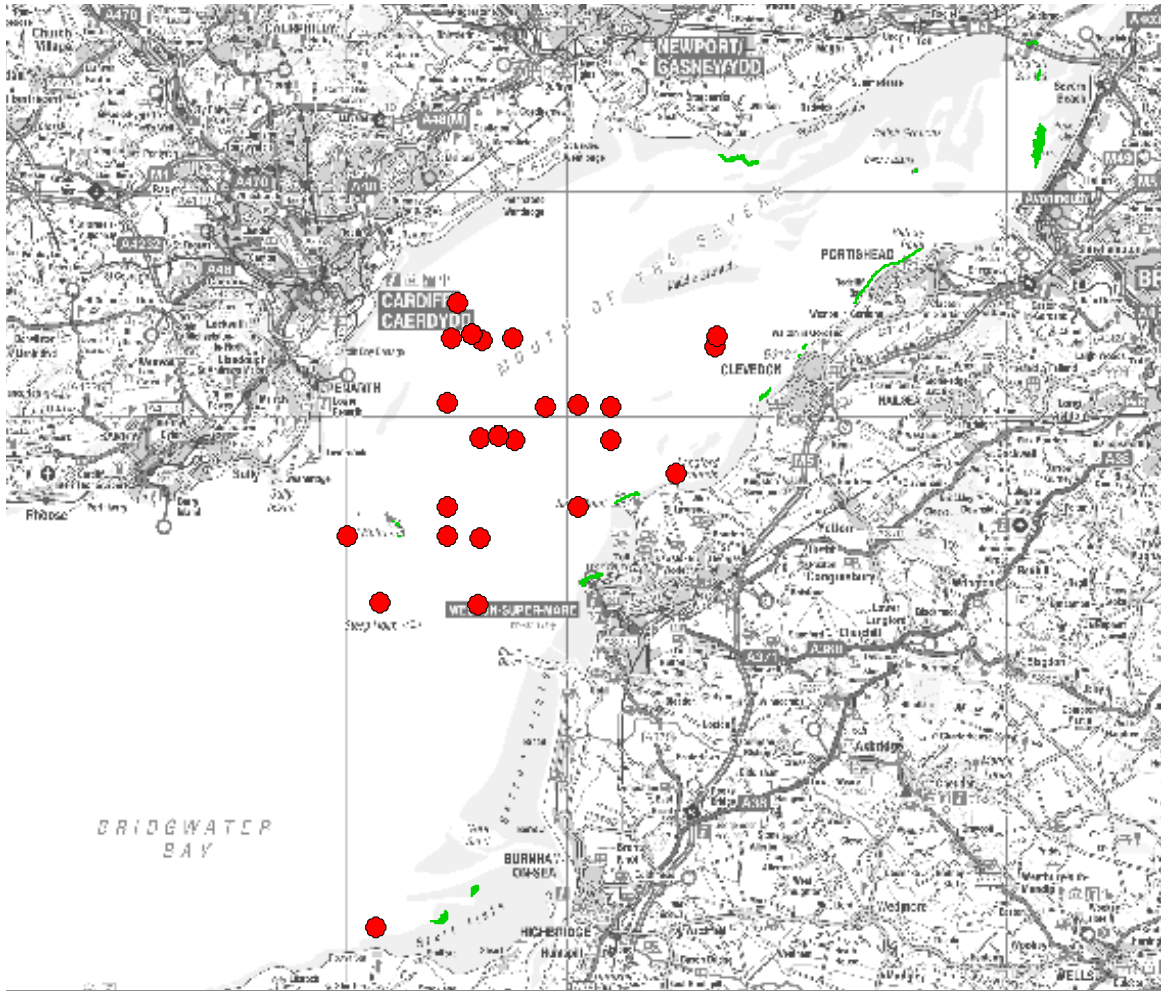
This map is indicative only and subject to review in the light of further information

Map produced by Natural England (C Pagendam), June 2008
Map reference : cSAC/05

Figure 6 : Map showing the extent of the "reef" feature of the Severn Estuary cSAC European Marine Site

Severn Estuary / Môr Hafren Candidate Special Area of Conservation : European Marine Site

A European Marine Site is defined in the Conservation (Natural Habitats &c.) Regulations 1994 as a Special Area of Conservation or Special Protection Area which is covered (continuously / intermittently) by tidal waters.



Scale

5 km

N

This map provides an indication of the recorded locations of *Sabellaria alveolata* reef in the Severn Estuary cSAC. Each red dot represents the locations of a survey station where dense aggregations of *Sabellaria alveolata* worms were recorded (density exceeding 1000 worms per m^2) from data from Mettam 1988, Environment Agency 1999 and Warwick 2001.
The presence of *Sabellaria* wormand reef habitat within the area covered by the red dots may not be continuous and *Sabellaria* may be transient or absent in other survey stations within this area. Limitations in survey techniques and the extreme physical environment of the Severn Estuary, particularly the high turbidity, make accurate survey and mapping of subtidal*Sabellaria* reef very difficult.
The green areas on this map show the recorded locations of intertidal *Sabellaria* reef - work is underway to define which are contiguous with areas of subtidal *Sabellaria* reef (and therefore contribute to the reef feature) and which are restricted to the intertidal only (and therefore are a sub-feature of the estuary feature).

This map is indicative only and subject to review in the light of further information

Map produced by Natural England (C Pagendam), June 2008
Map reference : cSAC/06