Margate and Long Sands Candidate Special Area of Conservation

Formal advice under Regulation 35(3) of The Conservation of Habitats and Species Regulations 2010

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Margate and Long Sands candidate Special Area of Conservation

Formal advice under Regulation 35(3) of The Conservation of Habitats and Species Regulations 2010[1]

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[1] http://www.legislation.gov.uk/uksi/2010/490/made

1 Introduction

This document contains Natural England's formal advice for Margate and Long Sands candidate Special Area of Conservation (cSAC) given under Regulation 35(3) of The Conservation of Habitats and Species Regulations 2010. This document supersedes the previous draft conservation advice for Margate and Long Sands proposed SAC (pSAC).

Margate and Long Sands was formally submitted by the Government to the European Commission as a candidate special area of conservation (cSAC) on 20 August 2010. Margate and Long Sands cSAC is with the European Commission awaiting 'moderation' (that is an assessment alongside all the other sites submitted by other Member States). If the European Commission approves the site, it becomes a Site of Community Importance and Government then has six years to designate it as a SAC.

The Margate and Long Sands cSAC is subject to full protection under the Habitats Directive[2] as transposed through The Conservation of Habitats and Species Regulations 2010[3] (referred to in this document as the 'Habitats Regulations'). Amongst other things, the Habitats Regulations place an obligation on relevant authorities[4] to put in place measures to protect the sites from damage or deterioration.

This document fulfils Natural England's duty under Regulation 35(3)[5] of The Habitats Regulations, to advise relevant authorities as to (a) the conservation objectives for Margate and Long Sands cSAC and (b) any operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species, for which Margate and Long Sands cSAC has been designated.

The advice is based on the best available information at the time of writing.

This formal conservation advice constitutes one element of our advisory role in relation to this site. Relevant authorities can use the current information to explore and put in place management measures (if required) and competent authorities[6] can fulfil their duties under the Habitats Regulations in making the necessary determinations on the impact of activities on the site. However, should relevant authorities or competent authorities require any further advice, they are not limited to taking account of Natural England's formal conservation advice contained here, and would be expected to make further enquiries as required in order to make determinations or implement management measures. Further information/reference should be made to the Selection Assessment Document[7] for Margate and Long Sands pSAC which is still relevant to the cSAC.

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[2] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

[3] http://www.legislation.gov.uk/uksi/2010/490/contents/made

[4] as defined under Regulation 6 of The Conservation of Habitats and Species Regulations 2010

[5] http://www.legislation.gov.uk/uksi/2010/490/regulation/35/made

[6] as defined under Regulation 7 of The Conservation of Habitats and Species Regulations 2010

[7] http://www.naturalengland.org.uk/Images/MLS-sad_tcm6-21644.pdf

An independent review of Natural England's marine SAC selection process carried out in 2011 made a number of recommendations as to how Defra and Natural England should modify their approach to future evidence based work. This resulted in Natural England adopting the Government Chief Scientific Adviser's (GCSA) guidelines on using evidence, through the development of a suite of Evidence Standards. Implementation of these standards has included Natural England working with JNCC to develop a protocol, which has been subject to independent expert review, setting out the processes and requirements for the development of conservation advice packages, to ensure that these fully comply with the GCSA's guidelines. Whilst the conservation advice provided here was developed prior to the finalisation of the protocol, it has been assessed for compliance with the protocol and a detailed report can be found on our website (link).

2. Roles and responsibilities

2.1 Natural England's role

The Habitats Regulations transpose the Habitats and Birds Directives into law in England and Wales. They give Natural England a statutory responsibility to advise relevant authorities as to the conservation objectives for cSACs, SAC and SPAs in English territorial waters (0-12nm); and to advise relevant authorities as to operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species for which the sites have been designated.

Natural England will provide additional advice as required for each site to relevant and competent authorities in order for them to fulfil their duties under the Habitats Regulations, such as a competent authority assessing the implications of any plans or projects on a cSAC, SAC, or SPA.

2.2 The role of relevant authorities and competent authorities

A **competent** authority is a public authority whose decision making may have an impact on the Natura 2000[8] series and therefore needs to be subject to the Regulations. All competent authorities are required to have regard for the requirements of the Habitats Directive in the exercise of their functions (regulation 9(3)).

Competent authorities have specific duties and powers under the Habitats Regulations. Where a decision is being considered within or affecting a Natura 2000 site, then the competent authority must follow the procedures in Regulations 61 & 62. Competent authorities also have duties under Regulations 69 & 70 for the review of decisions that have already been made. These Regulations refer back to the procedures set out in Regulation 61.

The competent authority carries out the appropriate assessment and makes a decision on integrity rather than the proponent of the plan or project or Natural England. Regulation 61(2) makes it clear that the applicant has to supply the necessary information for the competent authority to make the assessment. The competent authority can require the proponent to provide sufficient information to

[8] SACs and SPAs are together referred to as Natura 2000 sites or (in the marine environment) European Marine Sites.

inform the assessment. When carrying out the assessment, the competent authority **must** consult Natural England in accordance with the Habitats Regulations.

The Habitats Regulations require relevant authorities to exercise their functions so as to secure compliance with the Habitats Directive. A single management scheme, which the relevant authorities may draw up under Regulation 36[9] of the Habitats Regulations, will provide a framework through which this could be done and it should be based on the advice in this package. Relevant authorities must, within their areas of jurisdiction, have regard to both direct and indirect effects on interest features of the site. This may include consideration of issues outside the boundary of the site.

Nothing within a Regulation 35 package will require relevant authorities to undertake any actions or ameliorate changes in the condition of interest features if it is shown that the changes result wholly from natural causes. Having issued Regulation 35 advice for this site, Natural England will work with relevant authorities and others to agree, within a defined time frame, a protocol for evaluating observed changes to baselines and to develop an understanding of natural change and provide further guidance as appropriate and possible. This does not, however, preclude relevant authorities from taking any appropriate action to prevent deterioration to the interest features, and indeed such actions should be undertaken when required.

2.3 Role of conservation objectives

Conservation objectives are the starting point from which management schemes and monitoring programmes may be developed as they provide the basis for determining what is currently causing or may cause a significant effect, and they inform the scope of appropriate assessments.

The conservation objectives set out what needs to be achieved for the site to make the appropriate contribution to the conservation status of the features for which the site is designated and thus deliver the aims of the Habitats Directive.

In addition this advice will inform the scope and nature of any 'appropriate assessments[10]' which the Directive requires to be undertaken for plans and projects (Regulations 61 and 63 of the Habitats Regulations for inshore waters).

2.4 Role of advice on operations

The advice on operations set out in Section 4 of this document 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. The advice should also be used to identify the extent to which existing measures of control, management and forms of use are, or can be made, consistent with the conservation objectives, and thereby focus the attention of relevant/competent authorities and surveillance to areas that may need management measures.

This advice on operations may need to be supplemented through further discussions with the relevant / competent authorities and any advisory groups formed for the site.

[9] http://www.legislation.gov.uk/uksi/2010/490/regulation/36/made

[10] Assessment of implications for European sites and European offshore marine sites

2.5 Precautionary principle

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

3. Conservation objectives

3.1 Background to conservation objectives

The conservation objectives and definitions of favourable condition for features on the site may inform the scope and nature of any 'appropriate assessment' under the Habitats Regulations[11]. An appropriate assessment will also require consideration of issues specific to the individual plan or project.

The scope and content of an appropriate assessment will depend upon the location, size and significance of the proposed project. Natural England will advise on a case by case basis.

Following an appropriate assessment, competent authorities are required to ascertain the effect on the integrity of the site. The integrity of the site is defined in paragraph 20 of ODPM Circular 06/2005 (DEFRA Circular 01/2005)[12] as the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified. The determination of favourable condition is separate from the judgement of effect upon integrity. For example, there may be a time-lag between a plan or project being initiated and a consequent adverse effect upon integrity becoming manifest in the condition assessment. In such cases, a plan or project may have an adverse effect upon integrity even though the site remains in favourable condition, at least in the short term.

The conservation objectives for this site are provided in accordance with paragraph 17 of ODPM Circular 06/2005 (DEFRA Circular 01/2005) which outlines the appropriate assessment process. The entry on the Register of European Sites gives the reasons for which a site was classified or designated.

3.2 Margate and Long Sands cSAC conservation objectives

The formal conservation objectives for Margate and Long Sands cSAC interest features are provided below. These are high-level objectives for the site features and Natural England may refine them in future as our understanding of the features improves and further information becomes available, such as survey work. They should be read in the context of other advice given, particularly:

[11] Regulation 61 and 63 by a competent authority and Regulation 21 by Natural England
[12] http://www.communities.gov.uk/documents/planningandbuilding/pdf/147570.pdf

- the Selection Assessment Document[13], which provides more detailed information about the site and evaluates its interest features according to the Habitats Directive selection criteria and guiding principles;

- the Favourable Condition Table (Appendix A and Table 4.1) 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; and

- the attached maps (Appendix B) which show the known locations of the interest features.

[13] http://www.naturalengland.org.uk/Images/MLS-sad_tcm6-21644.pdf

3.2.1. Importance of features

Margate and Long Sands cSAC starts to the north of the Thanet coast of Kent and proceeds in a north-easterly direction to the outer reaches of the Thames Estuary. It contains a number of Annex I Sandbanks slightly covered by seawater at all times, the largest of which is Long Sands itself. The sandbanks are composed of well-sorted sandy sediments, with muddier and more gravelly sediments in the troughs between banks. The upper crests of some of the larger banks dry out at low tide (see section 7.2). The banks are tidally-influenced estuary mouth sandbanks, the southern banks aligned approximately east-west in the direction of tidal currents entering the Thames Estuary from the English Channel, whereas Long Sand is aligned in a north east - south west orientation with influence from the North Sea. In common with all sandbanks the structure of the banks is dynamic and there have been significant movements of the bank edges over time.

The fauna of the bank crests is characteristic of species-poor, mobile sand environments, and is dominated by polychaete worms and amphipods. Within the troughs and on the bank slopes a higher diversity of polychaetes, crustacea, molluscs and echinoderms are found. Mobile epifauna includes crabs and brown shrimp, along with squid and commercially important fish species such as sole and herring. Although this site is being put forward for designation on the basis of the presence of Sandbank Annex I interest feature, there is a significant amount of the reef-forming ross worm (*Sabellaria spinulosa*) at this site, which when formed as a reef qualifies as an Annex I habitat (biogenic reef). However, the available data indicate that the distribution of *S. spinulosa* is patchy, or that the aggregations form crusts rather than reefs. Areas of high *S. spinulosa* density support a diverse attached epifauna of bryozoans, hydroids, sponges and tunicates, and additional fauna including polychaetes, bivalves, amphipods and crustaceans. These diverse communities are usually found on the flanks of the sandbanks and towards the troughs.[14]

3.2.2 Sandbanks which are slightly covered with seawater all the time

Definition

Sandbanks are elevated, elongated, rounded or irregular topographic features, permanently submerged and predominantly surrounded by deeper water. They consist mainly of sandy sediments, but larger grain sizes, including boulders and cobbles, or smaller grain sizes including mud may also be present on a sandbank. Banks where sandy sediments occur in a layer over hard substrata are classed as sandbanks if the associated biota are dependent on the sand rather than on the underlying hard substrata. “Slightly covered by sea water all the time” means that above a sandbank the water depth is seldom more than 20 m below chart datum. Sandbanks can, however, extend beneath 20 m below chart datum. It can, therefore, be appropriate to include in designations such areas where they are part of the feature and host its biological assemblages. Guidance by Klein (2006) was followed for identification of sandbank features.

[14] http://www.naturalengland.org.uk/Images/MLS-sad_tcm6-21644.pdf

3.2.3 Key sandbank sub-features of Margate and Long Sands cSAC

The sandbank habitat of Margate and long Sands cSAC can be divided into sub-features according to Entec (2008b) as follows:

Dynamic sand communities

Tidal currents are strong within the site, and sediment mobility around the crests of sandbanks in the site is high as a result of the predominantly sandy sediments in the area. The dynamic crests of the sandbanks are characterised by polychaete-amphipod communities of low biodiversity. The infaunal communities are adapted to this environment by being able to rapidly re-bury themselves into this dynamic environment.

Gravelly muddy sand communities

The flanks of the sandbanks are more stable than the tops with areas characterised by gravelly muddy sands. These areas show more diverse infaunal and epifaunal communities. Areas of reduced sediment movement support communities of attached bryozoans, hydroids and sea anemones. Sand mason worms *Lanice conchilega and* keel worms *Pomatoceros* sp. along with bivalves and crustaceans are also associated with this subfeature.

3.2.4 The conservation objective for Margate and Long Sands cSAC Annex I Sandbanks slightly covered by seawater all the time:

Subject to natural change[a], maintain[b] the Sandbanks slightly covered by seawater at all times in favourable condition[15], in particular the sub-features**:**

Dynamic sand communities
Gravelly muddy sand communities.

Favourable condition of the Sandbanks will be determined through assessment that the following are maintained in the long term in the site:

1. Extent of the habitat
2. Diversity of the habitat and it's component species
3. Community structure of the habitat (e.g. population structure of individual notable species and their contribution to the functioning of the ecosystem)
4. Natural environmental quality (e.g. water quality, suspended sediment levels, etc.)
5. Natural environmental processes (e.g. biological and physical processes that occur naturally in the environment, such as water circulation and sediment deposition should not deviate from baseline at designation).

- The natural environmental quality is maintained for dynamic sand and muddy sand and gravel communities
- The natural environmental processes are maintained for dynamic sand and muddy sand and gravel communities
- The extent, physical structure, diversity, community structure and typical species representative of **low diversity dynamic sand communities** are maintained.
- The extent, physical structure, diversity, community structure and typical species representative of **moderate diversity stable sand communities** are maintained.[16]

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Further baseline survey work is being undertaken in 2012 to further refine the evidence base of this site. This may result in the revision/addition of reef sandbank areas of the site.

3.3 Background to favourable condition tables

The favourable condition table is the principle source of information that Natural England will use to assess the condition of an interest feature and as such comprises indicators of condition. The favourable condition table can be found in Appendix A.

[16] **Explanation of terms used in the Conservation Objectives**

a) Natural change refers to changes in the habitat which are not a result of human influences. 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. Features should not necessarily be considered in unfavourable condition when caused by the short term disappearance of a particular community due to natural processes.

b) Maintain implies that existing evidence suggests the feature to be in favourable condition and will, subject to natural change, remain at its condition at designation. Existing activities are therefore generally considered to be sustainable and be unlikely to adversely affect the condition of the feature if current practices are continued at current levels. However, it must be borne in mind that gradually damaging activities can take time to show their effects. If evidence later shows an activity to be negatively affecting the conservation objectives of the site, then the site will be deemed to be in unfavourable condition and restorative action will needed.

c) Favourable condition relates to the maintenance of the structure, function, and typical species for that feature within the site. Areas of the infralittoral, such as the kelp forests, are currently believed to be in favourable condition and will therefore have a conservation objective of 'maintain', whereas some areas of circalittoral bedrock are known to have experienced damage through towed demersal fishing gear (Royal Haskoning, 2008). Where damage is known to have occurred then a conservation objective of 'restore' will be applied.

d) Restore implies that the feature is degraded to some degree and that activities will have to be managed to reduce or eliminate negative impact(s). Restoration in the marine environment generally refers to natural recovery through the removal of unsustainable physical, chemical and biological pressures, rather than intervention (as is possible with terrestrial features).

On many terrestrial European sites, we know sufficient information 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, and consequently it is much harder to define favourable condition so precisely in such sites. It must be borne in mind that gradually damaging activities can take time to show their effects. If evidence later shows an activity to be negatively affecting the conservation objectives of the site, then the site will be reassessed in light of this new information and restorative action put in place if needed.

Where there are more than one year's observations on the condition of marine habitats, all available information will need to be analysed to determine, where possible, any natural environmental trends at the site. This will provide the basis for judgements of favourable condition to be determined in the context of natural change. Where it becomes clear that certain attributes may indicate a cause for concern, and if further investigation indicates this is justified, restorative management actions will need to be taken. The aim of such action would be to return the interest feature to favourable condition from any unfavourable state. This document will be revised in light of ongoing and future monitoring of the condition of designated features within the site. This will be linked with any developments in our understanding of the structure and functioning of features and the pressures they are exposed to.

This advice also provides the basis for discussions with relevant authorities, and as such the attributes and associated measures and targets may be modified over time. The aim is to have a single agreed set of attributes that will be used as a basis for monitoring in order to report on the condition of features. Condition monitoring of the attributes may be of fairly coarse methodology, underpinned by more rigorous methods on specific areas within the site. Common Standards Monitoring (JNCC 2004) requires mandatory monitoring of some attributes of a designated feature, while other attributes are considered discretionary (or site-specific) and are incorporated to highlight local distinctiveness. Priority will be given to measuring attributes that are at risk from anthropogenic pressure and for which changes in management may be necessary. This information may be generated by Natural England or collected by other organisations through agreements.

Whilst the favourable condition table is the key source of information of condition for site features additional source of information may also be selected to inform our view about the integrity and condition of the site. For example, a part of risk based monitoring activity data (as collected by the relevant authorities) will give an indication as to the levels of pressure that may impact on the site features.

The condition monitoring programme will be developed through discussion with the relevant / competent authorities and other interested parties, ideally as part of the management scheme process. Natural England 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. The condition assessment will take into account all available information, including other data on site integrity / condition that has been gathered by others for purposes such as appropriate assessment, licence applications etc. using the favourable condition table to guide the process.

4. Advice on operations

4.1 Background

Natural England has a duty under Regulation 35(3)(b) of the Habitats Regulations 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.

As part of its advice on operations Natural England has considered the pressures that may be caused by activities and the vulnerability of the sites interest features to those pressures.

The following sections provide information to help relate general advice to each of the specific interest features for the Margate and Long Sands cSAC to current levels of human usage. This is aimed at being a broad assessment of pressures and the vulnerability of features.

This advice relates to the vulnerability of the interest features and sub-features of the Margate and Long Sands cSAC. The process of deriving and scoring relative vulnerability is provided in Appendix C. A summary of the pressures which may cause deterioration or disturbance is given in Appendix D, and detailed in Appendix E. Further explanation of the sensitivity of the interest features or sub-features follows with examples of their exposure and therefore their vulnerability to damage or disturbance from the listed categories of pressures. This enables links to be made between the categories of pressure and the ecological requirements of the features.

4.2 Purpose of advice

The aim of this advice is to enable all relevant authorities to direct and prioritise their work on the management of activities that pose the greatest potential threat to the favourable condition of interest features at Margate and Long Sands cSAC. The advice is linked to the conservation objectives for interest features and will help provide the basis for detailed discussions between relevant authorities enabling them to formulate and agree a management scheme for the site should one be deemed necessary.

The advice given here will inform, but is given without prejudice to, any advice provided under Regulation 61 or Regulation 63 of the Habitats Regulations on operations that qualify as plans or projects within the meaning of Article 6 of the Habitats Directive.

4.3 Methods for assessment

To develop this advice on operations Natural England has used a three step process involving:

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

This three step process builds up a level of information necessary to manage activities in and around the site in an effective manner. Through a consistent approach, this process enables Natural England 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.

4.3.1 Sensitivity assessment

The sensitivity assessment used is an assessment of the relative sensitivity of the interest features or the component sub-features of the Margate and Long Sands cSAC to the effects of broad categories of human activities.

In relation to this assessment, sensitivity has been defined as the intolerance of a habitat, community or individual (or individual colony) of a species to damage, or death, from an external factor (Hiscock, 1996). Sensitivity is dependent on the intolerance of a species or habitat to damage from an external factor and the time taken for its subsequent recovery.

For example, a very sensitive species or habitat is one that is very adversely affected by an external factor arising from human activities or natural events (killed/destroyed, 'high' intolerance) and is expected to recover over a very long period of time, i.e. >10 or up to 25 years ('low'; recoverability).

The sensitivity of the interest sub-features was based on the sensitivities of their component biotopes, listed in Appendix F. Biotope sensitivities were derived from the Marine Life Information Network (MarLIN)[17] biology and sensitivity database (Tyler-Walters and Hiscock, 2003). Biotope sensitivities were assessed using the MarLIN approach (Hiscock and Tyler-Walters, 2005, 2006; Tyler-Walters et al., 2001). Sensitivities are available from the MarLIN and JNCC websites (www.marlin.ac.uk, www.jncc.defra.gov.uk)

4.3.2 Exposure assessment

This has been undertaken for the Margate and Long Sands cSAC by assessing the relative exposure of the interest features or their component sub-features on the site to the effects of broad categories of human activities currently occurring on the site (as of September 2011). These assessments were made on the best available information and advice.

Appendix E shows the relative exposure of the Margate and Long Sands sub-features to physical, chemical and biological pressures. This assessment is based on known human activities operating in or adjacent to the site, and the anticipated pressures associated with these activities.

4.3.3 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

[17] www.marlin.ac.uk

considered vulnerable. In this context therefore, ‘vulnerability’ has been defined as the exposure of a habitat, community or individual (or individual colony) of a species to an external factor to which it is sensitive (Hiscock, 1996).

4.4 Format of advice

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

- enables links to be made between human activities and the ecological requirements of the habitats or species, as required under Article 6 of the Habitats Directive;

- provides a consistent framework to enable relevant authorities in England to assess the effects of activities and identify priorities for management within their areas of responsibility; and

- is appropriately robust to take into account the development of novel activities or operations which may cause deterioration or disturbance to the interest features of the site and should have sufficient stability to need only infrequent review and updating by Natural England.

These broad categories provide a clear framework against which relevant authorities can assess activities under their responsibility.

4.5 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 Natural England knows about current activities and patterns of usage at the Margate and Long Sands cSAC. Natural England expects that the information on activities and patterns of usage will be refined as part of the process of developing the management scheme and through discussion with the relevant authorities. As part of this process the option of identifying a number of spatial zones with different activity levels may be appropriate. 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 information was gathered. In contrast, the information provided in this advice on the sensitivity of interest features or sub-features 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 will 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.

5. Specific advice on operations for the Margate and Long Sands cSAC

The following sections provide information to help relate general advice to each of specific interest features for the Margate and Long Sands cSAC.

This advice relates to the vulnerability of the interest features and sub-features of the Margate and Long Sands cSAC as summarised in Appendix D and detailed in Appendix E. Further explanation of the sensitivity of the interest features or sub-features follows with examples of their exposure and therefore their vulnerability to damage or disturbance from the listed categories of operations. This enables links to be made between the categories of operation and the ecological requirements of the features.

This advice relates to the vulnerability of the interest features and sub-features of the Margate and Long Sands cSAC to current levels of human usage. Details of human activity in and around the Margate and Long Sands cSAC are presented in a separate stakeholder report (Entec 2008).

Appendix E shows the vulnerability assessments for the sub-features of the Margate and Long Sands cSAC. They are drawn principally from MarLIN's (MarLIN, 2006) assessment of the sensitivities of biotopes which are comparable to that present within the cSAC. Studies in this area do however indicate that other biotopes are potentially present (Entec, 2008).

5.1 Annex I habitat Sandbanks which are slightly covered by seawater all the time

Sub-feature 1 - dynamic sand communities

There is no direct assessment of 'low diversity dynamic sand communities' on the MarLIN website (the widely used reference database for information on habitat ecology, distribution, species composition and likely sensitivity to human activities and natural events). The biotopes listed in Appendix F were recorded on this subfeature of this site (Emu, 2006; Entec, 2008a). The sensitivity assessments on biotopes listed in Appendix F were therefore used to determine vulnerability.

Sub-feature 2 - Gravelly muddy sand communities

The applicability of the MarLIN assessments of sensitivity is dependent on the quality of available scientific information on these biotopes and their characterising species. In addition, both the biotope classification system and the MarLIN sensitivity assessments primarily rely on inshore biological data, so although they are applicable to habitats in offshore waters, confidence in these assessments in an offshore context is necessarily lower. Further detail on our approach to evaluating sensitivity can be provided on request.

Interest feature sensitivity to physical, chemical and biological pressures:

The interest features and associated biological communities of the Margate and Long Sands cSAC are sensitive to: **Physical loss**, **Physical damage**, **Toxic** and **Non-toxic contamination**, and **Biological disturbance**, resulting from a range of activities.

Sandbanks which are slightly covered with sea water all the time

5.1.1 Physical loss

Low diversity dynamic sand communities and moderate diversity stable sand communities are relatively high energy habitats, often with a good ability to recover from physical disturbance. However, loss of distinct assemblages within the habitat sub-features through removal of sediment habitat may result in a decrease in the overall diversity of the interest feature. Thus sandbank sub-features are considered to be moderately sensitive to physical loss.

The pressures from marine aggregate extraction operations are associated with:

- the passage of the draghead over the seabed - removal (loss) and abrasion (damage)
- liberation of sediment plume from draghead, overspill and screening (where employed) - smothering (loss) and changes in suspended sediment concentration (damage)

The assessment also considers the potential for changes to environmental processes not covered under individual pressure categories (such as potential impacts on sedimentary processes).

A consented offshore wind farm overlaps the northern end of the Long Sands sandbank feature. Construction of phase 1 is expected to commence in 2011[18], and therefore the effects of this development have been taken into account in the exposure assessment. When constructed, piling activities and the placement of structures on the bed would result in the direct loss of habitat area within the site, and possibly additional losses as a result of scour and/ or the placement of scour protection around turbine bases. Although direct loss will occur, the proportion of the feature affected is considered to be small. For these reasons, the site is considered to have moderate exposure to physical loss.

Overall the **vulnerability of low diversity dynamic sandbank communities** and **moderate diversity gravelly muddy sand communities** within the Margate and Long Sands cSAC to **physical loss** is considered to be **moderate**.

5.1.2 Physical damage

Dynamic sand communities are characterised by frequent disturbance by tidal currents, and contain organisms which are adapted to recurrent erosion and accretion (for example, polychaetes and amphipods which are able to reburrow rapidly following disturbance). Following significant disturbance, communities can re-establish relatively quickly from the planktonic larval pool or migration from areas nearby, particularly as communities are largely composed of opportunistic species. Indications are that this re-establishment can occur within a few tidal cycles (Sherman and Coull 1980, Palmer 1988, Giere 1993).

Thus the low diversity **dynamic sand communities** are considered to have **low sensitivity** to **physical damage.**

[18] http://www.thecrownestate.co.uk/our_portfolio/interactive_maps/70_interactive_maps_marine/interactive_map__offshore_windfarms_table.htm

Recent research has indicated that suspended sediment loads in the East Anglian area of the southern North Sea can vary widely (Nio *et al*, 2009; HR Wallingford, 2002). Suspended sediment concentrations of 423 mg/l at 1.75 m above seabed was recorded at the Sizewell banks to the north of the cSAC (Nio *et al*, 2009). At a near-bed elevation of 15 cm above seabed, suspended sediment loads of 1892 mg/l where recorded. Typical concentrations in winter are regularly recorded as high as 100 mg/l (HR Wallingford, 2002) with an extreme storm weather recording of 330-410 mg/l recorded from marine aggregate licence area 447 (located just to the East of Long Sand Head) on March 14th 1994 (HR Wallingford, 2010). High suspended sediment loads would be unlikely to affect the communities in this area as they are evolved to exist in high turbidity waters.

Gravelly muddy sand communities are generally based on more stable sediments with higher levels of organic matter. Whilst exposed to tidal currents, the habitats tend to be more diverse and contain a wide range of infauna and epifauna. These communities are more sensitive to physical damage as it takes longer for sediments and 'climax' communities to re-establish. Thus moderate diversity stable sand communities are considered to have low to moderate sensitivity to physical damage.

Habitats within the Margate and Long Sands cSAC are considered to have a moderate exposure to physical damage. Physical damage may arise from periodic maintenance dredging within the adjacent Prince's Channel, use of the licensed sand placement site for dredged material in the North Edinburgh Channel, commercial fishing activities within the area (including trawling and suction dredging for cockles), along with cable laying as part of offshore wind developments as well as the BritNed interconnector cable consented in July 2010.

Overall the **vulnerability of low diversity dynamic sandbank communities** and **moderate diversity gravelly muddy sand communities** within the Margate and Long Sands cSAC to **physical damage** is considered to be **low to moderate**.

5.1.3 Toxic contamination

For many benthic communities, the sensitivity of exposure to different chemicals is unknown, or limited to a small number of toxicity studies on specific species. Based on available published information, the sensitivity of low diversity dynamic sand communities and moderate diversity stable sand communities has been classified as moderate.

Overall the **vulnerability of low diversity dynamic sandbank communities** and **moderate diversity stable sand communities** within the Margate and Long Sands cSAC to **toxic contamination** is considered to be **low** for both subfeatures.

Toxic substances can have a number of effects on benthic communities depending on the nature of the contaminant and receiving biota. Some may be lethal, removing individuals and species; others may be sub-lethal, which could affect functioning of organisms such as the reproduction, reducing the fitness for survival, and hence populations in the longer term (Nedwell, 1997). For many benthic communities, the sensitivity of exposure to different chemicals is unknown, or limited to a small number of toxicity studies on specific species. Based on available published information, the sensitivity of dynamic sand communities and gravelly muddy sand communities to different types of toxic contamination has been classified as moderate.

The pathways by which toxic contaminants can reach these sub-tidal features would include point source discharges of effluents, land run-off (mainly via rivers/estuaries), atmospheric deposition, and accidental spillage at sea (eg oil spills).

A number of operators will discharge effluent upstream into the Thames Estuary and into the adjacent coastal waters. Direct discharges into the estuary include low levels of radionuclides, and heavy metals, however significant dilution afforded to these low inputs, together with the high energy environments associated with sandbanks, mean that they have a low susceptibility to toxic contamination from these sources (Elliot *et al.*, 1998).

Prince's Channel (which runs through the site to the north of Margate Sands) carries a significant amount of vessel traffic in and out of ports in the inner Thames Estuary. Fisherman's Gat is also an active commercial shipping channel. In addition, smaller vessels use the shallower inshore channels across the site. This means that the risk of contamination by accidental spillages of fuel or cargo is increased, and a small level of contamination will exist as a result of normal shipping activities.
The exposure of communities within the Margate and Long Sands cSAC to toxic contamination is considered to be low.

Overall the **vulnerability of low diversity dynamic sandbank communities** and **moderate diversity gravelly muddy sand communities** within the Margate and Long Sands cSAC to **toxic contamination** is considered to be **low**.

5.1.4 Non-toxic contamination

The main impacts of increases in turbidity on benthic communities within the site are likely to be smothering and/or damage to filter-feeding organisms. Low diversity dynamic sand communities are adapted to frequent erosion and accretion of sediment, and their sensitivity to turbidity changes is considered to be low. Moderate diversity stable sand communities are also considered to have a low sensitivity to changes in turbidity based upon the sensitivity identified for their component species.

Non-toxic contamination can lead to changing levels of nutrients, organic enrichment, temperature, turbidity and salinity. All of which could have direct and in-direct effects on the exposed features and their communities. The sensitivity of dynamic sand communities and gravelly muddy sand communities to different types of non-toxic contamination is considered to be low.

The principle pathways by which non-toxic contaminants can reach these sub-tidal features would include point source discharges of effluents, land run-off (mainly via rivers/estuaries), and offshore operations (e.g. shipping).

A number of operators will discharge effluent upstream into the Thames Estuary and into the adjacent coastal waters, although there are no significant point sources directly into the site. Offshore operations such as channel dredging and disposal of dredged material may be localised sources of turbidity. In general, it is considered that the habitat features within the site have a low exposure to non-toxic contamination.

Overall the **vulnerability of low diversity dynamic sandbank communities** and **moderate diversity gravelly muddy sand communities** within the Margate and Long Sands cSAC to **non-toxic contamination** is therefore considered to be **low**.

5.1.5 Biological disturbance

Removal of fish and crustacean species can have significant impacts on the structure and functioning of benthic communities over and above the physical effects of fishing methods, particularly as some fish species fill upper roles in the trophic web, and shrimp are important prey items. Sandbank sub-features are considered to have low sensitivity to selective extraction of species.

Biological disturbance includes the introduction of pathogens or non-native species as well as selective extraction of species from the ecosystem. Removal of fish species and larger molluscs can have significant impacts on the structure and functioning of benthic communities over and above the physical effects of fishing methods, particularly as some fish species fill upper roles in the trophic web.

Alien species occurring within the site include razorshell *Ensis americanus* which are widespread in the Queens Channel (Eno *et al.* 1997) and the amphipod *Corophium sextonae* in the South Edinburgh channel (EMU 2006). The American slipper limpet *Crepidula fornicata* is also abundant across the sandbanks. *Crepidula fornicata* is typically found attached to shells (often the mussels *Mytilus edulis and* oysters *Ostrea edulis*) and stones on soft substrata around the low water mark and the shallow sublittoral. It competes with other filter-feeding invertebrates for food and space, and in waters of high concentrations of suspended material it encourages the deposition of mud. Although in general the sensitivity of subtidal sandbank communities to such invasive species is not well understood, in this instance the feature is considered to have a low to moderate sensitivity to these effects.

The site is not affected by direct discharges from the coastline, nor is there any known aquaculture within the site. Fishing activities within the site include suction dredging for cockles, set and drift-net trammelling, drift gill netting, and a limited amount of beam trawling for demersal species. As noted above a number of alien species are present. Exposure of habitats within the site to biological disturbance is therefore considered to be moderate.

Overall the **vulnerability of low diversity dynamic sandbank communities** and **moderate diversity gravelly muddy sand communities** within the Margate and Long Sands cSAC to **Biological Disturbance** is assessed as **low to moderate** due to fishing activities and the presence of alien species.

6 References

DETR & THE WELSH OFFICE. 1998. *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. London: DETR.

ELLIOTT, M., NEDWELL, S., JONES, N.V., READ, S.J., CUTTS, N.D. &.HEMINGWAY, K.L.. 1998. *Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks (volume II). An overview of dynamic and sensitivity characteristics for conservation management of marine SACs*. Scottish Association for Marine Science (UK Marine SACs Project). 151 Pages.

EMU LTD. 2006. *Benthic Survey of the Outer Thames Estuary Sandbank System. Final Report.* Report 06/J/1/03/0837/0572 for English Nature.

ENO, N.C, CLARK, R.A. & SANDERSON, W.G. (eds) (1997) Non-native Species in British Waters: A Review and Directory. Pp. 152. Joint Nature Conservation Committee, Peterborough.

ENTEC UK LTD, 2008a. Greater Thames Site Summaries. Report to Natural England as part of Contract FST20-18-030, January 2008.

GIERE O. (1993). Meiobenthology: the microscopic fauna in aquatic sediments. Berlin; Springer.

HISCOCK, K. 1996. Marine Nature Conservation Review: rationale and methods. Peterborough, JNCC.

HR WALLINGFORD, 2002. The Southern North Sea Sediment Transport Study (Phase 2). www.sns2.org

HR WALLINGFORD, 2010. *A Review of Waves, Tides, Sediment Transport and Plume Dispersion Impacts from Aggregate Dredging to 2013 – Thames Estuary Region*. Report EX 6304 Release 2.0.

London Array Offshore Wind Farm Sabellaria spinulosa Investigation, October 2010

NIO, S.D., SHUTTENHELM, R.T.E. and VAN WEERING, T.C.E., 2009. *Holocene Marine Sedimentation in the North Sea Basin*. J Wiley Books.

PALMER, M. A. (1988). Dispersal of marine meiofauna: a review and conceptual model explaining passive transport and active emergence with implications for recruitment. Marine Ecology Progress Series. **48**, 81-91.

RPS GROUP PLC. 2005. Environmental Statement. Volume 1: Offshore Works. London Array Ltd.

SHERMAN, K. M., & COULL, B.C. 1980. The response of meiofauna to sediment disturbance. Journal of Experimental Marine Biology and Ecology **46**, 59-71

TYLER-WALTERS, H. & HISCOCK, K., 2005. Impact of human activities on benthic biotopes and species. *Report to Department for Environment, Food and Rural Affairs from the Marine Life Information Network (MarLIN).* Plymouth: Marine Biological Association of the UK. [Contract no. CDEP 84/5/244]

APPENDIX A

Feature: Sandbanks which are slightly covered with sea water all the time
Sub-feature: General

Attribute	Measure	Target	Comment
Extent of sandbanks (Mandatory CSM attribute)	Overall area (ha) of sandbanks measured periodically throughout the reporting cycle.	No decrease in extent from established baseline, subject to natural succession/ known cyclical change. *ENVISION (March 2008) Greater Thames AoS; ENTEC (April 2008) Sac Site Selection Assessment; MALSF OT REC (July 2009); LAL ES and Sabellaria Report (October 2010)* **References** BURNINGHAM, H. & FRENCH, J. 2009. *Seabed mobility in the greater Thames Estuary.* The Crown Estate. COMMISSION OF THE EUROPEAN COMMUNITY (CEC), 2007. *The interpretation manual of European Union Habitats-* EUR27[Online]. Brussels European Commission DGEnvironment. Available from: http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm ENTEC UK LTD. 2008. SAC selection assessment: Greater Thames Estuary. Report to Natural England as part of Contract FST20-18-300.	Consideration of changes in extent will need to take account of the dynamic nature of the sandbank. The chart on page 29 of this document shows the extent of the features. Following revision of the extent of sandbank features, the site boundary was re-delineated by following the JNCC guidance for boundary setting (JNCC, 2008). The guidance states that in shallow waters (≤ 25m below chart datum), a boundary extension of 4 x actual depth should be added to the habitat area of interest. The pSACs contained Annex I sandbanks at depths of predominantly less than 25m. Therefore, a margin of 100m was used around each sandbank feature. Information on the mobility of Long Sands Head was contained in recent reports from the Crown Estate and the United Kingdom Hydrographic Office (Burningham & French 2009, UKHO 2009, 2010). These indicated that the northern extent of Long Sands Head had increased by 4.5 km over 180 years up to 2003 and, most recently, the rate of increase has been much higher; a 550m extension in the four years between 2005 and 2009.

Attribute	Measure	Target	Comment
		KLEIN, A. 2006. Identification of submarine banks in the North Sea and the Baltic Sea with the aid of TIN modelling. *In*: VON NORDHEIM, H., BOEDEKER, D. & KRAUSE, J.C. (Eds.). *Progress in Marine Conservation in Europe. Natura 2000 Sites in German Offshore Waters*. Springer, Berlin, Heidelberg, New York, pp. 97-110. JNCC. 2008. UK guidance on defining boundaries for marine SACs for Annex I habitat fully detached from the coast. Available from http://www.jncc.gov.uk/pdf/SACHabBoundaryGuidance_2008Update.pdf NATURAL ENGLAND. 2009. Inshore Special Area of Conservation (SAC): Margate and Long Sands pSAC Selection Assessment. UKHO 2009. Thames Estuary Long Sand Head: Assessment on the analysis of routine resurvey area TE5A from the 2008 survey. The United Kingdom Hydrographic Office, 25pp. UKHO 2010. Thames Estuary Long Sand Head: Summary assessment on the analysis of routine resurvey area TE5A from the 2009 survey. The United Kingdom Hydrographic Office, 7pp.	

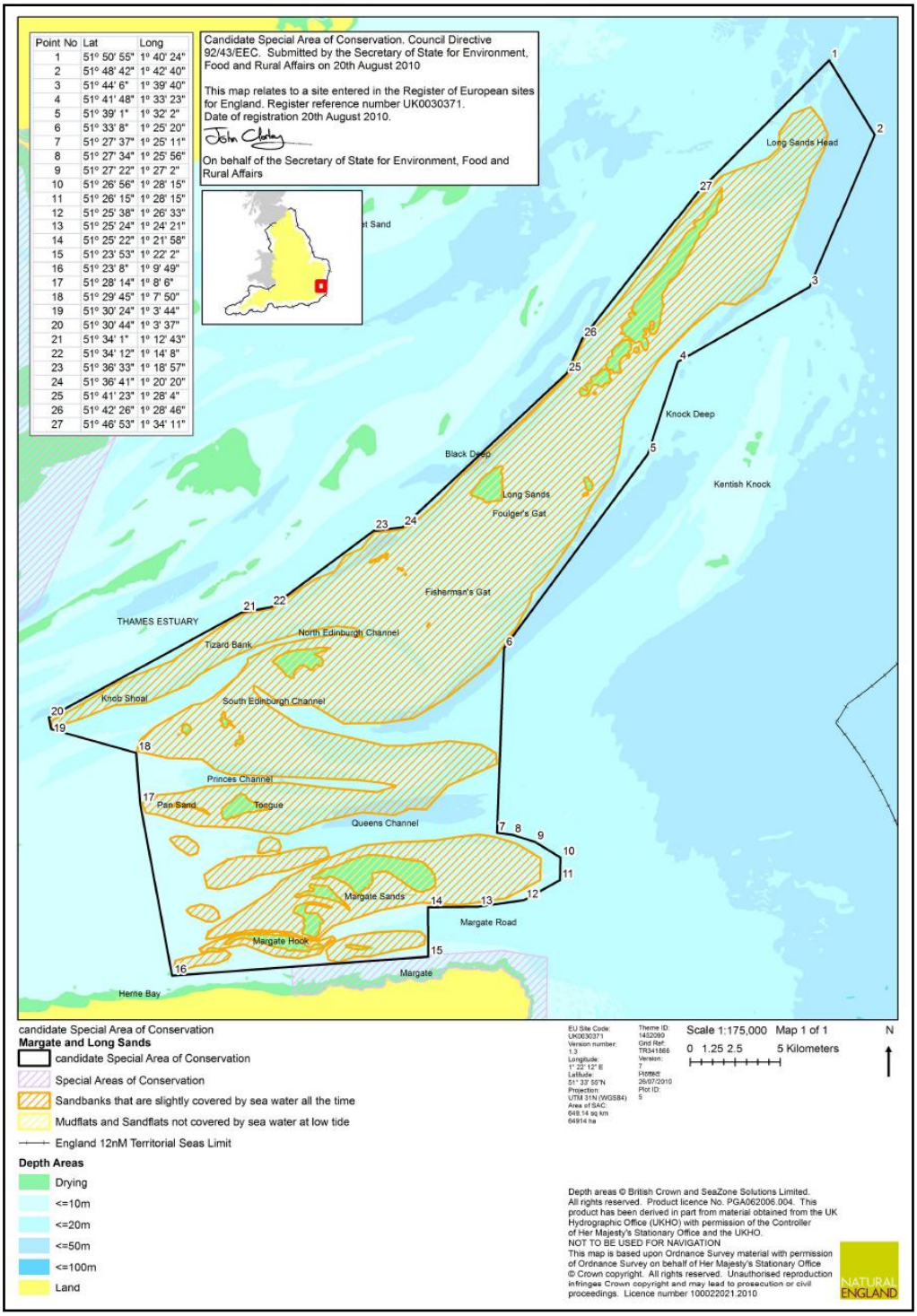
Attribute	Measure	Target	Comment
Topography of sandbanks (Mandatory CSM attribute)	Depth distribution of sandbanks from selected sites, measured periodically (as change is likely to be gradual in most areas, it is suggested that a 5 - 10 year survey timescale is sufficient for measurement of this attribute, although UKHO may be able to provide additional advice for specific sites based on their routine resurvey data).	No alteration in topography of the sandbanks, allowing for natural responses to hydrodynamic regime. *ENVISION (March 2008) Greater Thames AoS; ENTEC (April 2008) Sac Site Selection Assessment; MALSF OT REC (July 2009); LAL ES and Sabellaria Report (October 2010)*	The depth and distribution of the sandbanks reflects the energy conditions and stability of the sediment, which is key to the structure of the feature. However, it should be noted that subtidal sandbanks are naturally dynamic environments and sections of them may be subject to significant fluctuations in height over time, while other sections are more stable
Sediment character (Mandatory CSM attribute)	Assessed using Particle Size Analysis (PSA).Parameters include percentage sand/silt/gravel, mean and median grain size, and sorting coefficient, used to characterise sediment type	Maintain distribution of dynamic and stable sand and mixed sediments allowing for natural fluctuations. Average PSA parameters should not deviate significantly from the baseline established for the sites, subject to natural change. The site baselines have been determined by BGS SB250 sediment data and survey work. *ENVISION (March 2008) Greater Thames AoS; ENTEC (April 2008) Sac Site Selection Assessment; MALSF OT REC (July 2009); LAL ES and Sabellaria Report (October 2010)*	Sediment character is key to the structure of the sandbank, and reflects the physical processes acting on it. In addition to this, the sediment character is instrumental in determining the biological communities present on the sandbank.
Distribution of sub-features and biotopes (Distribution of biotopes is Mandatory CSM	Distribution and extent of community types, measured by grab sampling or drop down video. Frequency and	Maintain the distribution of subtidal sandbank communities, allowing for fluctation. *ENVISION (March 2008) Greater Thames AoS; ENTEC (April 2008) Sac Site Selection Assessment; MALSF OT REC (July 2009); LAL ES and Sabellaria Report (October 2010)*	Notable biotopes should be selected owing to their national significance, sensitivity, or how representative it is as a typical biotope for the biological zone. Where a biotope is lost from a baseline known area of presence (outside expected natural

Attribute	Measure	Target	Comment
attribute and Distribution of sub-features is Discretionary CSM attribute)	occurrence of component species of representative sandbank biotopes, SS.SSa.IMuSa.FfabMag, SS.SSa.IFiSa.NcirBat and SS.SCS.ICS.SLan measured once, during summer, within the reporting cycle. Distribution of sub-features has not yet been determined		variation), leading to a loss of the conservation interest of the site, then condition should be considered unfavourable. Changes in the presence or distribution of biotopes may indicate long-term changes in the physical conditions at the site, and deterioration in the overall biological value of the site.
Species composition of representative or notable biotopes (Discretionary CSM attribute)	Community composition measured by grab sampling or drop down video. Community composition not yet specified.	No decline in biotope quality as a result of reduction in species richness or loss of species of ecological importance, allowing for fluctuation. *ENVISION (March 2008) Greater Thames AoS; ENTEC (April 2008) Sac Site Selection Assessment; MALSF OT REC (July 2009); LAL ES and Sabellaria Report (October 2010)*	Whilst some change in community composition over time is expected (for example, as part of cyclic changes or successional trends) changes in the overall nature of communities across the key representative biotopes sandbank, may indicate deterioration in the condition of the biodiversity of the sandbanks. Species composition is an important contributor to the structure of a biotope. The presence and abundance of a characterising species gives an indication of the quality of a biotope, and any change in composition may indicate a cyclic change or trend in the sandbank community. Where changes in species composition are known to be clearly attributable to natural succession, known cyclical change or mass recruitment or dieback of characterising species, then the target value should accommodate this variability. Where there is a change in biotope quality outside the expected variation or a loss of the conservation

Attribute	Measure	Target	Comment
			interest of the site, then condition should be considered unfavourable.
Species population measures (Discretionary CSM attribute)	Species are not yet specified	Maintain age/size class structure of individual species Baseline yet to be established *ENVISION (March 2008) Greater Thames AoS; ENTEC (April 2008) Sac Site Selection Assessment; MALSF OT REC (July 2009); LAL ES and Sabellaria Report (October 2010)*	Changes in presence and/or abundance of a species can critically affect the physical and functional nature of the habitat, leading to unfavourable condition. The species selected should serve an important role in the structure and function of the biological community. Whilst some change in community structure over time is expected (for example, as part of cyclic changes or successional trends) changes in the overall nature of communities across the sandbank, including mobile species e.g. fish, crustacean species etc, may indicate deterioration in the condition of the biodiversity of the sandbanks. Where the field assessment judges changes in the presence and/or abundance of specified species to be unfavourable, and subsequent investigation reveals the cause is clearly attributable to natural succession and known cyclical change (such as mass recruitment and dieback of characterising species), the final assessment will require expert judgement by Natural England advisers to determine the reported condition of the feature. The feature's condition could be declared favourable where the expert judgement of Natural England/JNCC advisers is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change

Attribute	Measure	Target	Comment
			outside the expected variation or a loss of the conservation interest of the site, (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable

Appendix B Map of the site and features



Appendix C Methods for deriving vulnerability[19].

Sensitivity[20]	
None	-
Low	•
Moderate	••
High	•••

Exposure	
None	-
Low	+
Medium	++
High	+++

Vulnerability	
None detectable	
Low	
Moderate	
High	

The relative vulnerability of an interest feature or sub-feature is determined by multiplying the scores for relative sensitivity and exposure, and classifying that total into categories of relative vulnerability. For the sandbank sub-features the sensitivity is as defined by MarLIN (2011) The sensitivity assessment for each activity in Annex D for the sub-feature uses the highest (i.e. most precautionary) sensitivity for the range of biotopes used to define this sub-feature, where more than one biotope is related to a sub-feature (see Appendix F for list of biotopes sub-features consist of).

		Relative sensitivity of the interest feature			
		High (3)	**Moderate (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
Moderate	3-5
Low	1-2
None detectable	0

[19] Where sensitivities in MarLIN are defined as 'Very Low' they are classified here as 'Low'. Where sensitivities in MarLIN are defined as 'Very High' they are classified here as 'High'.

Appendix D Summary of operations which may cause deterioration or disturbance to Margate and Long Sands cSAC

Operations which may cause deterioration or disturbance	Margate and Long Sands cSAC Subtidal sandbanks
Physical loss	
Removal (e.g. capital dredging, offshore development)	✓
Smothering (e.g. by aggregate dredging, disposal of dredge spoil)	✓
Physical damage	
Siltation (e.g. run-off, channel dredging, outfalls)	✓
Abrasion (e.g. boating, anchoring, demersal fishing)	✓
Selective extraction (e.g. aggregate dredging)	✓
Toxic contamination	
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs)	✓
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	✓
Introduction of radionuclides	
Non-toxic contamination	
Changes in nutrient loading (e.g. agricultural run-off, outfalls)	✓
Changes in organic loading (e.g. mariculture, outfalls)	✓
Changes in thermal regime (e.g. power stations)	✓
Changes in turbidity (e.g. run off, dredging)	✓
Changes in salinity (e.g. water abstraction, outfalls)	✓

Operations which may cause deterioration or disturbance	Margate and Long Sands cSAC Subtidal sandbanks
Biological disturbance	
Introduction of microbial pathogens	
Introduction of non-native species and translocation	✓
Selective extraction of species (e.g. commercial and recreational fishing)	✓

Appendix E Assessment of the relative vulnerability of interest features and sub-features of the Margate and Long Sands cSAC to different categories of operations (for key see appendix A)

Operations which may cause deterioration or disturbance	**Annex I Subtidal sandbanks**					
	Dynamic sand communities			**Gravelly muddy sand communities**		
	Sensitivity	Exposure	Vulnerability	Sensitivity	Exposure	Vulnerability
Physical loss						
Removal[21] (e.g. capital dredging, offsore development)	••	++	Moderate	••	**++**	Moderate
Smothering (e.g. by aggregate dredging, disposal of dredge spoil)	•	++	Low	•	++	Low
Physical damage						
Siltation (e.g. run-off, channel dredging, outfalls)	•	++	Low	•	++	Low
Abrasion (e.g. boating, anchoring, demersal fishing)	•	++	Low	••	++	Moderate
Selective extraction[22] (e.g. aggregate dredging)	•	+	Low	•	+	Low
Non-physical disturbance						
Noise (e.g. boat activity)	-	-		-	-	

[21] This is equivalent to 'Substratum loss' in MarLIN sensitivity analysis

[22] This is equivalent to 'Displacement' in MarLIN sensitivity analysis

Operations which may cause deterioration or disturbance	Annex I Subtidal sandbanks					
Visual (e.g. recreational activity)	-	-		-	-	
Toxic contamination						
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs)	••	+	Low	••	+	Low
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	••	+	Low	••	+	Low
Introduction of radionuclides	Insufficient information	+	Insufficient information	Insufficient information	+	Insufficient information
Non-toxic contamination						
Changes in nutrient loading (e.g. agricultural run-off, outfalls)	••	+	Low	•	+	Low
Changes in organic loading (e.g. mariculture, outfalls)	••	+	Low	••	+	Low
Changes in thermal regime (e.g. power stations)	•	+	Low	•	+	Low
Changes in turbidity (e.g. run-off, dredging)	•	+	Low	•	+	Low
Changes in salinity (e.g. water abstraction, outfalls)	••	+	Low	•	+	Low
Biological disturbance						
Introduction of microbial pathogens	-	-		•	-	
Introduction of non-native species and translocation	-	++	Moderate	•	++	Low
Selective extraction of species (e.g. bait digging, wildfowling, commercial and recreational fishing)	•	++	Low	•	++	Low

Sensitivity[23]	
None	-
Low	•
Moderate	••
High	•••

Exposure	
None	-
Low	+
Medium	++
High	+++

Sensitivity[24]	
None	-
Low	•
Moderate	••
High	•••

Exposure	
None	-
Low	+
Medium	++
High	+++

[23] Where sensitivities in MarLIN are defined as ‘Very Low’ they are classified here as ‘Low’.

[24] Where sensitivities in MarLIN are defined as ‘Very Low’ they are classified here as ‘Low’.

Appendix F - Species and Biotopes used to determine site sensitivity

Margate and Long Sands cSAC Biotopes[25] used to determine site sensitivity		
Sandbanks: **Dynamic sand communities**		
SS.SSA.IFiSa.NcirBat	*Nephtys cirrosa* and *Bathyporeia* spp in Infralittoral sand	Emu (2006), Envision (2008) Entec (2008a)
SS.SSa.IFISa.IMoSa	Infralittoral mobile clean sand with sparse fauna	Emu (2006) Envision (2008) Entec (2008a)
SS.SSA.IMuSa.FfabMag*	*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand.	Emu (2006)
SS.SSA.ICS.SLan	*Lanice conchilega* and other polychaetes in tide-swept infralittoral sand and mixed gravelly sand	Envision (2008) Entec (2008a) Elliot et al (1998)
Gravelly muddy sand communities		
SS.SSA.IMuSa.FfabMag*	*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand.	Emu (2006)
SS.SSa.ImuSa.EcorEns	*Echinocardium cordatum* and *Ensis* spp in lower sublittoral slightly muddy sand	Emu (2006)
SS.SMx	Sublittoral mixed sediment	Emu (2006)

* SS.SSA.IMuSa.FfabMag is listed for both subfeatures as this biotope can form a gradient between the dynamic sand and muddier sand communities (Emu, 2006)

[25] Biotopes used are according to MarLIN 2004 codes (see www.marlin.ac.uk). These listed biotopes may be reviewed to reflect new evidence/survey results.