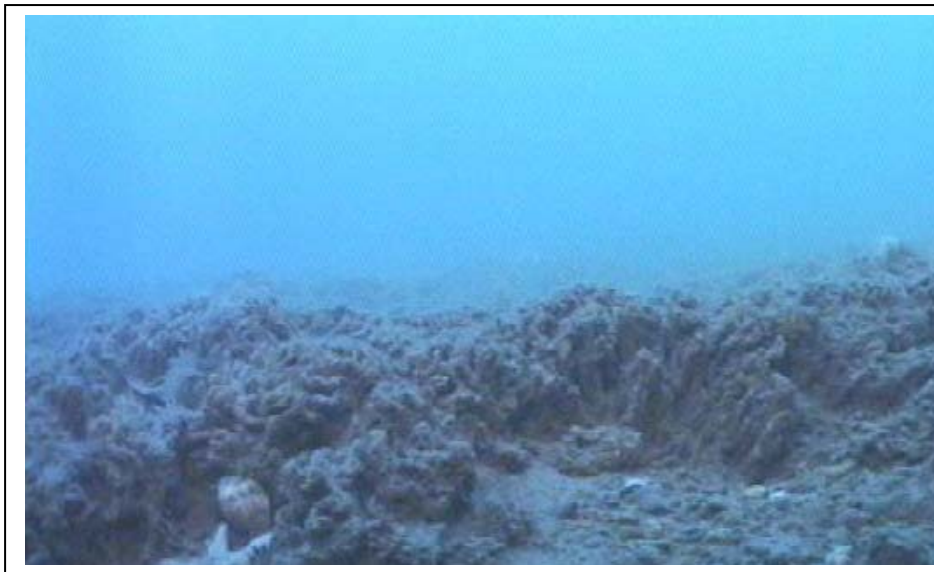




Offshore Special Area of Conservation: North Norfolk Sandbanks and Saturn Reef

Draft Conservation Objectives and Advice on Operations



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Version 4.0 (August 2010)

* Cover photo illustrates the Saturn *Sabellaria spinulosa* reef in 2003 (BMT Cordah, 2003).

Document Version Control

Version and issue date	Amendments made	Issued to and date
NNSandbanksandSaturnReef_Conservation Objectives_AdviceonOperations_4.0.doc (August 2010)	- Updated into new house style & removed references to pSAC, replace with cSAC	
NNSandbanksandSaturnReef_Conservation Objectives_AdviceonOperations_3.2.doc (December 2009)	- Further explanatory text inserted on roles and responsibilities, and sensitivity, exposure and vulnerability assessments updated	
NNSandbanksandSaturnReef_Conservation Objectives+AdviceonOperations_3.1_newC Otext_NOT_IN_v3.2_YET.doc (10 th September 2007)	- Updated conservation objectives	
NNSandbanksandSaturnReef_Conservation Objectives+AdviceonOperations_3.1.doc (10 th September 2007)	- Advice on Operations updated to reflect Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007 coming in to force.	UK Marine Biodiversity Policy Steering Group and Competent Authorities (Sept 07)
NNSandbanksandSaturnReef_Conservation Objectives+AdviceonOperations_3.0.doc (31 st May 2007)	- Stand alone Conservation Objectives and Advice on Operations (SAC Selection Assessment moved to separate document) - Sensitivity, exposure and vulnerability assessments modified; exposure data from Eastwood <i>et al.</i> (2007) incorporated - Summary of Advice on Operations moved to front of document	JNCC Committee (June 07) and UK Marine Biodiversity Policy Steering Group (30 th May 07)
NNSandbanksandSaturnReef Dossier_2.0_Draft.doc (26 th August 2006)	- Document structure modified: Conservation objectives and Advice on Operations combined with SAC selection assessment. - Map layout revised (boundary not changed) - Sensitivity/exposure/vulnerability assessments added (NNS)/revised (Saturn) - Advice on Operations amended	Defra (25 th September 2006)
North Norfolk Sandbanks Proforma and provisional management action statements: JNCC 05 P10 (September 2005) ¹		JNCC Committee (September 2005)
SaturnConservationObjectives_1204.doc (15 th December 2004)		Defra (15 th December 2004)

Further information

This document is available as a pdf file on JNCC's website for download if required (www.jncc.gov.uk).

Please return comments or queries to:

Offshore SAC Management Adviser

¹ The North Norfolk Sandbanks site was formally advised to Defra in December 2005 (without accompanying selection assessment)

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Summary of Draft Advice on Operations for North Norfolk Sandbanks and Saturn Reef Special Area of Conservation (SAC)

This advice is based on information on the SAC presented in JNCC's 'North Norfolk Sandbanks and Saturn Reef: SAC Selection Assessment' (version 4.0 July 2008). JNCC's Conservation Objectives and Advice on Operations is site and feature specific, and has been developed using best available scientific information and expert interpretation as at December 2009. The advice is generated through a coarse grading of sensitivity and exposure of site interest features to physical, chemical and biological pressures associated with human activity. Sensitivity and exposure have been combined to give a measure of the vulnerability of an interest feature to operations which may cause damage or deterioration, and which therefore require management.

The exact impact of any operation will be dependent upon the nature, scale, location and timing of events. This Advice on Operations for the North Norfolk Sandbanks and Saturn Reef site will be kept under review and will be periodically updated to reflect new evidence that suggests changes in both sensitivity and exposure.

Management actions should enable the North Norfolk Sandbanks and Saturn Reef to achieve Favourable Condition. This will require assessment and management of human activities likely to affect the feature adversely, and of activities likely to impact natural environmental quality and environmental processes upon which the features are dependent.

To fulfil the conservation objectives for the **Annex I Sandbanks which are slightly covered by seawater all the time**, the competent authorities for this area are advised to manage human activities within their remit such that they do not result in deterioration or disturbance of this feature through any of the following:

- i) **Physical loss** by Removal (aggregate dredging), Obstruction (installation of petroleum industry infrastructure and submarine cables) or Smothering (deposition of oil and gas cuttings piles)
- ii) **Physical damage** by Physical disturbance or abrasion (demersal fishing);
- iii) **Toxic contamination** by introduction of Synthetic and/or Non-synthetic compounds (pollution from oil and gas industry);
- iv) **Non-toxic contamination** by Changes in nutrient loading (sewage from oil and gas rigs);
- v) **Biological disturbance** by Selective extraction of species (demersal fishing).

To fulfil the conservation objectives for the **Annex I Reefs** interest feature, the competent authorities for this area are advised to manage current human activities within their remit such that they do not result in deterioration or disturbance of this biogenic reef through any of the following:

- i) **Physical damage** by Physical disturbance or abrasion (demersal fishing);
- ii) **Biological disturbance** by Selective extraction of species (demersal fishing).

Within the North Norfolk Sandbanks and Saturn Reef SAC, the following offshore activity is likely to result in damage to the interest features, and is not subject to prior authorisation or licensing. It is, therefore, currently considered to pose a high or medium-high risk of damage to the interest features of the SAC:

- **Demersal fishing**

Competent Authorities are advised to consider management actions that might need to be taken to reduce the risk of damage to the features associated with this activity.

The above list is not a catalogue of prohibitions but rather indicates where some form of management measure(s) may be required or further measures where actions are already in force. This advice is indicative and does not remove the need for formal consultation on individual plans and projects.

North Norfolk Sandbanks and Saturn Reef SAC: Draft Conservation Objectives and Advice on Operations

1. Introduction

1.1. JNCC's role

The Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007 transpose the Habitats Directive into law for UK offshore waters (from 12-200 nm from the coast or the UK Continental Shelf). These Regulations give JNCC a statutory responsibility to i) establish conservation objectives for SACs, ii) inform Competent Authorities of these conservation objectives and iii) advise Competent Authorities of any operations which may adversely affect the integrity of the site. This draft document for North Norfolk Sandbanks and Saturn Reef SAC is therefore prepared by JNCC in fulfilment of requirements under Regulation 18 of the Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007.

This advice is also required under the Offshore Petroleum Activities (Conservation of Habitats) Regulations (as amended in 2007); and the Environmental Impact Assessment and Natural Habitats (Extraction of Minerals by Marine Dredging) Regulations 2007.

For offshore SACs, JNCC are required to provide conservation objectives and advice on operations once a site has been submitted by Government to the European Commission (i.e. becomes a candidate SAC).

1.2. Offshore (12-200 nautical miles): The role of competent authorities

Regulations 22 and 23 of the Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007 require competent authorities to ensure compliance with the Habitats Directive. Competent authorities must, within their 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 SAC.

1.3. Activity outside the role of competent authorities

Nothing within this document will require competent authorities to undertake any actions if it is shown that any changes result wholly from natural causes. Having issued Advice on Operations for SACs, JNCC will work with competent authorities and others to agree, within a defined time frame, a protocol for evaluating all observed changes to baselines and to develop an understanding of natural change and provide further guidance as appropriate and possible. This does not, however, preclude competent authorities from taking action to prevent deterioration to the interest features, and indeed such actions should be taken when required.

1.4. Role of conservation objectives

The conservation objectives set out what is needed to ensure Favourable Condition of the Annex I feature. The UK conservation agencies use the term 'favourable condition' to represent the concept of Favourable Conservation Status for the interest features of an individual SAC (Davies,

2001). For an Annex I habitat, Favourable Conservation Status under the Habitats Directive occurs when: i) its natural range and area it covers within that range are stable or increasing; and ii) 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; and iii) the conservation status of its typical species is favourable² (Article 1e).

Conservation objectives are the starting point from which management measures and monitoring programmes may be developed as they provide the basis for determining what currently, or may in the future, impact the site. The SAC Conservation Objectives will also inform appropriate assessment under the Habitats Regulations.

1.5. Role of advice on operations

Under the Habitats Directive, Member States are required to take appropriate steps to avoid the deterioration or disturbance of interest features within SACs (Article 6.2). The advice on operations set out in Section 3 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 competent authorities on areas that may need management measures. This operations advice may need to be supplemented through further discussions with the competent authorities and any advisory groups formed for the SAC.

This document will also inform the scope and nature of any appropriate assessments which the Directive requires to be undertaken for plans and projects (Regulation 25 of the Offshore Regulations) that:

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

Where a project is likely to undermine the site's conservation objectives, it is anticipated to have a significant effect on the site and therefore require an appropriate assessment. The scope and content of any appropriate assessment will depend upon the location, size and significance of the proposed project and JNCC will advise on a case by case basis.

Through an appropriate assessment, competent authorities are required to ascertain the effect on the integrity of the site in view of the site's conservation objectives (Article 6.3). The integrity of the site is defined in paragraph 20 of ODPM Circular 06/2005 (DEFRA Circular 01/2005) as 'the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified'.

Although closely linked, the judgement of effect upon site integrity is subtly different to determination of favourable condition of a specific feature. An assessment of favourable condition determines the current status of a feature. Any evaluation of effects on site integrity needs to consider whether the plan or project in question is compatible with the long-term maintenance of the site's features. For example, there may be a time-lag between a plan or project being initiated

² The term Favourable Conservation Status relates to the individual habitats and species over their natural range within the European Union. However, because the selection of the European network of SACs is seen as fundamental to achieving Favourable Conservation Status, the European Commission considers that the concept should also be applied at the site level.

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 long-term site integrity even though the features remain in favourable condition in the short term.

1.6. North Norfolk Sandbanks and Saturn Reef SAC conservation objectives

The conservation objectives for the North Norfolk Sandbanks and Saturn Reef SAC interest features are provided below. These are high level objectives for the site features, and JNCC may refine them in future as our understanding of the features improves. They should be read in the context of (and in conjunction with) other advice given, particularly the site Selection Assessment Document which provides more detailed information about the site and evaluates its interest features according to the Habitats Directive selection criteria and guiding principles.

Within the objectives below superscript letters refer to explanatory text provided subsequently in section 2.3.

The Conservation Objectives for the North Norfolk Sandbanks are:

Subject to natural change, restore^a the sandbanks which are slightly covered by seawater all the time to favourable condition, such that:

- The natural environmental quality^b is restored;
- The natural environmental processes^c are restored;
- The extent^d, physical structure^e, diversity^f, community structure^g and typical species^h representative of **infralittoral mobile clean sands on tidal ridge sandbanks** in the southern North Sea are restored.

The Conservation Objectives for the Saturn *Sabellaria spinulosa* reef are:

Subject to natural change, restore the *Sabellaria spinulosa* to favourable condition, such that:

- The natural environmental quality is maintained;
- The natural environmental processes are maintained;
- The extent, physical structure, diversity, community structure and typical species representative of representative of *Sabellaria spinulosa* biogenic reef in the southern North Sea are restored.

In the case of the North Norfolk Sandbanks and Saturn Reef SAC, there is evidence to date that, due to damage caused by bottom trawling and infrastructure development, the Annex I features may not be in favourable condition and are likely to require restoration (Bob Foster-Smith, Dave Limpenny, pers. comm., 2006). The feature's vulnerability to human pressure is further documented in section 3.3. However there is a lack of detailed information on levels of exposure to human activities and their ecological impact on the feature at this site. As such, it is not

possible to ascertain precisely the degree to which the feature has been damaged, and the extent to which restoration might be required. As outlined in section 1.8 below, further information will be required to assess and monitor favourable condition of the reef at this offshore SAC.

1.7. Explanation of terms used in the Conservation Objectives

a) **Maintain or restore**

Maintain implies that, based on our existing understanding, the feature **is regarded as being in favourable condition and will**, subject to natural change, remain at **its** condition at designation.

Restore implies that the feature is likely to have been degraded to some degree and that activities may have to be managed to **reduce or eliminate** potential **negative** impact(s). Restoration in the marine environment generally **refers to** natural recovery to favourable condition **through the reduction or removal of impacts**.

JNCC consider that maintenance or restoration of the following parameters (b - h) meets the requirements of the Habitats Directive to achieve favourable conservation status of the natural habitat through favourable “distribution, structure and functions”.

- b) **Natural environmental quality** e.g. chemical quality parameters of water, suspended sediment levels, radionuclide levels etc should not deviate from baseline at designation (if available) or reference conditions.
- c) **Natural environmental processes** e.g. circulation, sediment deposition and erosion etc. should not deviate from baseline at designation (if available) or reference conditions.
- d) **Extent** - the area covered by the habitat and communities
- e) **Physical structure** - the shape, form and composition of the habitat and its substrata.
- f) **Diversity** - the number of different biological communities or number of species within a given community.
- g) **Community structure** e.g. age classes, sex ratios, distribution of species, abundance, biomass, reproductive capacity, recruitment, range and mobility.
- h) **Typical species** – see Appendix V for criteria for identifying typical species.

1.8. Favourable condition

Conservation objectives for inshore SACs have been provided in association with a ‘favourable condition’ table, which outlines how to recognise favourable condition status for the interest features in question. However, understanding the functioning and condition of complex and dynamic offshore marine sites, which experience a variety of pressures resulting from historic and current activities, is difficult. For offshore sites, there is presently insufficiently detailed information on i) the existing condition of qualifying interest features and ii) the preferred or target condition of interest features. This currently limits identification of measures and associated targets for condition monitoring. It is anticipated that further information on the condition of interest features will be obtained through baseline surveys and mo

2. Advice on Operations

2.1. Purpose of advice

The aim of this advice is to enable all competent authorities to prioritise management of activities that pose a threat to the interest features of the North Norfolk Sandbanks and Saturn Reef site. The advice is linked to the conservation objectives outlined in the section above, and will help provide the basis for detailed discussions within the management group to formulate and agree a management scheme for the site, where one is felt to be necessary.

2.2. Methods of assessment

Six broad Pressure Categories which may cause i) deterioration of natural habitats or the habitats of species, or ii) disturbance of species, (either alone or in combination), are considered in JNCC's Advice on Operations:

- Physical loss
- Physical damage
- Non-physical disturbance
- Toxic contamination
- Non-toxic contamination
- Biological disturbance

Example sources of pressures are provided (See Table 1), although these examples are not inclusive of all potentially detrimental activities.

A three-step process is used to assess the vulnerability of the site's features (**sandbanks slightly covered by seawater all the time** and ***Sabellaria spinulosa* reef**) to the above pressures (see flow diagram in Appendix I):

- An assessment of the **sensitivity** of the interest features to the listed pressures (Appendix II);
- An assessment of the current **exposure** of the interest features to the pressures (Appendix III); and
- An assessment of the **vulnerability** of the interest features to the pressures. Vulnerability occurs where sensitivity to a given pressure is combined with exposure to that pressure.

This approach is sufficiently robust to take into account the effects of new activities or changes in patterns of usage. By assessing sensitivity, exposure and vulnerability independently, the reasoning behind current (and any future) advice is made clear. If an interest feature is known or thought to be sensitive to a particular pressure category, new activities or changes in patterns of activities which result in that pressure are likely to cause deterioration or disturbance.

All the scores of relative **sensitivity**, **exposure** and **vulnerability** are derived using best available scientific data and expert judgement. This method uses a coarse categorisation system, reflecting the current state of our understanding of the marine environment. It should be recognised that data for offshore habitats are sparse and assessments are likely to need revision in light of new research.

2.3. Vulnerability assessment

The vulnerability of the interest feature to external pressures is determined by integrating the sensitivity evaluation with that of exposure. Only if a feature is both sensitive *and* exposed to a human activity is it considered vulnerable. In this context, therefore, **vulnerability** has been defined as the **exposure** of the habitat, community or individual (or individual colony) of a species to an external factor to which it is **sensitive** (Hiscock, 1996). An assessment of interest features' vulnerability (Table 1) helps to guide site management decisions by highlighting potentially detrimental activities that may need to be managed (or continue to be managed) by the competent authorities.

Interest feature vulnerability to physical, chemical and biological pressures

i) The **North Norfolk sandbanks slightly covered by seawater all the time** and associated biological communities are:

- Highly vulnerable to **obstruction** (oil and gas industry infrastructure, and submarine cables)
- Moderately vulnerable to **smothering** (oil and gas cuttings piles), **physical disturbance or abrasion** (demersal trawling) and **selective extraction of species** (demersal trawling).

ii) The ***Sabellaria spinulosa* reef** and associated biological communities are:

- Moderately vulnerable to **physical disturbance or abrasion** (demersal trawling) and **selective extraction of species** (demersal trawling)

Vulnerability of both interest features to the **introduction of synthetic compounds, introduction of non-synthetic compounds** and **changes in nutrient loading** (all due to onsite oil and gas industry activities) has been identified, but this cannot be quantified at present.

Vulnerability to **noise (acoustic), introduction of radionuclides, introduction of microbial pathogens** and **introduction of non-native species** remains unknown for both interest features.

2.4. Risk assessment

JNCC considers 'risk' to be the likelihood of deterioration of the feature due to an activity. It is the vulnerability of the feature to an activity, assessed against the level of management of that activity.

High risk activities will be those to which the feature is highly or moderately vulnerable, and for which there is insufficient management. For example, industries which are not location specific and not subject to prior consent procedures or reliable enforcement are more likely to cause damage/disturbance to the interest feature. These industries include fishing and shipping. However, clearly not all activities associated with these industries are detrimental to interest features.

Low risk activities will be those where there is no feature vulnerability (i.e. the activity does not interact with the feature) or where the high vulnerability is mitigated for by management. For example, for industries which are location specific, are always subject to prior consent and have clear reliable methods of enforcement, there is generally a lower likelihood of causing damage or

disturbance to interest features. This includes the activities of the oil and gas, aggregates and renewable energy industry sectors. Only high or medium-high risk activities are noted here.

Within the North Norfolk Sandbanks and Saturn Reef site, the following offshore activities are currently considered to pose a high risk to the interest features:

- **Demersal fishing**

Competent Authorities are advised to consider management actions that might need to be taken to reduce the risk of damage associated with this activity to the SAC features.

The vulnerability of the SAC to climate change is not considered in the tables below, given the uncertainties surrounding the effects of global change on the oceans.

Table 1. Sensitivity, exposure and vulnerability of North Norfolk Sandbanks to physical, chemical and biological pressures.

Sensitivity key: ●● = High sensitivity; ●● = Moderate sensitivity; ● = Low sensitivity; ○ = No known sensitivity; ? = Insufficient information to make an assessment

Exposure key: High = High exposure; Medium = Medium exposure; Low = Low exposure; None = No known exposure; Unknown level = Exposure of an unknown level; ? = Insufficient information to make an assessment

List of pressures which may cause deterioration or disturbance (with example activities)		North Norfolk Sandbanks: Sandbanks which are slightly covered by seawater all the time		
		Sensitivity	Exposure	Vulnerability
Physical loss	Removal (e.g. aggregate dredging, isolated rock dump, infrastructure development)	●●	Low	Low: 2
	Obstruction (e.g. permanent constructions [oil and gas infrastructure, windfarms, cables] and wrecks)	●●●	Medium	High: 6
	Smothering (e.g. drill cuttings)	●	High	Moderate: 3
Physical damage	Changes in suspended sediment (e.g. screening plumes from aggregate dredging)	●	Low	Low: 1
	Physical disturbance or abrasion (e.g. mobile benthic fishing, anchoring, windfarm scour pits, pipeline burial, potting)	●●	Medium	Moderate: 4
Non-physical disturbance	Noise (e.g. boat activity, seismic)	○	?	No known vulnerability: 0
	Visual presence (e.g. recreational activity)	○	None	No known vulnerability: 0
Toxic contamination	Introduction of synthetic compounds (e.g. TBT, PCBs, industrial chemical discharge, produced water, fuel oils)	●●	Unknown level	Vulnerability (not quantifiable)
	Introduction of non-synthetic compounds (e.g. heavy metals, crude oil spills)	●●	Unknown level	Vulnerability (not quantifiable)
	Introduction of radio-nuclides (e.g. nuclear energy industry)	?	?	Insufficient information
Non-toxic contamination	Changes in nutrient loading (e.g. outfalls)	●●	Unknown level	Vulnerability (not quantifiable)
	Changes in thermal regime (e.g. cooling water discharges)	●	None	No known vulnerability: 0
	Changes in turbidity (e.g. laying of pipelines, aggregate dredging)	○	Low	No known vulnerability: 0
	Changes in salinity (e.g. outfalls from rigs, ships)	●●	None	No known vulnerability: 0
Biological disturbance	Introduction of microbial pathogens (e.g. outfalls)	?	?	Insufficient information
	Introduction of non-native species and translocation (e.g. ballast water, hull fouling)	?	?	Insufficient information
	Selective extraction of species (e.g. bioprospecting scientific research, demersal fishing)	●●	Medium	Moderate: 4

Table 2. Sensitivity, exposure and vulnerability of North Norfolk *Sabellaria spinulosa* reefs to physical, chemical and biological pressures.

List of pressures which may cause deterioration or disturbance (with example activities)		Saturn Reef: <i>Sabellaria spinulosa</i> reefs		
		Sensitivity	Exposure	Vulnerability
Physical loss	Removal (e.g. aggregate dredging, isolated rock dump, infrastructure development)	●●●	None	No known vulnerability: 0

	Obstruction (e.g. permanent constructions [oil and gas infrastructure, windfarms, cables] and wrecks)	•••	None	No known vulnerability: 0
	Smothering (e.g. drill cuttings)	••	None	No known vulnerability: 0
Physical damage	Changes in suspended sediment (e.g. screening plumes from aggregate dredging)	•	Low	Low: 1
	Physical disturbance or abrasion (e.g. mobile benthic fishing, anchoring, windfarm scour pits, pipeline burial, potting)	••	Medium	Moderate: 4
Non-physical disturbance	Noise (e.g. boat activity, seismic)	○	?	No known vulnerability: 0
	Visual presence (e.g. recreational activity)	○	None	No known vulnerability: 0
Toxic contamination	Introduction of synthetic compounds (e.g. TBT, PCBs, industrial chemical discharge, produced water, fuel oils)	••	Unknown level	Vulnerability (not quantifiable)
	Introduction of non-synthetic compounds (e.g. heavy metals, crude oil spills)	••	Unknown level	Vulnerability (not quantifiable)
	Introduction of radio-nuclides (e.g. nuclear energy industry)	?	?	Insufficient information
Non-toxic contamination	Changes in nutrient loading (e.g. outfalls)	••	Unknown level	Vulnerability (not quantifiable)
	Changes in thermal regime (e.g. cooling water discharges)	•	None	No known vulnerability: 0
	Changes in turbidity (e.g. laying of pipelines, aggregate dredging)	○	None	No known vulnerability: 0
	Changes in salinity (e.g. outfalls from rigs, ships)	••	None	No known vulnerability: 0
Biological disturbance	Introduction of microbial pathogens (e.g. outfalls)	?	?	Insufficient information
	Introduction of non-native species and translocation (e.g. ballast water, hull fouling)	?	?	Insufficient information
	Selective extraction of species (e.g. bioprospecting scientific research, demersal fishing)	••	Medium	Moderate: 4

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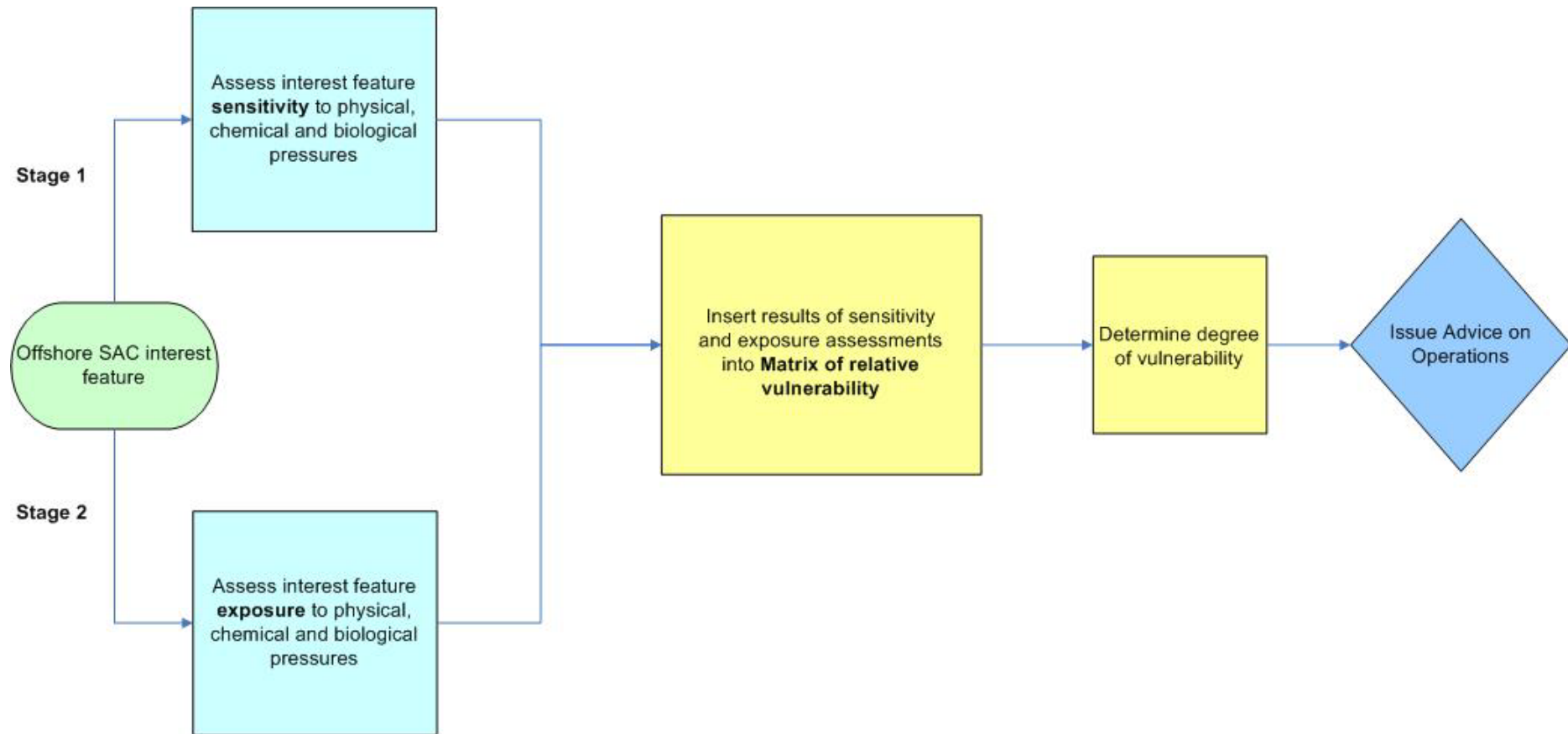
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Appendix I: Flow diagram indicating process of determining vulnerability of interest features



Appendix II: Sensitivity assessment

2.5. Appendix II: Sensitivity assessment

This assessment evaluates the relative sensitivity of the features of the North Norfolk Sandbanks and Saturn Reef SAC to the effects of physical, chemical and biological pressures. Sensitivity is defined here as 'intolerance of a habitat, community or individual (or individual colony) of a species to damage, or death, from an external factor and the time taken for its subsequent recovery' (MarLIN, 2006). 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) (MarLIN, 2006). The sensitivity of interest features (and scientific understanding of sensitivity) may change over time. Hence, an operation which is not currently deemed to have a negative effect may do so in the future.

Tables 1 and 2 (column 3) show the sensitivity assessments for the features of the North Norfolk Sandbanks and Saturn Reef SAC. They are drawn principally from MarLIN's (2002; 2006) evaluations of the sensitivities of the following biotopes (which are comparable to those present within the SAC):

- ***Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand (IGS.NcirBat)**
- ***Sabellaria spinulosa* on stable circalittoral mixed sediment (SS.SBR.PoR.SspiMx)**

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. JNCC have in some cases, therefore, adjusted the assessments of sensitivity to be more precautionary. 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 North Norfolk Sandbanks and Saturn reef site are sensitive to: **physical loss, physical damage, toxic and non-toxic contamination, and biological disturbance**, resulting from a range of activities. Further detail on sensitivities of the sandbanks and *Sabellaria spinulosa* reef features is provided in Table 1 and Table 2 respectively.

The interest features and associated biological communities of the North Norfolk Sandbanks and Saturn Reef site are sensitive to:

a) **Physical loss**

Removal of the sandbank feature would result in loss of its ecological communities. The structure and diversity of sandbank communities are determined by environmental characteristics such as sediment particle size distribution, seabed slope, and water depth. Any change in these environmental parameters (by removing or smothering part of the feature) would result in a loss of habitat and a possible shift in community organisation.

Loss of *S. spinulosa* reef would remove a hard substrate from a predominately soft-sediment environment, which provides unique refugia for certain species. Biogenic reefs increase habitat heterogeneity and offer associated species a surface for attachment and a place to escape from predation (Bruno & Bertness 2001). Such reefs are also provide nursery grounds for juveniles and can buffer disturbance for species that live within their structure.

Any construction over either of the features would lead to their (partial) removal, and permanent infrastructure may prevent their natural recovery through obstruction.

b) **Physical damage**

Physical abrasion (for example, by mobile fishing gear) can directly damage both interest features and their typical species. In particular, larger, fragile, sessile species are likely to be selectively removed from the community (Sewell & Hiscock 2005).

Disturbance of the soft sediments surrounding both features could also indirectly affect the features by causing the suspension of fine sediment (studies have shown mobile fishing gear can double the suspended matter content of the water, an effect that is likely to persist for several days). Whilst the increase in suspended particulates may benefit filter feeders, many species are adversely affected by increases in suspended sediment (Hartnoll 1998). Even on sandbanks, a shift from predominately sand and gravel to finer sediments may result in a dramatic drop in species richness, abundance and biomass (Desprez 2000).

c) **Toxic and non-toxic contamination**

The feature and associated communities are considered sensitive to various types of chemical disturbance, though there is currently no information available to quantify this disturbance.

d) **Biological disturbance**

The biological effects of fisheries include:

- Removal of target species
- Mortality of non-target species

These effects lead to shifts in community structure (e.g. if predators are removed from the system) which then lead to indirect effects on the food web as a whole.

It has not been possible to determine whether the interest feature is sensitive to noise (acoustic), introduction of radionuclides, introduction of microbial pathogens or introduction of non-native species.

Appendix III: Exposure assessment

Table 1 (column 4) shows the relative exposure of the North Norfolk Sandbanks and Saturn Reef SAC interest 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.

As offshore sites cover a relatively large geographical area and precise information on operations within SAC boundaries is not yet available, assigning scores for exposure carries certain assumptions about the spatial extent, frequency and intensity of the pressures associated with offshore activities. Expert judgement was used to determine where onsite activities are likely to affect interest features physically, chemically and/or biologically. Spatial data on offshore industry activities has been provided by the Crown Estate for aggregate extraction and windfarm development, UK Deal for oil and gas industry activities and the United Kingdom Cable Protection Committee for submarine cable distribution. UK-wide fisheries data for offshore waters are not yet available to JNCC at sufficient resolution to enable a full assessment of exposure to different types of fishing activities. Availability of Vessel Monitoring System (VMS) data combined with logbook and/or vessel registration data for all European vessels across UK waters on an annual basis would allow the spatial extent and intensity of physical and biological pressures associated with demersal fishing to be evaluated more thoroughly. We are not aware of an adequate methodology to assess the distribution of static/set demersal gear use, or the intensity of its physical and biological impacts. Interest feature exposure and vulnerability to static/set demersal gears have therefore not been assessed.

The exposure assessment is based on best available information on the levels of pressures associated with activities at the North Norfolk Sandbanks and Saturn Reef site. If new information becomes available this may lead to modification of the advice on operations presented herein. In addition, an activity may not currently be occurring on the site but may do in future. As such, **competent authorities will need to take into account both the sensitivity of the feature and the conservation objectives outlined in section 1.6 whenever a new activity is proposed.**

Interest feature exposure to physical, chemical and biological pressures

The interest features and associated biological communities of the North Norfolk Sandbanks and Saturn reef site are exposed to the following pressures.

- **Physical loss:** The sandbanks are exposed to low levels of **removal** (aggregate dredging), moderate levels of **obstruction** (oil and gas industry infrastructure, and submarine cables) and high levels of **smothering** (oil and gas cuttings piles)

Aggregate extraction occurs within the site boundary, but away from the defined sand bank features and over 15km from Saturn Reef. Also within the boundaries of the site are two application areas for marine aggregate production. Whether these sites have the potential to significantly affect the integrity of the principle designation features will have to be determined through the consents process, informed by EIA and Appropriate Assessment.

Furthermore, Oil and Gas UK estimated that for the site boundary proposed in the March 2008 JNCC consultation:

- there are 43 different fields, 78 installations, 75 pipelines (including smaller pipes and cables) and 36 wellheads within the boundary
- 15 manned installations within the boundary and

- 7 member companies operating within the boundary

There will also be ancillary activities to support the installations – e.g. supply vessels.

Potential impacts from this activity arise from:

- (at the sandbanks): gas extraction infrastructure (mainly pipelines across banks) across several banks; oil and gas cuttings piles; sewage and contamination from sites.
- (at the reef): contamination and sewage
- **Physical damage:** The sandbanks and reef are both exposed to low levels of **changes in suspended sediment** (effects of aggregate screening plumes and demersal trawling) and moderate levels of **physical disturbance or abrasion** (demersal trawling)

This area is heavily commercially fished with mixed demersal fisheries and shellfisheries. The majority of beam trawlers are Dutch and Belgian operating around the banks and targeting sole, plaice and possibly cod, skate and rays. There are also some UK beam trawls and UK vessels using static fishing gear. Some 5 UK long-liners can work the area, principally for cod, skate and dogfish, though the numbers have declined in recent years.

- **Toxic contamination:** The sandbanks and reef are likely to be exposed to both **synthetic** and **non-synthetic compounds** at unknown levels (due to onsite oil and gas industry activities);
- **Non-toxic contamination:** Both the sandbanks and reef are likely to be exposed to **changes in nutrient loading** at unknown levels (sewage from oil and gas industry onsite); the sandbanks are also exposed to low levels of **changes in turbidity** (demersal trawling);
- **Biological disturbance:** The sandbanks and reef are both exposed to moderate levels of **selective extraction of species** (demersal trawling).

It has not been possible to determine whether the interest features are exposed to **noise (acoustic)**, **introduction of radionuclides**, **introduction of microbial pathogens** or **introduction of non-native species**.

Appendix IV: Matrix of relative vulnerability

The relative vulnerability of an interest feature is determined by combining the sensitivity and exposure assessments according to the table below.

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

Note: if there is insufficient information to assess either exposure **or** sensitivity of a given interest feature, vulnerability will always be categorised 'insufficient information to make any assessment'.

Categories of relative vulnerability

High vulnerability	6 to 9
Moderate vulnerability	3 to 5
Low vulnerability	1 to 2
Vulnerability identified, but not quantified as level of exposure unknown	
No known vulnerability	0
Insufficient information to make any assessment	

Appendix V: Typical species criteria

Identification of a species as typical is not in itself sufficient to indicate the importance of the species or any need for management. The importance of the species should be judged on the contribution made by the species to ecological integrity of the feature. These criteria are intended to help identify or classify typical species and are not limited to the benthos. They are relevant to the Annex I habitat feature and its component parts at the *site* level.

A typical species should meet one or more of the following criteria a – e below:

a) Consistently associated with, but not necessarily restricted to, the feature

For example

- Can be predicted to occur at certain seasons/times (e.g. seasonal & temporal)
- Stages of life cycle associated with the feature (e.g. spawning)
- Species is dependent upon feature (for food, shelter, nest)

b) A species on which identification of the habitat is founded

- This criterion is unlikely to apply to complex physiographic features which may be composed include other Annex 1 features (e.g. H1130 Estuaries, H1160 Large Shallow Inlets and Bays which may include H1170 Reefs, H1110 Sandbanks which are slightly covered by seawater all the time etc.)

c) Characteristic of the habitat

For example

- *Ammodytes tobianus*, *Zostera marina* for 'H1110 Sandbanks which are slightly covered by seawater all the time'

d) An integral part of the structure of the habitat

For example

- Any species that gives the habitat structural complexity (e.g. kelp)
- Any species that forms the habitat (e.g. biogenic reef species, maerl)

e) A species which influences the habitat's structure and function

For example:

- Bioturbators
- Grazers
- Animals which bore into the substratum
- Predators
- Keystone species (i.e. a species that influences the ecological composition, structure, or functioning of its community far more than its abundance would suggest (EEA, 2008)

Note: The above criteria should not be used to describe non-native species as typical. A non-native species is one that has been introduced directly or indirectly by human agency (deliberately or otherwise) to an area where it has not occurred in historical times and which is separate from and lies outside the area where natural range extension could be expected (Eno, Clark, & Sanderson, 1997). Non-native species cannot be representative of the UK's biodiversity and therefore would not be considered as typical species of Annex I features.