Title:	Impact Assessment (IA)
Haisborough, Hammond & Winterton Special Area of Conservation.	**IA No:**
Lead department or agency: Defra Marine Biodiversity Policy	**Date:** 14/07/2010
Other departments or agencies: Joint Nature Conservation Committee (JNCC), Natural England.	**Stage:** Final
	Source of intervention: EU
	Type of measure: Secondary legislation
	Contact for enquiries: rebecca.clark@naturalengland.org.uk 0300 060 1959

Summary: Intervention and Options

What is the problem under consideration? Why is government intervention necessary?

The UK marine environment is rich in species and habitats that provide valuable goods and services to society. In most of the UK marine environment living things are treated as open access resources. This means that most users of the marine environment do not individually have economic incentives to operate in ways that conserve fish, shell fish, birds, mammals and their habitats. Though regulation is in place for some activities (such as fisheries, marine aggregate extraction and wind farms) this is not necessarily designed to achieve nature conservation objectives. Consequently marine habitats and populations of some marine species are being degraded, are declining, or are at risk due to human activates.

What are the policy objectives and the intended effects?

The European Council's Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna (the Habitats Directive, 1992) aims to promote the maintenance of biodiversity. The Directive requires the UK (as a Member State) to propose sites that are eligible (that host habitats and species in need of conservation listed in the Directive) for designation as Special Areas of Conservation (SACs). The UK is required to establish conservation measures for SACs, through management of potentially damaging activities where the habitats and species are present and in their vicinity.

What policy options have been considered? Please justify preferred option (further details in Evidence Base)

1. Designate the site. This will contribute to conserving habitats of European importance.

The purpose of this IA is to inform the government of impacts of designating the site and not the decision about whether to designate the site (which will be based on its selection assessment document). Other options are not considered because JNCC and Natural England are recommending this site as necessary contribution by the UK to the network of SACs for sandbanks and reefs (based on its geographical location and other factors). If this site is not designated there is a significant risk that the EC will judge the UK's contribution to the network of SACs for sandbanks and reefs (both listed in the Habitats Directive) to be insufficient, which could lead to infraction proceedings. Alternative sites of similar quality and extent are not currently known to exist (known alternatives were considered during the identification process but not recommended on scientific grounds). Though the site could be conserved under voluntary agreements or a national designation this would not contribute to fulfilling the requirements of the Habitats Directive.

When will the policy be reviewed to establish its impact and the extent to which the policy objectives have been achieved?	It will be reviewed 01/2020
Are there arrangements in place that will allow a systematic collection of monitoring information for future policy review?	Yes

SELECT SIGNATORY Sign-off For consultation stage Impact Assessments:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible SELECT SIGNATORY:..... Date:.....

Summary: Analysis and Evidence — Policy Option 1

Description:

Price Base Year 2010	PV Base Year 2010	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low: n/a	**High:** n/a	**Best Estimate: n/a**

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	0.645m		0.125m	**£1.483m**
High	248.138m		0.183m	**£210.431m**
Best Estimate	124.391m		0.154m	**£105.957m**

Description and scale of key monetised costs by 'main affected groups'

Economic costs of impacts on aggregate extraction (0 - £2.2m), gas storage pipelines (0 - £22m), carbon dioxide storage pipelines (0 - £21m), wind farm developments (0 - £201m), replacement of telecom cables (0 - £1.8m); commercial fisheries (0 - £0.06m p.a.). Plus costs (mostly to the public sector) of managing the SAC (£0.65m plus £0.13m p.a.).

Other key non-monetised costs by 'main affected groups'

Low cost scenario: social & unknown economic impacts from effects on fisheries; unknown SAC management costs; costs beyond 10 years. High cost: as above plus unknown potentially significant cost of impacts on new & decommissioned gas infrastructure & wind farm developments. Unknown costs of impacts on aggregate extraction, possible restrictions on anchoring & recreational angling. Higher likelihood developments not permitted, costs from delay to consents, unknown costs to public sector bodies.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional		Optional	**Optional**
High	Optional		Optional	**Optional**
Best Estimate	unquantified		unquantified	**unquantified**

Description and scale of key monetised benefits by 'main affected groups'

It has not been possible to monetise the benefits of designating the sites because the benefits cannot be readily quantified and most of the benefits are not traded so cannot be easily valued.

Other key non-monetised benefits by 'main affected groups'

Contributes to conservation of marine habitats & their species (outcomes sought & valued by society), conserving 66,900 ha of sandbank and 90 ha of Sabellaria spinulosa reef. Low to moderate improvements in fisheries landings and recreation (benefiting low numbers of people). Low to moderate benefits of protecting education & research resources & low benefits of protecting cultural heritage (all benefiting society). Also positive environmental impacts outside site and benefits beyond ten years.

Key assumptions/sensitivities/risks — **Discount rate (%)** 3.5%

Management for the site is developed after designation so a range of plausible hypothetical measures is used for the analysis. If the site is not designated condition of the habitats may be maintained but could be at risk to further deterioration. Formal mechanisms to avoid damage to the habitats are weaker if the site is not designated. Risk of infraction if the suite of proposed SACs is not designated. Fisheries management beyond 12nm is sought through the Common Fisheries Policy. Risk that displacement of fisheries and aggregate extraction will translocate their environmental impacts. Other additional costs to operators. Project financiers may seek to develop projects elsewhere. Benefits are reliant on effective management. Risk of cumulative economic impacts of marine protected areas.

Impact on admin burden (AB) (£m):			**Impact on policy cost savings (£m):**	**In scope**
New AB: 0	**AB savings:** n/a	**Net:** 0	**Policy cost savings:** 0	No

Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?			United Kingdom		
From what date will the policy be implemented?			01/11/2010		
Which organisation(s) will enforce the policy?			MMO, DECC, SFCs/IFCAs		
What is the annual change in enforcement cost (£m)?			0.064 plus		
Does enforcement comply with Hampton principles?			Yes		
Does implementation go beyond minimum EU requirements?			No		
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded:** n/a	**Non-traded:** n/a	
Does the proposal have an impact on competition?			No		
What proportion (%) of Total PV costs/benefits is directly attributable to primary legislation, if applicable?			**Costs:** n/a	**Benefits:** n/a	
Annual cost (£m) per organisation (excl. Transition) (Constant Price)	**Micro**	**< 20**	**Small**	**Medium**	**Large**
Are any of these organisations exempt?	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No

Specific Impact Tests: Checklist

Set out in the table below where information on any SITs undertaken as part of the analysis of the policy options can be found in the evidence base. For guidance on how to complete each test, double-click on the link for the guidance provided by the relevant department.

Please note this checklist is not intended to list each and every statutory consideration that departments should take into account when deciding which policy option to follow. It is the responsibility of departments to make sure that their duties are complied with.

Does your policy option/proposal have an impact on…?	**Impact**	**Page ref within IA**
Statutory equality duties[1] Statutory Equality Duties Impact Test guidance	No	
Economic impacts		
Competition Competition Assessment Impact Test guidance	No	96
Small firms Small Firms Impact Test guidance	Yes	96
Environmental impacts		
Greenhouse gas assessment Greenhouse Gas Assessment Impact Test guidance	No	97
Wider environmental issues Wider Environmental Issues Impact Test guidance	Yes	All
Social impacts		
Health and well-being Health and Well-being Impact Test guidance	Yes	98
Human rights Human Rights Impact Test guidance	No	98
Justice system Justice Impact Test guidance	No	
Rural proofing Rural Proofing Impact Test guidance	No	98
Sustainable development Sustainable Development Impact Test guidance	Yes	All

[1] Race, disability and gender Impact assessments are statutory requirements for relevant policies. Equality statutory requirements will be expanded 2011, once the Equality Bill comes into force. Statutory equality duties part of the Equality Bill apply to GB only. The Toolkit provides advice on statutory equality duties for public authorities with a remit in Northern Ireland.

Evidence Base (for summary sheets) – Notes

Use this space to set out the relevant references, evidence, analysis and detailed narrative from which you have generated your policy options or proposal. Please fill in **References** section.

References

Include the links to relevant legislation and publications, such as public impact assessment of earlier stages (e.g. Consultation, Final, Enactment).

No.	Legislation or publication
1	JNCC and Natural England (2010) *Special Area of Conservation (SAC): Haisborough, Hammond and Winterton pSAC Selection Assessment.* http://www.naturalengland.org.uk/ourwork/marine/sacconsultation/default.aspx
2	JNCC and Natural England (2009a) *Offshore Special Area of Conservation: Haisborough, Hammond and Winterton. Draft conservation objectives and advice on operations.* http://www.naturalengland.org.uk/ourwork/marine/sacconsultation/default.aspx
3	JNCC and Natural England (2009) Consultation impact assessment for designation of the Haisborough, Hammond and Winterton draft Special Area of Conservation. http://www.naturalengland.org.uk/ourwork/marine/sacconsultation/default.aspx
4	

+

See attached evidence base. Details of the impact tests are provided in Appendix I.

Evidence Base

Ensure that the information in this section provides clear evidence of the information provided in the summary pages of this form (recommended maximum of 30 pages). Complete the **Annual profile of monetised costs and benefits** (transition and recurring) below over the life of the preferred policy (use the spreadsheet attached if the period is longer than 10 years).

The spreadsheet also contains an emission changes table that you will need to fill in if your measure has an impact on greenhouse gas emissions.

Annual profile of monetised costs and benefits* - (£m) constant prices

	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9
Transition costs										
Annual recurring cost										
Total annual costs										
Transition benefits										
Annual recurring benefits										
Total annual benefits										

* For non-monetised benefits please see summary pages and main evidence base section

Microsoft Office Excel Worksheet

Evidence Base (for summary sheets)

There is discretion for departments and regulators as to how to set out the evidence base. However, it is desirable that the following points are covered:

- Problem under consideration;
- Rationale for intervention;
- Policy objective;
- Description of options considered (including do nothing);
- Costs and benefits of each option;
- Risks and assumptions;
- Administrative burden and policy savings calculations;
- Wider impacts;
- Summary and preferred option with description of implementation plan.

Inserting text for this section:

Select the notes here and either type section text, or use **Paste Without Format** toolbar button to paste in the standard EBBodyPara Style. Format text by applying EB styles from the toolbar.

Annexes

Annex 1 should be used to set out the Post Implementation Review Plan as detailed below. Further annexes may be added to provide further information about non-monetary costs and benefits from Specific Impact Tests, if relevant to an overall understanding of policy options.

Annex 1: Post Implementation Review (PIR) Plan

A PIR should be undertaken, usually three to five years after implementation of the policy, but exceptionally a longer period may be more appropriate. A PIR should examine the extent to which the implemented regulations have achieved their objectives, assess their costs and benefits and identify whether they are having any unintended consequences. Please set out the PIR Plan as detailed below. If there is no plan to do a PIR please provide reasons below.

Basis of the review: [The basis of the review could be statutory (forming part of the legislation), it could be to review existing policy or there could be a political commitment to review]; The Secretary of State has a duty to report to the European Commission (EC) on the condition of interest features in the site every six years. Review of economic impacts of the site is required under the impact assessment guidance.
Review objective: [Is it intended as a proportionate check that regulation is operating as expected to tackle the problem of concern?; or as a wider exploration of the policy approach taken?; or as a link from policy objective to outcome?] Reporting on the condition of the interest features informs assessment of whether the conservation objectives for the site are being achieved. The review of economic impacts of the site aims to inform understanding of the impacts of marine protected areas but under the Habitats Directive it cannot inform review of the designation.
Review approach and rationale: [e.g. describe here the review approach (in-depth evaluation, scope review of monitoring data, scan of stakeholder views, etc.) and the rationale that made choosing such an approach] Reporting on the condition of the interest features will be based on assessment of indicators and monitoring where appropriate (in terms of the risk that human activities are impacting on the condition of the interest features). Review of the economic impacts will be based on information in the public domain and collection of information from stakeholders where necessary and proportionate.
Baseline: [The current (baseline) position against which the change introduced by the legislation can be measured] Baseline data on the condition of interest features in the site and baseline data collected for the impact assessment on human activities in the site.
Success criteria: [Criteria showing achievement of the policy objectives as set out in the final impact assessment; criteria for modifying or replacing the policy if it does not achieve its objectives] Achievement of the conservation objective of the site.
Monitoring information arrangements: [Provide further details of the planned/existing arrangements in place that will allow a systematic collection systematic collection of monitoring information for future policy review] Assessment of the condition of the interest features every six years to inform reporting to the EC, as described above. Collection of information from stakeholders through ongoing engagement via the advisory group.
Reasons for not planning a PIR: [If there is no plan to do a PIR please provide reasons here]

Add annexes here.

Evidence base for designation of Haisborough, Hammond and Winterton Special Area of Conservation

CONTENTS

1. Introduction

1.1 Purpose

1.1.1 This is the Impact Assessment (IA) for the recommendation that the Haisborough, Hammond and Winterton Special Area of Conservation (SAC) is designated. Natural England and the Joint Nature Conservation Committee (JNCC) are recommending designation of the site to the Department for Food, Environment and Rural Affairs (Defra). The site extends offshore from the north east coast of Norfolk, in the UK's Southern North Sea Regional Sea, and lies both within and beyond 12 nautical miles (nm) of the coast.

1.1.2 The IA informs the government of impacts the site could have on the UK economy[1] and the site's potential environmental and social effects. It should not inform the decision to designate the site (which should be based on the site's Selection Assessment Document). This is because under the European Union's (EU's) Habitats Directive[2] economic or social impacts should not influence selection of SACs or delineation of their site boundaries. However, information provided on the type and level of activities taking place in and near the site may be used to inform management measures for the site.

1.2 Rationale for government intervention

1.2.1 Government intervention is required to protect marine habitats and species. Though some activities (such as fisheries, marine aggregate extraction and wind farms) are regulated this is not necessarily designed to achieve nature conservation objectives. Consequently marine habitats and species may be at risk of degradation or population decline as a result of human activities now or in the future.

1.2.2 The UK has one of the world's richest marine environments: it includes a diversity of habitats and a huge variety of animals and plants. Many species of seabird occur in internationally important numbers in UK waters. Conservation of marine habitats, plants and animals helps improve the environment (a principle of sustainable development[3]). It also contributes to the wellbeing of current and future generations.

1.2.3 The UK government is aiming to recover and protect the richness of our marine environment and wildlife through development of a strong, ecologically coherent and well managed network of marine protected areas that is well understood and supported by all sea users by 2012[4]. Establishment of this network plays a key part in delivering the government's vision for the marine environment of clean, safe, healthy, productive and biologically diverse oceans and seas[5]. The network of marine protected areas (MPAs) will include Special Areas of Conservation (SACs) designated under the EC's Habitats Directive and Special Protection Areas (SPAs)

[1] In keeping with guidance provided by the Defra impacts on the other Member States and other countries are not considered in this Impact Assessment.
[2] Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna.
[3] HM Government, 2005.
[4] Defra, 2009.
[5] Defra, 2002.

designated under the Birds Directive[6]. Further information on the MPA network is provided in Annex 2.

1.3 Intervention objectives and intended effects

1.3.1 The UK (as a Member State of the EU) is required to take measures to maintain or restore favourable conservation status[7] of natural habitats and species that are considered to be most in need of conservation at a European level and to introduce robust protection for them. Habitats that are in need of conservation (listed in Annex I of the Habitats Directive[8]) are described as those in danger of disappearance within their natural range, or that have a small natural range, or that are outstanding examples of typical characteristics of the biogeographical regions listed in the Directive[9]. The Directive not only aims to conserve these habitats but also their typical species (the approach adopted for typical species in this IA is set out in Annex 9).

1.3.2 Under the Habitats Directive, habitats (and their typical species) in need of conservation are to be protected by a coherent European ecological network of sites (the „Natura 2000' network[10]). The network is being identified by the European Commission from lists of national sites proposed by each Member State. The sites are designated as SACs by the Member State once the Commission adopts them into the Natura 2000 network.

1.3.3 The UK's existing contribution to the European coherent ecological network of sites is insufficient for Annex I reef habitat and Annex I sandbank habitat[11]. Additional sites are needed both to represent the range of habitat sub-types in the UK and to ensure sufficient proportion of the UK resource of reefs and sandbanks is included within the network. The southern North Sea has been identified[12] as an area that is under-represented by existing sites. Natural England and the JNCC have identified additional sites that will contribute towards sufficiency. They consider that all sites they are recommending in 2010 (plus a small number of other UK sites still under consideration) will be needed to achieve sufficiency (further details on the process for site identification are provided in Annex 2).

1.3.4 Haisborough, Hammond and Winterton possible SAC[13] (pSAC) has been identified by Natural England and the JNCC as one of the best examples of the range and diversity of sandbanks and biogenic reefs in the UK for protection under the Habitats Directive (based on the habitats' biological quality, geographical

[6] Council Directive 2009/147/EC on the conservation of wild birds.
[7] The conservation status of a habitat is described as favourable when the „natural range' and area it covers within that range are stable or increasing, and the specific structure and functions which are necessary for its long term maintenance exist and are likely to exist for the foreseeable future, and the conservation status of its typical species is favourable'.
[8] The species are listed in Annex II of the Directive.
[9] Council Directive 92/43/EEC Article 1(c).
[10] which comprises SPAs as well as SACs.
[11] This was endorsed by the outcome of a „moderation' meeting of the European Commission and Member States for the Atlantic biogeographic region in Galway 24-25 March 2009.
[12] At the „moderation' meeting of the European Commission and Member States for the Atlantic biogeographic region in Galway 24-25 March 2009.
[13] The site is referred to as a „possible SAC' from public announcement of the site on formal consultation until submission of the site to European Commission.

location, the proportion of the UK resource of the habitats the site contains, and other factors; for further details see Annex 2). Though the percentage contribution of reef resource appears low, this site offers a very high percentage of the UK's resource of the sub-type biogenic reef.

1.3.5 The Conservation of Habitats and Species Regulations and the Offshore Marine Conservation Regulations[14] that implement the Habitats Directive provide significant protection to the habitat and its typical species that an SAC aims to protect. Key features of the protection that is provided are (further details are provided in Annex 3):

- Competent authorities[15] are required to consider whether any plan or project (either alone or in combination with other plans and projects) is likely to have a significant effect[16] on any SAC or SPA when considering whether to consent it. A plan or project can be consented when it has been ascertained that there will be no significant effect.
- If it finds that a plan or project[17] is likely to have a significant effect, the competent authority is required to undertake an „Appropriate Assessment' with advice from the appropriate statutory nature conservation adviser(s). Appropriate Assessment assesses the potential impacts of the plan or project on achievement of the conservation objectives of the SAC or SPA and is limited to the implications of the plan or project for the specific habitats or species for which the SAC or SPA is designated. This can increase costs to the developer (as developers are responsible for providing and paying for the information required) and can cause delays though the risk of this is reduced if appropriate consultation[18] is instigated early on. Many types of plan or project are required to undergo comprehensive environmental assessment under existing legislation[19]. Under these circumstances Appropriate Assessment under the Conservation of Habitats and Species Regulations and the Offshore Marine Conservation Regulations may not add significantly to assessment costs, since much of the information required for assessment under those Regulations will be available from the wider environmental assessment.
- The competent authority considers the Appropriate Assessment when deciding whether to grant consent. When doing so, it is required to apply the

[14] The Conservation of Habitats and Species Regulations 2010 implement the Habitats Directive in English territorial waters within 12 nautical miles (nm) off the coast and the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended 2009 and 2010, the Offshore Regulations) implement the Habitats Directive for offshore waters (waters within British fishery limits and any part of the sea bed and sub soil within the UK Continental Shelf Designated Area (within approximately 200nm off the coast).

[15] A competent authority is a public body or statutory undertaker that grants consents for regulated activities, for example, the Department of Energy and Climate Change (DECC) is the competent authority for wind farm and oil and gas licensing. It is responsible for taking into account the 2010 Conservation of Habitats and Species Regulations and 2007 Offshore Marine Regulations when it considers consenting activities under the regulations within its remit. It is also responsible for applying the Conservation of Habitats and Species Regulations and Offshore Marine Regulations tests (as required) for plans and projects which may affect how the site's conservation objectives are maintained or reached.

[16] A „significant' effect is one that brings a significant risk of not achieving the designated site's conservation objectives. Assessment of significance in this respect is established on a case by case basis.

[17] That is not directly connected with or necessary to the management of the site.

[18] Consultation of nature conservation bodies, The Crown Estate, regulatory authorities, non-government organisations (NGOs) and other stakeholders.

[19] Environmental Impact Assessment (EIA) of projects and "Strategic Environmental Assessment" (SEA) of plans and programmes.

precautionary principle[20] and consequently can only grant consent if it can ascertain that the plan or project will have no adverse effect on the SAC or SPA. This greatly enhances the protection provided for SACs and SPAs compared with some other designations (further details are provided in Annex 3).

- Derogations may be made under very limited circumstances (discussed in Annex 3).

This greatly enhances the protection provided for SACs and SPAs compared with some other designations (further details are provided in Annex 3).

1.4 Features of conservation interest in the site[21]

1.4.1 The Haisborough, Hammond and Winterton site[22] comprises a series of headland associated sandbanks with alternating ridges that meet the Annex I habitat description „sandbanks slightly covered by sea water all the time' as well as a number of biogenic reefs created by the Ross worm, *Sabellaria spinulosa*, that meet the Annex I habitats description for „reefs' (Figure 1, which can be found along with the other figures at the end of the main body of the Evidence Base, just before the references).

1.4.2 The central sandbank ridge in the site is the main Haisborough, Hammond and Winterton ridge composed of headland associated sandbanks that have evolved into an S-shape of alternating ridges over the last 5000 years. Hewett Ridge and Smiths Knoll form an older sequence of sandbank ridges located along the outer site boundary. Inshore are the Newarp Banks and North and Middle Cross Sands which lie on the south west corner of the site. These banks are believed to be geologically recent from around only 2000 years ago.

1.4.3 The sandy sediments within the sandbanks are very mobile due to high tidal currents but the movement of the banks themselves is very slow. The sandbank crests support low numbers of worms and amphipod crustaceans (small shrimp-like animals) which are typical of sandbanks (only a few animals are adapted to live on continually shifting mobile sands). The stable flanks of the banks and the troughs between them support more diverse communities that include an abundance of attached bryozoans (sea-mats), hydroids (sea-firs) and sea anemones. Other tube-building worms such as keel worms and sand mason worms are also found in these areas, along with bivalves and crustaceans.

1.4.4 Overall these sandbanks are representative of sandbanks within the Southern North Sea Regional Sea. Most of the UK's resource for sandbanks is located in the Southern North Sea Regional Sea and therefore a number of sites have been selected that will contribute towards sufficiency of sandbank habitat in the Natura 2000 network of sites for the UK. The different sites represent different sub-types of sandbank habitat, from sheltered estuarine sandbanks, vegetated sandbanks, to different physiographic types associated with headlands, and offshore shelf sandbanks. Each has a slightly different range of sediment types, salinity and

[20] The precautionary principle and its application in this context are described in Annex 3.
[21] For further details see JNCC and Natural England, 2010.
[22] The spelling of the name „Haisborough' is taken from the Admiralty charts and should not be confused with the adjacent North Norfolk coastal village of Happisburgh, which is pronounced the same.

exposure to tides and wave action which results in different ranges of associated biological communities.

1.4.5 Ross worms live in tubes they build out of sand particles. Reefs are formed when the worms occur in high densities and the tubes stick together. The reefs change the structure of the sandy sea bed that supports them from one that is mostly soft to one that is mostly hard, with a more complex structure. The reefs, therefore, support a range of animals that would not otherwise be able to live on a sand-dominated sea bed; they attach themselves to the tubes of the worms or live in the crevices between them. Species associated with the reefs include hydroids, hornwrack, anemones, squat lobster, velvet swimming crab, brittlestars and pink shrimp.

1.4.6 The site provides spawning grounds for sand eel, lemon sole and sole[23] and nursery grounds for cod, herring, mackerel, sole, lemon sole and plaice[24]. The site is an important feeding ground for little tern. There is a large breeding colony of 400 to 500 grey seals adjacent to the site[25].

1.4.7 The Haisborough, Hammond and Winterton pSAC covers 146,749 ha and comprises 66,900 ha of sandbanks (of which 24,696 ha lies in water less than 20 metres deep) and 90 ha of biogenic Ross worm reef. The pSAC overlaps with the Outer Thames pSPA but the overlap is very small (less than 1 percent of the pSAC overlaps with the pSPA, see maps in Annex 8) and therefore is not analysed further.

1.5 The options

1.5.1 Option 1, the preferred option is to designate the SAC. This is assessed relative to a baseline of the situation if the site is not designated (the „do nothing' option). Other options are not considered here as JNCC and Natural England are recommending this site as a necessary contribution by the UK to the network of SACs for sandbanks and reefs (based on its biological quality, geographical location, the proportion of the UK resource of the habitat the site contains, and other factors). If this site is not designated there is a significant risk that the European Commission (EC) will judge the UK's contribution to the network of SACs for sandbanks and reefs (both listed in the Habitats Directive) to be insufficient, which could lead to infraction proceedings[26]. Known alternatives were considered during the site identification process but not recommended on scientific grounds. Sites of similar quality and overall extent of these habitats were not found and are not currently known to exist. Though the site could be conserved under voluntary agreements or a national designation this would not contribute to fulfilling the requirements of the Habitats Directive.

[23] CEFAS, 2001 and Centrica, 2007.
[24] CEFAS, 2001; Scira Offshore Energy Ltd., 2006 and Centrica, 2007.
[25] Rick Southwood personal communication, 2.7.09.
[26] The outcome of the „moderation' meeting of the EC and Member States for the Atlantic biogeographic region, held in Galway 24-25 March 2009 was that the existing UK network of sites for Annex I reef and sandbank habitat is insufficient and additional sites are required.

1.6 Overview of the IA

1.6.1 This IA replaces the IA that was formally consulted on in 2009-10 and has been modified in light of new information and responses to the formal consultation.

1.6.2 It assumes that the site is designated in 2010. Impacts have been assessed in the IA over a time scale of ten years based on the Impact Assessment guidance and toolkit. It is anticipated that costs and benefits of the site will occur for as long as it is designated, but because these are difficult to predict further into the future (for example, due to changes in technology and regulation), a ten year time frame is used for the analysis. Figures used in the calculations have been rounded for presentation in the text and tables in the Evidence Base. Further details of the method used are set out in Annex 4.

1.6.3 The baseline („do nothing' option) against which the option to designate the site is assessed is set out in Section 2. This describes current and (known) planned human activities in the site and their potential impact on the reef habitats and their typical species. Section 3 assesses the potential costs and benefits of Option 1, designate the site.

1.6.4 The Figures (showing charts) that are referred to in the text can be found at the end of the main body of this evidence base, before the reference list. Annexes provide further detail of the policy and legislative drivers (Annex 2), further information on the regulation and nature of human activities occurring at the site (Annexes 3 and 5), and the combined costs of the recommended suite of Natura 2000 sites on those activities (Annex 8). A summary of abbreviations used in the IA is provided in Annex 1, Annex 7 describes the method used to estimate the value of landings from fisheries, Annex 6 is a glossary of fishery and ecological terms and Annex 9 describes the approach to typical species adopted in the IA.

2. Baseline (the „do nothing' option)

2.1 Human activity at the site

2.1.1 This section describes current and proposed human activities[27] that are expected to occur over the next ten years in the area of the Haisborough, Hammond and Winterton pSAC that may be impacted on by the site. It describes activities that are expected to occur if the site is not designated and includes all those that may be impacted on by designation of the site. Human activities in the terrestrial and marine environment (including developments promoted by Local Development Frameworks and their equivalent) that are not likely to be impacted on by the site are not included in this description or in the analysis for this Impact Assessment. For example, some activities will not be impacted on because they do not have a significant mechanism for interaction with the site's interest features[28]. All current and proposed activities that may be impacted on by the SAC have been identified as falling under the following sector headings:

- Aggregate extraction;
- Oil and gas exploration and production;
- Gas interconnectors;
- Gas storage;
- Pipelines transporting carbon dioxide for storage;
- Generation of electricity from renewable sources of energy;
- Cables;
- Commercial fisheries;
- Shipping;
- Recreation;
- National defence;
- Activities that result in land-based sources of pollution.

2.1.2 Descriptions of these activities are provided in Annex 5 and the regulatory processes that manage their potential impacts on or risks to the environment are described in Annex 3. The size of each sector in the UK is discussed in the analysis of combined impacts in Annex 8.

Vulnerability of interest features in the site to pressures from human activities

2.1.3 An initial assessment of the vulnerability of interest features in the site to pressures from human activities is provided in the table in Appendix A at the end of this document[29]. In summary, the sandbank habitats, their communities and typical species have a moderate sensitivity to removal, obstruction, toxic and non-toxic contamination (apart from changes in turbidity) and selective extraction of species. They have low to moderate sensitivity to physical disturbance or abrasion. The *Sabellaria spinulosa* reefs have high sensitivity to physical loss (from obstruction removal and smothering) and physical damage or abrasion. They are moderately

[27] Including outstanding consents and permissions and proposed projects.
[28] „Interest features' is used throughout the document to refer to the site's features of conservation interest, which are described in Section 1.4.
[29] JNCC and Natural England, 2009.

sensitive to toxic contamination, changes in nutrient loading, thermal regime and salinity and selective extraction of species.

2.1.4 In the sections that follow, assessment of the potential impacts of human activities on interest features in the site if it is not designated is informed by the table in Appendix A. This provides the baseline against which the potential impacts of designating the site (Option 1) are assessed later.

Aggregate extraction

Extent of Activity

2.1.5 Commercial aggregate extraction takes place along the site boundary. Three licence areas and two application areas are located within the southern part of the site. (Figure 2.1); none of the licence areas coincide with interest features in the site. There are 18 licence and application areas within one tidal excursion of the site boundary[30].

2.1.6 The East Coast Region (within which this site lies) is one of the most active and expansive areas of aggregate extraction around the coast of England and is possibly the most strategically important area for the industry[31]. The resources extracted are used in the construction industry for development and maintenance of infrastructure (such as roads, and bridges) particularly in London and South East England; some is exported to Europe. Sand extracted at some of the licence areas is used for beach re-charging schemes, such as at the adjacent Winterton coast. In the Region in 2008, dredging occurred within 48.9 km^2 (18 percent of the licensed area)[32]. 153.9 km^2 of sea bed was available in active dredge zones with 6.08 MT (million tonnes) of sands and gravels extracted for use in the construction industry and some 0.68 MT of sands dredged for beach nourishment schemes.

Potential environmental impacts if the site is not designated

2.1.7 An increase in direct damage to the sandbanks or deterioration in their condition is unlikely to occur if the site is not designated. Due to the location of aggregate resources there is a very low level of risk that impacts on the interest features from aggregate extraction will occur over the next ten year period. Given the high background levels of turbidity in the area, dredge plumes are unlikely to have a significant impact on interest features in the site. Further details on the potential impacts of aggregate extraction on the site's interest features are provided in Appendix B.

[30] Tidal excursion is the movement of water in one tidal cycle; it is used as a proxy for the worst case influence of sediment plumes.
[31] Gubbay, 2005.
[32] The Crown Estate & British Marine Aggregate Producers Association (2009).

Oil and gas exploration and production

Extent of activity

2.1.8 The pSAC covers most of the gas pipelines that land at Bacton gas terminal (Figure 2.2). In 2008, 23 percent of UK gas production landed at Bacton[33] from the Southern Basin and the central North Sea[34]. There are several producing gas fields within the area and one proposed new field (Aberdonia, which is likely to be developed by a single extended reach development well from the Camelot Alpha platform with production starting in 2012)[35]. New pipelines would be needed to get gas from any new fields (such as Aberdonia) to shore but these would go to an offshore hub or pipeline not all the way to Bacton[36]. Gas fields overlapped by the site include Hewett, Arthur, Camelot N., Camelot C.S., and Aberdonia[37].

2.1.9 The following are within the site[38] (Figure 2.2):

- Four platforms: 53/1a, 52/5a, and 48/29a (which comprises 2 platforms).
- Four appraisal wells that are all now abandoned: 52/5a/2, 52/5a/3, 53/1a/6 and 53/1a/11.
- At least nine exploration wells, including 48/29a/9 (suspended); 52/5b/12 (completed) and the following abandoned wells: 52/5b/11, 53/1b/2, 53/1b/12, 53/1a/4, 53/1a/8, 49/26b/29, 48/30a/1.
- A number of gas pipelines pass through the site, a length of about 226 km in total.
- The following Licensed Blocks: 53/1a, 49/26a, 48/30a, 52/4b, 53/2b, 48/29a, 52/4a, 48/28c, 52/5b and 52/5a.
- The following Blocks on offer in the 26th Seaward Licensing Round: 52/4c, 53/1b, 49/26b, 48/30c, 52/5c, 53/2c, 48/29c, 52/9, 53/6, 52/10, 52/14, 53/11, 52/15, 53/12.

2.1.10 Decommissioning of gas installations and/or pipelines is likely to occur in the site within the next ten years[39]. Other than pipelines[40], removal of all infrastructure that is proud of the sea bed is mandatory in line with the OSPAR Convention Decision 98/3 so it does not pose hazards[41].

Potential environmental impacts if the site is not designated

2.1.11 If the site is not designated an SAC the possible impacts of new pipelines on the site's interest features may not be assessed and measures to reduce the impact

[33] Digest of UK energy statistics (DUKES) Annex F.2 (http://www.decc.gov.uk/en/content/cms/statistics/source/oil/oil.aspx)
[34] M. Earp, DECC, personal communication (6.5.2010).
[35] M. Earp, DECC, personal communication (28.3.2010).
[36] M. Earp, DECC, personal communication (6.5.2010).
[37] Source: https://www.og.decc.gov.uk/information/bb_updates/maps/index.htm.
[38] On 9.3.2010, Source: DECC websites, specifically for location of platforms and wells: https://www.og.decc.gov.uk/information/bb_updates/maps/index.htm; status of wells: https://www.og.decc.gov.uk/pls/wons/wdep0100.qryWell; 26th Seaward Licensing Round: https://www.og.decc.gov.uk/upstream/licensing/26_rnd/index.htm.
[39] K. Mayo, DECC, personal communication (29.3.2010).
[40] Pipelines that are already buried are likely to be left in place.
[41] K. Mayo, DECC personal communication (29.3.2010 & 6.4.2010).

may not be secured. There is an increasing (and possibly significant) risk of impacts from gas pipelines over the next ten years. Our current knowledge is that *Sabellaria spinulosa* reefs occupy only small areas of the site so any impact on these could be significant. Further details on the potential impacts of pipelines and other activities associated with gas exploration and production are provided in Appendix B at the end of this document.

Gas interconnectors

Extent of activity

2.1.12 Bacton gas terminal is the most significant import route for UK gas supplies[42]. The Bacton-Zeebrugge Interconnector passes through the site (Figure 2.2), which is used variously to export gas to Europe via Belgium (capacity of 20 billion cubic metres (bcm)/yr, mostly in the summer) and import gas from Europe (capacity of 25.5 bcm/yr, mostly in the winter). In addition the Balgzand Bacton Line natural gas pipeline runs through the site connecting the UK to the Netherlands. It currently has a capacity of 16 bcm/yr which is to be increased to 19.2 bcm/yr by the end of 2010. The total length of interconnector within the site is 76 km.

Potential environmental impacts if the site is not designated

2.1.13 At the current level of activity, the risks are low that impacts on interest features in the site from gas interconnectors would increase over the next ten years if the site was not designated.

Gas storage

Extent of activity

2.1.14 Gas storage does not currently take place in the site. However, routes for the pipelines for two proposed natural gas storage projects pass through the site. One of these is in the partially depleted Baird gas field, outside the site approximately 86 kilometres north east of Bacton (in Block 49/23)[43]. Gas will be taken from the National Transmission System during period of low demand, stored here and retrieved during high demand. For the purpose of this analysis it is estimated that about 34 km of the pipeline from Bacton to the Baird field will pass through the pSAC.

2.1.15 The other gas storage project is in the depleted Deborah gas field which is also outside the site and north east of Bacton (in Block 48/30a)[44]. For the purposes of this analysis it is estimated that about 19 km of the pipeline from Bacton to the Deborah field would pass through the site.

Potential environmental impacts if the site is not designated

2.1.16 If the site is not designated an SAC the possible impacts of new pipelines on the site's interest features may not be assessed and measures to reduce the impact may not be secured. If the site is not designated there is a high risk that the new pipelines will impact on interest features of the site. This impact will arise from the

[42] Oil and Gas UK consultation response.
[43] Source: S. Benn, Natural England.
[44] M. Earp, DECC, personal communication (28.3.2010).

pipeline "footprint" within which the sea bed will be disturbed. Our current knowledge is that *Sabellaria spinulosa* reefs occupy only small areas of the site therefore any impact on this could be significant. Further details on the potential impacts are provided in Appendix B at the end of this document.

Pipelines for storage of carbon dioxide

Extent of activity

2.1.17 The route for a proposed pipeline transporting carbon dioxide (CO_2) from Kingsnorth power station (in Kent, south east of the pSAC) for storage in the Hewett gas field (in the north of the site) passes through the site[45]. In light of this it is assumed for the purposes of this analysis that a pipeline for transporting CO_2 for storage may pass through the site over the next ten years (based on the Kingsnorth proposal it is assumed that 50km of pipeline passes through the site).

Potential environmental impacts if the site is not designated

2.1.18 If the site is not designated an SAC the possible impacts of new pipelines on the site's interest features may not be assessed and measures to reduce the impact may not be secured. There is a risk that the proposed pipeline transporting CO_2 would impact on the sandbanks, reefs and their typical species. Further details on the potential impacts are provided in Appendix B at the end of this document.

Generation of Electricity from Renewable Sources of Energy

2.1.19 Currently, no viable resources[46] for generation of electricity from wave or tidal stream energy have been identified within the site (though the ability to generate electricity from lower levels than the current criteria may develop in the future). The focus for the remainder of this section is on the generation of electricity using the significant resources of wind power in the region.

Wind Farms

Extent of Activity

2.1.20 There are no wind farms that have been consented but not yet constructed or applications under Rounds 1 and 2 of the offshore wind farm leasing programme for wind farms in the site or adjacent to it. Scroby Sands offshore wind farm lies outside the site to the south west (Figure 2.3). In terms of future development, the Norfolk Zone in the Round 3 offshore wind farm leasing programme[47] overlaps with the site (285 km^2 or 5 percent of the zone lies within the site; Figure 2.3). The zone could potentially be the location for one or more wind farm development applications; details are not currently available. In addition, routes for power export cables may be sought through the site for wind farm developments in the area of the Norfolk Zone outside the site.

[45] The environmental scoping report (E.On, 2010) was issued for comment in February.

[46] Based on the assessment made by ABPmer (2008) and Black and Veatch (2005). ABPmer (2009a) suggests criteria of a mean spring peak current of at least 2 metres per second and an annual mean significant wave height of more than 2 metres for electricity generation to be viable.

[47] for the delivery of up to 25 Giga Watt (GW) in capacity of potential new offshore wind farm sites by 2020 (in addition to the 8GW already planned).

Potential environmental impacts if the site is not designated

2.1.21 Several wind farms have been consented within or near areas that have recommended for designation as SACs for both sandbank and *Sabellaria spinulosa* reef habitats suggesting that wind farms and protection of sandbank and reef habitat can co-exist[48]. However, many have not yet been constructed and post-construction monitoring information only exists for some projects. If the site was not designated an SAC, possible impacts on the interest features may not be assessed and it would be more difficult to secure licence conditions that prevent wind farm developments from damaging these habitats[49]. There is therefore a medium risk that impacts from wind farms could increase over the next ten years. Further details on the potential impacts are provided in Appendix B at the end of this document.

Cables

Extent of activity

2.1.22 Several cables run through the site, including 70 km of a telecommunications cable that comes ashore at Winterton-on-Sea (Figure 2.4). No power cables (other than power cables for wind farms, which are discussed in the preceding section) have been identified for this analysis within the site. Laying of cables that are not replacements or upgrades of existing cables is unlikely[50].

Potential environmental impacts if the site is not designated

2.1.23 Laying of cables in the site may cause temporary damage and disturbance to the sandbanks but they are likely to recover relatively quickly. However laying cables through areas of *Sabellaria spinulosa* reef would be damaging to the reef. If protective covering of the cable using rock and/or concrete mattressing is required this could damage the sandbank habitat and would increase damage to reef further. If the site is not designated, it would be more difficult to secure licence conditions that prevent cable laying from damaging the reefs and also the sandbanks. Further details of potential impacts are provided in Appendix B.

Commercial fisheries

2.1.24 This section provides an overview of commercial fishing activity in the site, estimates of the scale of activity and its potential impact on the interest features.

Overview of commercial fishing activity

2.1.25 The description below draws on information supplied by the Marine and Fisheries Agency (MFA)[51] in response to a request from Natural England,

[48] The London Array wind farm was consented within an area recommended as an SAC for sandbanks and Kentish Flats and Scroby Sands near areas recommended as SACs for sandbanks. The Lynn and Inner Dowsing wind farm and the export cable route for Lincs were consented within an area recommended as an SAC for *Sabellaria spinulosa* reef and the Lincs Array was consented near an area recommended as an SAC for *Sabellaria spinulosa* reef. Thanet wind farm was consented within area of with *Sabellaria spinulosa* reef but that is not proposed as an SAC.

[49] Though *Sabellaria spinulosa* reef is subject to a Biodiversity Action Plan there is not the same legal requirement to avoid an adverse effect on it this habitat if the Conservation of Habitats and Species Regulations and the Offshore Marine Conservation Regulations do not apply.

[50] Due to over-capacity in the current network (ABPmer *et al*., 2007).

[51] The functions of the MFA have since been absorbed by the Marine Management Organisation (MMO).

information provided by specialists in Natural England and information in consultation responses.

2.1.26 Within the site, UK vessels operate exclusively within 6 nm and predominately UK vessels fish from 6-12 nm (Figure 2.5). Although Belgian vessels fishing for demersal species[52] have legal access between 6 nm and 12 nm their activity in the area has been low in recent years[53]. Beyond 12nm there is a greater presence of foreign (Dutch, French and Belgian) vessels.

2.1.27 Approximately 61 vessels operate from the ports adjacent to the site and fish the inshore area, mainly out to 6 nm but some out to 12nm[54]. They mainly use pots, targeting crabs and lobsters, velvet crabs and possibly whelks (brown crab is a very important species for the area; there are a number of crab processing plants at Cromer). Gill, tangle and drift nets are commonly used on the East Anglian coast to catch cod, bass, thornback rays, herring, mackerel, whiting, and mullet[55]. At least 21 individual fishers mostly from Caister operate with drift nets targeting herring and mackerel along the length of the East Anglian coast[56]. Trammel nets and beam trawls are the main gears used for Dover sole which is an important species in the area. A number of long-liners are based in Great Yarmouth harbour, which is also the base for many private angling boats. Long-lines are used to catch cod, whiting, rays, dogfish and bass. There is no hydraulic dredging for shellfish in the site[57].

2.1.28 Within a couple miles of the shore (in the area adjacent to the site) most fishing activity is undertaken by vessels working from beaches between Cromer/Sheringham to Caister inclusive. Small (under 10 metre) beach-launched boats also operate from Great Yarmouth beaches. They mainly fish using parlour pots (the number of pots used by individual fishers is relatively low; about 300 pots per boat[58]) and gill nets. Vessels from Lowestoft and Great Yarmouth and occasionally King's Lynn beam trawl for brown shrimp close to the beaches.

2.1.29 Outside 12nm Dutch, Belgian, French and possibly Danish vessels may operate around Smith's Knoll. Dutch and Belgian beam trawlers target flat fish such as Dover sole and a wide variety of other demersal species. About five French vessels use otter trawls to target demersal and pelagic species[59] whilst Danish vessels usually target cod with gill nets. UK vessels from the Yorkshire coast set pots further offshore and may be present on an irregular basis.

2.1.30 The main ports[60] in the area from north to south are King's Lynn, Brancaster, Wells-next-the-sea, Blakeney, Sheringham, Cromer, Winterton area, Caister, Great Yarmouth, and Lowestoft (Figure 2.5). Fishers from all these ports are active in the

[52] Demersal species are those that live on or near the seabed, such as plaice and sole.
[53] Note that the effective fisheries limits from 1983 that relate to access by other Member States are different to the fisheries limits shown in Figure 2.5 (which are the effective limits from 1987).
[54] Walmsley & Pawson, 2007.
[55] Weston, 2010a.
[56] Weston, 2010a
[57] Source: Eastern Sea Fisheries Joint Committee Input to Impact Assessments for the new Special Areas of Conservation and Special Protection Areas, May 2010.
[58] Weston, 2010b.
[59] Pelagic species are those that feed in the water column.
[60] Not all these locations have formal ports: from some of them vessels are beach launched.

site[61]. There are also comparatively isolated beaches between Cromer and Caister that support small numbers of beach launched boats. Fisheries are an important aspect of tourist attractions in ports in the area and further afield. Tourists enjoy viewing the boats in port and seeing fishers at work in port and at sea and also purchase fish and seafood from boats, market stalls, shops and restaurants. Fisheries in the site supply the local population with fish and seafood as well as the wider population in the UK and consumers overseas.

2.1.31 Fisheries may be impacted on by development of wind farms in the site. For safety reasons, a fisheries exclusion zone is established during development of a wind farm. Following construction there is a possibility that fisheries within the footprint of the wind farm will be restricted; wind farms differ in their approach to this. The presence of the turbines and cables may restrict use of certain gears within the area of the wind farm. In some cases operational and maintenance work for the wind farm is undertaken by fishing crew and vessels, providing additional or alternative income to fisheries.

Estimated value of landings

2.1.32 In the absence of audited statistics on fisheries that are specific to the site, a description of landings is provided here for fisheries in the two ICES rectangles[62] that contain the majority of the site (34F1 and 34F2, as shown in Figure 2.5). The description uses data from the Fishing Activity Database (FAD) and is summarised in tables in Appendix C. Note that fisheries within the site may differ from those in each rectangle as a whole because the site only covers a proportion of the rectangles (Figure 2.5), distribution of fishing activity is not uniform throughout the rectangles[63] and not all fisheries landings are captured in the FAD[64]. Potting for crustaceans accounted for over 77 percent of the value of landings for the UK fleet from ICES rectangles 34F1 and 34F2 over 2005-8; trawling with bottom contact accounted for a further 13 percent (Table C.1). Over this period, Edible Crabs accounted for the majority (45 percent) of the value of the UK fleet's landings from the rectangles, followed by lobsters (31 percent) (Table C.2). Vessels 10 metres and under accounted for 84 percent of the value of landings by UK vessels from the rectangles (Table C.3). Over 2005-8, landings from the rectangles were a significant proportion of the total value of landings for some sections of the UK fleet that fish in rectangles 34F1 and 34F2, particularly vessels 10 metres and under trawling with bottom contact and vessels over 15 metres fishing with lines (Table C.4). However, many sections of the fleet fishing in the rectangles also got a significant proportion of their value of landings from elsewhere.

[61] Weston, 2010a and 2010b.

[62] Fisheries data in the Fisheries Activity Database is referenced to the rectangles that were introduced by the International Council for the Exploration of the Seas (ICES) to standardise the division of sea areas for use in statistical analysis. Each ICES statistical rectangle is '30 min latitude and 1° longitude in size (approximately 30 nautical miles square depending on its location) and has a unique identifier, such as 34F1 (Source: MFA, 2009).

[63] For example, the inshore area may be associated with smaller rather than larger vessels.

[64] The following may not be captured in the Fishing Activity Database: landings made by fishers operating under 10 metre vessels who process and offer their own fish and shellfish for sale; landings by under 10 metre vessels without shellfish entitlements; landings from Regulating Order Fisheries (in England these are all for bivalves); landings sold to individuals for private consumption (less than 25kg); shellfish that are damaged or die after they are landed (as these are not sold).

2.1.33 Estimates based on FAD data indicate that the average annual value of landings from the pSAC from 2005 to 2008 for all UK vessels 15 metres and under was roughly £0.211m and was £0.055m for all UK vessels over 15 metres. This has been estimated for the area within the pSAC boundary and is based on analysis of data in the FAD[65] and the unlikely but necessary assumption that the value of landings is evenly distributed across the two ICES rectangles that contain the majority of the site (further details of the method used are described in Annex 7. Combined these provide a rough estimate based on FAD data of average total value of landings from the site of £0.266m per year. This is subject to considerable uncertainty and may be an underestimate for reasons set out in Annex 7.

Potential environmental impacts if the site is not designated

2.1.34 The impacts of fisheries on interest features over the next ten years if the site is not designated are difficult to predict. This is because of the paucity of information on the likely intensity of fishing over this period and the level of information available on the existing impact of fisheries in the site. If the SAC is not designated, fisheries will not be managed in light of their impact on the interest features in the site. If fishing intensity remains the same (which will not necessarily be the case), fisheries that may be currently detrimentally affecting the condition of interest features in the site may continue to do so. Fisheries that are not impacting on the interest features of the site may continue not to but changes in fishing effort and intensity (for example as a result of changes in technology, displacement and diversification) could result in some of these fisheries having an impact in future. Potential impacts of specific gear types are described in Appendix B at the end of this document.

Shipping

Extent of activity

2.1.35 A moderate amount of shipping passes through the site, including vessels travelling to and from ports in The Wash. An inshore shipping route between Great Yarmouth and Kings Lynn used by commercial vessels, sailing boats and leisure craft passes between the sandbanks but is not dredged. About 50 vessels per day move through „The Would', which is between the North Norfolk coast and Haisborough Sands[66]. Further vessel traffic passes through various channels between sandbanks in the site as they pass from the port of Lowestoft out to the Southern North Sea gas fields and other ports to the north[67]. Normal anchorage is outside the site but vessels may anchor within the site in the event of an emergency. Recent Government forecasts and policy[68] suggest that the ports sector will continue to grow to meet an increasing demand.

2.1.36 No maintenance dredging occurs in the site and there are no dredge disposal sites. SeaZone Hydrospatial data[69] (the source suggested by the Maritime and Coastguard Agency for anchoring areas outside port limits) indicates that there are no shipping anchorages within the pSAC (Figure 2.6). It is recognised that smaller

[65] The analysis undertaken by ABPmer (2009b) could not be used to estimate value of landings from the site because of an anomaly in the data in this region.
[66] CEFAS, 2006
[67] ABPmer consultation response.
[68] Department for Transport, 2007 and 2009; Eddington, 2006 and House of Commons Transport Committee, 2007.
[69] The last known update to the data layer that was used occurred on 04/01/2008.

vessels (for example local fishing boats) may anchor within the site boundary although to what extent is unknown.

Potential environmental impacts if the site is not designated

2.1.37 The risk is low that non-designation will increase impacts from ships passing through the site on interest features in the site (under the current level of operations). Shipping could potentially affect the sandbanks and reefs in the site through abrasion and collision of vessels with each other and/or the seabed but impacts from "normal" operations are unlikely (for further details see Appendix B at the end of this document). Ships anchoring generally have a low impact on the sandbanks but, depending on the regularity of anchoring, they could significantly impact on the small areas of *Sabellaria spinulosa* reef in the site. The absence of shipping anchorages in the site means that these impacts are only likely to arise from small vessels anchoring in the site, which could for example dislodge plants and animals.

Recreation

Extent of activity

2.1.38 The area is popular with anglers who fish from the shore and from boats, for example out of Lowestoft[70]. Recreational angling from Great Yarmouth has decreased and has increased from Southwold in the past ten years. Species caught include cod, whiting, dab and bass[71].

2.1.39 Areas of the site are used for recreational boating and personal watercraft (which are launched from Sea Palling and Cart Gap, for example). There are no marked anchorages in the site and it is unlikely that recreational vessels would anchor in the site under normal circumstances due to its exposed nature[72]. Resources for recreation in the area are shown in Figure 2.7 and Figure 2.8 shows areas of recreational boating activity. Some recreational diving takes place mostly to explore wrecks but the level of activity is low because of the generally poor visibility.

2.1.40 The breeding colony of grey seals adjacent to the site attracts large numbers of visitors to nearby coastal areas each year when the pups are born[73]. The coast adjacent to the pSAC is used for bird watching, including watching little terns when they are breeding on Winterton beach[74]. The site is adjacent to a section of the Norfolk Coast Area of Outstanding Natural Beauty (designated for its landscape qualities for the purpose of conserving and enhancing its natural beauty[75]).

Potential environmental impacts if the site is not designated

2.1.41 Recreational fishing could potentially have a significant impact on the populations of fish, shell fish and other crustaceans that are typical of the sandbanks and reefs. Further information is required to assess the risk of this impact if the site

[70] Drew Associates, 2004.
[71] Source: consultation responses.
[72] Source: Royal Yachting Association Consultation Response.
[73] More than 2,000 people visited on Boxing Day 2008 (R. Southwood, Natural England personal communication, 2.7.09).
[74] R. Southwood, Natural England, personal communication (10.3.2010).
[75] For further details see http://www.norfolkcoastaonb.org.uk/pages/pspage.php?PageID=94 and http://www.naturalengland.org.uk/ourwork/conservation/designatedareas/aonb/default.aspx.

was not designated. At the current level of activity, the risk is low that impacts of other recreational activities on interest features would increase if the site was not designated (for further details see Appendix B).

National defence

Extent of activity

2.1.42 Naval vessels transit through the site and aircraft fly over the site[76]. The site is 75km from RAF Marham and the other nearest Ministry of Defence site is The Wash Firing Ranges 100km away.

Potential environmental impacts if the site is not designated

2.1.43 The potential impacts of naval vessels on interest features in the site are the same as those described for shipping above. Ships anchoring generally have a low impact on the sandbanks but could significantly impact on the small areas of *Sabellaria spinulosa* reef in the site.

Activities that result in land-based sources of pollution

Extent

2.1.44 Toxic and non-toxic pollutants enter the sea from direct point source discharges of effluents or diffuse sources such as agricultural run-off via rivers. Discharges can be both continuous and intermittent in nature, but the high dilution that any land-based discharge is likely to receive would reduce the risk of these to interest features in the site. Any point source discharges are currently controlled through licensing by the Environment Agency. Assessments made under the Water Framework Directive (WFD)[77] indicate that relevant coastal waters in and adjacent to the pSAC boundary are of good quality.

Potential environmental impacts if the site is not designated

2.1.45 Pollution from the land could potentially lead to changes in water quality at sea and in turn impact on the resident biology (see Appendix B at the end of this document). However, the Water Framework Directive will be addressing freshwater and coastal water quality issues and discharges will be controlled under this to meet objectives specified in the Directive. The areas of the site beyond 12nm are so far off shore that they are unlikely to be significantly affected by pollution from the land.

Benefits of the interest features

2.1.46 In their current condition a range of benefits are obtained from the sandbanks, reefs and their typical species in the site. If the habitats became degraded or the populations of typical species became depleted as a consequence of not designating the site this could potentially diminish the benefits. Benefits of fisheries and recreation have already been described. Other benefits include:

- **Research and Education:** The Centre for Environment, Fisheries and Aquaculture Science (Cefas) is located nearby in Lowestoft. Currently little use is made of the site for education.

[76] Source: Ministry of Defence Consultation Response.
[77] Environment Agency (2009).

- **Cultural Value:**
  - As an island nation, local fishing communities are an important factor in defining an area's character, history and cultural heritage. Currently and in the past the fishing industry and its supporting industries often play a significant role in many small port communities and the surrounding area, contributing towards their cultures and community identities. Family traditions in commercial fishing and the supporting small-scale industries have been passed down over a number of generations and fishers have built up many decades of local knowledge of fishing within their area.
  - There are at least 160 known wrecks that can be dived in the area (a number of the wrecks in the site are shown in Figure 2.7 and listed in Appendix D). The shallow sandbanks present navigational hazards and vessels in the area were targeted by the German forces during both World Wars. Some wrecks are composed only of remaining sand-blasted steel plating while others have fairly intact hulls with considerable associated marine life. Though wrecks are generally avoided by fishing vessels there is some evidence of fishing activity inadvertently damaging wrecks[78].
  - There are important Palaeolithic artefacts in this part of the North Sea[79]. These may be recovered through fishing activity and aggregate dredging in the area[80]. Important historic information that is recovered may be put into the public domain under voluntary reporting protocols.
- **Option and Non-use Value:** People gain from having the option to benefit in future from habitats and species in the site even if they do not currently benefit from them. People also benefit from the knowledge that there are good examples of biogenic reef and sandbank habitats in the site.

2.2 Summary of condition of interest features in the baseline

2.2.1 In summary, at the current level of activity (including current proposals) there is a medium to high risk that impacts on the interest features in the site from pipelines for gas and carbon dioxide storage, and wind farms will increase. Vessels anchoring have potential to significantly impact on the areas of reef. Additional information is needed to assess the impact of commercial and recreational fisheries on the biogenic reef and sandbank habitats and their typical species. Evidence indicates that demersal trawling has resulted in damage or deterioration to the structure of the Haisborough Gat *Sabellaria spinulosa* reef[81]. Laying of cables and pipelines for gas exploration and production could potentially impact on the reef and sandbank habitats. At their current level of activity, there is a low risk that aggregate extraction, gas interconnectors, vessels passing through the site, recreation (other than fisheries and anchoring of vessels), and activities resulting in land-based sources of pollution will have impacts on the interest features in the site that increase over the next ten years.

[78] Kingsley, 2009.
[79] For example, in area 240 (http://www.wessexarch.co.uk/projects/marine/alsf/seabed_prehistory/area-240).
[80] Wessex Archaeology, personal communication, April 2010.
[81] JNCC and Natural England, 2009.

2.2.2 The situation summarised above is reflected in the conservation objectives for management of the sandbanks in the Haisborough, Hammond and Winterton pSAC, the Haisborough Tail *Sabellaria spinulosa* reef and Winterton Ridge *Sabellaria spinulosa* reef. These are to **maintain** the environmental quality and processes of the sandbanks and maintain the extent, physical structure, diversity, community structure and typical species representative of the sandbanks and these reefs. This implies that, in general, current activities, plans and projects have not been identified as causing significant damage to these interest features. This could be either because no such damage is occurring or because there is insufficient information on the actual effects of activities on the condition of the feature.

2.2.3 The conservation objectives for the management of the Haisborough Gat *Sabellaria spinulosa* reef is to **restore** (and then maintain) the environmental quality and processes of the reef and to **restore** (and then maintain) the extent, physical structure, diversity, community structure and typical species representative of the reef. These objectives result from the assessment that the reef is highly vulnerable to demersal trawling in the site and this is likely to have caused damage to its features.

2.2.4 New activities and changes to current activities are likely to be pro*posed in the Haisbor*ough, Hammon**d and W**interton area. These activities could potentially have adverse impacts on the i**nterest** features. If the site is not designated it will be difficult to influence the consenting of plans and projects through, for example, the introduction of effective mitigation measures. The Conservation of Habitats and Species Regulations and the Offshore Marine Conservation Regulations will not apply as a matter of law to plans or projects that may significantly affect site integrity. For nationally significant infrastructure projects, regulatory authorities would still be required to consult the statutory nature conservation advisers about potentially damaging effects on interest features in the site but less weight would be placed on the assessment of impacts on interest features and securing appropriate mitigation. Also, developers would not be required to demonstrate no adverse effect in the same way (see Annex 3).

2.2.5 Not designating the recommended suite of marine Natura 2000 sites will reduce the likelihood that government will meet its aims for the marine environment. The government would fail to deliver its responsibilities under the EU Birds and Habitats Directives (to maintain or restore Annex I habitats and the populations of Annex I and regularly occurring migratory species).

2.2.6 The recommended suite of sites will form an important component of the UK's MPA network which will make a significant contribution towards maintaining and restoring resilience of the marine ecosystem. A key component of the network will be missing if the sites are not designated. This will increase the risk that the marine ecosystem will undergo irreversible change as a result of natural perturbations and human activities particularly in the face of climate change.

3. Costs and benefits of Option 1: Designate the site

3.1 Approach adopted to assess impacts

3.1.1 This section describes key features of the approach that has been used to estimate the impacts of the policy option (designate the SAC). It is followed by the hypothetical management measures that are used for this analysis, estimates of the costs and benefits and a summary of these.

3.1.2 The costs and benefits of the SAC will result from the management measures that are applied to the site. These are not yet known; the process of developing and implementing management measures follows designation of the site. Competent authorities will be required to assess the impacts on interest features in the site of any activity they consent and to review outstanding consents and permissions with a view to achieving the site's conservation objectives (as discussed in Annex 3). Activities that do not result in pressures to which the interest features are sensitive may continue at their current levels of spatial and temporal intensity. The intended outcome of the management measures is to prevent further degradation and help deliver restoration of the interest features in the site where damage to them has occurred.

3.1.3 To estimate the costs of the management measures scenarios have been used for the IA that describe a range of plausible hypothetical management measures (discussed further below).

3.1.4 To avoid under-estimation of the impacts, for the purposes of the analysis it has been assumed that the conservation objective of „restore' for Haisborough Gat *Sabellaria spinulosa* reef applies to reef in the entire site. However, in management of the site a conservation objective of restore will apply only to this area of reef; the conservation objective for the rest of the site will be „maintain'.

3.1.5 This section estimates the potential costs and benefits of designating the site compared with the baseline (the „do nothing' option). These are subject to significant uncertainty because:

- there is uncertainty about what fishing activity occurs in the site;
- there is a high degree of uncertainty about the effects of activities on the interest features;
- it is not yet known what management measures will be developed and implemented for the site;
- it is difficult to know how the management measures will impact on operators, how operators will respond, the economic costs of the impacts and what the wider effects will be;
- it is difficult to predict how the condition of the interest features and wider marine environment will change with designation of the SAC; and
- there is limited evidence on the benefits that will arise.

Hypothetical management measures

3.1.6 The hypothetical management measures for the SAC developed for the purposes of this analysis are presented below in Table 3.1. Development of these was informed by:

- the sensitivity of interest features (including typical species[82]) in the site to pressures from human activities (Appendix A),
- current and proposed levels of activities in the site (Section 2),
- the potential environmental impacts of those activities if the site was not designated (Appendix B, summarised in Section 2),
- sector specialists in Natural England who drew on their knowledge of licence conditions for plans and projects.

3.1.7 Because the measures that will apply to the site are not known, a range of plausible hypothetical measures is used for the analysis, described by a minimum and maximum scenario. It is assumed that the true costs of the final management measures that are developed for the site will fall within the range. The management measures that are implemented will be determined by the relevant authorities[83] (as described in Annex 3) and may differ from those used for this analysis.

3.1.8 The minimum scenario involves the smallest change in activities that may plausibly be needed compared with the baseline and therefore presents the minimum potential effect on activities. It assumes that all activities, plans and projects are deemed to have no likely significant effect on interest features in the site with the exception of dredging and trawling with bottom contact which are assumed to impact on *Sabellaria spinulosa* reef.

3.1.9 The maximum scenario is at the other end of the scale: it involves the maximum change in activities that plausibly may be needed. It assumes that activities, plans and projects that could potentially impact on interest features in the site are deemed to have a likely significant effect. Consequently Appropriate Assessment is required for plans and projects and therefore costs for competent authorities are likely to increase (discussed under other costs to the public sector at the end of Section 3.2). The management measures used for this scenario are precautionary to avoid under-estimation of costs. They are used to estimate an upper limit for plausible costs (not the worst case scenario).

3.1.10 The two scenarios are used to reflect the range of management measures that may be required. The benefits are therefore assumed to be the same for both.

3.1.11 The management measures used for the analysis are generic in that they could apply to any site that is being designated for sandbanks with conservation objectives of „maintain' and *Sabellaria spinulosa* reef with conservation objectives of

[82] See Annex 9 for the approach adopted in the IA for typical species.

[83] Relevant authorities are statutory bodies with powers or functions that have or that could have an impact on the marine area within or adjacent to the site (for example, local authorities, harbour authorities, the environment agency, SFCs /IFCAs). They have powers to establish a management scheme for marine SACs and SPAs and have a general duty under the Conservation of Habitats and Species Regulations and Offshore Marine Regulations to exercise their functions so as to further the conservation of marine SACs and SPAs. Some relevant authorities are also competent authorities.

„restore'. However, they are specified only for activities that are currently known to occur or are expected to occur at a significant level in the site.

3.1.12 The sections that follow estimate the economic cost of the impact of the SAC on each sector of human activity in the site in turn, followed by the costs of managing the SAC. The impact of designating the site on existing activities, outstanding consents and permissions (which will be subject to Review of Consents) and proposed projects that are expected to occur over the next ten years (though it is possible that these may not be funded or consented) is assessed. The assessments that follow do not pre-judge Review of Consents, Environmental Impact Assessments or Appropriate Assessments (AAs) (discussed in Annex 3) for individual plans and projects and have been developed drawing on past experience. If Appropriate Assessment is required this could delay consent, but the risk of this is reduced if appropriate consultation[84] is instigated early on. Costs are assessed for known outstanding consents and permissions and known existing fisheries.

3.1.13 An overview of the generic costs that could be incurred is provided in Annexes 3 and 4. The combined and strategic impact on each sector of the suite of proposed marine Natura 2000 sites is considered in Annex 8.

[84] Consultation of nature conservation bodies, The Crown Estate, regulatory authorities, non-government organisations and other stakeholders.

Table 3.1 Summary of the "minimum" and "maximum" management scenarios employed in the analysis for Haisborough, Hammond and Winterton SAC	
"Minimum" scenario: *assumes that aside from the specified exception that all activities, plans and projects are deemed to have no likely significant effect on interest features in the site.*	***"Maximum" scenario:*** *assumes that the activities, plans and projects listed below are deemed to have a likely significant effect on interest features in the site. Consequently Appropriate Assessment is required for plans and projects.*
<u>Outstanding consents & permissions & existing fisheries:</u>	
Fisheries (further details are provided in Section 3.2): Closure of the *Sabellaria spinulosa* reef in the site to dredging and trawling with bottom contact to restore the condition of the reef. **Other sectors:** No change	**Aggregate extraction:** ▪ Licences that are not EIA Directive compliant that are within the site or one tidal excursion of the boundary are required to cease extraction until Review of Consents in 2014. ▪ Following Review of Consents these licences may be subject to licence variation or revocation. **Fisheries (further details are provided in Section 3.2):** ▪ Closure of the site to dredging and trawling with bottom contact. ▪ Ban on landings of berried lobster. ▪ Seasonal closure of spawning and nursery grounds. ▪ Reduction in effort for all gear types. ▪ Minimum and maximum landing size for crustaceans. **Recreational angling:** ▪ If angling is found to significantly impact on interest features in the site, controls may be required. **All sectors:** ▪ Higher likelihood of prohibition of anchoring over sensitive interest features, except in emergency circumstances.
<u>New plans or projects:</u>	
No change	▪ Businesses may face delays to consents if Appropriate Assessment is required and increased cost of additional survey. ▪ It is likely that more projects would not pass the hurdle of no „adverse effect' and so would not be consented. ▪ Businesses may make adjustments to projects proposed relative to the baseline to ensure no significant effects. ▪ Businesses are also likely to invest more in proposal assessment. **Oil & gas exploration and production, pipelines for gas storage and CO_2 storage, wind farms, cables:** ▪ Possible spatial limits on the intensity and/or extent of development. ▪ Routes of new pipelines and cables avoid sensitive interest features. Siting of installations and turbines to avoid sensitive interest features. These would be considered in the design of new projects that are proposed for the site. ▪ Increased cost for surveys to inform the baseline and siting of infrastructure to avoid sensitive interest features. ▪ Increased cost of post-construction surveys to assess impacts on interest features. ▪ Possible restrictions on scour protection and disposal of cuttings.

3.2 Costs

Aggregate extraction

3.2.1 In the minimum scenario it is assumed that it can be demonstrated that all licences in the site or in its vicinity do not have significant effects on the site's interest features. Consequently it is assumed that the site has no impact on aggregate extraction.

3.2.2 In the maximum scenario[85] it is assumed for the analysis that licences that are not Environmental Impact Assessment (EIA) Directive compliant cannot be demonstrated to not have significant effects on the interest features (either alone or in combination). It is assumed that this applies to non EIA Directive compliant licences within the site or within one tidal excursion of the SAC boundary[86]. A realistic worst case scenario is that the regulator may determine that extraction from these licences needs to cease until these consents are reviewed; information required for the review would not be available until 2014[87].

3.2.3 To avoid under-estimation of the costs it is assumed for the analysis that extraction under all of the licences that are not EIA Directive compliant in the site or within one tidal excursion of the site boundary would be required to cease production following designation until the consents have been reviewed in 2014. Of the 18 licensed areas wholly or partially within the site or within one tidal excursion of the site boundary, 11 are currently not EIA Directive compliant.

3.2.4 It is assumed that any resultant shortfall of supply would be met through increased extraction from other licences in the region (which have not been operating at full capacity over the last few years) or from alternative sources[88]. The immediate shortfall in supply might be met at increased cost in the short term (increased costs of increasing capacity in other licences or increased cost of other sources) but over the long term it is anticipated that the aggregate sector would adapt and utilise lower cost sources. Due to the high level of uncertainty, the costs of increased supply are not estimated here. Cessation of extraction would have significant financial impacts on the operator and could impact on the viability of its business.

3.2.5 Following the Review of Consents in 2014, licences that are found to significantly affect the interest features may be subject to limits on extraction and / or methods of activity through variation in the licence or revocation may be required to mitigate impacts. The costs of these restrictions will be situation and licence-specific. In the event that revocation of licences impacts on the viability of operations at the current site[89], the operator may look to re-locate. This would

[85] The British Marine Aggregates Producers' Association has kindly informed the assessment of potential impacts in the maximum scenario.

[86] Tidal excursion is the movement of water in one tidal cycle; it is used as a proxy for the worst case influence of sediment plumes.

[87] Impacts of such licences would need to be assessed at a regional scale and would be delayed until the industry-led Regional Environmental Assessment (REA) and Regional Environmental Characterisation (REC) surveys[87] are available, which will be delivered in 2012-13 in the East Coast Region. The REA and REC are a well planned process (agreed by Defra, the MMO and its technical and statutory advisors, including Natural England and JNCC) to improve the robustness of the assessment process at a regional scale.

[88] Other marine licences in the UK, terrestrial extraction or recycling, or imports.

[89] Which would depend both on the number of licences that were revoked and the scale of the operator's

involve additional surveys and would probably increase the cost of operations as new sites are likely to be further from the shore than existing licences[90]. The costs of this are not known but are very roughly estimated here based on the cost of prospecting to investigate a new licence area. It is assumed in the analysis that these costs are not incurred until the licence is revoked (and so they are incurred in 2014). Revocation of the licence would result in loss of sunk costs (for prospecting, environmental characterisation, EIA development and monitoring) for the operator. The cost of an EIA for the new licence area is not included in this analysis because the cost of an EIA for the original licence would need to be met if the site was not designated.

3.2.6 Licences that are not EIA Directive compliant have to become EIA Directive compliant by 2013. This will occur regardless of designation of the site as part of the Marine Works Regulations review process, because of licence expiration deadlines of a number of existing Government View production licence areas.

3.2.7 Licences that are compliant with the Environmental Impact Assessment (EIA) Directive will be subject to review in 2014. These are unlikely to be impacted on by the SAC because there is a low risk that the licence will have significant effects on the site's interest features[91].

3.2.8 It is highly unlikely that any restrictions on screening of extracted marine aggregate cargo will be required to protect the site's interest features given the features' nature and sensitivity.

3.2.9 The economic costs of the impacts of the SAC on aggregates extraction are estimated to have a present value[92] in the range of zero under the minimum scenario and £1.917m under the maximum scenario (for details see Table 3.2).

operations in the area.

[90] Because most economically viable resources that are closer to the shore have been worked or are too close to the shore to be granted consent.

[91] This is because the potential environmental impacts of the licence (determined in its Environmental Statement and Environmental Impact Assessment) have already been deemed acceptable.

[92] This is the total value of all the costs over the 10 year assessment period (2010 – 2019) adjusted for the timing of their incidence because as a whole, society prefers to defer costs to future generations (and to receive goods and services sooner rather than later). This adjustment is achieved through discounting (using a discount rate of 3.5%).

Table 3.2 **Estimated economic costs of impacts of the SAC on aggregate extraction**		
"Minimum" scenario:	*Assumptions**	*Costs*
Existing and future activities: ▪ No change.	It is proved that all licences within in the site and within one tidal excursion of the boundary do not have a significant effect on the site's interest features.	£0
"Maximum" scenario		
Existing and future activities: ▪ Aggregate production ceases from 2010 to 2013 for all non-EIA Directive compliant licences within the site or one tidal excursion of the boundary.	The shortfall in supply is met by other licences in the region operating at increased capacity and from alternative sources.	Unknown short term additional cost of aggregate supply from alternative sources.
▪ Potential limits on or revocation of licences.	Revocation of the 11 licences that are not EIA Directive compliant results in the operator having to re-locate. Costs would be incurred through prospecting to investigate a replacement licence area, estimated at £200,000 per licence. Cost = 200,000 x 11.	£2.2m one–off in 2014 Unknown additional cost of supply from licences further from the shore in the long term.
* Source of costs: BMAPA and The Crown Estate personal communication.		

Oil and gas exploration and production

3.2.10 The SAC could impact on oil and gas exploration and production in the site. To reflect uncertainty in these impacts it is assumed in the analysis that no impacts arise in the minimum scenario. In the maximum scenario it is assumed that all new gas infrastructure (including platforms and pipelines) would need to be sited to avoid sensitive interest features in the site (to avoid the *Sabellaria spinulosa* reef and pipeline routes that require shaving of the tops of large sandbanks). Restrictions on rock dumping and use of concrete mattressing may also be required. It is not yet known how de-commissioning of infrastructure in the site will be undertaken[93] so impacts on this cannot be assessed.

3.2.11 To inform siting of infrastructure and assessment of the impacts of decommissioning additional survey costs may be incurred to provide required baseline information on interest features in the site. These costs would arise, for example, if sufficient information was not collected in initial surveys or if the location of *Sabellaria spinulosa* reef needed to be re-assessed because operations had been delayed. To avoid under-estimation of the costs it is assumed here that the cost of any additional surveys that are required is equivalent to the cost of an entire benthic and geophysical survey. It is estimated that 20% additional length of new pipelines could be required to avoid sensitive interest features in the site[94].

3.2.12 For the purposes of the analysis it is assumed that a post construction survey (benthic and geophysical) would be required for any construction or

[93] The decision on how decommissioning will be undertaken is made when infrastructure reaches the end of its planned period for operation.
[94] Based on the opinion of experts in ABPmer and eftec.

decommissioning of oil and gas infrastructure in the site to assess the impact on interest features. Data provided by industry[95] indicate that a benthic survey for a well costs around £45,000 - £65,000[96] and that benthic survey for a corridor (for example for a pipeline) costs £600 per km. The cost of geophysical surveys for a corridor of 400-1000 metres ranges from £1,285 to £6,500 per km[97]. Purchasing and installing a pipeline is estimated by ABPmer *et al.* (2007) to cost £2m per km.

3.2.13 The additional costs for new infrastructure developments in the site cannot be estimated here as details of new developments over the next ten years are not known. Oil & Gas UK has advised[98] that deviation of new pipelines routes and restrictions on cutting discharges would involve significant costs (millions of pounds). For purposes of the analysis it is assumed that the SAC does not result in additional costs for decommissioning other than possible increases in survey costs.

3.2.14 The economic costs of impacts of the SAC on the oil and gas industry are estimated here to range from zero to unknown and potentially significant (for details see Table 3.3).

Table 3.3 Estimated economic costs of impacts of the SAC on oil and gas exploration and production		
"Minimum" scenario:	*Assumptions*	*Costs*
▪ No change	NA	£0
"Maximum" scenario		
Future projects: ▪ Additional costs for baseline surveys and costs of a survey to monitor impact of new developments and decommissioning. ▪ Siting of infrastructure to avoid sensitive interest features. ▪ Restrictions on scour protection and disposal of cuttings.	Level and nature of future development for oil and gas exploration and production and level of decommissioning in the site is unknown.	Unknown, potentially significant Unknown, potentially significant Unknown

Gas interconnectors

3.2.15 It is not anticipated that designation of the site will impact on gas interconnectors.

[95] Source: confidential.
[96] Usually ten survey stations, at a cost of £1,500 per station, over an area of 2 km^2 that is centred on the proposed well site. Collection for the survey is completed within a day. The vessel costs £30,000 to £50,000 per day.
[97] Source: confidential.
[98] In its consultation response.

Gas storage

3.2.16 The economic costs of the impact of the SAC on a proposed pipeline for gas storage have a present value of zero to £18.331m. Details of the calculations are provided in Table 3.4 (the survey costs are the same as those described for pipelines for gas production).

Table 3.4	**Estimated economic costs of impacts of the SAC on gas storage**	
"Minimum" scenario:	*Assumptions**	*Cost*
▪ No change	NA	£0
"Maximum" scenario		
Future projects: ▪ Additional cost for survey to inform baseline and route planning plus cost of a post-construction survey to monitor impact on interest features.	Additional cost for each of baseline and post construction survey is estimated based on the cost of undertaking an additional benthic monitoring survey (£600 per km) and geophysical survey (£3,893 per km). Assume cost incurred on two occasions (baseline and post-construction survey). Assume 20 percent extra pipeline required to divert around sensitive interest features**. 53km of pipeline route (34km + 19km) passes through the site, plus 20%, a total length of 63.6km. Cost = 4,493 x 63.6 x 2.	£0.571m one-off
▪ Routes of new pipelines avoid sensitive interest features	For 53km of gas storage pipeline route, if 20% extra is required to avoid sensitive interest features, 10.6km of additional pipeline is required. Unit cost of £2m per km for purchase and installation of new pipeline. Cost = 2m x 10.6	£21.2m one-off *(Total of above = £21.771m)*
▪ Restrictions on scour protection.		Unknown.
Total		

* Source of benthic and geophysical survey costs: industry (confidential) (in comparison, ABPmer et al. (2007) estimate cost of geophysical survey as £3,000 per km and additional benthic survey £300 per km). Source of cost of purchasing and installing pipeline ABPmer *et al*. (2007). Cost of geophysical survey estimated as midpoint of the range of £1,285 to £6,500 per km. One-off costs could occur at any time, so are assumed to arise in 2015.

** Assumption based on the opinion of experts in ABPmer and eftec.

Pipelines for carbon dioxide storage

3.2.17 The economic costs of impacts of the SAC on a proposed pipeline for carbon dioxide storage is estimated to have a present value in the range of zero to £17.293m. Details of the calculations are provided in Table 3.5 (the survey costs are the same as those described for pipelines for gas production).

Table 3.5	Estimated economic costs of impacts of the SAC on pipelines for CO_2 storage	
"Minimum" scenario:	*Assumptions**	*Costs*
▪ No change	NA	£0
"Maximum" scenario		
Future projects: ▪ Additional cost for survey to inform baseline and inform route planning plus cost of a post-construction survey to monitor impact on interest features.	Additional cost for each of the baseline and post-construction survey assessed as the cost of undertaking an additional benthic monitoring survey (£600 per km) and geophysical survey (£3,893 per km). Assume cost incurred on two occasions (baseline and post-construction survey). Assume 20 percent extra pipeline required to divert around sensitive interest features**. Assume 50 km of pipeline route passes through the site, plus 20%, a total length of 60km). Cost = 4,493 x 60 x 2.	£0.539m one-off
▪ Routes of new pipelines avoid sensitive interest features	For 50km of pipeline route, if 20 percent extra pipeline is required to divert around sensitive interest features, 10km of additional pipeline is required. Unit cost is £2m per km for purchase and installation of new pipeline. Cost = 2m x 10	£20m one-off *(Total of above = £20.539m)*
▪ Restrictions on scour protection.		Unknown.
* Source of benthic and geophysical survey costs: industry (confidential). Source of cost of purchasing and installing pipeline ABPmer *et al.* (2007). Cost of geophysical survey estimated as midpoint of the range of £1,285 to £6,500 per km (in comparison, ABPmer et al. (2007) estimate cost of geophysical survey as £3,000 per km and additional benthic survey £300 per km). One-off costs could occur at any time, so are assumed to arise in 2015. ** Assumption based on the opinion of experts in ABPmer and eftec.		

Generation of electricity from renewable sources

Wind farms

3.2.18 The SAC could impact on wind farm developments in the area of the Round 3 Norfolk Zone that lies within and in the vicinity of the site. It could potentially also impact on wind farm developments elsewhere in the Zone. To reflect uncertainty in the impacts it is assumed in the minimum scenario that no impacts arise. The impacts that may arise in a realistic worst case scenario are described below; these are used for the maximum scenario in the analysis.

3.2.19 Information is not currently available on the extent of wind farm development that is likely to take place under Round 3 within the site[99]. To achieve its generation capacity 33% of the Norfolk Zone will need to be developed[100] but the location of the proposed wind farms is not currently available. In light of this and to avoid under-estimating the costs it is assumed here that development of wind farms could be sought on the entire area of the Norfolk Zone that is within the site. Again, to avoid under-estimating the costs the maximum scenario assumes that no development of

[99] The target of Round 3 is to develop wind farm capacity to generate 25GW; the area on offer is approximately 27,000 km^2.
[100] Entec, 2009.

wind farms is permitted in this area of the SAC because of potential impacts on the site's interest features. In reality, some development may be permitted if potential turbines and cables are sited to avoid impacts on sensitive interest features. This would incur costs to the developer but it is assumed here that these would be less than the costs of development not being permitted.

3.2.20 The SAC overlaps with 5 percent (285 km^2) of the Norfolk Zone[101], an area that could potentially generate 0.72 GW if it was entirely developed with wind farms (estimated assuming that a 1GW wind farm occupies 392 km^2 [102]). If development of this area was not permitted, the capacity to generate 0.72 GW from renewable energy could potentially be provided by:

a) developing wind farm(s) elsewhere, and/or
b) developing the capacity using alternative sources of renewable energy (though these are unlikely to provide the capacity of a large offshore wind farm).

Alternatively the capacity for generation from renewable energy may not be provided.

3.2.21 Given the UK's commitments under the EU Renewable Energy Directive[103], the potential impact of the SAC on wind farm development in the Norfolk Zone is estimated here in terms of (a) above. It is assumed that the same capacity would be developed in an alternative area in the Norfolk Zone (as only 33 percent of the zone is likely to be developed). The costs this would incur include:

- the costs of investigating the suitability of alternative sites (including the costs of Environmental Impact Assessments and surveys). These are not estimated here as they are likely to be situation specific (determined by factors that include the number of alternative sites that are investigated and their area).
- Any additional costs of developing the alternative site rather than the site in the SAC. In the absence of more accurate data, the additional costs are estimated for development of a wind farm at a site in the Norfolk Zone that is 30 to 60 nm off shore as opposed to the area of the Zone in the SAC some of which is 12 to 30 nm off shore. This would increase costs for cables, turbine foundations and shipping amongst other things. The costs are assumed to be approximately 8 percent higher[104].
- Additional costs incurred in operating and maintaining a wind farm that is further off shore. These are not estimated here as they are likely to be specific to the developer.

The analysis assumes that wind farm development in the area of the Norfolk Zone that lies in the SAC would cost approximately £3.4m per MW[105] . Development of the capacity of the area of the zone within the SAC (0.72 GW) would therefore cost approximately £2,472m.

[101] The area of the Norfolk Zone is 6036.8 km² (http://www.thecrownestate.co.uk/r3-developers#zone5).
[102] Based on the assumptions that it comprises two groups of 98 x 5MW turbines arranged in a rectangular array of 7 rows or 14 turbines facing the prevailing wind direction with 850 metres between turbines within the rows and 1200 metres between rows giving an average array spacing of approximately 8 rotor diameters.
[103] Directive 2009/28/EC on the Promotion of the Use of Energy from Renewable Sources. This includes a target of obtaining 15% of energy (in gross final consumption) from renewable sources by 2020.
[104] On the basis that, in 2008, capital expenditure costs were £2.54m per MW capacity for wind farms developed 12 to 30 nm off shore and £2.74m per MW capacity for wind farms developed 30 to 60 nm off shore, both for mid depth of water (the water depth throughout the Norfolk Zone) (Jennings, 2008).
[105] Source: Scottish Power consultation response; Ernst & Young (2009) estimated capital costs of £3.2m per MW for projects at or near financial close in January 2009.

3.2.22 The SAC could potentially also impact on wind farm developments elsewhere in the Norfolk Zone if export cable routes are sought through the site. For this analysis it is assumed that 30km of export cable for a planned wind farm development in an area of the Zone outside the site might pass through the site[106]. Additional survey costs may be incurred to provide required baseline information on interest features, to inform routing of the cable to avoid sensitive interest features in the site and to assess impact on the interest features. These costs would arise, for example, if sufficient information was not collected in initial surveys or if the location of *Sabellaria spinulosa* reef needs to be re-assessed because operations have been delayed. To avoid under-estimation of the costs it is assumed here that the cost of any additional surveys that are required is equivalent to the cost of an entire benthic and geophysical survey. These additional costs could arise on four occasions: the baseline survey prior to construction and the monitoring surveys conducted (under Food and Environment Protection Act licence conditions) each year for three years following cable laying. It is assumed that the cable would need to be 20 percent longer to avoid sensitive interest features in the site[107].

3.2.23 The costs for the offshore wind farm sector of designating the site compared with not designating the site could potentially have a present value that lies within the range of £0 to £169m plus unknown potentially significant costs over the 10 year assessment period (for details see Table 3.6). These costs should be considered in the context of the cost of development: it would cost £17 billion to undertake the development that is likely in the Norfolk Zone[108].

[106] Based on the opinion of experts in ABPmer and eftec.
[107] Based on the opinion of experts in ABPmer and eftec.
[108] Calculated on the basis that 33% of the zone would be developed, a 1GW wind farm occupies 392km^2 and development of the wind farms would cost £3.4m per MW.

Table 3.6	Estimated economic costs of impacts of the SAC on wind farms	
"Minimum" scenario:	*Assumptions**	*Costs*
No change	NA	£0
"Maximum" scenario:		
<u>Future projects:</u> Impacts on cable laying: ▪ Additional cost for survey to inform baseline and inform siting to avoid sensitive interest features. Plus additional cost for monitoring to assess impact on interest features each year for 3 years following cable laying.	Additional cost for the baseline survey and for each of the post-cable laying surveys estimated based on the cost of undertaking an additional benthic monitoring survey (£600 per km) and geophysical survey (£3,893 per km). Assume cost is incurred on four occasions (for the baseline survey and each of the three post-laying surveys). Assume 20 percent extra cable required to divert around sensitive interest features**. Assume 30 km of power export cable from a Round 3 OWF outside the site passes through the site, plus 20%, a total of 36km. Cost = 4,493 x 36 x 4.	£0.647m one-off
▪ Routes of cables avoid sensitive interest features.	For 30 km of power export cable from a Round 3 OWF outside the site, if 20 percent extra is required to avoid sensitive interest features, 6km of extra cable is required. Unit cost is £465,300 per km for purchase and installation of new power cable. Cost = 465,300 x 6.	£2.792m one-off *(Total of above = £3.439m)*
▪ Restrictions on scour protection.		Unknown
See Table 3.1 for management measures for new developments.	Potential impact on Round 3 developments (for assumptions see text):	
	▪ Costs of investigating alternative sites	Unknown, potentially significant
	▪ Additional costs of developing the capacity at an alternative site in the Norfolk Zone: 8 % of £2,472 m (for details see text).	£197.755m one-off
	▪ Costs of delay to development.	Unknown, potentially significant
	▪ Additional costs of operating and maintaining a wind farm further off shore.	Unknown, potentially significant

* Source of benthic and geophysical survey costs: industry (confidential) (in comparison, ABPmer et al. (2007) estimate cost of geophysical survey as £3,000 per km and additional benthic survey £300 per km). Source of cost of purchasing and installing cable Scottish Power Renewables consultation response (note that cost estimated by ABPmer *et al.* (2007) is £465,000 per km). Cost of geophysical survey estimated as midpoint of the range of £1,285 to £6,500 per km. One-off costs could occur at any time so are assumed to arise in 2015.

** Assumption based on the opinion of experts in ABPmer and eftec.

Cables

3.2.24 To reflect uncertainty, it is assumed in the minimum scenario that the SAC has no impact on activities concerning telecommunication cables.

3.2.25 In the maximum scenario it is assumed that all cables that pass through the site will need to be replaced within the next ten years[109]. It is assumed that additional survey costs for cable replacement may be incurred to provide required baseline information on interest features, to inform routing of the cable to avoid sensitive interest features in the site and to assess impact on the interest features. These costs would arise for example, if sufficient information was not collected in initial surveys. To avoid under-estimation of the costs it is assumed here that the cost of any additional surveys that are required is equivalent to the cost of an entire benthic and geophysical survey. These additional costs could arise on four occasions: the baseline survey prior to construction and the monitoring surveys conducted (under Food and Environment Protection Act licence conditions) each year for three years following cable laying. It is estimated that 20% additional cable could be required to avoid sensitive interest features in the site[110].

Table 3.7	**Estimated economic costs of impacts of the SAC on telecom cables**	
"Minimum" scenario:	*Assumptions**	*Costs*
Outstanding consents: No change.	NA	£0
"Maximum" scenario:		
Future projects: ▪ Additional cost for survey to inform baseline and inform siting to avoid sensitive interest features. Plus additional cost for monitoring to assess impact on interest features each year for 3 years post cable laying.	Additional cost for baseline survey and each of the post-cable laying surveys estimated as cost of undertaking an additional benthic monitoring survey (£600 per km) and geophysical survey (£3,893 per km). Assume cost is incurred on four occasions (for the baseline survey and each of the three post-laying surveys). Assume 20% extra cable required to divert around sensitive interest features**. 70km of telecom cable to be replaced over the next ten years plus 20%, a total of 84km of cable. Cost = 4,493 x 84 x 4.	£1.509m one off.
▪ Routes of replacement cables avoid sensitive interest features	For 70km of telecom cable, if 20% extra is required to avoid sensitive interest features, 14km of additional cable is required. Unit cost is £20,000 per km for purchase and installation of new telecom cable. Cost = 20,000 x 14	£0.280m one off *(Total of above = £1.789m)*
* Source of benthic and geophysical survey costs: industry (confidential) (in comparison, ABPmer et al. (2007) estimate cost of geophysical survey as £3,000 per km and additional benthic survey £300 per km). Source of cost of purchasing and installing cable ABPmer *et al.* (2007). Cost of geophysical survey estimated as midpoint of the range of £1,285 to £6,500 per km. One-off costs could occur at any time so are assumed to arise in 2015. ** Assumption made based on the opinion of experts in ABPmer and eftec.		

[109] This assumption is made to avoid under-estimation of costs on the basis that the stock of cables in the UK is relatively old (other than cables for wind farms).
[110] Based on the opinion of experts in ABPmer and eftec.

3.2.26 The economic costs of the impacts of the SAC on telecom cables is estimated to have a present value in the range of zero to £1.507m over the 10 year assessment period. Details of the calculation of this are provided in Table 3.7.

Commercial fisheries

3.2.27 The impact of the site on the contribution that fisheries make to the UK economy is estimated here in terms of the impact on gross value added (GVA) for the sector[111]. Ideally this would be estimated as the change in GVA that arises from the impacts of the site on costs and revenue for fishers arising from changes in fishing patterns, steaming time, species targeted, landings, gear types used, and also from vessels leaving the fleet. Displacement of fishing effort is likely to result in impacts on fishers operating outside as well as within the site. Regrettably such detailed analysis was not feasible. Instead the impact on GVA is estimated based on:

- the proportion of the value of landings in the site (by the UK fleet) that could be affected by the hypothetical management measures[112]. For the purpose of the analysis, largely arbitrary hypothetical estimates have been provided of the level of restriction provided (and the value of landings affected) by the theoretical management measures. These have been crudely informed by the outcome of previous implementation of similar management measures and are precautionary to avoid under-estimation of the costs. The value of landings affected by a measure is estimated based on contribution to value of landings made by the gear type (or landings of species) that the measures aims to restrict. The contribution is calculated using FAD statistics for landings by gear type (Table C.1) and by species (Table C.2) for the ICES rectangles that contain most of the site. These are very rough estimates as the site only occupies part of the rectangles and fishing is not uniform throughout the rectangles.
- the value of landings in the site (by the UK fleet), presented in Section 2. As discussed in Annex 7 these are rough estimates, not least because as fishing by vessels that do not have Vessel Monitoring Systems (VMS) is not distributed evenly throughout the rectangles and the value of shellfish landings by vessels under 10 metres may not be fully reflected in the data.
- estimates of GVA as a proportion of earnings from fisheries for the vessels in the UK fleet.

Finally, potential social impacts are considered.

3.2.28 The assessment assumes the measures apply to the whole site with the exception of Measure 1. In practice, where management measures are needed they

[111] GVA measures the contribution to the economy of each individual producer, industry or sector by estimating the value of output (goods or services) less the value of inputs used in that output's production process (Source: Office for National Statistics, http://www.statistics.gov.uk/cci/nugget.asp?ID=254). The source that is used here (Anderson & Guillen, 2009) estimates GVA for the UK fleet in terms of the sum of remuneration of labour (crew) and capital (owner), calculated as income minus all expenses (fuel, repairs, variable and fixed costs) except crew cost.

[112] As set out in Section 3.1 a range of hypothetical management measures has been used here to so that the potential impacts of the designation can be assessed. This is because the management measures for the site are not yet known; they will be developed by the relevant authorities and may differ from those set out here. The involvement of local fisheries stakeholders in the design of any new management measure for new Natura 2000 sites will help ensure compliance and reduce enforcement costs.

may be applied only to interest features for which they are required. Management measures that aim to protect habitats in the site are likely to be needed only for areas in the site with sensitive interest features (largely biogenic reef and medium diversity sandbank flanks) which are present only sporadically. The feasibility of doing this depends on enforcement considerations. The cost of the measures estimated here may therefore be overestimated. However, if enforcement capacity is not refined enough to discriminate implementation of measures required only in small areas of the site, those measures may need to be implemented in other areas of the site (where they are not necessary).

3.2.29 The analysis assumes that new management measures are not applied if the necessary controls are already in place. An overview of existing relevant byelaws that apply to the site is provided in Appendix E at the end of this document. If the government decides that national and local management measures are required to protect stocks of brown crab and lobster (which it is currently considering), many (if not all) of the measures suggested below to manage brown crab and lobster fisheries may not be necessary (though additional measures may still need to be sought beyond 6 nm where appropriate).

Value of landings affected in the minimum scenario

3.2.30 The following hypothetical management measure is used for the purposes of the analysis to estimate the impact on fisheries in the minimum scenario (the value of landings affected by each measure is summarised in Appendix F).

Measure 1: *Closure of Sabellaria spinulosa reef in the site to all towed demersal gear (including rock-hopper, otter and beam trawling and shellfish dredging). This aims to prevent damage to Annex I sea floor habitats for which the site has been designated and stationary species.*

3.2.31 This measure is included in the minimum scenario because the conservation objectives for the site are to restore (and then maintain) the environmental quality and processes of one of the reefs. It is anticipated that in addition to the reef, a margin around the reef would also need to be closed to these gears to protect the reef from accidental incursion by fishing gears. However, as *Sabellaria spinulosa* reef currently covers less than 0.1 percent of the site this measure is assumed to have a negligible impact on fisheries in the site. It is assumed that trawling with bottom contact that does occur in these areas would be displaced to alternative areas with little economic impact.

Value of landings affected in the maximum scenario

3.2.32 The following hypothetical management measures are used for the purposes of the analysis to estimate the impact on fisheries in the maximum scenario. The impact of each measure applied alone (not in combination with the other measures) is provided in Appendix F.

Measure 2: *Closure of the site for all towed demersal gear (including rock-hopper, otter, beam and scallop/shellfish dredging and trawling). This aims to prevent damage to Annex I sea floor habitats for which the site has been designated and stationary species.*

3.2.33 Hydraulic dredging does not currently occur in the site[113] so it is assumed that this measure would have no impact on dredging. For trawling, the value of trawling landings as a proportion of total landings within the two rectangles that contain most of the site (given in Table C.1) is multiplied by the value of landings in the site (given in Section 2.1) to estimate the level of trawling landings potentially affected from this measure: approximately £0.034m per year. This same approach is used to estimate the value of landings affected for each of the measures.

Measure 3: *Cap on the number of pots deployed; reduction by 50 percent. This aims to reduce the number of crustaceans taken from the site[114]. It is intended to protect typical species of the site[115].*

3.2.34 This measure is assumed to affect 50 percent of the value of landings from potting; approximately £0.103m of landings per year.

Measure 4: *Three month[116] spatial closure of sensitive areas (to protect spawning/nursery grounds) to all gears apart from potting. This aims to reduce the biomass of typical species taken from the site and to increase the reproductive capacity of the site.*

3.2.35 To avoid under-estimating the impact, this measure is assumed to affect 25 percent of the value of landings by all gears apart from potting, approximately £0.015m of landings per year. This assumes that the area closed and the period of closure are more productive than average. Ideally real-time closures would be used where stocks are monitored and areas of the site closed in response to high frequencies of juvenile fish but the monitoring capacity for this does not exist at present.

Measure 5: *Cap on mortality consequent of all gear with any bottom contact excluding potting; mortality reduced by 25 percent. This aims to prevent damage to Annex 1 sea floor habitats for which the site has been designated and stationary species.*

3.2.36 This measure is assumed to affect 25 percent of the value of landings from all gears that have bottom contact apart from potting. It would potentially affect £0.013m of landings per year.

[113] Indicated by FAD data and confirmed by the Eastern Sea Fisheries Joint Committee (Input to Impact Assessments for the new Special Areas of Conservation and Special Protection Areas, May 2010).

[114] This is a hypothetical scenario used for the purposes of the Impact Assessment. A more likely management scenario would be a cap on existing potting and netting levels. This scenario would be based on the assumption that if management of the site required reduction in mobile gear activity, a cap on potting and netting levels might be required to limit the impacts of fishers who were trawling/dredging and have diversified to potting (as greater levels of static gear activity could increase impacts on the site's interest features). Such a cap would be accompanied by appropriate monitoring of typical species to adequately ascertain the true impact of these activities upon them.

[115] Further information on the approach to typical species adopted in the IA is provided in Annex 9.

[116] The appropriate duration would need to be determined if the measure was required. A fisheries stakeholder has indicated that spawning areas are not located within the boundary of the site, questioning the need for this measure.

Measure 6: *Cap on mortality consequent of all activity except for potting; effort*[117] *reduced by 25 percent (targeting effort reduces discarding of by-catch). This aims to reduce the biomass of typical species taken from the site by reducing mortality.*

3.2.37 It is assumed that this might cap effort by up to 25 percent and this might reduce landings for all gear types by up to 25 percent. This would potentially affect approximately £0.015m of landings per year.

Measure 7: *Increase minimum landing size and introduce maximum landing size for crustaceans. The minimum landing size aims to help crustaceans reach maturity and breed and the maximum landing size aims to enable presence of larger crustaceans in the site (protecting typical species of the site).*

3.2.38 Crustaceans may have a functional role in an ecosystem to the extent that they determine the community of plants and animals. Evidence from North Eastern Sea Fisheries Committee suggests that where landings of lobsters are high, as is the case in this site, there is a low abundance of lobsters that are bigger than the minimum landing size[118]. As the largest lobsters and crabs, at an individual level, can make the greatest contribution to the function of the ecosystem, these size classes should be represented within a healthy community.

3.2.39 It is assumed that the existing minimum landing size for crustaceans that applies to the area of the site within 6nm would be increased by this measure The maximum landing size would be likely to be variable and it is not currently known what size would be appropriate. It is estimated for the purposes of this analysis that this measure might affect 25 percent of landings of crustaceans or approximately £0.051m per year.

Application of all measures:

3.2.40 The impact of applying all of the hypothetical management measures is not the sum of the impacts of the individual measures estimated above because some of the measures overlap. It is assumed that if the control that is sought by one measure (for example restrictions on potting under Measure 6) is being achieved by another measure (for example the restriction on potting sought under Measure 2), the control is not increased further. However, for controls that are not duplicated (for example, controls for different fisheries) the effects of all measures are assumed to be additive. For each gear type, the impact of combined application of all of the measures in the maximum scenario is set out in Table 3.8. This indicates the measures that restrict each gear type, the percentage of the total value of landings by that gear type that would be affected and what this represents as percentage of the total of landings from the site (for all gear types).

[117] Where effort is time spent fishing.
[118] Bannister, 1999.

Table 3.8	Estimated value of landings by UK vessels affected by application of all hypothetical management measures in maximum scenario (assuming average value of landings from the site of £266k)*				
			Percentage of value of landings by UK vessels affected by application of all measures		
Category of gear type	*Landings for each gear type as a percentage of value of landings by UK vessels** (a)*	*Manage-ment measures that affect landings*	*Landings by that gear type (b)*	*Landings by all vessels fishing in the site (a x b)*	*Value of landings affected (£m per year) ****
Trawling with bottom contact	13%	2	100%	13%	0.034
Dredging	0%	2	100%	0%	0
Trawling with no bottom contact	0%	4 & 6	25%	0%	0
Netting with bottom contact	1%	4, 5 & 6	25%	0%	0.001
Netting with no bottom contact	2%	4 & 6	25%	1%	0.002
Lines with bottom contact	6%	4, 5 & 6	25%	2%	0.004
Lines with no bottom contact	0%	4 & 6	25%	0%	0
Pots (crustaceans)	77%	3 & 7	50%	39%	0.103
Pots (others)	0%	none	-	-	0
Other	0%	4 & 6	25%	0%	0
Total for all gear types				54%	0.143

* For details see Section 2.1. These figures take in to account the value of the seed mussel fishery in the site. Note that figures in this table are rounded so may not add up to the total.

** For vessels fishing in the ICES rectangles that contains the majority of the site (Average for 2005-8. Source: Fishing Activity Database, data supplied by the MFA (the functions of which have since been absorbed by the MMO). For details see Table C.1).

*** Calculated as a x b x £265,986.

3.2.41 The sum of the percentage of value of landings affected by each gear type in Table 3.8 gives the total percentage affected: 54 percent. It is estimated based on FAD data that approximately £0.143m per year of landings could be affected in the maximum scenario if the potential management measures were all implemented. Note that this is subject to considerable uncertainty and may be an underestimate for reasons set out in Section 2.1 and Annex 7.

Impact on the fishing sector

3.2.42 Fishing businesses would adapt to any additional management measures in different ways and it is difficult to predict whether and to what extent the above estimates of value of landings potentially affected would translate into impacts on costs and revenue for the fishing sector. Further details on the potential impacts are provided in Appendix G at the end of this document.

3.2.43 It is assumed here that the hypothetical management measures used for the analysis may reduce the contribution that fisheries in the area make to the UK economy to some extent. It is assumed in the minimum scenario that the site has no

impact on fisheries (as the management measure would have negligible impact). In the absence of more detailed information on the impact that would arise in the maximum scenario it is assumed that the entire value of landings affected by the hypothetical management measures is lost and not replaced. Consequently the impact on the economy is the loss in GVA from these landings. Landings from outside the site for vessels that fish in the site are not assumed to be lost as well as it is assumed that other fishing businesses would make these landings.

3.2.44 The average GVA for the UK national fleet is estimated to have been 40% of total fleet earnings for 2005-7 inclusive[119]. A figure for the national fleet is used here because of the high margin of error in the estimates that are being used[120]. Using this, Table 3.9 estimates the cost of the impact of the site on fisheries based on the impact on GVA.

3.2.45 The economic costs of impacts of the SAC on fisheries are roughly estimated to have a present value in the range of zero to £0.499m over the 10 year assessment period (for details see Table 3.9). There may be additional costs relating to impacts on landings and on the fishing industry not captured in the data used for the analysis. Once the fisheries management measures that will be adopted for the site are known, advice will be sought from Sea Fisheries Committees (SFCs) / Inshore Fisheries and Conservation Authorities (IFCAs)[121] and the Marine Management Organisation (MMO) on the estimated loss of GVA that will arise from the impact on fisheries and potential social impacts[122]. This will result in a better informed assessment than it has been possible to provide here.

Table 3.9	**Estimated economic costs of impacts of the SAC on fisheries**	
"Minimum" scenario:	*Assumptions*	*Cost*
Existing activities ▪ Closure of biogenic reef to dredging and towed demersal gear.	Negligible impact and fishing activity is displaced to alternative grounds without major impacts.	£0
"Maximum" scenario:		
Existing activities ▪ Impacts from a collection of management measures.	Assumptions set out in text above. Loss of GVA is estimated as 40% of the value of landings affected (£0.143m per year) plus impacts on fisheries' contribution to the economy that are not included in the estimate.	£0.058m per year plus unknown costs.

[119] Source: EC Annual Economic Report on the European Fishing Fleet (Anderson & Guillen (2009).
[120] Estimates of GVA as a percentage of earnings can be estimated for a number (but not all) segments of the UK fleet using data from Curtis *et al.* (2010).
[121] Sea Fisheries Committees will be replaced with Inshore Fisheries and Conservation Authorities (IFCAs) in April 2011. The limits of the jurisdiction for IFCAs have not yet been decided.
[122] This could potentially be informed by research funded by Defra, due to be completed in May 2010, that will provide more detailed information on fishing effort by under 15 metre vessels within 6nm.

Potential social impacts and impacts on the local and regional economy

3.2.46 In the minimum scenario, it is assumed in this analysis that the SAC would have no negative social or economic impacts through its effects on fisheries as the management measure would not have a significant effect on landings.

3.2.47 In the maximum scenario, the estimated reduction in income to fishing businesses could potentially result in negative social impacts and impacts on the local and regional economy. For example, there could be a potential reduction in demand for services such as fish processing, packaging, storage and transport, as well as a reduction in the demand for supplemental services such as vessel and gear maintenance. Some ports could be affected by reduction in landings and a decrease in income from fisheries. Ports in the area that could be affected are listed in Section 2.1.

3.2.48 The MFA[123] has indicated that the SAC could potentially have a significant effect on the local and regional economy through its impact on shellfish, crab and lobster fisheries. Shortfalls in landings may be made up locally or regionally (off the Yorkshire coast or further offshore) though this would increase the pressure on stocks in these areas. In their consultation responses, fisheries stakeholders have indicated that if access to grounds near the shore for certain gear types was prohibited for certain fisheries, fishing trips would need to become longer. This may change fishing patterns from 24 hour to 36 hour trips which could negatively impact on quality of life for fishers and their families. It could also implications for crew safety. Stakeholders also indicated that if effort moves further offshore this could reduce locally made landings from potting. This could occur because longer trips may warrant the use of vivier[124] boats, increasing the proportion of this type of vessel relative to local inshore day boats and reducing the number of boats reliant on making landings to local ports.

3.2.49 Fisheries stakeholders have also indicated that a shift in fishing effort (particularly potting) from Inner Dowsing, Race Bank and North Ridge pSAC could affect the viability of the local inshore day fleet operating within Haisborough, Hammond and Winterton SAC. Reduction in local landings could impact on the quality of the product processed in the area (if supplies were outsourced) and the contribution to the local economy from fishers preparing and selling their own catch. Reductions in landings could have knock on effects to other businesses such as Lowestoft fish market. New investment in fish processing which creates employment in the area, such as a proposed new factory, could be put at risk by restrictions on fisheries. Stakeholders also indicated that there are limited alternative employment opportunities in the area.

[123] The functions of the MFA have since been absorbed by the MMO.
[124] Vivier boats incorporate a live-storage facility onboard, so can remain at sea for longer.

Shipping

3.2.50 No additional measures to manage shipping are likely to be required for the current level of shipping movements and vessel sizes[125]. If significant anchoring of small vessels (such as fishing boats) occurs over the *Sabellaria spinulosa* reefs, restrictions on such anchoring may be required in these areas. These restrictions would not apply in emergency circumstances.

Recreation

3.2.51 Hypothetical management measures for recreational sea angling are not suggested here because of insufficient information on its impact on interest features in the site. If angling was found to be significantly impacting on fish typical of the sandbanks and reefs controls such as bag limits that restrict the number and size of fish extracted by recreational anglers might need to be introduced. If they were required, these measures could lead to a reduction in sea angling activity at the site and associated economic activity. However, there is so much uncertainty about whether they would be required and the net impact that they would have on angling in the area is not investigated further at this stage.

3.2.52 Additional management measures for other recreational activities are unlikely to be necessary due to the fairly low impacts of these activities.

National defence

3.2.53 As for shipping, no additional measures are likely to be required to manage naval vessels transiting through the site given the current level of vessel movements and vessel sizes. If significant anchoring occurs over *Sabellaria spinulosa* reefs, restrictions on such anchoring may be required in these areas. These restrictions would not apply in emergency circumstances.

Activities that result in land-based sources of pollution

3.2.54 The Environment Agency's ongoing Review of Consents that may have a likely significant effect on existing SACs and SPAs[126] will need to include consents that may affect Haisborough, Hammond and Winterton SAC. The results of this review could lead to further costs to industry to address any impacts from discharges (which could include capital costs associated with improved effluent treatment and increases in operational costs)[127]. It is unlikely that action on discharges will be required to protect interest features in the site. In addition, current coastal water quality as reported in the Environment Agency River Basin Management Plans should be sufficient to support conservation objectives for interest features in the site.

[125] Designation of this site is not likely to significantly impact on a ships right of innocent passage and freedom of navigation in seas around the UK. Equipment carried and used by ships for the safe navigation (such as echo sounders) would not be affected by the site designation.

[126] Mostly inland or extending to estuaries and some coastal waters.

[127] For existing SACs and SPAs the Review of Consents has informed the need for investment by industry to limit the adverse impact of abstractions or effluent on environmental water quality. For example, over 2005-10 water companies are programmed to spend £320m on investigations and improvements in the quality of discharges to meet Habitats and Birds Directives' requirements (Source: Office of Water Services, 2004).

Costs of managing the SAC

3.2.55 For the purposes of this analysis it is assumed that a management group (comprising representatives from relevant authorities) will be established for the site[128]. Once the site is designated, the management group would be responsible for establishing operations that may cause deterioration to interest features in the site (based on advice from the statutory nature conservation advisers) and evaluating current use against the conservation objectives. From this it would develop an action plan with targets for management of the site then implement this through agreements, working practices and byelaws, for example. It would also establish and carry out a monitoring plan for periodic assessment and review of the site (which will consider requirements for base line data, compliance monitoring and condition monitoring) in consultation with the statutory nature conservation advisers.

3.2.56 The management group would probably meet twice a year and its members would also provide advice during the year on management measures that might be needed, surveillance, the annual review, plans and projects and report any damaging activities. It should[129] also meet periodically to consult with representatives from the advisory groups and interest groups. Full public consultation should be undertaken on any proposals for managing the site and wide publicity should be given at appropriate stages[130]. It is assumed for the purposes of the analysis that an advisory group (of representatives of other stakeholders including local interests, user groups and conservation groups) would also be formed (though again, this is not required).

3.2.57 The organisations involved will incur costs from the contributions that they make to the management group and advisory group. Based on inputs made for the Wash and North Norfolk Coast SAC it is estimated that input to the management group costs the member organisations (from the public sector) in the region of £47,000 per year[131]. The costs are estimated to be treble this for the first year after the site is designated whilst the management scheme for the site is developed and the advisory group established, and double in the second year whilst development of the management scheme continues. If the site requires other staff input to help organise the work of the management group and write the site's management scheme (possibly also undertake education and communication work) this will be an additional cost to the public sector. The cost to stakeholder groups of participating in the advisory group is estimated at around £13,500 per year[132]. Though this is an annual cost that will be incurred by the private sector it is not an administrative cost[133]

[128] The Conservation of Habitats and Species Regulations imply (but do not require) that the relevant authorities should work together, ideally within a management group, to develop a suitable management scheme for an SAC. The level of human activity in the site is likely to determine whether a group is formed.

[129] Based on the guidance in DETR and the Welsh Office (1998).

[130] The management schemes for existing English marine Natura 2000 sites were developed with participation of user groups and extensive consultation. Many of these sites are located in estuaries or on the coast and have strong links with adjacent terrestrial protected sites (such as the New Forest SPA and Solent and Southampton Water SPA).

[131] Input to the management group for each of the relevant authorities (of which there could be about twenty) is estimated here to cost about £2,000 per year (in staff time and travel costs), a total cost of £40,000 per year. The cost to the lead authority of hosting the group is estimated at about £7,000 per year (in staff time for participating in the group, arranging meetings, taking minutes amongst other things).

[132] Input to the advisory group for each of the stakeholder groups (of which there could be about fifteen) is estimated here to cost about £900 per year (in staff time and travel costs), a total cost of £40,000 per year.

[133] Under the Simplification Programme, administrative costs arise from regulatory obligations for the private sector to provide information and data to the public sector (Better Regulation Executive, 2005).

as defined by the government's Simplification Programme. The total cost of inputs to the management and advisory group are estimated at £60,500 per year plus in the first year, an additional £94,000 for the management group and in the second year an additional £47,000 for the management group and £13,500 for the advisory group (for developing the management scheme)[134].

3.2.58 Competent authorities will be responsible for „compliance' monitoring in the site, to check that no un-consented activities, plans or projects are taking place and activities that do occur are undertaken in accordance with the management scheme to avoid damage to interest features. The costs of enforcing fisheries management measures will be largely affected by the measures that are developed for the site and so are currently subject to considerable uncertainty. The MFA[135] (unless specified otherwise) has provided the following rough estimates of the additional annual costs that may be incurred to effectively enforce additional fisheries management measures that are required for the site: 2 days of Royal Navy surveillance time (cost £8,850 per day), 5 days of joint patrols by the MMO and SFCs/IFCAs (cost £3,500 per day[136]), 4 hours air surveillance (cost £2,114 per hour) and perhaps 2 prosecution cases (cost £10,375 per case). This is estimated to cost about £0.064m per year. It is assumed that administration of records and other activities is carried out as part of existing duties. The requirement for patrols could decrease if VMS technology is fitted on more fishing vessels (though this uptake will incur set up and running costs for fishers and increase VMS monitoring costs). In the unlikely event that management of the site requires new regulations for migratory fish (specifically salmon, sea trout, eel, lamprey and smelt) in tidal waters and to 6nm, this would result in costs for the Environment Agency[137]. Due to the low likelihood, these costs are not estimated here. In the absence of more refined estimates, the analysis makes the simplistic assumption that the costs of enforcement are the same for both the minimum and maximum scenarios.

3.2.59 The statutory nature conservation advisers will face survey costs to assess the condition of interest features in the site. These are provisionally estimated (subject to considerable uncertainty) as a survey costing £110,000 in the first three years and a survey costing £160,000 every three years for the following six years. In addition, further survey or research may be required by relevant authorities (perhaps including conservation advisers) in order to inform any appropriate changes or additions to existing fisheries management measures.

3.2.60 The present value of the total quantified costs arising from managing the SAC, monitoring and enforcement (summarised in Table 3.10) is estimated at £1.483m.

[134] Estimates based on experience with the Wash and North Norfolk Coast SAC.
[135] J. Hatchman, personal communication, 15/07/09. The functions of the MFA have since been absorbed by the MMO.
[136] Source: Eastern Sea Fisheries Joint Committee consultation response.
[137] Costs would arise from amending or implementing new regulations (byelaws or net limitations), the additional assessments required for any new projects or plans affecting the site, additional compliance monitoring and additional fish population studies.

Table 3.10	Summary of costs of managing, enforcing and monitoring the site in both the minimum and maximum scenario
	Cost
Managing the SAC	Total over 10 years (not discounted): £0.652m comprising: ▪ £0.047m per year for the management group and £0.014m per year for the advisory group (total of £0.061m per year). ▪ Plus additional £0.094m for the management group in the first year (2010/11) to develop the management scheme and establish the advisory group. ▪ Plus an additional £0.047m for the management group and an additional £0.014m for the advisory group in the second year (2011/12) to develop the management scheme (total of £0.061m). ▪ Unknown cost of staff input to site management if required.
Enforcing fisheries management measures	£0.064m per year
Surveys to assess condition of interest features	Total over 10 years (not discounted): £0.320m comprising: ▪ £0.110m in first 3 years (assumed to occur in 2011). ▪ £0.190m in following 3 years (assumed to occur in 2014). ▪ £0.190m in following 3 years (assumed to occur in 2017).

Other costs to the public sector

3.2.61 The following costs to the public sector (which cannot be quantified) will also be incurred as a result of the SAC:

- Informing users of the marine environment about the sites and any management measures that are required for the sites. This will include addition of the sites to charts by the UK Hydrographic Office and communication through Notice to Mariners.
- Review by competent authorities (with advice from statutory nature conservation advisers) of outstanding permissions and consents and other existing activities that may have impacts on the designated site.
- Lead competent authorities will need to undertake Appropriate Assessment when necessary for new plans or projects that are likely to have a significant effect[138] on the SAC. The statutory nature conservation advisers advise when Appropriate Assessment is required (as described in Section 1.3 and Annex 3). It may involve significant work for the competent authority and the appropriate statutory nature conservation adviser(s).

Administrative costs

3.2.62 This IA has not identified any administrative costs (as defined under the government's Simplification Programme[139]) that will arise from designation of the site.

[138] A „significant' effect is one that brings a significant risk of not achieving the designated site's conservation objectives. Assessment of significance in this respect is established on a case by case basis.
[139] Better Regulation Executive, 2005.

3.3 Benefits of designating the site

3.3.1 The benefits of designating the site are considered below in terms of the conservation of habitats and species and the economic benefits.

Conservation of habitats and species

3.3.2 The Habitats Directive aims to promote the maintenance of biodiversity through conservation of natural habitats, wild animals and plants in Member States. SACs protect types of habitat and species that have been identified as in danger of disappearance, having a small natural range, or that are outstanding examples of typical habitats or species. The aim of designating an SAC is neither predominantly nor specifically to deliver economic benefits[140]. The Directive and the legislation implementing it demonstrate that society in the UK and in the EU seek to conserve habitats and species; this could reflect a range of values such as social, political, moral as well as economic. The Marine Strategy Framework Directive and UK Marine and Coastal Access Act (2009) indicate that they seek to conserve marine habitats and species. Consultation responses provided evidence that the conservation of marine habitats and species is important to people in the UK. The Directives and legislation recognise that the natural environment has intrinsic value[141] (which means that it has value „in itself' or „for its own sake', independent of other things, including people) and seek to maintain or improve the environment's status. However, because intrinsic value is neither known nor knowable to people it cannot be used to inform this assessment.

3.3.3 Designation of the sites will reduce the risk that the environmental quality and processes of reef and sandbank habitats in the sites will diminish over time and the risk that the extent, physical structure, diversity, community structure and typical species of the habitats will diminish. If the site is not designated there is a risk that new human activities and changes to existing activities could have an adverse effect on the habitats and species (as described in Section 2.2). It will also be difficult to influence the consenting of activities through, for example, the introduction of effective mitigation measures. Aside from the possible impact of demersal trawling on one of the *Sabellaria spinulosa* reefs, current activities have not been identified as causing significant damage to the interest features. This is either because no damage is occurring or because there is insufficient information on the effects. However, it is unknown whether and to what extent, any adverse impact on the habitats and species will arise in future. Where damage to one of the reefs has occurred, more effective management (as an SAC) will contribute towards the aim of restoring the reef to favourable condition.

3.3.4 The site will conserve 66,900 ha of sandbank habitat and 90 ha of biogenic *Sabellaria spinulosa* reef habitat. A brief description of species in the site is provided in Section 1.4[142]. Sandbanks (in their entirety) can have a higher biodiversity than the flatter seabed of the wider southern North Sea[143] habitat. Coastal seas

[140] Neither economic benefits that are traded nor economic benefits that are not traded.
[141] As is explained in Defra (2007) "While it is recognised that the natural environment has intrinsic value i.e. is valuable in its own right, such non-anthropocentric value is, by definition, beyond any human knowledge".
[142] And in further detail in JNCC and Natural England (2010).
[143] Elliot *et al*., 1998.

themselves are often dynamic and productive ecosystems[144]. Shallow water mixing with nutrients from the land creates a highly productive water column. This results in a sea floor rich in organic matter especially on sandbanks and particularly in their troughs where sediment is less sandy and more stable. This higher organic input leads to an increased amount of animals living in the seabed[145]. Where there are high tidal currents and mobile sediment, sandbanks are a challenging environment for animals. Relatively few species are well adapted to live in and on sandbanks, but high species abundance means that shallow inshore and offshore sandbanks are feeding grounds for fish, birds and sea mammals such as common seals. In the troughs between the sandbanks sediments are less sandy and therefore less mobile. A greater variety of animals can exist here in high abundance fed by high organic inputs from above. In addition, sandbanks can support a large and diverse microbial community which is important in the rapid cycling of organic matter[146]. This cycling returns nutrients to the water column contributing to phytoplankton production throughout the year after the main spring phytoplankton bloom.

3.3.5 *Sabellaria spinulosa* reef adds to the heterogeneity of the living organisms found at the bottom of the sea by increasing the structural complexity of the seabed. The physical reef habitat allows communities that live on the seabed to be present in areas of sediment that would usually be unavailable to them. This can result in increased biodiversity and biomass which may also provide added ecosystem services and support elevated numbers (and biomass) of predators such as shrimps and fishes.

Economic benefits

3.3.6 In addition to being a desirable outcome to society in itself, conservation of habitats and species in the site will also provide economic benefits. These are discussed here from an ecosystem services perspective (as described in Annex 4). The benefits of the site compared with the baseline of not designating the site are assessed qualitatively (summarised in Table 3.11). It has not been possible to quantify or value the benefits because the impacts cannot be readily quantified (and there is considerable uncertainty about the impacts) and most of the services are not traded (described in further detail in Annex 4).

Fish, shellfish and other crustaceans for human consumption

3.3.7 Extraction of fish that are both targeted by fisheries and caught as bycatch may be affected by designation with the potential for both positive and negative effects. On the one hand, if additional fisheries management measures are required they could reduce the amount of fish caught from the site. These controls could contribute to sustainable management of some fish stocks at the site and as a result the abundance of fish may increase[147]. On the other hand, controls could cause fishing effort to be displaced to other areas outside of the site, increasing pressure on the stocks in these areas, but not overall. Conservation of biogenic reef within the site may provide extra food and security to predator species such as shrimps and fish beyond that found in areas without reef.

[144] Jickells, 1998.
[145] Gray, 2002.
[146] Rocha, 2008.
[147] Examples of benefits to fisheries of marine protected areas are provided in Natural England (2009).

3.3.8 The control of commercial fishing on the site may extend the longevity of shellfish such as lobsters and there may be greater numbers of larger individuals that can produce more young. This may contribute to a potentially larger population of fish in the future.

3.3.9 Positive impacts on fish, shellfish and crustacean stocks will benefit human consumption only if landings of fish, shellfish and crustaceans for consumption (from within or outside the site) are improved as a result of designating the site. This benefit will not be realised if fisheries management measures required for the site prevent improvements (in composition, quality, and/or quantity) in landings within and/or outside the site.

Research and education

3.3.10 Information for visitors on coastal processes, the biogenic reef and sandbank habitats and their typical species could be provided in association with several designated nature conservation sites on the nearby coast. Designation of the site could act as a stimulus for communications (such as interpretative boards in coastal protected areas or at the Visitor Centre at Great Yarmouth established to promote the Scroby Sands Offshore Wind Farm) that also inform the public about the need for marine conservation and how it works. This would build on Natural England and the JNCC's ongoing communication with the public about the pSAC, the marine environment and its conservation. Examples include Natural England's participation in events in the region (including the Great Yarmouth Maritime Festival, the Walberswick crabbing festival and the Eastern Leisure Sea Anglers Alliance Open Day), its work with schools and the media, and drop-in meetings that it held for the public during the formal consultation.

3.3.11 In addition to educational opportunities, designation of the site could potentially provide a stimulus for research in the site that increases our understanding of the structure and the functions of sandbanks and *Sabellaria spinulosa* reefs and the environmental impacts of designating the site.

Recreation

3.3.12 There could be potential for the low level of recreational diving to be maintained if designation of the site maintains interest for divers by protecting animals living in the site and providing additional protection to the wrecks from inadvertent damage. However, the level of diving is unlikely to increase due to the generally poor diving conditions on the east coast of England. In comparison, if the site was not designated, the level of diving activity might be maintained or decrease depending on the impacts of activities on the wrecks and animals.

3.3.13 If fish populations increase or the size of fish increase as a result of controls on some commercial fishing activities in the site, anglers fishing in the area could potentially benefit from an improved sea angling experience. However, these benefits may not be realised if it transpires that additional controls on angling are required.

Cultural heritage

3.3.14 If protection of the sandbanks and reefs from inadvertent damage caused by certain kinds of mobile fishing gear is required this may provide additional protection to maritime heritage and Palaeolithic artefacts from some inadvertent damage. The benefits would probably be minimal as vessels normally attempt to avoid wrecks.

Option value

3.3.15 People will gain from having the option to benefit in future from conservation of interest features in the site even if they do not currently plan to benefit from them (option value). This arises because if the site is not protected now there may not be good examples still available to conserve in future. Also, people will gain from the knowledge that the biogenic reef and sandbank habitats and their typical species are conserved in case future information reveals that these provide important benefits that we are not currently aware of (quasi-option value).

Non-use value

3.3.16 People will gain satisfaction from knowing that good examples of biogenic reef and sandbank habitats and their typical species are being conserved. Most people who benefit from knowing the site is being conserved are unlikely to use it or get tangible benefits from it. This is known as the existence value of conserving the site. Some people will also gain satisfaction from knowing that the habitats are being conserved for others in the current generation (altruistic value) and for future generations (bequest value).

3.3.17 There is reliable evidence that the general population in the UK has significant positive combined[148] use and non-use values associated with conserving the marine environment. McVittie and Moran (2008) found that households in the UK were willing to pay a total of between £0.48 – 1.17 billion per year for a UK network of marine protected areas[149]. Based on households' willingness to pay, Beaumont et al (2006) estimate the non-use value of maintaining sea mammals in the UK marine environment at £0.5-1.1 billion per year to the UK population. In a recent survey[150] 80 percent of the adult population in England stated that a healthy marine environment was important to them.

Summary of economic benefits

3.3.18 The level and value of the ecosystem services under the baseline scenario (if the site is not designated) and for the scenario where the site is designated (option 1) are summarised in Table 3.11. The value of these benefits is described followed by an assessment of the potential for designation of the site to increase the level of service provision. This has been assessed subjectively based on a combination of the scale of any increase in service provision (assessed on a subjective scale of the level of benefits that could be delivered by a marine protected area in the UK) and

[148] Even if people do not currently use the marine environment, it is likely that their responses to surveys will be influenced by motives to maintain the option for future use so will include a component of use value.

[149] These findings of this study cannot be used to indicate willingness to pay for groups of sites or individual sites within this network. They apply only to an entire network of sites in UK (not just English) waters that will conserve numerous interest features.

[150] Undertaken in July 2009 with 898 individuals as part of Natural England's Monitor of Engagement with Natural Environment (MENE) omnibus survey.

the number of beneficiaries. The final column indicates the level of confidence in the assessments. In summary, designation of the site will provide a low to moderate level of benefits. The beneficiaries include the relatively low number of direct and indirect users of the sites and all members of the society. The economic benefits are estimated to arise mainly through increased provision of the following ecosystem services: fisheries, recreational angling, wildlife watching, research and education and through non-use and option values.

Other benefits

3.3.19 Designation of the proposed suite of marine Natura 2000 sites may aid marine spatial planning and more strategic consideration of available resources by sectors that use the marine environment. These sectors will be able to undertake future plans and applications for their operations (for example applications for licenses) with the better knowledge of the nature conservation significance of different parts of the marine environment. They will also have a better understanding of the added costs for making an application within or adjacent to a Natura 2000 site boundary as opposed to outside it.

3.4 Summary of Costs and Benefits

3.4.1 On the pages that follow, Table 3.12 summarise the potential costs and benefits of the site identified in Sections 3.2 and 3.3 and Table 3.13 summarises the total quantified costs. In the analysis, minimum and maximum scenarios have been used to present the range of management measures that may be required for the site given that these are currently unknown; they are not alternatives. As has been indicated in the IA, the estimates made are subject to considerable uncertainty. Costs and benefits are likely to occur beyond the ten year time frame for the analysis but these are subject to even greater uncertainty.

3.4.2 The aim of designating the site is to contribute to maintaining biodiversity through conserving natural habitats and species; the legislation indicates that this is an outcome that is sought by society (not necessarily for economic reasons). Though the aim is not specifically to deliver economic benefits, designation of the site will deliver benefits through improved delivery of some ecosystem services and the satisfaction people gain from knowing the site is being conserved. It has not been feasible to quantify these benefits though they are estimated qualitatively.

3.4.3 Details of calculation of the total present value and the time profile of the total costs (not discounted) are provided in Appendix H at the end of this document. The impact tests are presented in Appendix I.

Table 3.11	Estimated economic benefits of Haisborough, Hammond and Winterton SAC				
Ecosystem service	**Relevance and value of service in the site**	**Level of service provision in baseline**	**Level of service provision if the site is designated**	**Increment in service provision if the site is designated**	**Level of confidence**
Fish, shellfish and other crustaceans for human consumption	**High relevance, moderate value.** There are habitats (including spawning and nursery grounds) for several commercially significant fish and shellfish species in the site.	**Moderate, could decrease.** Continued demersal fishing could (but may not necessarily) impact on reef and sandbank habitats in the site.	**Moderate, could decrease.** Protection of habitats in the site could maintain or increase populations of some commercially significant species. Migration in/out of the site will impact on the benefit to some fisheries. Service provision could be restricted by additional controls on fisheries. Displacement of fishing effort may result in negative impacts off site limiting the net gain.	**Low to moderate increase in value to a low number of beneficiaries (consumers of fish and shell fish from the site).** Any increase in landings may be offset to some extent by the impacts of displacement of fishing effort to areas outside the site.	**Low to moderate.** The net impact on the service is difficult to predict
Recreation	**High relevance and moderate value.** Site is popular for recreational angling, wildlife watching and is used at a low level for diving (largely to investigate wrecks).	**Moderate, could decrease.** Angling and wildlife watching are associated with biodiversity and size of populations in the site, which may decline without designation.	**Moderate.** Protection of habitats in the site is likely to maintain or could increase diversity of species and size of certain populations, which could maintain or improve angling and wildlife watching experiences.	**Low to moderate increase in value for a relatively small number of anglers and wildlife watchers.** Although the site is popular, substitutes sites could replace some of the lost recreational value if this site not designated.	**Low to moderate**. Difficult to predict impact on recreation due to scope for substitution
Research and Education	**Moderate relevance and value.** Opportunity for educational initiatives and for research.	**Moderate, could decrease.** Possible degradation could reduce the scope for using the site for research and education.	**Moderate.** Designation will prevent possible degradation of the research and educational resource. It will enable restoration where damage to habitats, communities and typical species has occurred. It could also stimulate increased research and educational use.	**Low to moderate increase in value that the whole of society could potentially benefit from in the long term.** Site is well situated for research use.	**Moderate.**

Continued overleaf

Services	Relevance and value of service in the site	Level of service provision in baseline	Level of service provision if the site is designated	Increment in service provision if the site is designated	Level of confidence
Cultural Heritage	**High relevance and value.** There are many submerged wrecks in the site and Palaeolithic artefacts.	**Moderate, could decrease.** Demersal fishing can inadvertently damage wrecks.	**Low.** Protection from demersal gear will help protect wrecks, but benefits of this will be low.	**Low increase in value for the whole of society.**	**High** (in mapping of wrecks).
Non-use and option values of natural environment	**Moderate relevance and value.** Evidence public has preferences for a healthy marine environment and conservation of habitats and species.	**Moderate, could decrease.** Possible degradation could impact on the habitats and species but may not have an adverse effect on non-use and option values	**Moderate.** Designation will prevent degradation and enable restoration where damage to habitats, communities and typical species has occurred.	**Low to moderate increase in value for all members of society who gain from knowing that a good example of sandbank and reef habitat is being conserved.**	**Moderate.**
Total value of changes in ecosystem services:				**Low to moderate increase in value. Beneficiaries include the low number of indirect users of the site and all members of society**	**Moderate**

Table 3.12	Summary of estimated economic costs & benefits for Option 1: Designate the site		
Sector impacted on	*Minimum Scenario Costs*	*Maximum Scenario Costs*	*Benefits*
Aggregate extraction	£0	£2.2m one-off costs of relocation following revocation of non-EIA compliant licences. Also unknown costs arising from: ▪ additional cost of meeting shortfall in aggregate supply from other sources in the short term; ▪ additional cost of supply from licences further from the shore in the long term.	Conservation of habitats (66,900 ha of sandbank and 90 ha of *Sabellaria spinulosa* reef) and species. Low to moderate increases in value of ecosystem services, benefiting the low number of direct and indirect users of the site and all of society. Also benefits outside the site.
Oil & gas exploration & production	£0	Unknown potentially significant costs for arising from: ▪ additional baseline and post-construction survey costs for new infrastructure and decommissioning; ▪ siting of infrastructure to avoid sensitive interest features; ▪ costs of restrictions on use of scour protection and disposal of cuttings.	
Pipelines for gas storage	£0	£0.571m one-off additional costs for baseline and post-construction surveys for 2 pipelines. £21.2m one-off cost of longer pipelines to avoid sensitive interest features. Also unknown costs of restrictions on scour protection.	
Pipelines for CO_2 storage		£0.539m one-off additional costs for baseline and post-construction surveys for 2 pipelines. £20.0m one-off cost of longer pipelines to avoid sensitive interest features. Also unknown costs of restrictions on scour protection.	
Wind farms	£0	£198m one-off increased cost of developing wind farms in other areas of the Round 3 Zone further from the shore. Also unknown potentially significant costs of investigating alternative sites for development, costs of delay to development and additional costs of operating and maintaining a wind farm further off shore. £0.647m one-off cost of additional baseline and post-construction survey costs for a power export cable passing through the site for a wind farm in the Norfolk Round 3 Zone outside the site. £2.792m one-off cost of longer power export cable to avoid sensitive interest features in the site. Also unknown costs of restrictions on scour protection.	
Telecom cables	£0	£1.509m one-off additional costs of baseline and post-construction surveys. £0.280m one-off cost of longer cables to avoid sensitive interest features.	
Commercial fisheries	£0	£0.058m per year loss in gross value added. Also: ▪ loss of gross value added not captured in estimate; ▪ social impact and impact on local and regional economy of effect on fishing industry.	

Continued overleaf

Sector impacted on	*Minimum Scenario Costs*	*Maximum Scenario Costs*	
Shipping	£0	£0	
Recreation	£0	Unknown costs of controls on recreational fisheries if required.	
All sectors		Also: ▪ higher likelihood new developments are not permitted; ▪ costs from delay of consents if Appropriate Assessment is required; ▪ higher likelihood that anchoring is prohibited in areas with sensitive interest features (except in emergency circumstances); ▪ cumulative costs of suite of Natura 2000 sites.	
Managing the SAC	Participation in the management group (by public sector bodies) and advisory group (by private sector bodies) for the site: £0.061 per year plus £0.094m in 2010/11 and £0.061m in 2011/12. Unknown other costs of staff input to site management if required. Enforcement (cost to public sector): £0.064m per year. Surveys (cost to public sector): £0.110m in 2011, £0.190m in 2014 and £0.190m in 2017.		
Other costs to public sector	▪ Cost of informing users of the site about the sites and any management measures that are required; ▪ cost of incorporating the sites onto nautical charts and into relevant publications; ▪ other costs to competent and relevant authorities.		

Table 3.13 Summary of quantified costs (£m) for Option 1: designate the site

	Minimum scenario	*Maximum scenario*	*Midpoint**
Total one-off	0.645	248.138	124.391
Average Annual Costs	0.125	0.183	0.154
Total (PV)	1.483	210.431	105.957

* Calculated as the midpoint in the range between the minimum and maximum scenario.

Risk of Unintended Consequences

3.4.4 The main risks of unintended consequences are assessed to be the following:

- Increased requirements for assessment may potentially slow down or halt development of marine aggregate licence areas in the area, resulting in a short term reduction in revenue for The Crown Estate and hinder the delivery of primary aggregate to the building industry and beach recharge projects.
- In the event that licences are revoked and extraction is relocated, the environmental impacts of aggregate dredging could be translocated to the new area. There would also be a likely increase in greenhouse gas emissions associated with new extraction activity as the licence areas are likely to be further offshore involving longer transit distances and greater fuel consumption.

- Uncertainty increases for wind farm developers who have projects planned in or near the sites, which may discourage development and impact on regeneration of the local economy. However, experience shows that offshore wind farms and designated sites can co-exist and early dialogue between developers and regulators, thorough baseline data collection, robust Impact Assessment and following the clear process set out by the Conservation of Habitats and Species Regulations and the Offshore Marine Conservation Regulations will reduce the uncertainty.
- If longer export cables are required for offshore wind farms (to avoid sensitive habitats), these will have higher inspection and maintenance costs, will be at greater risk of incurring damage and have higher transmission losses in exporting electricity back to shore. These impacts have not been included in the assessment of costs in the IA.
- Additional costs and delays could arise as a result of changes in wind farm developments that are required to mitigate impacts on interest features in the site. Procurement of vessels and infrastructure has to be undertaken years in advance, so changes (such as those arising from micro-siting) can be difficult and expensive.
- Mitigation measures to manage impacts on sensitive interest features could discourage drilling of gas wells in the site. Costs of these measures could affect the financial viability of new projects in the site or result in early cessation of production from existing facilities[151].
- In the long term, the designation could discourage investment in gas storage or carbon dioxide storage at the site or investment in pipelines that pass through the site (for projects outside the site).
- Project financiers may preferentially seek to develop projects at other locations.
- In practice, some of the fishing businesses that are affected by fisheries management measures for the site may continue to fish but operate in alternative grounds and / or switch to using different gear[152]. This could impact on other fishers and other users of the marine environment. Displacement of fishing activity may also put greater pressure on stocks outside of the sites and could result in overfishing or increased overfishing in some cases.
- If enforcement efforts at sea are not successful due to uncontrollable circumstances, the conservation objectives for the site may not be achieved.
- The proposed designation could affect sources of income to the UK Treasury and The Crown Estate. If developments do not take place within the site but take place elsewhere in the UK this may not have a significant impact on revenues to the Treasury (for example from electricity generation) or royalties to The Crown Estate. If, however, exploitation of resources is constrained as a whole in the longer term then it could impact on income to the UK Treasury and The Crown Estate. However, it is assumed that this would not occur within the period for this assessment.
- If the suite of pSACs that JNCC and Natural England are recommending is not put forward to the EC as candidate SACs or eventually designated there is a high risk of infraction from the EC and legal challenge from non-governmental

[151] Source: Oil and Gas UK consultation response.
[152] As discussed in Appendix G. This is an alternative scenario to that used for calculation of costs in the IA, which assumes that the entire value of landings that would be affected is lost.

organisations. This was indicated at a „moderation' meeting of the EC and Member States[153]. The costs of infraction can be significant for a Member State. They involve the potential legal costs of dealing with the situation and a potential fine from the EC.

[153] for the Atlantic biogeographic region, held in Galway 24-25 March 2009.

4. Figures

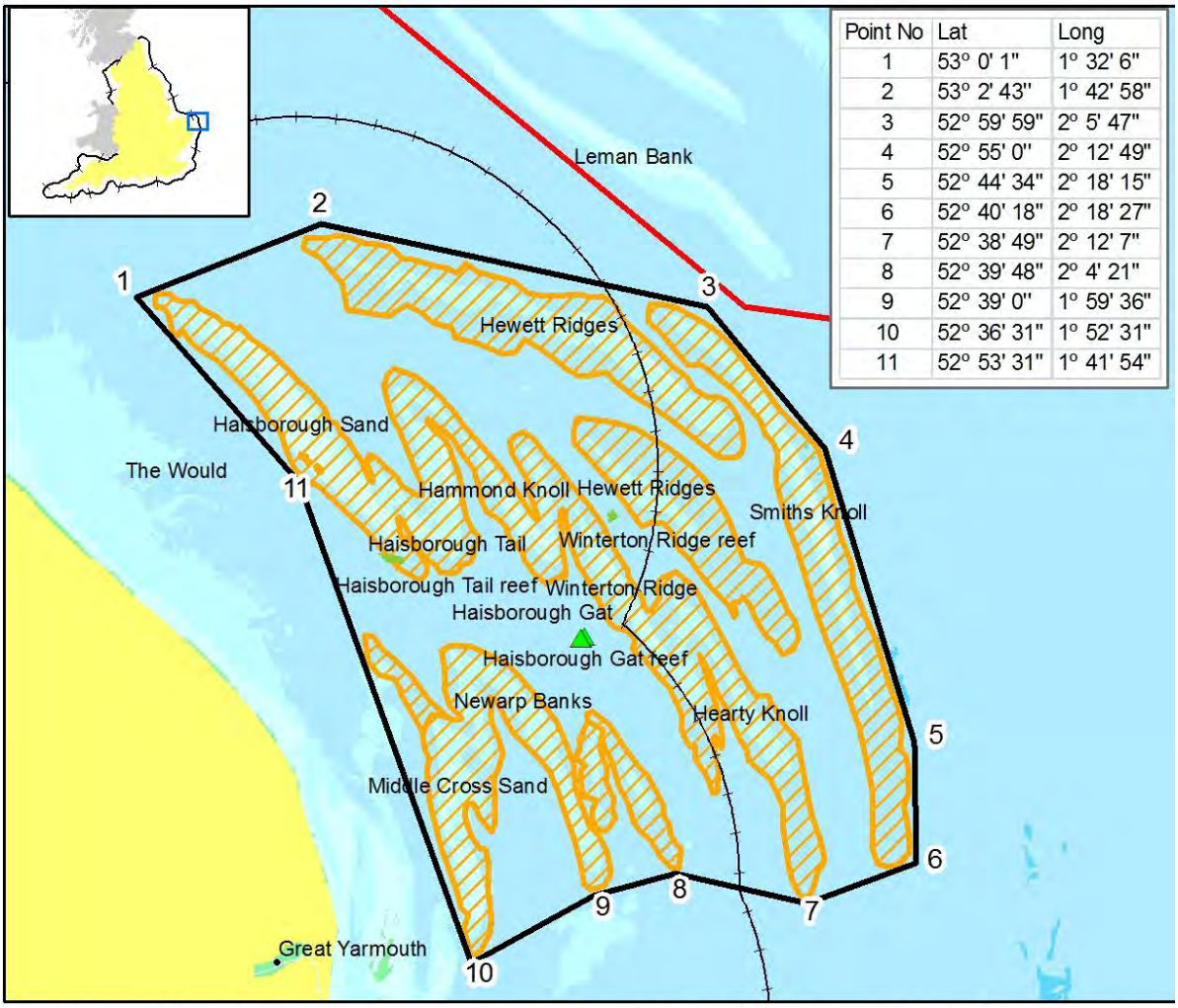

Figure 1 Chart showing Haisborough, Hammond & Winterton pSAC

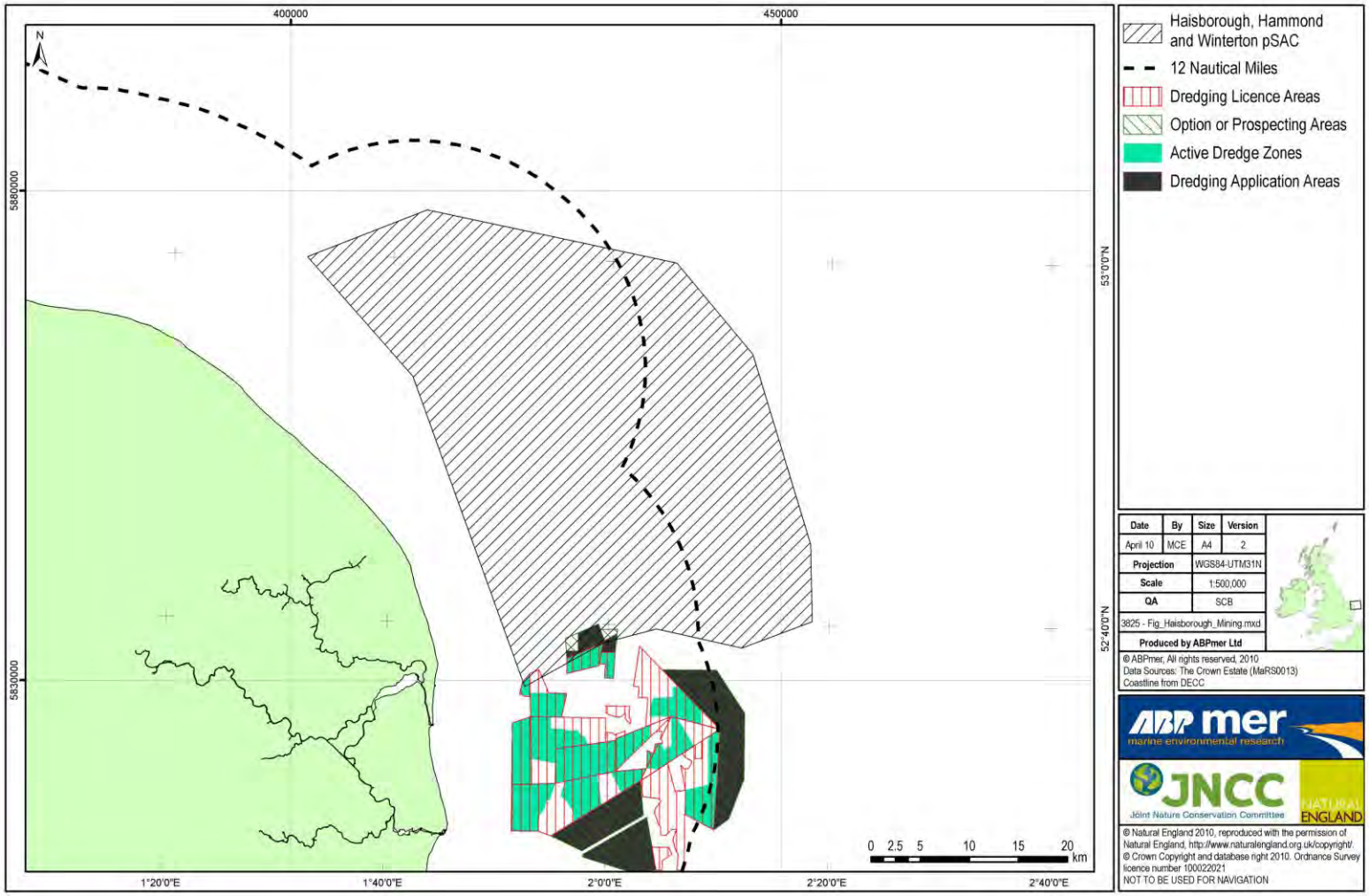

Figure 2.1 Chart showing aggregate extraction licence areas in the area of the Haisborough, Hammond and Winterton pSAC.

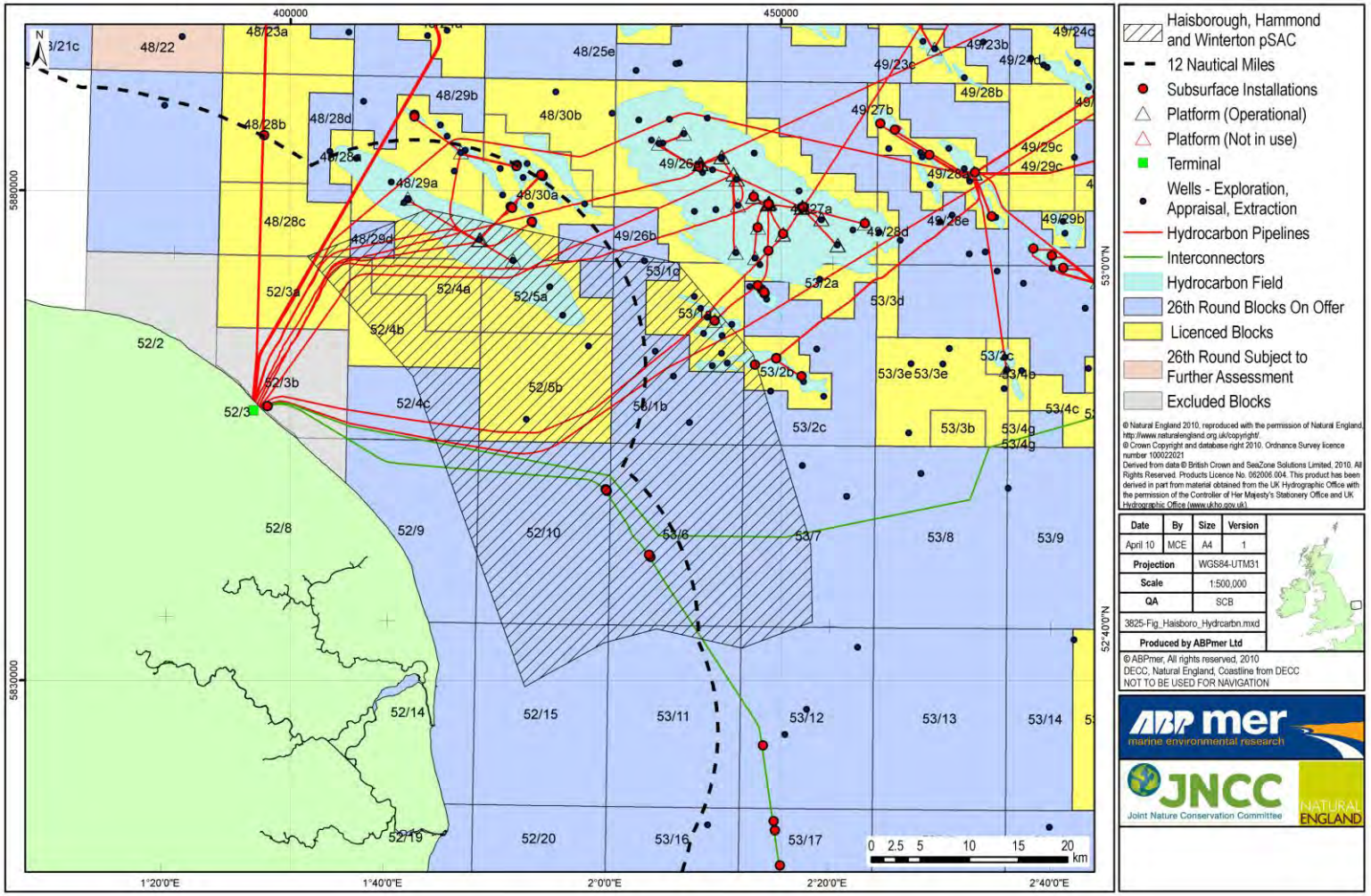

Figure 2.2 Chart showing gas infrastructure, licences and interconnectors in the area of Haisborough, Hammond and Winterton pSAC.

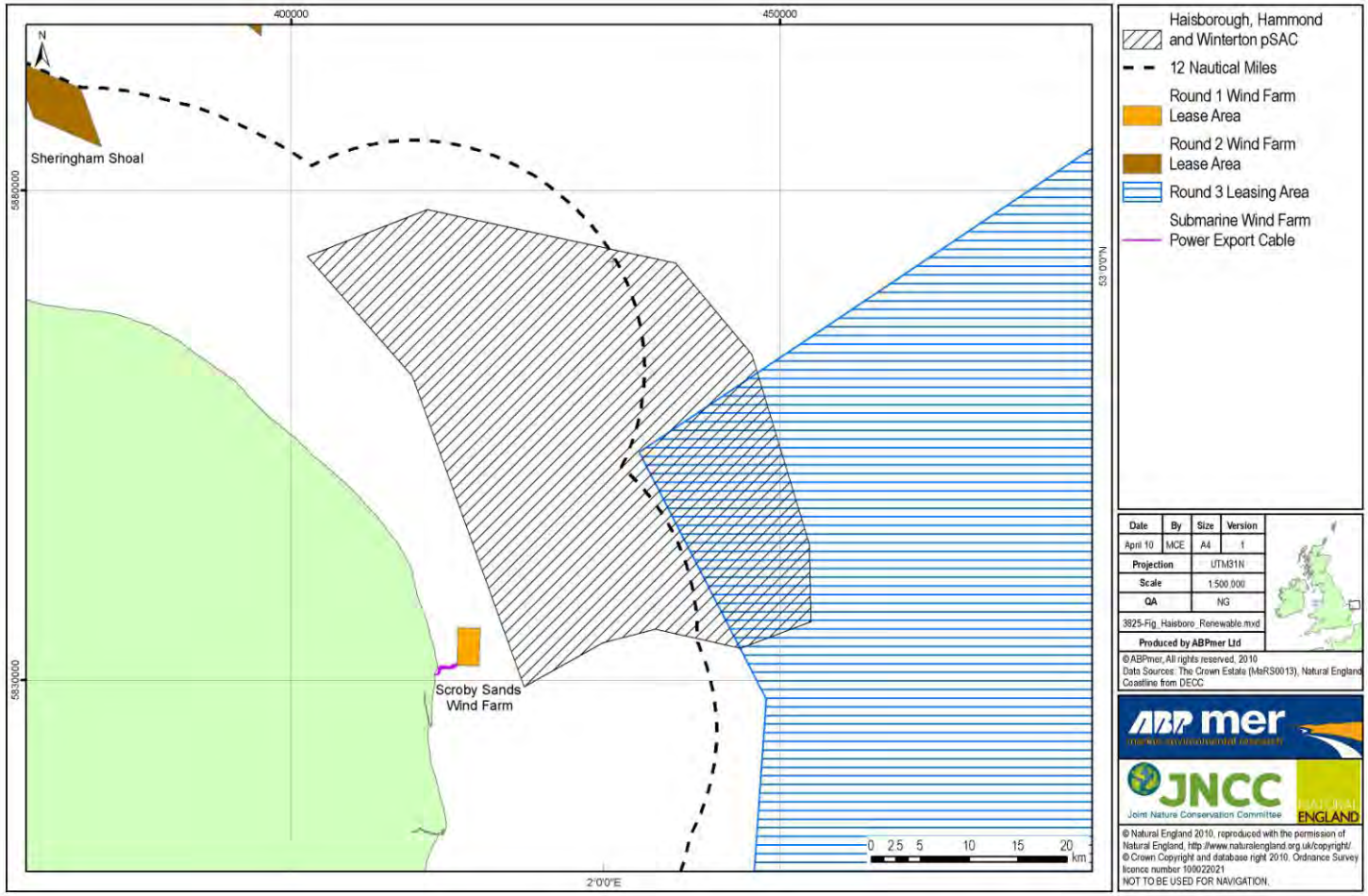

Figure 2.3 Chart showing offshore wind farm lease areas in the area of the Haisborough, Hammond and Winterton pSAC

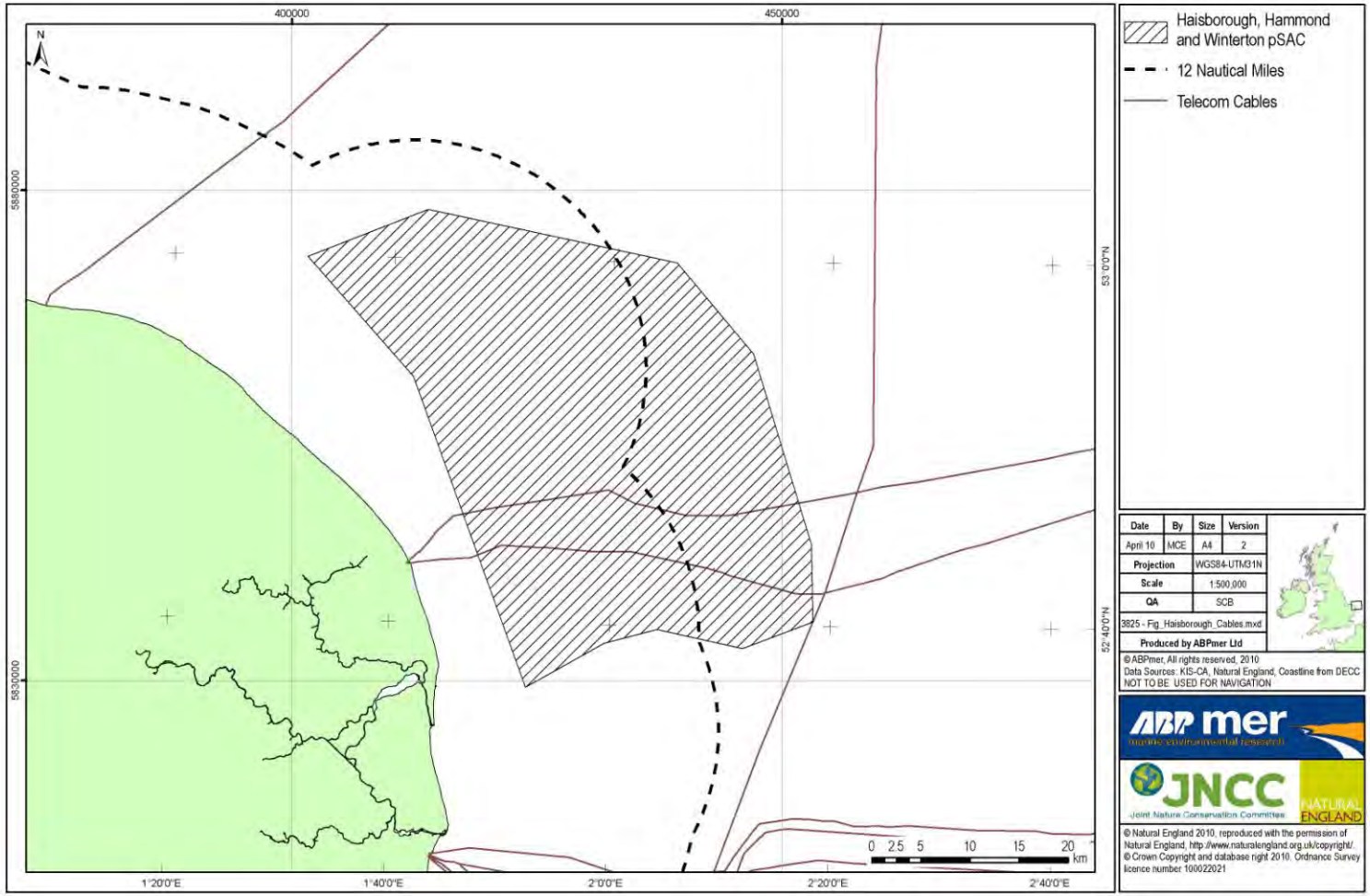

Figure 2.4 Chart showing cables (other than for wind farms) in the area of the Haisborough, Hammond and Winterton pSAC

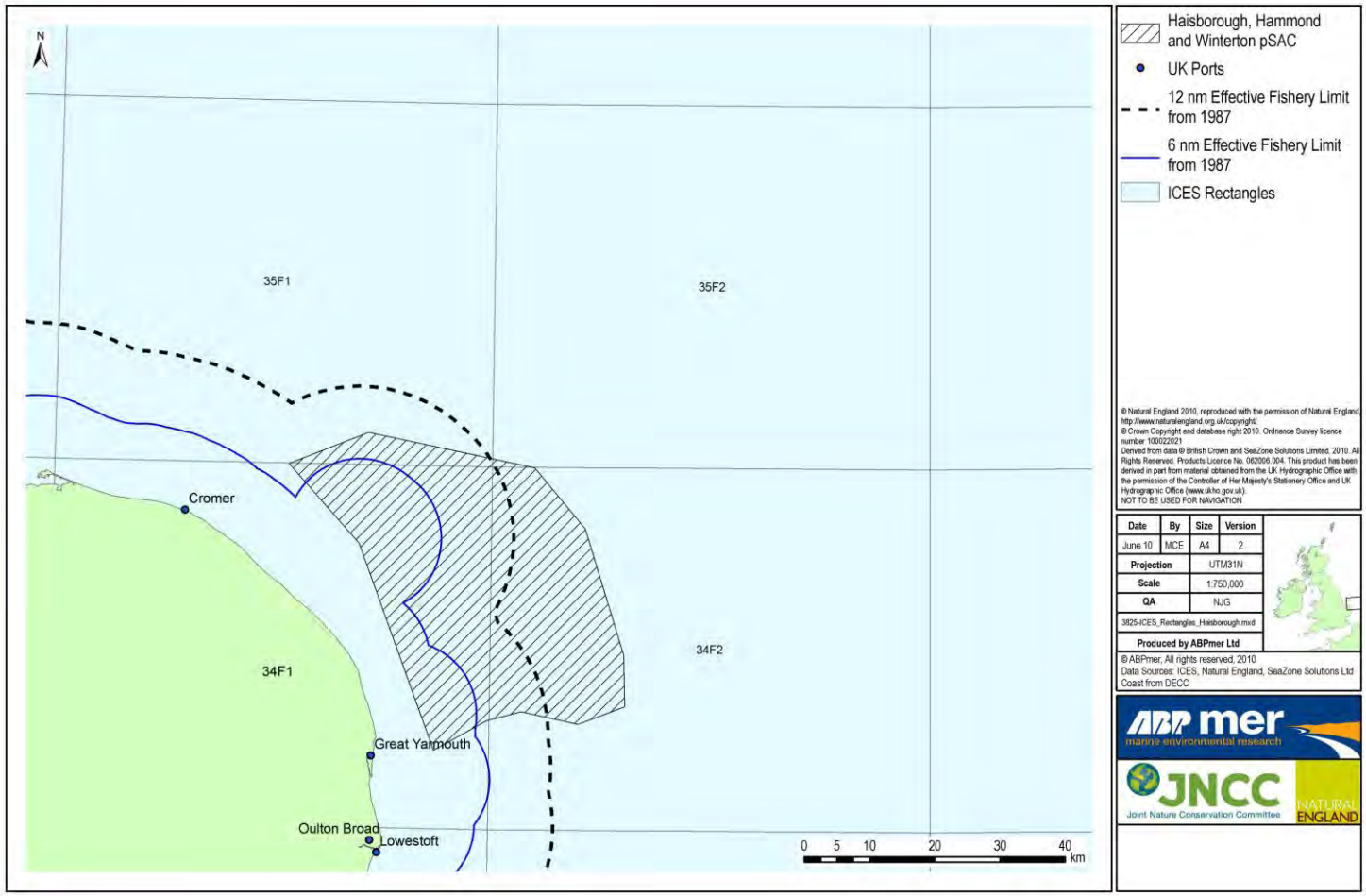

Figure 2.5 Chart showing ICES rectangles that contain the pSAC (34F1, 34F2, 35F1 & 35F2), ports, effective fisheries limits from 1987 and boundary of the Haisborough, Hammond and Winterton pSAC.

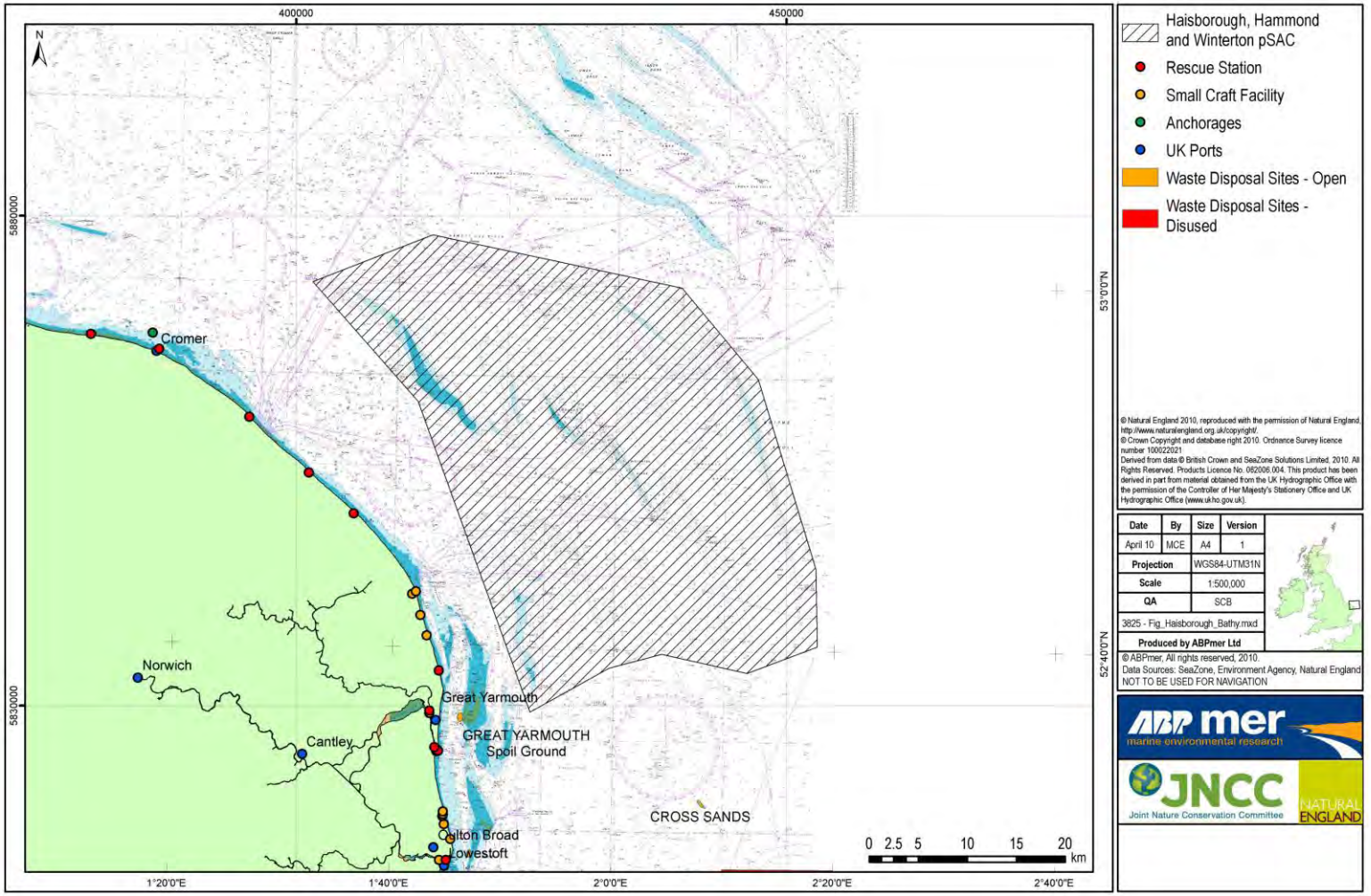

Figure 2.6 Chart showing information concerning shipping in the area of the Haisborough, Hammond and Winterton pSAC

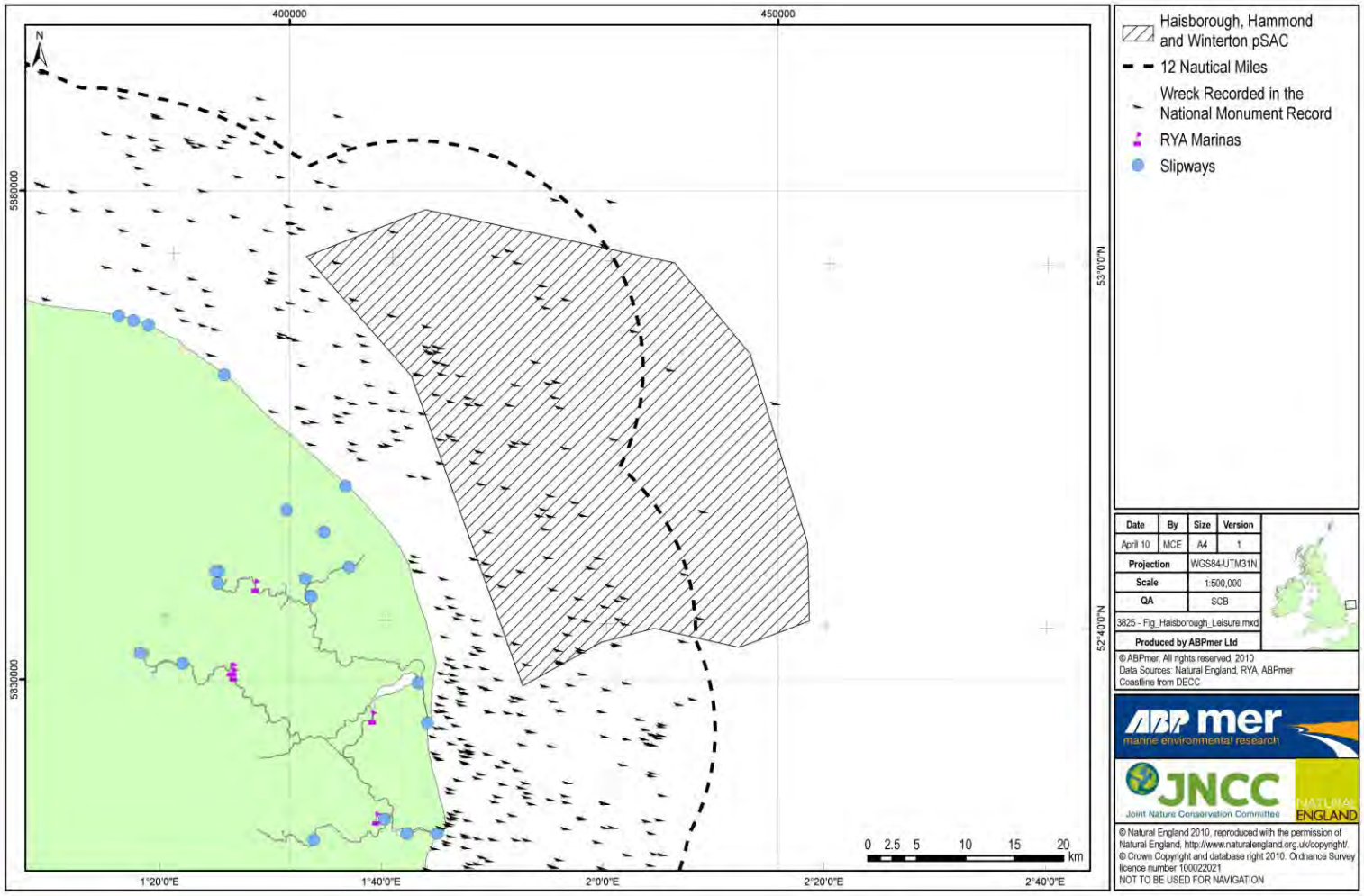

Figure 2.7 Chart showing recreational resources in the area of the Haisborough, Hammond and Winterton pSAC

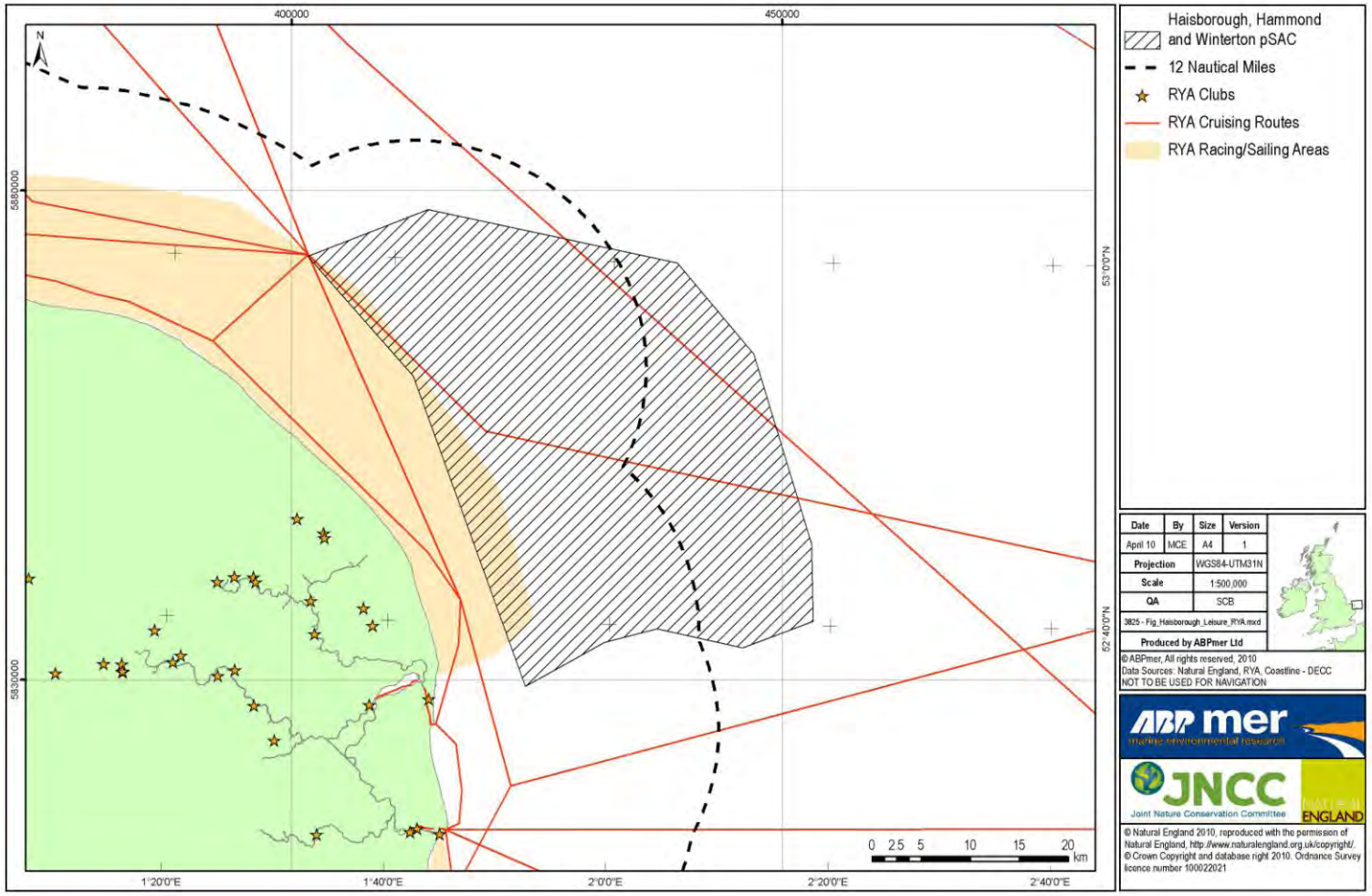

Figure 2.8 Chart showing recreational boating activity in the area of the Haisborough, Hammond and Winterton pSAC

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APPENDICES

A. Vulnerability of the site's interest features

The table below summarises initial assessment of the vulnerability of interest features in the site to pressures from human activities. This is reproduced here from the Draft Conservation Objectives and Advice on Operations for the site[154]. These were provided as supplementary information in the public consultation and will be revised following designation of the site. The information on operations that may cause deterioration of the site's interest features is based on the statutory nature conservation advisers' knowledge of current activities and patterns of use at the site. This is likely to be refined during development of the management scheme for the site and through discussion with the relevant and competent authorities. In contrast, the information on sensitivity of the interest features is relatively stable and will only change as a result of an improvement in scientific knowledge[155].

Vulnerability of the site's interest features to human activities is determined by the features' sensitivity to the specified impacts and the potential exposure to those impacts. Only if an interest feature is both sensitive and exposed to a human activity is it considered vulnerable. The scores of relative sensitivity, exposure and vulnerability have been derived using best available scientific information and expert judgement.

Sensitivity key:
••• = High sensitivity
•• = Moderate sensitivity
• = Low sensitivity,
○ = No known sensitivity (sensitivity of the feature has been researched and no evidence of sensitivity to this pressure has been found) and
? = Insufficient information to make assessment.

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

[154] JNCC and Natural England, 2009.
[155] For further details see JNCC and Natural England (2009).

Table A.1 The relative vulnerability of interest features and sub-features of Haisborough, Hammond and Winterton Sandbank pSAC to operations

Operations which may cause deterioration or disturbance	Low diversity dynamic sand communities	Moderate diversity stable sand communities			*Sabellaria spinulosa* reef		
	Sensitivity	Sensitivity	Exposure	Vulnerability	Sensitivity	Exposure	Vulnerability
Physical Loss							
Removal (e.g. aggregate dredging, isolated rock dump, infrastructure development)	••	••	Low	Low	•••	Moderate	High
Obstruction (e.g. permanent constructions [oil & gas infrastructure, wind farms, cables], wrecks)	••	••	Low	Low	•••	Moderate	High
Smothering (e.g. drill cuttings)	•	•	Low	Low	•••	Low	Moderate
Physical Damage							
Changes in suspended sediment (e.g. screening plumes from aggregate dredging)	•	•	Low	Low	•	Low	Low
Physical disturbance or abrasion (e.g. mobile benthic fishing, anchoring, wind farm scour pits, pipeline burial, potting)	•	••	Moderate	Low / Moderate	•••	Moderate	High
Non-physical disturbance							
Noise (e.g. boat activity, seismic)	○	○	Unknown Level	No known vulnerability	○	Unknown Level	Insufficient information
Visual presence (e.g. recreational activity)	○	○	None	No known vulnerability	○	None	No known vulnerability

Operations which may cause deterioration or disturbance	Low diversity dynamic sand communities	Moderate diversity stable sand communities			*Sabellaria spinulosa* reef		
	Sensitivity	Sensitivity	Exposure	Vulnerability	Sensitivity	Exposure	Vulnerability
Toxic contamination							
Introduction of synthetic compounds (e.g. TBT, PCBs, industrial chemical discharge, produced water, fuel oils)	••	••	Low	Low	••	Low	Low
Introduction of non-synthetic compounds (e.g. heavy metals, crude oil spills)	••	••	Low	Low	••	Low	Low
Introduction of radionuclides (e.g. nuclear energy industry)	Insufficient information	Insufficient information	Unknown Level	Insufficient information	Insufficient information	Unknown Level	Insufficient information
Non-toxic contamination							
Changes in nutrient loading (e.g. outfalls)	••	••	None	No known vulnerability	••	None	No known vulnerability
Changes in thermal regime (e.g. cooling water discharges)	••	••	None	No known vulnerability	••	None	No known vulnerability
Changes in turbidity (e.g. laying of pipelines, aggregate dredging)	•	•	Low	Low	•	Low	Low
Changes in salinity (e.g. outfalls from rigs, ships)	••	••	None	No known vulnerability	••	None	No known vulnerability
Biological disturbance							
Introduction of microbial pathogens (e.g. outfalls)	Insufficient information	Insufficient information	Unknown Level	Insufficient information	Insufficient information	Unknown Level	Insufficient information
Introduction of non-native species and translocation (e.g. ballast water, hull fouling)	Insufficient information	Insufficient information	Unknown Level	Insufficient information	Insufficient information	Unknown Level	Insufficient information
Selective extraction of species (e.g. bioprospecting, scientific research, demersal fishing)	••	••	Moderate	Moderate	••	Moderate	Moderate

B. Potential impacts on interest features in the baseline

The following sections provide detailed information on the potential impacts of human activities on biogenic reefs and sandbanks and their typical species in the site in the baseline (if the site is not designated). A general description of regulation of human activities to manage impacts on the marine environment is provided in Annex 3, along with further detail for some of the sectors listed below.

Aggregate extraction

Regulation of environmental impacts is described in the aggregate extraction section in Annex 3. Currently best practice dictates that any potential Annex I habitats, identified as part of licence application characterisation surveys, are zoned out of (excluded from) licence areas or Active Dredge Zones (ADZ). Exclusion zones are an area around a defined seabed feature within which dredging is not permitted in order to prevent disturbance. These are agreed with the regulator and statutory nature conservation agency prior to award of the licence. Similarly should on-going environmental monitoring identify potential Annex I habitat then it is good practice to vary the licence conditions and zone these areas out of ADZs.

Generally in English waters marine minerals are not extracted from sandbanks. Therefore non-designation is unlikely to result in an increase in direct damage or deterioration.

Aggregate extraction in the site would remove and lower the surface of the seabed and remove animals that live on and burrow beneath the surface within the path of the dredge. Suspended sediment concentrations and near-bed loads can be affected as a result of sediment plumes. Future changes in extraction practices could result in an increase in these effects through the production of increased sediment plumes, though this has to be set in context of natural background concentrations of suspended sediment. Also, it is important to recognise that the habitat features in this area are evolved to exist in highly turbid waters.

Oil and gas exploration and production

Regulation of environmental impacts is described in the oil and gas exploration and production section in Annex 3. . Current best practice dictates that any potential Annex I habitats are identified as part of benthic or environmental surveys ensuring that appropriate mitigation strategies are implemented at the earliest stage possible. Standard practice currently dictates that if environmental baseline surveys identify reefs operations are altered accordingly to ensure that no likely significant effect occurs from the operations. If it is not possible to ensure no likely significant effect then an Appropriate Assessment is required. This is agreed with the regulator and statutory nature conservation agency prior granting consent to the proposed operations.

In some instances, scour protection in the form of rock dumping for drilling rigs is required to mitigate the effects of scour (erosion of the sand in immediate vicinity of the feet caused by water flow). Scour normally occurs in sandy areas where a combination of high currents and shallow water depth are found. Scour protection normally involves the addition of rocks to the base of the rig at each foot, as a

general guide around 1,000 tonnes of rock is added at each foot (this equates to a total of 3,000 tonnes of rock per rig). The problem is that often the rig may be located in soft sediment and the addition of small rocks (around 5-8 cm in size) has the potential to change the soft surface of the sediment to a hard surface. If the amount of change is significant then the impacts on the sea floor and the plants and animals living on it could be significant because the change from a soft to a hard surface has potential to alter the suitability of the habitat for colonisation by organisms. The impacts from scour protection could affect any area of soft sediment and may have cumulative effects.

The footprint of seabed impact may further be increased through the deposition of rock, concrete mattresses or grout bags to protect, support and stabilise seabed structures such as pipelines, umbilicals and spoolpieces. For example, mattresses may be used to support pipelines where the seabed profile is uneven or to stabilise pipelines in areas which are susceptible to high currents. In addition, deposition of rock may be required to prevent damage from fishing gear.

When laying a pipeline across sandbanks the sand waves can cause a problem by inhibiting adequate burial or increase the risk of free spans. In such situations an option is to “shave” the sand crest which physically removes the tops of the waves. The presence of pipelines may potentially obstruct and alter natural movement of sediment and so the distribution of sediment in the vicinity as a result of disruption to hydrological flow. To address these effects, the oil/gas industry may be advised to bury the pipeline, though this would cause temporary disturbance of the sandbanks, or perhaps to place concrete mattresses over the pipelines which may subsequently be covered by sand and colonised by species that live on the sea bed.

The footprint of seabed impact may be increased through the deposition of rock, concrete mattresses or grout bags to protect, support and stabilise seabed structures such as pipelines, umbilicals and spool pieces. For example, mattresses may be used to support pipelines where the seabed profile is uneven or to stabilise pipelines in areas which are susceptible to high currents. In addition, deposition of rock may be required to prevent damage from fishing gear. There is potential for rock dumping and/or concrete mattresses to change the sea bed from a “soft” habitat to a “hard” habitat, causing loss of sandbank and reef habitat and a resultant change in species in these areas. If maintenance work is required there is potential for obstruction and alteration of sediment in the vicinity of the pipelines. Any maintenance work situated close to or adjacent to reef features will impose a greater risk to the reef than to the sandbanks. Anchoring by vessels used for laying and maintaining pipelines could cause damage to the reef.

Drilling into the sandbank features within the site will cause physical damage to the sandbanks. Drill cuttings are the main source of waste from oil and gas infrastructure. The first section of a well is drilled before the casing can be installed. Drill cuttings from the first section are discharged directly onto the seabed. When the casing is installed the drill cuttings can be circulated back to the surface with the drilling mud ready for cleaning and reuse of the mud. From here the drill cuttings are dispersed in surface water where they are subject to dilution and dispersal through the whole water column. If there are too many drill cuttings or if the receiving environment is significantly sensitive or of low energy and thus they are not

dispersed, then the relevant nature conservation adviser to the government may advise that the drill cuttings are taken to land for appropriate treatment and disposal, although this is rarely required.

Sewage and rubbish from the oil/gas structures could potentially cause toxic and non-toxic contamination. Sewage is discharged from a well, but is unlikely to have a significant impact. Rubbish should be managed within the company's waste management system and this should return all solid wastes (such as scrap metal, waste oil and surplus chemicals) back to shore for treatment and appropriate disposal.

Gas interconnectors, pipelines for gas storage and for CO_2 storage

Impacts from these pipelines will be similar to those described above for pipelines.

Wind farms

Regulation of environmental impacts is described in the renewables section in Annex 3. Generally in English waters offshore wind farms are located or planned in shallow waters on sediment dominated seabeds. These may coincide with sandbanks and therefore non-designation could result in an increase in direct damage or deterioration. Developers are expected to apply good practice and plan the location of individual turbines, cables and substations in order to avoid impacts on sandbank and reef habitat identified in baseline or pre-construction surveys[156]. This is agreed with the regulator and statutory nature conservation agency through conditions attached to development licences.

In terms of potential future development of wind farms in the site, the footprint of the turbines may be small relative to the area of the site but placement of the turbine foundations would result in direct loss of habitat and there is potential for some further damage to habitat through scour around the base of each foundation. The need to control the extent of scour (using rock armour or sandbags) would need to be carefully considered. The placement of scour protection could be an issue for the site as it could increase the direct loss of sandbank and *Sabellaria spinulosa* reef. It would also introduce new artificial habitat into a sediment dominated environment. Additional controls at the site could include FEPA conditions to use up to date seabed habitat information to ensure that the planned location for each turbine or cable does not impinge on the *Sabellaria spinulosa* reef either directly or indirectly (through impacts from construction vessels).

Development of a wind farm on the site could potentially damage the sandbanks and reefs and their typical species. Piles for turbine bases may be driven using a hammer on a jack-up or floating crane barge and the upper part of the turbine is then placed on top of the pile(s). The legs of the jack-up barges leave large round („spudcan') depressions on the seabed, whereas floating barges use a number of anchors to hold their position. The footprints of the jack-up legs or anchors could impact temporarily on the sandbanks during construction of the wind farm, which is a one-off activity. However, evidence from North Hoyle has shown that these

[156] Good practice as set out in Natural England's responses to the EIAs and FEPA consents for the Lincs and Thanet OWFs.

depressions have lasted for more than two years and efforts should be made to avoid this effect on *Sabellaria spinulosa* reef.

Laying the inter-array cables with ploughs that either use anchors to pull them along the seabed or are towed by barges would result in temporary damage and disturbance to the sandbanks. This would be short lived and the habitat has high recoverability. Cables that are surface laid (rather than buried) may abrade the seabed. There is also a possibility that export cables from new wind farms in the Round 3 zone might be installed through the area.

Given the relatively small diameter of cables, the loss of habitat and species in the „footprint' of the cable can be very small in magnitude and the effect is usually short term. However, some fragile seabed habitats such as *Sabellaria spinulosa* reef can be impacted on and large wind farms may require more than one export cable which could be laid over a period of time in a relatively narrow corridor causing repeated disturbance; on these occasions impacts on the seabed may be significant.

Where it is not possible to bury cables using ploughing or jetting techniques, it may be necessary to leave cables on the seabed in which case there could be a requirement to protect them from damage by installing materials such as deposition of rock or concrete mattresses. This is particularly significant considering the extent of inter-array cabling required at large wind farm sites and the cumulative effects of this and scour protection around the turbine bases. The cabling might also pass through the nearby Winterton Horsey Dunes SAC and Great Yarmouth North Deans Special Protection Area (SPA).

Power cables produce electromagnetic fields (EMF) that may impact on electromagnetically-sensitive organisms such as skates and rays.

Cables

Regulation of environmental impacts is described in the cables section in Annex 3. . Cable routes may coincide with the *Sabellaria spinulosa* reefs and if the site was not designated, it would be more difficult to secure licence conditions that prevent cable laying from damaging the reefs.

The existing cables at the site have negligible impact on the sandbanks as they are buried. However, when it is required, replacement of the cables and laying of new cables in the site may cause temporary damage and disturbance to the sandbanks. This is likely to be short lived and the habitat has high recoverability. Cables are generally buried where possible using specialised trenching equipment to ensure protection from the environment and other anthropogenic activities such as beam trawling and dredging that may damage the cable. Where this is not possible, where the seabed is hard or in some places where the submarine cable meets land, the cable is usually fixed to the seabed and may be protected by covering with rock and/or mattressing (made out of concrete) which increases the footprint of seabed impact. Burying the cable at the landfall could affect intertidal habitats and habitats on land.

Cables that are surface laid and unfixed or unprotected may abrade the seabed, but generally cables are only installed like this in deep water. Given the relatively small

diameter of cables, the loss of habitat and impact on biological communities in the „footprint' of the cable can be localised and the effect is usually short term though the impact is greater on sensitive and fragile communities. Impacts can be reduced through diverting the route of cables away from sensitive communities such as *Sabellaria spinulosa* reef or micro-routeing around them.

Power cables produce electromagnetic fields (EMF) that may impact on electromagnetically-sensitive organisms such as skates and rays. New telecom cables and those that do not require an electric current have negligible EMF in absolute terms. Older telecoms cables and those that contain electric current could potentially produce EMF but this is likely to be less significant than for power cables.

Commercial fisheries

The approach to regulating environmental impacts is described in the fisheries section in Annex 3. The potential environmental impacts of the main types of gear used in the site are discussed below.

Bottom trawling

Bottom trawling on a sandy seabed can reduce sediment cohesion (which affects the structure and function of the sandbank) by disturbing fine sediment as gear passes over the seabed. Siltation and abrasion that may result from trawling may negatively affect animals in sandbank habitats[157] but the natural mobility of the sediment is likely to counteract this to some degree. Bottom trawling impacts on sedentary animals and plants largely through abrasion, potentially affecting the composition of the community, and causing a reduction in diversity. A range of species may also be damaged or killed by trawling. Some types of trawling including beam and shrimp trawling may also result in a significant bycatch of non-target species being caught. Otter trawls have a (comparatively) reduced impact on the seabed compared with beam trawls and dredges as they have a reduced „footprint' of contact with the seabed. However, the „otter' boards used in trawling could potentially damage erect structures on *Sabellaria spinulosa* reef.

Shrimp trawling

Bottom trawling for shrimp is considered to have a potentially high impact on reef structures (for example, it is thought to have caused loss of reef from the Wadden Sea and Morecambe Bay[158]). Trawling can potentially break down the reef, and if worms are removed they are unable to rebuild tubes, resulting in degradation of the reef and loss of the communities of animals that live on them. These can take a number of years to develop maximum biodiversity and productivity[159]. Reef that is high quality and that has a high elevation is potentially particularly vulnerable to damage.

Shrimp trawling uses fine mesh nets, which can result in significant by-catch of non-target species. There are spawning and nursery areas for commercially important species including sole, lemon sole, cod, plaice and thornback ray within the site

[157] Gubbay & Knapman,1999.
[158] Reise *et al.*, 1989 & Taylor & Parker, 1993 .
[159] Pearce *et al.*, 2007.

along with other common important species including sand eels. Where „veils' are in place to prevent bycatch, this impact is likely to be reduced.

Mid-water trawling

Because mid-water trawling gear does not make contact with the seabed it is unlikely to impact on the sandbanks themselves though it could potentially have a significant impact on species typical of sandbanks, such as herring.

Drift, gill, tangle and trammel netting

Gill, tangle and trammel nets can be set to touch the seabed so there is potential for them to impact on the sandbanks. The anchor or weights that are used may have some abrasion impact on the seabed. However, this is likely to be limited.

Other impacts of netting on the sandbanks are limited to extraction of fish; drift nets are designed to drift with the tide and have limited if any contact with the seabed.

Potting

The impacts of potting on the sandbanks are likely to be minimal as static gear is relatively benign in terms of abrasion and siltation. It could potentially damage the reefs through abrasion and could potentially significantly reduce the numbers of individuals of species typical of the sandbanks and reefs such as crabs, lobsters and whelks.

Lining

Line-fishing does not affect sandbanks directly. There may be some direct or indirect impacts (as the result of lost gear entangling some species) to the typical species of the sandbanks and reefs. This method of fishing could potentially impact on the site through lost gear entangling seabed animals.

Angling

Angling is unlikely to have any significant impact to the sandbanks and biogenic reefs other than a potentially minor impact to typical species as the result of extraction.

Shipping

Shipping could potentially affect the sandbanks in the site through abrasion and collision of vessels with each other and/or the seabed but impacts from "normal" operations are unlikely. Ships anchoring in sand are unlikely to have significant impacts.

Risk of pollution

There is always a risk that toxic and non toxic contamination and nutrient and organic enrichment of sediment and the water column may occur due to accidental spillage of fuel or cargo or the release of sewage and rubbish by shipping, or very rarely the purposeful release of "tank washings" from vessels. MARPOL contains substantial quantities of internationally agreed design and operational requirements for ships which have been instrumental as a preventative instrument for reducing

marine pollution. MARPOL also provides for implementation of controls to address marine pollution incidents.
Oil spill response plans exist for all local authorities in adjacent areas and well developed emergency plans are in place for major incidents.

Anchoring

In general, ships at anchor can cause damage to the animals living in and near the seabed. This is not a significant issue in sandy areas. However, if ships or small vessels anchor over areas of *Sabellaria spinulosa* reef this may cause significant damage. Potential impacts include:

- Direct damage to the reef from an anchor dropping onto it;
- Abrasion from the anchor and anchor chain on the reef itself;
- A circular area of damage to the reef and its associated communities (plants and animals) due to the ship revolving around the anchor as a result of wind, waves, tide and current action.

It is likely that recovery of the reef would be slow, although it not known how long recovery would take.

Non-native invasive species

Through ballast water discharge, shipping may be a key vector for the introduction and dispersal of non-native invasive species which could potentially cause disturbance to species living in the site. There are many non-native invasive species found along England's coastline and in the marine environment. . Once the International Maritime Organisation's Ballast Water Management Convention enters into force the risk of non-native invasive species from shipping is likely to be reduced.

Recreation

Anchoring could potentially cause physical damage to the sandbanks and reefs and fuel spills or discharges could potentially lead to toxic or non-toxic contamination of the sediment or water column. As discussed in the preceding section, the risks of these causing significant impacts on sandbank features in the site, if it was not designated, are thought to be low.

Activities that result in land-based sources of pollution

Discharges of pollution from the land could potentially impact on interest features in the site by causing changes in physico-chemical conditions of the overlying water, such as changes in temperature, turbidity, salinity, and increases in nutrient and organic matter. However, the high dilution that any land-based discharge is likely to receive would reduce the risk of these having an impact.

C. Fisheries in ICES rectangles that contain most of the site

The tables below present statistics for 2005-8 calculated using FAD data kindly supplied by the MFA[160]. These statistics are for fisheries in the entire rectangles that contain most of the site and are not estimates of fisheries for only the area within the site.

Based on FAD data, Table C.1 indicates average annual landings from the rectangles for each gear type for both the UK fleet and foreign vessels. Table C.2 indicates average annual landings according to species and Table C.3 presents landings according to vessel length category (both for the UK fleet). Table C.4 indicates the significance (in terms of value of landings) of landings from the rectangles that contain the site for UK vessels that fished within those rectangles. It presents the percentage of landings that vessels fishing in the rectangles obtained from the rectangles, and the percentage they obtained elsewhere.

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Table C.1 Average annual landings by gear type in the ICES rectangles (34F1 and 34F2) that contain the majority of the site (2005-2008)

	UK Vessels			*Foreign vessels*
Category of gear type	*Live weight landed (tonnes p.a.)*	*Value of landings (£k p.a.)*	*Percentage of value of landings by UK vessels*	*Value of landings (£k p.a.)*
Trawling with bottom contact	53	130	13	2
Dredging	0	0	0	
Trawling with no bottom contact	0	0	0	
Netting with bottom contact	5	12	1	
Netting with no bottom contact	23	24	2	
Lines with bottom contact	33	64	6	
Lines with no bottom contact	0.3	1	0.1	
Pots (Crustacean)	269	789	77	
Other pots	0	0.1	0	
Other	0	0	0	
Total for all gear types	384	1,020	100	2

Note that most figures in this table are rounded to the nearest integer so may not add up to the total.
Source: Fishing Activity Database, data supplied by the MFA.

[160] The functions of the MFA have since been absorbed by the MMO.

Table C.2	**Average annual UK fleet landings by species in the ICES rectangles (34F1 and 34F2) that contain the majority of the site (2005-2008)**		
Species	*Live weight of landings (tonnes p.a.)*	*Value of landings (£k p.a.)*	*Percentage of value of landings by UK fleet*
Brown Shrimps	9	25	2%
Cod	15	29	3%
Edible Crabs	223	457	45%
Lobsters	35	318	31%
Plaice	25	28	3%
Skates and Rays	17	28	3%
Sole	9	64	6%
Velvet Crabs	10	14	1%
Other	42	58	6%
Total	384	1,020	100%

Note that figures in this table are rounded to the nearest integer so may not add up to the total.
Source: Fishing Activity Database, data supplied by the MFA.

Table C.3	**Average percentage of UK vessel landings by vessel length in the ICES rectangles (34F1 and 34F2) that contain most of the site (2005-2008)**
Category of Vessel Length	*Percentage of Value of Landings*
10 metres and under	84%
10.01 to 15 metres	6%
Over 15 metres	10%
Total	100%

Note that figures in this table are rounded to the nearest integer so may not add up to the total.
Source: Fishing Activity Database, data supplied by the MFA.

Table C.4	**Average contribution that landings from ICES rectangles 34F1 and 34F2 made to total value of landings of UK vessels that fish in the rectangles (2005-2008)**		
		Percentage of landings for UK vessels fishing in ICES rectangle 34F1 & 34F24	
Category of gear type	Category of Vessel Length	From ICES rectangles 34F1 & 34F24	From elsewhere
Trawling with bottom contact	10 m* and under	72%	28%
	10.01 to 15 m	13%	87%
	Over 15 m	1%	99%
Dredging	Over 15 m	0%	100%
Netting with bottom contact	10 m and under	14%	86%
	10.01 to 15 m	6%	94%
Netting with no bottom contact	10 m and under	48%	52%
	10.01 to 15 m	8%	92%
	Over 15 m	5%	95%
Lines with bottom contact	10 m and under	37%	63%
	10.01 to 15 m	33%	67%
	Over 15 m	100%	0%
Lines with no bottom contact	10 m and under	83%	17%
	10.01 to 15 m	100%	0%
Pots (Crustacean)	10 m and under	59%	41%
	10.01 to 15 m	2%	98%
	Over 15 m	0.2%	99.8%
Other pots	10 m and under	62%	38%
Total		10%	90%

Source: Fishing Activity Database, data supplied by the MFA.
* Throughout this table „m' is used to refer to metres.

D. Wrecks in the site

The following wrecks (which are not protected) in the area of the site within 12nm have been identified by ABPmer using data from the National Monument Record. Note that the data used were subject to some positional inaccuracies so the list below should be viewed as indicative.

NAME	DESCRIPTION
EXCELLENZ MEHNERT	Possible remains of 1916 wreck of Norwegian cargo vessel
UNITY	Possible remains of 1917 wreck of British smack
WILLOWPOOL	Possible remains of 1939 wreck of English cargo vessel
ABERHILL	Possible remains of 1941 wreck of British cargo vessel
AFON TOWY	Possible remains of 1941 wreck of British cargo vessel
DEERWOOD	Possible remains of 1941 wreck of British cargo vessel
BETTY HINDLEY	Possible remains of 1941 wreck of British collier
HMS AGATE	Possible remains of 1941 wreck of British trawler
MERCHANT	Possible remains of 1941 wreck of craft
GALLOIS	Possible remains of 1941 wreck of French cargo vessel
HMS WILLIAM STEPHEN	POSSIBLE REMAINS OF A BRITISH TRAWLER, 1943
GEORGE E CARTER	POSSIBLE REMAINS OF AMERICAN LIBERTY SHIP
ROSE MARIE	POSSIBLE REMAINS OF BRITISH CARGO VESSEL, 1923
IONIAN	POSSIBLE REMAINS OF BRITISH CARGO VESSEL, 1939
GLEN DERRY	POSSIBLE REMAINS OF BRITISH CRAFT, 1930
WALDINGE	POSSIBLE REMAINS OF BRITISH STEAMER, 1941
CROSS SANDS	POSSIBLE REMAINS OF LIGHT FLOAT, 1941
OXSHOTT	Possible remains of part of 1941 wreck of British cargo vessel
OXSHOTT	Possible remains of part of 1941 wreck of British cargo vessel
DASHWOOD	Probable remains of 1941 wreck of English cargo vessel
RYE	REMAINS (IN TWO PARTS) OF BRITISH STEAMER, 1941
GALATEA	Remains of 1898 wreck of Scottish full-rigged ship
ENGLISH TRADER	Remains of 1941 wreck of English cargo vessel
TREVETHOE	Remains of 1941 wreck of English cargo vessel
HMS C11	REMAINS OF BRITISH C CLASS COASTAL DEFENCE SUBMARINE, 1909
MONTFERLAND	REMAINS OF DUTCH CARGO VESSEL, 1940
HMS GLEN PROSEN	REMAINS OF VESSEL, POSSIBLY ADMIRALTY TRAWLER, 1916
BARRHILL	REMAINS OF VESSEL, POSSIBLY BRITISH STEAMER, 1941

NAME	DESCRIPTION
STANMOUNT	REMAINS OF VESSEL, POSSIBLY BRITISH TANKER, 1941
NEREUS	REMAINS OF VESSEL, POSSIBLY DUTCH STEAMER, 1941
HMS TRANIO	REMAINS OF VESSEL, PROBABLY A BRITISH TRAWLER, 1941
ROBRIX	SMALL WRECK COMPLETELY BROKEN UP, POSSIBLY STEAMER, 1929
NORSEMAN	SMALL, WELL-DISPERSED WRECK, POSSIBLY BRITISH STEAMER, 1925
HMS DHOON	SONAR CONTACT, PROBABLY REMAINS OF ADMIRALTY TRAWLER, 1916
TORBAY	1912 wreck of Norwegian cargo vessel
LEADER	1915 wreck of English smack
LEOPOLD II	BELGIAN CARGO VESSEL, 1941
ANT	BRITISH CRAFT, 1838
ROY	BROKEN UP REMAINS OF VESSEL, 1941
MERIONES	BURIED REMAINS OF BRITISH MERCHANT STEAMER, 1941
VOREDA	BURIED REMAINS, POSSIBLY OF BRITISH TANKER, 1940
ISABELLA	CRAFT, 1826
CHEVINGTON	DISPERSED REMAINS OF BRITISH MERCHANT STEAMER, 1941
CORDENE	DISPERSED REMAINS OF BRITISH STEAMER, 1941
HMS CANTATRICE	INDISTINCT SONAR CONTACT, POSSIBLY ADMIRALTY TRAWLER, 1916
HMS FORCE	INTACT REMAINS OF BRITISH TRAWLER, 1941
CONWAY	INTACT REMAINS OF THREE-MASTED BARQUE, 1911
BLUE GALLEON	MEDIUM SIZED WRECK, POSSIBLY BRITISH VESSEL, 1940
EFFRA	PARTIALLY BURIED REMAINS OF VESSEL, POSSIBLY BARGE, 1941
NAVARRA	Possible remains of 1907 wreck of Norwegian cargo vessel
LANGELI	Possible remains of 1916 wreck of Norwegian cargo vessel

E. Relevant existing fisheries byelaws

Within 6nm, fisheries in the site are controlled by the Eastern Sea Fisheries Joint Committee (ESFJC) which puts in place byelaws to control fishing activity either through seasonal closures, permanent closures, or restrictions on the type of fishing activity that can take place. The following byelaws are relevant to the control that may be required to protect interest features in the site.

Byelaw No.	Overview of ESFJC bye-laws that may overlap with the hypothetical management measures for the pSAC
3	No fishing for oysters, mussels, cockles, clams, scallops or queens other than by hand, with a hand rake and with a licence or having been issued a certificate of approval.
4	No removal of mussels (*Mytilus edulis*) that are less than 50mm in length and immediate return of any that are removed.
5	No use of edible crab as bait.
6	Removal of soft-shelled or berried crabs (*Cancer pagurus*) or lobsters (*Homarus gammarus*) is not permitted.
7	No removal of any edible crab, velvet crab or lobster or part thereof that does not comply with the undersized Orders for these species.
8	After consultation with fishers, the Sea Fisheries Committee may close a shell fishery if necessary to control its exploitation.
9	The immediate return of shellfish, if removal is prohibited.
10	A seasonal closure for fishing of white-footed edible crab (*Cancer pagurus*). No removal of the crab between 1 November and 30 June.
11	No use of a vessel in fishing for shellfish if the skipper is required to provide the Committee with a record of catch taken, area fished, and fishing effort for a specified period and fails to do so.
12	Trawling: there are restrictions on vessel length and trawling in certain areas of the District.
14	No removal of any tope (*Galeorhinus galeus*) or any part thereof.
15	No fishing for bivalve molluscs using any kind of towed fishing gear apart from in certain areas and certain exceptions apply.

Source: Eastern Sea Fisheries Joint Committee (http://www.esfjc.co.uk/index2.htm)

F. Fisheries landings affected by each management measure.

Table F	Estimated value of landings by UK vessels affected by each of the hypothetical management measures in the maximum scenario when applied alone (not in combination) (assuming average value of landings from the site of £0.266m)*				
Hypothetical manage-ment measure	*Category of gear type or species affected*	*Percentage of value of landings accounted for by the gear type category or species** (a)*	*Percentage of value of landings that the measure affects*		*Value of landings affected (£m p.a.)****
			for the category of gear type or species (b)	*for all UK vessels fishing in the site (a x b)*	
2	Trawling with bottom contact	13%	100%	13%	
	Dredging	0%	100%	0%	
	Total			13%	0.034
3	Potting (Crustaceans)	77%	50%	39%	0.103
4	Trawling with bottom contact	13%	25%	3%	
	Dredging	0%	25%	0%	
	Trawling with no bottom contact	0%	25%	0%	
	Netting with bottom contact	1%	25%	0%	
	Netting with no bottom contact	2%	25%	1%	
	Lines with bottom contact	6%	25%	2%	
	Lines with no bottom contact	0%	25%	0%	
	Other	0%	25%	0%	
	Total			6%	0.015
5	Trawling with bottom contact	13%	25%	3%	
	Dredging	0%	25%	0%	
	Netting with bottom contact	1%	25%	0%	
	Lines with bottom contact	6%	25%	2%	
	Total			5%	0.013
6	Trawling with bottom contact	13%	25%	3%	
	Dredging	0%	25%	0%	
	Trawling with no bottom contact	0%	25%	0%	
	Netting with bottom contact	1%	25%	0%	
	Netting with no bottom contact	2%	25%	0%	
	Lines with bottom contact	6%	25%	1%	
	Lines with no bottom contact	0%	25%	0%	
	Other	0%	25%	0%	
	Total			6%	0.015
7	Pots (Crustaceans)	77%	25%	19%	0.051

For footnotes see overleaf.

* For details see Section 2.1. Note that figures in this table are rounded to the nearest integer so may not add up to the total.

** For vessels fishing in the ICES rectangles that contain the majority of the site (Rectangles 34F1 and 34F2; Average for 2004-7. Source: Fishing Activity Database, data supplied by the MFA. For details see Table 2.1).

*** Calculated as a x b x £0.265986m.

G. Impact of maximum scenario on the fishing sector

If the hypothetical management measures used for this analysis were applied, fishing businesses might adapt. However, their capacity to adapt will be subject to constraints, which are considered below.

Vessels could potentially be changed from towed gear methods to fixed gear methods to avoid the impact of management measures. However, this can involve considerable cost[161]. It may not be feasible to switch gear, or obtain the necessary licence to permit this without a track record in an alternative fishery and vessels that do not have the necessary licence consents cannot be adapted. Some vessels may be unsuitable for alteration to other gear types. Therefore some vessels would need to displace their effort to alternative grounds to retain levels of effort. Whether fishers were able to do so would depend on a number of considerations:

- availability of suitable grounds.
- whether boats have capacity to reach alternative grounds which could have implications for vessel safety. Smaller vessels may not have the capacity to go further out from the shore or to deeper grounds. Weather is the biggest constraint to small inshore vessels.
- There may also be other seasonal constraints to moving to alternative areas.

For businesses that respond by fishing alternative grounds this could have implications for costs and profitability. If the grounds were further afield this would increase fuel and labour costs, a higher proportion of time would be spent steaming rather than fishing and so profitability could be reduced. Alternative grounds might also be less productive, reducing profitability of days spent fishing. Vessels based at ports that are tidal or that are launched from the beach may have restricted access to grounds further away from their home port. If access to the vessel's berth is subject to tidal restrictions this will limit the amount of time the vessel can stay out at sea. There may also be implications as a result of competition for grounds with foreign fishermen, should local fishermen choose to fish further offshore. Fisheries stakeholders[162] have indicated that potting pressure in Haisborough may increase to unsustainable levels as a result of displacement from potting in the Inner Dowsing, Race Bank and North Ridge site, should management measures restricting potting be implemented within the latter site.

Information provided by the MFA[163] suggests that if restrictions on potting, long-lining or netting are required, some of the vessels that use these methods in the site are unlikely to be able to relocate to fishing other grounds. These include shellfish potting boats in the Cromer/Sheringham area and long liners and netters from Great Yarmouth and Lowestoft.

In some cases, particularly where moving to an alternative ground would be unprofitable, individual fishers may stop fishing. Depending on the type and main target species of the vessel leaving the industry, this may not alter landings from the

[161] For example from the purchase of fixed gear haulers, changes and removal of deck machinery and alterations to stowage for gear.
[162] In their consultation responses
[163] The functions of the MFA have since been absorbed by the MMO.

commercial fishing fleet in the area. Should a vessel that is part of the under 10 metre fleet or that is classed as being „non-sector' leave the industry, the quota that it would have landed will be taken up by other vessels remaining in the industry, as these types of vessel do not own the quota[164]. Should a „sector' vessel'[165] leave the industry then there is a possibility that the value of its landings would be lost to the area. Should a vessel fishing for shellfish such as crab and lobster (which are not subject to European quota restrictions) leave the industry, the MMO would determine whether its licence could be transferred to another vessel. The shellfish licensing scheme restricts the number of vessels allowed to land these species. In the event that other businesses do not meet the shortfall of landings that arise from a vessel leaving the industry (as a result of designating the site), the contribution to the economy from the vessels landings from both within and outside the site are lost.

[164] Vessels that are part of the under 10 metre fleet or are classed as being „non-sector' have quota allocated to them by the MMO on a monthly basis.

[165] Sector vessels are generally over 10 metres in length and have their quota managed by a producer organisation; the quota can be individually owned by the vessel.

H. Spreadsheets calculating the costs

The tables below shows the quantified costs identified for each sector in Section 3.2. The costs that are not quantified are listed in Section 3.2 and are not repeated here.

The left half of the table identifies the one-off and annual costs for each of the minimum and maximum scenarios. These are given as current costs in 2010 prices. Administrative costs (as defined by the government's Simplification Programme[166]) and policy costs are presented separately and the timing of the costs is specified. These costs are summed at the bottom of the left half of the table to give the total one-off costs and the total annual costs for each sector in current prices. The total of these costs for all the sectors is shown in the summary sheets of the IA and in the summary table in Section 3.4 of the IA.

In the right half of the table, the discount factor (for a discount rate of 3.5%[167]) in the top row is used to calculate the present value[168] of each of the costs for each of the 10 years (2010 – 2019) of the analysis. The right half of the table presents the present values of all of the costs for all of the years and the total present value of the administrative and policy costs. The present value of a cost in year 1 is the cost discounted by 3.5% (calculated by multiplying it by (1 - 1/(1+3.5%)) or by 99.6% as shown in the tope row of the right hand side of the table). The discount factor builds up year on year, so the present value of the cost in year 2 is the cost multiplied by the discount factor from year 1 (99.6%) discounted by 3.5% (again multiplied by (1 - 1/(1+3.5%)), giving a discount factor of 93.4%.

The present values of the costs are used to calculate the following:

- The present value for the total costs of each item (the first column in the tables in the right). These are the present value figures reported for each sector in Section 3.2.
- The present value of the total costs for all sectors shown in the summary sheets of the IA.

[166] Better Regulation Executive, 2005.
[167] As specified in H.M. Treasury (2007).
[168] This is the total value of all the costs over the 10 year assessment period (2010 – 2019) discounted at a rate of 3.5% to reflect society's preference to defer costs to future generations (and to receive goods and services sooner rather than later).

The present value and time profile of the total costs shown in the summary sheets of the IA.

Aggregates

Description			One-off Cost		Annual Cost		
Scenario	Cost Item	Type	Cost £k	Year Experienced	Cost £k	Year Commencing	Average
MINIMUM							-
Total		Admin	-		0		-
		Policy	0		0		-
		Both	0		0		-
MAXIMUM	Prospecting for new licenses	Policy	2,200	2014			-
Total		Admin	-		0		-
		Policy	2200		0		-
		Both	2200		0		-

	Discount Factor	100.0%	96.6%	93.4%	90.2%	87.1%	84.2%	81.4%	78.6%	75.9%	73.4%
	Year of Analysis	0	1	2	3	4	5	6	7	8	9
Cost £k	Present Value of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Policy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Both	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Cost £k	Present Value of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	1917.17	0	0.00	0.00	0.00	1917	0.00	0.00	0.00	0.00	0.00
Admin	0.00	0	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Policy	1917.17	0.00	0.00	0.00	0.00	1917	0.00	0.00	0.00	0.00	0.00
Both	1917.17	0	0.00	0.00	0.00	1917	0.00	0.00	0.00	0.00	0.00

Gas Storage

Description			One-off Cost		Annual Cost		
Scenario	Cost Item	Type	Cost £k	Year Experienced	Cost £k	Year Commencing	Average
MINIMUM							-
Total		Admin	-		0		-
		Policy	0		0		-
		Both	0		0		-
MAXIMUM	Additional survey costs	Policy	571	2015			-
	Longer pipeline route	Policy	21,200	2015			-
Total		Admin	-		0		-
		Policy	21771.45		0		-
		Both	21771.45		0		-

	Discount Factor	100.0%	96.6%	93.4%	90.2%	87.1%	84.2%	81.4%	78.6%	75.9%	73.4%
	Year of Analysis	0	1	2	3	4	5	6	7	8	9
Cost £k	Present Value of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Policy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Both	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Cost £k	Present Value of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	481.14	0.00	0.00	0.00	0.00	0.00	481.14	0.00	0.00	0.00	0.00
	17850	0	0	0	0	0	17850	0	0	0	0
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Policy	18,331	-	-	-	-	-	18,331	-	-	-	-
Both	18,331	-	-	-	-	-	18,331	-	-	-	-

Transport and Storage of Carbon Dioxide

Description			One-off Cost		Annual Cost		
Scenario	Cost Item	Type	Cost £k	Year Experienced	Cost £k	Year Commencing	Average
MINIMUM							-
Total		Admin	-		0		-
		Policy	0		0		-
		Both	0		0		-
MAXIMUM	Additional survey costs	Policy	539	2015			-
	Longer pipeline route	Policy	20,000	2015			-
Total		Admin	-		0		-
		Policy	20539.1		0		-
		Both	20539.1		0		-

	Discount Factor	100.0%	96.6%	93.4%	90.2%	87.1%	84.2%	81.4%	78.6%	75.9%	73.4%
	Year of Analysis	0	1	2	3	4	5	6	7	8	9
Cost £k	Present Value of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Policy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Both	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Cost £k	Present Value of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	453.91	0.00	0.00	0.00	0.00	0.00	454	0.00	0.00	0.00	0.00
	16839.46	0.00	0.00	0.00	0.00	0.00	16839	0.00	0.00	0.00	0.00
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
Policy	17293.37	0.00	0.00	0.00	0.00	0.00	17293	0.00	0.00	0.00	0.00
Both	17293.37	0.00	0.00	0.00	0.00	0.00	17293	0.00	0.00	0.00	0.00

Renewables - Wind farms

Description			One-off Cost		Annual Cost		
Scenario	Cost Item	Type	Cost £k	Year Experienced	Cost £k	Year Commencing	Average
MINIMUM							-
Total		Admin	-		0		-
		Policy	0		0		-
		Both	0		0		-
MAXIMUM	Additional survey costs	Policy	647	2015			-
	Longer cable route	Policy	2,792	2015			-
	Relocation of round 3 developments	Policy	197,755	2015			-
Total		Admin	-		0		-
		Policy	201,194		0		-
		Both	201,194		0		-

	Discount Factor	100.0%	96.6%	93.4%	90.2%	87.1%	84.2%	81.4%	78.6%	75.9%	73.4%
	Year of Analysis	0	1	2	3	4	5	6	7	8	9
Cost £k	Present Value of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Policy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Both	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Cost £k	Present Value of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	544.69	0.00	0.00	0.00	0.00	0.00	544.69	0.00	0.00	0.00	0.00
	2350.62	0.00	0.00	0.00	0.00	0.00	2350.62	0.00	0.00	0.00	0.00
	166504	0.00	0.00	0.00	0.00	0.00	166504	0.00	0.00	0.00	0.00
Admin	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00
Policy	169,400	0.00	0.00	0.00	0.00	0.00	169,400	0.00	0.00	0.00	0.00
Both	169,400	0.00	0.00	0.00	0.00	0.00	169,400	0.00	0.00	0.00	0.00

Telecommunications

Description			One-off Cost		Annual Cost		
Scenario	Cost Item	Type	Cost £k	Year Experienced	Cost £k	Year Commencing	Average
MINIMUM							-
Total		Admin	-		0		-
		Policy	0		0		-
		Both	0		0		-
MAXIMUM	Additional survey costs	Policy	1,509	2015			-
	Longer cable routes	Policy	280	2015			-
Total		Admin	-		0		-
		Policy	1789.48		0		-
		Both	1789.48		0		-

	Discount Factor	100.0%	96.6%	93.4%	90.2%	87.1%	84.2%	81.4%	78.6%	75.9%	73.4%
	Year of Analysis	0	1	2	3	4	5	6	7	8	9
Cost £k	Present Value of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Policy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Both	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost £k	Present Value of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	1270.94	0.00	0.00	0.00	0.00	0.00	1271	0.00	0.00	0.00	0.00
	235.75	0.00	0.00	0.00	0.00	0.00	236	0.00	0.00	0.00	0.00
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
Policy	1506.69	0.00	0.00	0.00	0.00	0.00	1507	0.00	0.00	0.00	0.00
Both	1506.69	0.00	0.00	0.00	0.00	0.00	1507	0.00	0.00	0.00	0.00

Fisheries

Description			One-off Cost		Annual Cost		
Scenario	Cost Item	Type	Cost £k	Year Experienced	Cost £k	Year Commencing	Average
MINIMUM							-
Total		Admin	-		0		-
		Policy	0		0		-
		Both	0		0		-
MAXIMUM	Loss of GVA from impact on fisheries landings	Policy			58.03	2010	58.03
Total		Admin	-		0		-
		Policy	0		58.03		58.03
		Both	0		58.03		58.03

	Discount Factor	100.0%	96.6%	93.4%	90.2%	87.1%	84.2%	81.4%	78.6%	75.9%	73.4%
	Year of Analysis	0	1	2	3	4	5	6	7	8	9
Cost £k	Present Value of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Policy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Both	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost £k	Present Value of Cost	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	499.46	58.03	56.06	54.17	52.34	50.57	48.86	47.20	45.61	44.06	42.57
Admin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Policy	499.46	58.03	56.06	54.17	52.34	50.57	48.86	47.20	45.61	44.06	42.57
Both	499.46	58.03	56.06	54.17	52.34	50.57	48.86	47.20	45.61	44.06	42.57

Managing the SAC																					
	Description		One-off Cost		Annual Cost					Discount Factor	100.0%	96.6%	93.4%	90.2%	87.1%	84.2%	81.4%	78.6%	75.9%	73.4%
										Year of Analysis	0	1	2	3	4	5	6	7	8	9
Scenario	*Cost Item*	*Type*	*Cost £k*	*Year Experienced*	*Cost £k*	*Year Commencing*	*Average*			*Cost £k*	*Present Value of Cost*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
MINIMUM	Management and advisory groups	Policy	94	2010							94.00	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Management and advisory groups	Policy	60.5	2011							58.45	0.00	58.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Management and advisory groups	Policy			60.5	2010	60.50				520.77	60.50	58.45	56.48	54.57	52.72	50.94	49.22	47.55	45.94	44.39
	Fisheries enforcement	Policy			64.41	2010	64.41				554.39	64.41	62.23	60.12	58.09	56.13	54.23	52.39	50.62	48.91	47.26
	Survey	Policy	110	2011							106.28	0.00	106.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Survey	Policy	190	2014																	
	Survey	Policy	190	2017							149.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	149.34	0.00	0.00
Total		*Admin*	-		0		-			*Admin*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Policy	644.5		124.9		124.91			*Policy*	1483.22	218.91	285.42	116.60	112.66	108.85	105.17	101.61	247.51	94.86	91.65
		Both	644.5		124.9		124.91			*Both*	1483.22	218.91	285.42	116.60	112.66	108.85	105.17	101.61	247.51	94.86	91.65
										Cost £k	*Present Value of Cost*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
MAXIMUM	Management and advisory groups	Policy	94	2010							94.00	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Management and advisory groups	Policy	60.5	2011							58.45	0.00	58.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Management and advisory groups	Policy			60.5	2010	60.50				520.77	60.50	58.45	56.48	54.57	52.72	50.94	49.22	47.55	45.94	44.39
	Fisheries enforcement	Policy			64.41	2010	64.41				554.39	64.41	62.23	60.12	58.09	56.13	54.23	52.39	50.62	48.91	47.26
	Survey	Policy	110	2011							106.28	0.00	106.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Survey	Policy	190	2014																	
	Survey	Policy	190	2017							149.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	149.34	0.00	0.00
Total		*Admin*	-		0		-			*Admin*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Policy	644.5		124.9		124.91			*Policy*	1483.22	218.91	285.42	116.60	112.66	108.85	105.17	101.61	247.51	94.86	91.65
		Both	644.5		124.9		124.91			*Both*	1483.22	218.91	285.42	116.60	112.66	108.85	105.17	101.61	247.51	94.86	91.65

Time profile of total costs (not discounted, £m, Y = Year)

	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9
Transition costs	0.09	0.17	-	-	2.39	245.29	-	0.19	-	-
Annual recurring cost	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Total annual costs	0.28	0.35	0.18	0.18	2.57	245.48	0.18	0.37	0.18	0.18

I. Impact Tests

Consideration has been given within the main body of the assessment to relevant and identifiable environmental impacts and effects on sustainable development. The further specific tests specified by the IA guidance are considered here.

Competition Assessment

Designation of the SAC is not expected to have a significant impact on competition. Assessment of the impact, shown in the table below (in the format specified in the Office of Fair Trading Guideline (2007)), is restricted to the impacts of designating Haisborough, Hammond and Winterton SAC. The table presents the impact of the hypothetical management measures for the maximum scenario as this scenario would involve larger potential effects on competition than the minimum scenario. In addition to these effects, the cumulative impacts of marine conservation under EU legislation, through designation of Natura 2000 sites in the marine environment, could have more significant effects on competition in some sectors.

Table I.1	**Competition assessment for hypothetical management measures for the maximum scenario for Haisborough, Hammond and Winterton SAC**						
Would the proposal:	*Aggregate extraction*	*Oil & gas exploration & production*	*Gas storage*	*CO_2 storage*	*Wind farms*	*Cables*	*Commercial fisheries*
1. Directly limit the number or range of suppliers?	Wind Farms – possibly within the context of Round 3, but not in the medium term considering other wind development options Other sectors - No						
2. Indirectly limit the number or range of suppliers?	The main tests of this are whether the policy is expected to: - raise significantly the costs of new suppliers relative to existing suppliers, - raise significantly the costs of some existing suppliers relative to other existing suppliers, or - raise significantly the costs of entering, or exiting, the affected market. This will not be the case for the sectors considered, with the possible exceptions of: - Fishing: as a result of potential increases in competition in certain fisheries within the site and/or in certain fisheries outside the site. - Wind Farms: minor restriction of UK capacity or increased costs of developing wind farms.						
3. Limit the ability of suppliers to compete?	No restrictions on factors which determine the ability of suppliers to compete.						
4. Reduce suppliers' incentives to compete vigorously?	No reduction of incentive to compete.						

Small Firms Impact Test

Small and Medium Enterprises (SMEs) are considered for these purposes to be those with fewer than 250 employees. The industries potentially affected by the designation with a significant number of SMEs are: fishing, and development of renewable sources of energy.

In the fishing industry it is likely that the fishing vessels that may be impacted on by any additional management measures would be owned by SMEs. The number of fishing vessels affected would depend on the actual management measures implemented. Under the maximum scenario, the profitability of some small fishing businesses could potentially be affected. For example, their adaptation to the management measures for the site may increase costs, reduce value of landings or both.

Down-stream and up-stream effects in other sectors could also impact on SMEs, but impacted activities are likely to be displaced, at least partly to other locations in the UK economy, limiting the overall impact on SMEs in the UK. For example, there are a number of SMEs which are directly and indirectly connected to the fishing sector, which could potentially be impacted on by designation. These include, the retail trade (fish mongers, markets) fish processing plants, ship builders and diesel suppliers.

Both positive and negative impacts on local and regional suppliers and contractors to the renewables industry could arise through restrictions or delays imposed on projects due to designation of the site. Where additional surveys are required to assess the impacts of wind farms and export cables on interest features, this work is often carried out by or subcontracted to SMEs which may benefit financially from the additional work Restriction on the use of scour protection within the site may have a minor negative impact on SMEs if they are involved in the supply or installation of scour protection. Should wind farm developments not proceed as a result of the SAC local ports and associated local businesses are likely to lose revenue that would have otherwise been gained through use of the ports as construction and servicing bases. It could also indirectly affect SMEs which are suppliers to the larger organisations that would be expected to be involved in these developments. These effects on SMEs discussed above could be displaced, and therefore an impact on SMEs would only arise indirectly if the designation impacted on the overall development of capacity to generate electricity in the UK. Therefore these impacts are not considered further here.

Greenhouse Gas Assessment

The impact of designating the site on greenhouse gas (GHG) emissions is unknown but not expected to be significant. If fishing vessels have to travel longer distances to access alternative fishing grounds this would increase emissions depending on vessel size and whether they already operate over a variety of fishing grounds. In the event that aggregate extraction from certain licences has to cease prior to Review of Consents shortfalls in supply may be met from other licences in the region with a slight impact on greenhouse gas emissions. If the licences are revoked and the operator relocates in response, extraction would move further offshore resulting in increased emissions from longer transit times. However this scenario is subject to considerable uncertainty. If oil and gas exploration/production and gas interconnector development is restricted this could potentially lead to a higher consumer price and therefore a decrease in consumption and emissions. However, there would be additional GHG emissions from any decommissioning.

Another potential impact arises if any increase in operations and therefore emissions is required at sewage treatment works for nutrient removal. However, this can be offset by using renewable sources of energy and more sustainable technologies at

the nutrient source. If renewable developments from wind energy are significantly restricted, this could affect achievement of the UK's commitment to reducing GHG emissions. However it should be noted that there are alternative locations for generating renewable energy and other means to reduce GHG emissions.

Health and well being

Well being of UK society is expected to benefit through the satisfaction people gain from the knowledge that habitats and species in the site are being conserved.

Human rights

The designation will have the effects set out in section 1.3 and may have the effects, or some of them, set out in section 3.2. The effect of designating the site on Human Rights has been considered and it is thought that this designation, balancing the public and the private interests, justifies any interference with property rights that it may have under Protocol 1 Article 1 of the European Convention on Human Rights and is compatible with the Convention rights.

Rural proofing

Some of the economic costs identified in relation to fisheries and other sectors may occur in remote coastal communities in predominantly rural areas of the UK. Due to the less diversified nature of their local economies, the potential impacts may be relatively more important as a proportion of economic activity in these locations.

Other Impact Tests

The effect of designating the site on statutory equality duties and the justice system has been considered and it is not thought to have an impact. Consequently these impact tests are not examined further here.