

**From:** [Brown, Emma](#)  
**To:** [Hornsea Project Three](#)  
**Subject:** Hornsea Project Three - Deadline 9 Response from Natural England  
**Date:** 26 March 2019 19:14:13  
**Attachments:** [SouthernNorthSeaDRAFTConservationObjectivesAndAdviceOnActivities.pdf](#)  
[EN010080 Hornsea Project Three Deadline 9 Natural England Comments on ExA Q F3.1.pdf](#)  
[EN010080 Hornsea Project Three Deadline 9 Natural England Correction to REP7-078.pdf](#)  
[EN010080 Hornsea Project Three Deadline 9 Natural England Response to ExA Q F4.1, F4.2 and F4.3.pdf](#)  
[EN010080 Hornsea Project Three Deadline 9 Natural England's Response to ExAO F6.1.pdf](#)  
[EN010080 Hornsea Project Three Deadline 9 Natural England's comments on the Applicant's D7 Submissions.pdf](#)  
[OffshoreRegisterEntry\\_SouthernNorthSea \(Citation\).pdf](#)

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Good Evening,

Please find attached Natural England's Deadline 9 Response.

This includes:

- Natural England's Comments on the Applicants D7 submissions
- Natural England's Comments on ExA Q F3.1
- Natural England's Response to ExA Qs F4.1, F4.2 and F4.3
- Natural England's Response to ExA Q F6.1
- Offshore Register Entry for the SNS SAC (Citation)
- SNS SAC Draft Conservation Objectives and Advice on Activities

Kind regards,

Emma

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**Harbour Porpoise (*Phocoena phocoena*) possible  
Special Area of Conservation:  
Southern North Sea**

**Draft Conservation Objectives and Advice on  
Activities**

January 2016

Advice under Regulation 18 of The Offshore Marine Conservation (Natural Habitats, etc.) Regulations 2007 (as amended), and Regulation 35(3) of The Conservation of Habitats and Species Regulations 2010 (as amended).

## **Further information**

This document is available as a pdf file on the JNCC website for download if required ([www.jncc.defra.gov.uk](http://www.jncc.defra.gov.uk)).

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## Summary of Conservation Objectives and Advice on Activities

The Conservation Objectives and Advice on Activities are set out for the Southern North Sea possible SAC (pSAC) for the Annex II species harbour porpoise (*Phocoena phocoena*). The site covers both inshore (within 12 nautical miles of coast) and offshore (beyond 12 nautical miles of coast) waters where Natural England (NE) and the Joint Nature Conservation Committee (JNCC) have respective advisory responsibilities.

The general objective of achieving or maintaining Favourable Conservation Status (FCS) for all species and habitat types listed in Annexes I and II of the Habitats Directive needs to be translated into site-level Conservation Objectives. These describe the condition to be achieved by species and habitat types within the sites in order for the site to contribute in the best possible way to achieving FCS at the national, bio-geographical and European level. The Conservation Objectives have been developed for the feature (harbour porpoise) throughout the recommended possible SAC network to ensure coherence across the network. This is also appropriate for a wide ranging, mobile and continuous population. The Advice on Activities is site-specific but based on a broad assessment of the sensitivity of the harbour porpoise to man-made pressures at a UK scale. The advice has been developed using the best-available scientific information and expert interpretation as at November 2015. The advice provided here will be subject to change as our knowledge about the site and the impacts of human activities improve.

The site should be managed in a way that ensures that its contribution to the maintenance of the harbour porpoise population at FCS is optimised. This may require management of human activities occurring in or around the site if they are likely to have an adverse impact on the site's Conservation Objectives either directly or indirectly identified through the assessment process. Management of activities that may affect processes on which the harbour porpoise is dependent, e.g. recruitment of prey species from supporting habitats, cannot be considered at present due to insufficient (often no) evidence linking habitat characteristics to prey of the harbour porpoise. There is some information on the prey of harbour porpoises, but their prey preferences whilst within the sites are not well known. It should be noted that as European Protected Species under Annex IV of the Habitats Directive, harbour porpoise are already strictly protected wherever they are in European waters. As such several management measures are already in place in the UK.

To fulfil the Conservation Objectives for the Southern North Sea harbour porpoise site, the relevant<sup>1</sup> and competent<sup>2</sup> authorities should consider human activities within their remit which might affect the integrity of the site.

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<sup>1</sup> Relevant authorities are those who are already involved in some form of relevant marine regulatory function and would therefore be directly involved in the management of a marine site.

<sup>2</sup> A competent authority is any Minister, government department, public or statutory undertaker, public body of any description or person holding a public office.

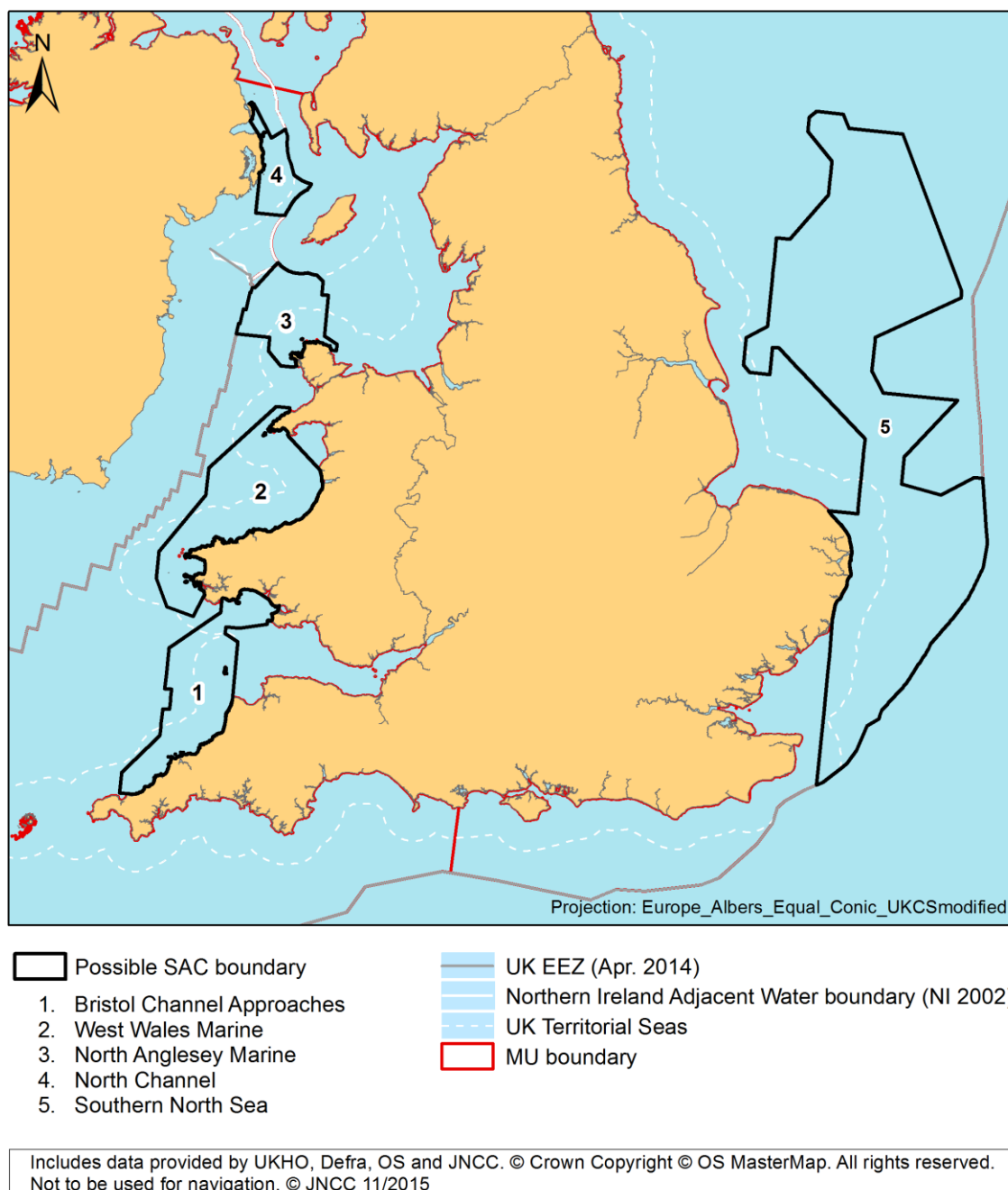
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# 1 Introduction

## 1.1 Background

A potential network of eight sites was identified within UK waters for harbour porpoise (*Phocoena phocoena*). Sites were identified within the UK portions of Management Units (MUs) defined for the species (ICES, 2014; IAMMWG, 2015a). The Welsh and Northern Ireland Governments, along with Defra on behalf of England and offshore waters, gave approval for sites within their areas of jurisdiction to proceed to consultation. The resulting five sites are shown in Figure 1.



**Figure 1:** Possible Special Areas of Conservation for the harbour porpoise, *Phocoena phocoena* identified in Northern Ireland, England, Wales and offshore waters. The MU boundary refers to management units North Sea and Celtic and Irish Seas.

This advice is for the Southern North Sea site (Figure 2) which is subject to protection under the Habitats Directive as transposed by the Conservation of Habitats and Species Regulations 2010<sup>3</sup> and the Offshore Marine Conservation Regulations (Natural Habitats, etc.) Regulations 2007<sup>4</sup> (as amended). The advice is given in fulfilment of the duty of the Statutory Nature Conservation Bodies (SNCBs) under the Habitats Regulations to inform Relevant and Competent Authorities as to (a) the Conservation Objectives for the site; and (b) any activities which may negatively impact the feature [harbour porpoise] for which the site is designated. The SNCBs aim to ensure that the Conservation Objectives are up-to-date, accessible and allow the assessment of the impact of proposed developments against them.

## **2 Responsibilities of Relevant and Competent Authorities**

The Habitats Regulations require Relevant and Competent Authorities to exercise their functions so as to secure compliance with the Habitats Directive. Competent Authorities must, within their areas of jurisdiction, have regard to both direct and indirect effects on the site. This may include consideration of issues outside the boundary of the SAC, if the impact of these occurs within the site boundaries. Relevant and Competent Authorities are not required to undertake any actions or ameliorate changes in the condition of the site if it is shown that the changes result wholly from natural causes.

The natural variability of harbour porpoise distribution and abundance within sites is likely to be large due to the mobility and wide ranging nature of this species. Apparent deterioration of harbour porpoise presence at the site must be contextualised in terms of the natural variability in abundance and distribution patterns at the population level (i.e. Management Unit level). SNCBs will work with Relevant and Competent Authorities and others to agree a protocol to guide assessments, and this will require consideration for the population at the wider scale MU population. It is essential that any assessment for the site reflect the natural variation of the species, including assessments in the condition of the site.

## **3 Conservation Objectives for harbour porpoise SACs**

### **3.1 The role of Conservation Objectives**

Site level Conservation Objectives are a set of specified objectives that must be met to ensure that the site contributes to maintaining or achieving Favourable Conservation Status (FCS) of the designated site feature(s) at the national and biogeographic level (EC, 2012). Conservation Objectives constitute a necessary reference for identifying site-based conservation measures and for carrying out Habitat Regulations Assessments of the implications of plans or projects. The purpose of the Habitat Regulations Assessment is to determine whether a plan or project adversely affects a site's integrity. The critical consideration in relation to site integrity is not the extent or degree of an impact, or whether an impact is direct or indirect, but whether the implications of any activities affecting a site, either individually or in combination with other plans or projects, affect the site's ability to achieve its conservation objectives and favourable conservation status.

Harbour porpoise are protected everywhere in European waters under the provisions of Annex IV and Article 12 of the Habitats Directive. The harbour porpoise in UK waters is considered part of a wider European population and the mobile nature of this species means that the concept of a 'site population' may not be appropriate for this species. Site based

<sup>3</sup> [http://www.legislation.gov.uk/ukxi/2010/490/pdfs/ukxi\\_20100490\\_en.pdf](http://www.legislation.gov.uk/ukxi/2010/490/pdfs/ukxi_20100490_en.pdf)

<sup>4</sup> [http://www.legislation.gov.uk/ukxi/2007/1842/pdfs/ukxi\\_20071842\\_en.pdf](http://www.legislation.gov.uk/ukxi/2007/1842/pdfs/ukxi_20071842_en.pdf)



conservation measures will complement wider ranging measures that are in place for the harbour porpoise.

### **3.2 Background to Conservation Objectives**

The Conservation Objectives are designed to ensure that the obligations of the Habitats Directive can be met. Article 6(2) of the Directive requires that there should be no deterioration or significant disturbance of the qualifying species or to the habitats upon which they rely. Therefore, the focus of the Conservation Objectives for harbour porpoise sites is on addressing pressures that affect site integrity and would include:

- killing or injuring significant numbers of harbour porpoise (directly or indirectly);
- preventing their use of significant parts of the site (disturbance / displacement);
- significantly damaging relevant habitats; or
- significantly reducing the prey base.

This Conservation Objectives document includes both a statement of the actual Conservation Objectives and supplementary advice with regard their intent and interpretation specific to the site. The Objectives have been set taking account of European Commission guidance (EC, 2012). Further guidance on their specific application to certain casework will also be provided at a later stage.

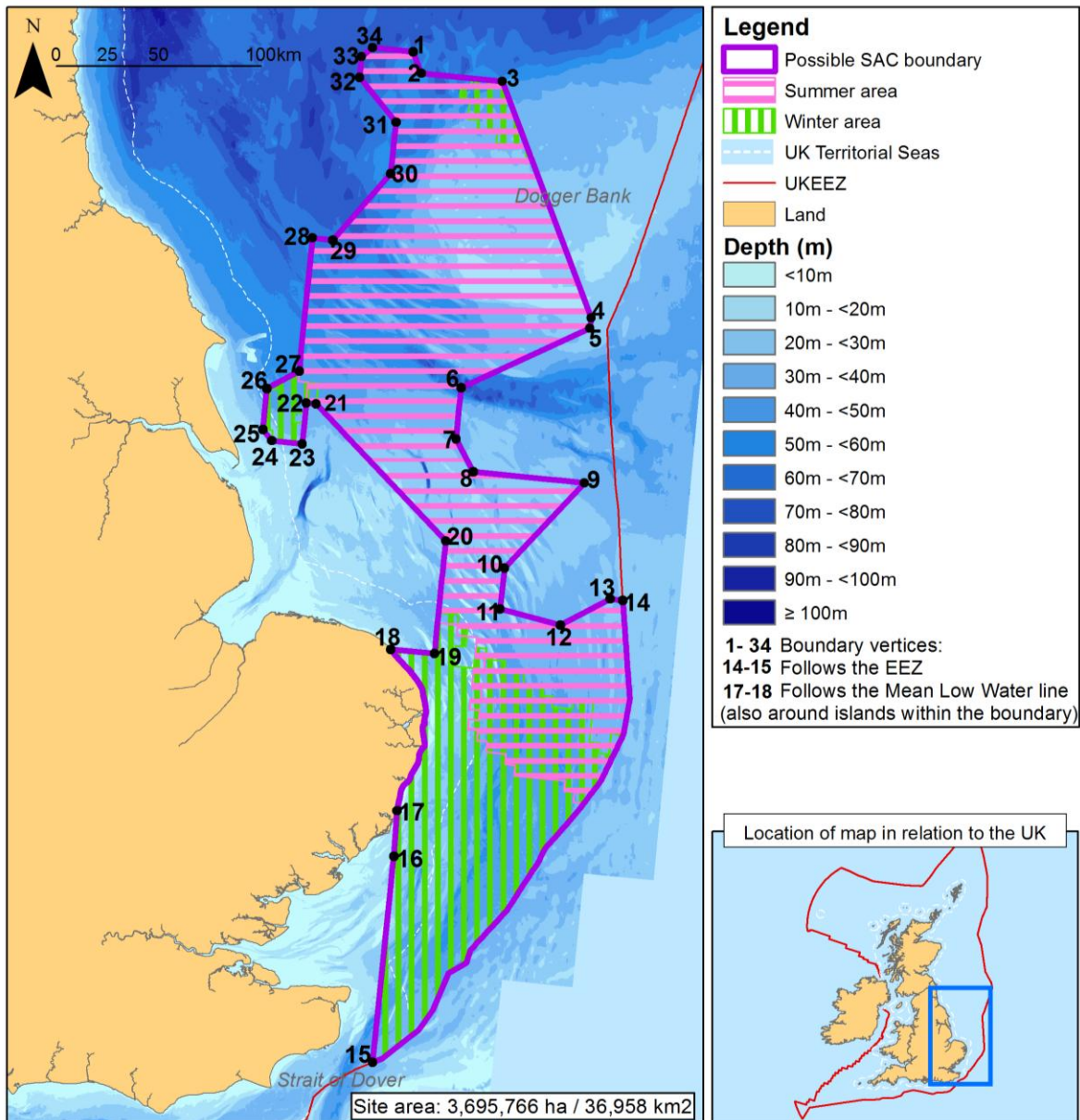
### **3.3 The Southern North Sea pSAC Conservation Objectives**

The Southern North Sea pSAC is the largest of the possible SACs proposed for the conservation of harbour porpoise (Figure 2). The qualifying feature of the site is the Habitats Directive Annex II species:

- harbour porpoise (*Phocoena phocoena*)

Seasonal differences in the relative use of the site have been identified based on the analyses of Heinänen and Skov (2015) which shows that harbour porpoise occur in elevated densities in some parts of the site compared to others during summer and winter (Figure 2). The seasonality in porpoise distribution should be considered in the assessment of impacts and proposed management.

## Southern North Sea



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| ID | Latitude        | Longitude       | ID | Latitude        | Longitude       | ID | Latitude        | Longitude       | ID | Latitude        | Longitude       |
|----|-----------------|-----------------|----|-----------------|-----------------|----|-----------------|-----------------|----|-----------------|-----------------|
| 1  | 55° 28' 53.1" N | 01° 02' 24.8" E | 10 | 53° 17' 32.9" N | 02° 11' 31.6" E | 19 | 52° 53' 06.4" N | 01° 45' 21.9" E | 28 | 54° 37' 0.5" N  | 00° 27' 44.8" E |
| 2  | 55° 23' 34.2" N | 01° 07' 24.8" E | 11 | 53° 06' 45.7" N | 02° 11' 43.8" E | 20 | 53° 22' 42.4" N | 01° 44' 22.2" E | 29 | 54° 37' 11.8" N | 00° 37' 01.8" E |
| 3  | 55° 24' 03.2" N | 01° 45' 17.6" E | 12 | 53° 04' 11.8" N | 02° 38' 38.6" E | 21 | 53° 54' 05.6" N | 00° 39' 29.7" E | 30 | 54° 56' 28.6" N | 00° 59' 18.7" E |
| 4  | 54° 25' 05.4" N | 02° 37' 56.9" E | 13 | 53° 12' 19.1" N | 02° 59' 22.3" E | 22 | 53° 54' 0.3" N  | 00° 35' 04.2" E | 31 | 55° 09' 56.9" N | 00° 58' 38.1" E |
| 5  | 54° 22' 23.6" N | 02° 37' 58.3" E | 14 | 53° 12' 19.0" N | 03° 04' 57.1" E | 23 | 53° 43' 17.2" N | 00° 35' 41.1" E | 32 | 55° 20' 23.2" N | 00° 39' 10.7" E |
| 6  | 54° 03' 07.5" N | 01° 43' 06.7" E | 15 | 51° 04' 38.9" N | 01° 39' 44.1" E | 24 | 53° 42' 60.0" N | 00° 22' 03.6" E | 33 | 55° 25' 46.4" N | 00° 38' 51.5" E |
| 7  | 53° 49' 40.4" N | 01° 43' 32.5" E | 16 | 51° 59' 04.9" N | 01° 38' 08.0" E | 25 | 53° 45' 35.5" N | 00° 17' 20.7" E | 34 | 55° 28' 33.4" N | 00° 43' 26.4" E |
| 8  | 53° 41' 38.9" N | 01° 52' 54.2" E | 17 | 52° 10' 54.3" N | 01° 37' 11.0" E | 26 | 53° 56' 22.0" N | 00° 16' 38.8" E |    |                 |                 |
| 9  | 53° 41' 57.7" N | 02° 42' 50.7" E | 18 | 52° 52' 51.4" N | 01° 26' 06.8" E | 27 | 54° 02' 03.1" N | 00° 30' 01.3" E |    |                 |                 |

**Figure 2:** The Southern North Sea possible Special Area of Conservation for harbour porpoise showing summer and winter areas.

The Conservation Objectives for the site are:

**To avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to maintaining Favourable Conservation Status (FCS) for the UK harbour porpoise.**

To ensure for harbour porpoise that, subject to natural change, the following attributes are maintained or restored in the long term:

1. The species is a viable component of the site.
2. There is no significant disturbance of the species.
3. The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

These Conservation Objectives are common across all sites proposed for this species to ensure coherence across the network (EC, 2012). These Conservation Objectives are based on considerations of the ecological requirements of the species within the site, yet their interpretation is contextualised in their contribution to maintaining FCS at a wider scale (EC, 2012). With regard the Southern North Sea site, harbour porpoise need to be maintained rather than restored. Maintain implies that, based on our existing understanding, the feature is regarded as being in favourable condition and will, subject to natural change, remain in this condition after designation.

#### **1. The species is a viable component of the site:**

Harbour porpoises are considered to be a 'viable component' of the site if they are able to survive and live successfully within it. The Southern North Sea site has been selected primarily on the basis of its long-term, preferential use by harbour porpoise in contrast to other areas of the North Sea. The implication is that this site provides good foraging habitat and it may also be used for breeding and calving. However, because the number of harbour porpoise using the site naturally varies, there is not an exact number of animals within the site above which the species is viable or below which it will become unviable.

For that reason, the intent of this objective is to minimise the risk posed by activities within the site to the species viability. Activities that kill, injure or significantly disturb harbour porpoise have the potential to affect species viability within the site.

The harbour porpoise is a European Protected Species (EPS) listed on Annex IV of the Habitats Directive and as such is protected under Article 12 from deliberate killing (or injury), capture and disturbance throughout its range. However, the relevant/competent authorities are reminded of these provisions and their application to the site as an integral part of the species' range. The Habitats Directive Article 12 guidance<sup>5</sup> proposes the following definition of deliberate: "*deliberate actions are to be understood as actions by a person who knows, in the light of the relevant legislation that applies to the species involved, and the general information delivered to the public, that his action will most likely lead to an offence against a species, but intends this offence or, if not, consciously accepts the foreseeable results of his action*".

The meaning of 'deliberately injure' should be taken from the definition under regulations 41(1)(a) and 39(1)(a) of the Conservation (Natural Habitats etc.) Regulations 1994 and its

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<sup>5</sup> [http://ec.europa.eu/environment/nature/conservation/species/guidance/pdf/guidance\\_en.pdf](http://ec.europa.eu/environment/nature/conservation/species/guidance/pdf/guidance_en.pdf)

amendments consolidated in The Conservation of Habitats and Species Regulations 2010 for England and Wales

The disturbance under Article 12(1)(b) must be deliberate and not accidental. The definition of 'deliberate disturbance' is given in 39(1)(b) of Offshore Marine Conservation (Natural Habitats, etc.) Regulations 2007 (Offshore Marine Regulations, OMR, as amended in 2009 and 2010). It is an offence under these Regulations to deliberately disturb EPS in such a way as to: a) impair their ability to survive, to breed or reproduce, or to rear or nurture their young or b) to affect significantly the local distribution or abundance of that species. Further guidance as to the interpretation of and what constitutes 'deliberate' and 'significant disturbance' is given in the JNCC EPS guidance<sup>6</sup>. These definitions of types of disturbance are for the purposes of assessing the need for an EPS licence and apply throughout UK waters.

Bycatch of harbour porpoise in fishing nets is not deliberate but incidental killing. Article 12 (4) of the Habitats Directive applies and states that Member States '*shall establish a system to monitor the incidental capture and killing of the species listed on Annex IV (all cetaceans). In the light of the information gathered, Member States shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned*'. Consideration must be given to the effect of bycatch on the conservation status of harbour porpoise at the population level. The impacts of bycatch within a site contribute to impacts from bycatch outside the site and thus may affect the conservation status of harbour porpoise. Bycatch, therefore, poses a risk to the viability of the population and therefore could be deemed to affect the integrity of the site. Measures may be needed to minimise the risk of bycatch to porpoises using the site.

## **2. There is no significant disturbance of the species within the site**

Disturbance of harbour porpoise generally, but not exclusively, originates from activities that cause underwater noise (section 4). Responses to noise can be physiological and/or behavioural. JNCC has produced guidelines to minimise the risk of physical injury to cetaceans from various sources of loud, underwater noise<sup>7</sup>. However, disturbance is a behavioural (non-injurious) response to noise and may lead to harbour porpoises being displaced from the area affected.

Within sites, the immediate effects of disturbance are in the loss (usually temporary) of habitat available to harbour porpoise. The Southern North Sea site has been identified on the basis of having persistent higher densities of harbour porpoises (Heinänen and Skov 2015) when compared to other areas of the UK's North Sea continental shelf which is linked to the habitats within the site that likely promote good feeding opportunities. Therefore, activities within the site should be managed to ensure access to the site; any disturbance should not lead to the exclusion of harbour porpoise from a significant portion of the site for a significant period of time. Case Work Advice Guidance in relation to various activities is being developed and expands this supplementary advice to define 'significant portion and period' in the context of impacting site integrity.

This Conservation Objective aims to ensure that the site contributes, as best it can, to maintaining the Favourable Conservation Status of the wider harbour porpoise population. As such, how the impacts within the site translate into effects on the North Sea Management Unit population are of greatest concern.

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<sup>6</sup> [http://jncc.defra.gov.uk/PDF/consultation\\_epsGuidanceDisturbance\\_all.pdf](http://jncc.defra.gov.uk/PDF/consultation_epsGuidanceDisturbance_all.pdf)

<sup>7</sup> <http://jncc.defra.gov.uk/page-4273>

### **3. The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.**

The harbour porpoise is a species that is highly dependent on a year-round proximity to food sources and its distribution and condition may strongly reflect the availability and energy density of its prey (Brodie 1995 in Santos & Pierce, 2003). The densities of porpoise using the site are likely linked to the availability (and density) of prey within this site. Porpoise eat a variety of prey including gobies, sandeel, whiting, herring and sprat (which all have spawning grounds within the Southern North Sea site). However, the diet of porpoises specifically when using the site is unknown. The activity which potentially risks the achievement of this CO is commercial fishing; although environmental variability also plays a role in determining the status of fish stocks. However, currently there is no evidence to suggest that competition for prey species with commercial fisheries is having an impact on the conservation status of the harbour porpoise.

The delineation of the Southern North Sea site is based on the prediction of 'harbour porpoise habitat' within the North Sea (Heinänen and Skov 2015). Habitat, in this context, means the characteristics of the seabed and water column. Peaks in density of harbour porpoise in the Southern North Sea site vary seasonally (Figure 2). At the Management Unit scale, for both the summer and winter seasons the distribution of harbour porpoise is related to water depth and variables within the water column (Heinänen & Skov 2015). Harbour porpoise density peaked in stable stratified waters (based on vertical differences in temperature) with lower gradients of eddy activity (turbulence); higher densities were also found in areas with current speeds of 0.4-0.6m/s. The analysis indicated a preference for water depths between 30 and 50m throughout the year. In general, in both seasons, harbour porpoise preferred coarser seabed sediments (sand/gravel). How these environmental characteristics of the site influence the prey of harbour porpoise or other aspects of their life directly (e.g. breeding/calving) is currently unknown.

## **4 Advice on Activities**

### **4.1 Purpose of advice**

This section details the advice on human activities specifically occurring within or close to the Southern North Sea pSAC that would be expected to impact the site. Initial assessments were done at UK scale, with subsequent site level assessment detailing our understanding of impacts occurring with potential to affect harbour porpoise when using the site (Section 5 & 6). Advice is only given where pressures<sup>8</sup> may act at the site level and therefore, may require management if the Conservation Objectives are to be met. Wide-spread pressures may also act to affect the overall status of harbour porpoise, but such effects are not restricted to specific sites. Such pressures are best dealt with through broader measures. Alongside and in addition to the identification of the network of harbour porpoise sites, an overarching conservation strategy (DETR, 2000) has been in place for harbour porpoise since 2000. In light of a recent conservation literature review (IAMMWG *et al* 2015b), this strategy will be reviewed and updated where necessary.

The advice identifies activities with potential to affect harbour porpoise using the site (site level impacts) as well as (where possible) its supporting habitats in UK waters which may impact the species' capacity to maintain FCS. This advice should also be used to help identify the extent to which existing activities are, or can be made, consistent with the conservation objectives, and thereby focus the attention of Relevant and Competent Authorities and surveillance programmes to areas that may need management measures.

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<sup>8</sup> See Annex A for definition of key terms

This draft advice on activities will be updated and supplemented through further discussions with the Relevant and Competent Authorities and any advisory groups formed for the site.

## **4.2 Background**

In compiling this advice on activities, the SNCBs have considered the pressures that may be caused by human activities and the sensitivity of the qualifying feature, harbour porpoise, to those pressures. The advice is generated through a broad grading of sensitivity and exposure of the harbour porpoise to pressures associated with activities in order to gain an understanding of how vulnerable the species is to each activity at a UK level. The activities and their associated pressures to which the harbour porpoise is deemed vulnerable at UK level are then considered at site level in order to inform possible management needs necessary for the site to meet the conservation objectives. Annex A details the approach taken to identify the significant impacts on harbour porpoise from pressures, and the relative sensitivity and current exposure of harbour porpoise to those pressures at a UK wide scale.

This document is guidance only and activities and their management will be considered in the context of Habitats Regulations Assessments/Appropriate Assessment and where applicable through other environmental assessment processes (e.g. EIA).

## **5 Activity assessments at UK scale**

The assessments have been carried out using all available evidence as of November 2015. As further information becomes available, assessments may be subject to alteration in line with the new evidence to support the change, and further improving the understanding of the vulnerability of harbour porpoise to activities occurring in UK waters. This advice is made without prejudice to any assessment that may be required for specific proposals to be considered by a Relevant Authority. The level of any impact will depend on the location, timing and intensity of the relevant activity. This advice is provided to assist and focus the Relevant Authorities in their consideration of the management of these activities.

The harbour porpoise is a wide-ranging species and occurs throughout the UK Continental Shelf area (JNCC, 2013). It does occur in deeper waters but in very low densities, and perhaps only seasonally. As a predominantly shelf species, it is exposed to a wide range of pressures, that are both ubiquitous (e.g. pollution) and patchy (e.g. bycatch) in nature, and the list of anthropogenic activities leading to these pressures is long. Based on current available information, the activities with the most notable impact on UK harbour porpoise are shown in Table 1.

The definitions of the pressures as applied within harbour porpoise SAC advice can be found in Annex B

Activities which currently pose a low risk to porpoises at the UK level (Annex A, Table A2) have not been considered in this advice. The exposure to the pressures associated with these activities is currently very limited and poses no significant threat to the maintenance of harbour porpoise FCS. Non-anthropogenic impacts are also not considered, such as attack and predation from other marine mammal species, that have the potential to impact harbour porpoise populations.

The full list of assessed activities and key references can be found in Annex A, Table A3. Updates to the assessments will occur as more evidence becomes available.

**Table 1:** Key activities and the relative risk of impacts on harbour porpoise throughout UK waters. Those pressures ranked 'high' are known to have the greatest impact relative to other pressures on the population of UK harbour porpoises.

| Activities   | Pressures                             | Impacts  | Current relative level of impact |
|--|---------------------------------------|--|----------------------------------|
| Commercial fisheries with bycatch of harbour porpoise (predominantly static nets)  | <b>Removal of non-target species</b>  | <ul style="list-style-type: none"> <li>• Mortality through entanglement/bycatch</li> </ul>   | High                             |
| Discharge/run-off from land-fill, terrestrial and offshore industries  | <b>Contaminants</b>                   | <ul style="list-style-type: none"> <li>• Affects on water and prey quality</li> <li>• Bioaccumulation through contaminated prey ingestion</li> <li>• Health issues (e.g. on reproduction)</li> </ul>                                     | High                             |
| Shipping, drilling, dredging and disposal, aggregate extraction, pile driving, acoustic surveys, underwater explosion, military activity, acoustic deterrent devices and recreational boating activity | <b>Anthropogenic underwater sound</b> | <ul style="list-style-type: none"> <li>• Mortality</li> <li>• Internal injury</li> <li>• Disturbance leading to physical and acoustic behavioural changes (potentially impacting foraging, navigation, breeding, socialising)</li> </ul> | Medium                           |
| Shipping, recreational boating, tidal energy installations   | <b>Death or injury by collision</b>   | <ul style="list-style-type: none"> <li>• Mortality</li> <li>• Injury</li> </ul>  | Medium/Low                       |
| Commercial fisheries (reduction in prey resources)   | <b>Removal of target species</b>      | <ul style="list-style-type: none"> <li>• Reduction in food availability</li> <li>• Increased competition from other species</li> <li>• Displacement from natural range</li> </ul>  | Medium                           |

### Removal of non-target species (harbour porpoise bycatch)

Bycatch of harbour porpoise in fishing gear is one of the most significant anthropogenic pressures impacting on the population. The relevant commercial fisheries with harbour porpoise bycatch are certain bottom set nets. The areas where bycatch is of greatest concern is off southwest England and the southern North Sea. Mitigation of bycatch through the use of acoustic deterrent devices ('pingers') is required under EU Regulation 812/2004<sup>9</sup> on setnet vessels of 12m or over. However, smaller set net vessels (<12m) comprise the majority of the fleet and are the major source of harbour porpoise bycatch in UK waters. Where the bycatch/risk of bycatch within porpoise SACs threatens the sites' integrity, mitigation may be required.

### Contaminants

The latest evidence (Law *et al* 1992-2005 & 2009; Law *et al* 2008; ASCOBANS, 2011; Murphy *et al* 2015) shows that there is still a significant pollution issue for at least some cetacean species in European waters, which includes harbour porpoise and organochlorines (e.g. Polychlorinated biphenyls [PCBs]). Monitoring and investigation will continue to be important, and research in this field should not remain focused on 'old' compounds and

<sup>9</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:150:0012:0031:EN:PDF>

contaminants. Careful consideration is required to ensure we also monitor historical contaminant impacts as well as any current or emerging issues.

### **Anthropogenic underwater sound**

Harbour porpoise use sound for foraging, navigation, social activities and predator detection. Changes in underwater noise therefore have the potential to interrupt these behaviours. The peak frequency of echolocation pulses produced by harbour porpoise is 120–130 kHz, corresponding to their peak hearing sensitivity although hearing occurs throughout the range of ~1 and 180 kHz (Southall *et al* 2007). A range of activities emit sound that falls within the hearing sensitivities of porpoise, including shipping, pile driving, Acoustic Deterrent Devices and military activities. The exact frequency, intensity and longevity of the sound will determine the response. The impact on the porpoise is also mediated through individual behaviour, and perhaps quality of its immediate habitat, at the time of exposure.

### **Death or injury by collision**

Post-mortem evidence indicates that few collisions between harbour porpoise and vessels occur and is not a significant pressure for this species.

Research surrounding wet renewables shows potential risk of harbour porpoise collision with sub-marine turbines, although there is no evidence of such collisions to date.

### **Removal of target species (harbour porpoise prey)**

Porpoise diet within UK waters includes a wide variety of fish and they will generally focus on the most abundant local species (De Pierrepont *et al* 2005; Camphuysen *et al* 2006). The predominant prey type in general appears to be whiting, gobies and sandeel, although shoaling fish such as mackerel and herring are also taken. In the north-east Atlantic, a long term shift from predation on clupeid fish (mainly herring) to predation on sandeels and gadoid fish, possibly related to the decline in herring stocks since the mid-1960s has been observed. Porpoise diets overlap extensively with diets of other piscivorous marine predators (notably seals) and many of the main prey species are also taken by commercial fisheries, although porpoises tend to take smaller fish than those targeted by fisheries (Santos and Pierce 2003).

## **6 Site specific considerations: Southern North Sea pSAC**

### **6.1 Sensitivity of harbour porpoise to existing activities within or impacting on the site**

The Southern North Sea site spans territorial and offshore waters and covers a large geographical area. A summary of the site can be found in the Selection Assessment Document<sup>10</sup>. Precise information on many activities within the boundary is not currently available due to lack of targeted data collection to date. Assessing exposure carries certain assumptions about the spatial extent, frequency and intensity of the pressures associated with marine activities. Therefore site based exposure and resulting current level of impact has not been assessed at this stage.

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<sup>10</sup> SAC Selection Assessment Document:

<http://jncc.defra.gov.uk/pdf/SouthernNorthSeaSelectionAssessmentDocument.pdf>



Table 2 is an overview of activities occurring within or in proximity to the Southern North Sea site to which the harbour porpoise has a current level of impact risk of High or Medium at UK level (Table 1) and therefore may require further consideration concerning options for management. This was derived from spatial data as GIS layers and a review of the literature, and includes all available data at time of writing.

Management measures are the responsibility of the relevant regulatory bodies, which consider the SNCBs' advice and hold appropriate discussions with the sector concerned, but the scale and type of mitigation is decided by the Regulators. Where consent is required and the activity (if considered a plan or a project) is likely to significantly affect a European Marine site, Article 6(3) of the Habitats Directive requires that an Appropriate Assessment is carried out. Assessments under Article 6(3) of the Directive are often referred to in the UK as "Habitat Regulations Assessments" (HRA). The HRA is a case-specific assessment made in view of the Conservation Objectives for the affected site. Each HRA requires case-specific, unbiased advice from the SNCB but is the responsibility of the regulatory body concerned.

In 2012 the UK Government adopted a revised approach to the management of fishing activities within European marine sites (EMS) in England. The revised approach is designed to ensure the consistency of the management of fishing activities with Article 6 of the Habitats Directive. Risk based prioritisation of managing the fishing activities of UK and non UK vessels has been applied to relevant European marine site features and sub features within the UK 12nm territorial limit. For EMS outside of 12nm, or sites outside 6nm where there are access rights for other Member States, management measures designed to ensure adequate protection are to be proposed to and agreed by the European Commission in accordance with the Common Fisheries Policy (CFP).

**Table 2:** Activities occurring within/near to the Southern North Sea site to which the harbour porpoise is considered sensitive.

| <b>Activities</b>                                    | <b>Pressure</b>                         | <b>Comment on current level of activity</b>   | <b>Management considerations</b>   |
|--|---|---|--|
| Commercial fisheries (with harbour porpoise bycatch) | Removal of non-target (bycatch) species | <p>UK registered vessels &gt;12m: Negligible effort of Vessel Monitoring System (VMS) registered vessels using static net gears within the site<sup>11</sup></p> <p>UK registered vessels &lt;12m: current exposure is unknown</p> <p>EU registered vessels: higher effort of static net setting than UK vessels with two concentrated areas. Effort in the south east appears to have increased between 2009 and 2013.</p> | <p>Where management measures are required, the development of these would be undertaken via discussion with fishing interests and fishery managers and informed by any detailed information about fishing activity that can be made available. Detailed measures, if required, will be developed by the relevant regulator (European Commission/MMO/IFCA/Defra)</p> <p>The use of pingers as a mitigation measure is required on static nets deployed by vessels &gt;12m in length in specified areas through EU Regulation 812/2004. Through derogation, this part of the UK fleet currently utilise the DDD.</p> <p>Because bycatch most often occurs in bottom set nets deployed from vessels &lt;12m, and the use of pingers</p> |

<sup>11</sup> The fisheries data are aggregated VMS data collected between 2006 and 2013.

|   |                                |  |  |
|---|--------------------------------|--|--|
|   |                                |  | is not mandatory under Regulation 812/2004, one option for management could be to extend the pinger requirement to further vessels. The risk of bycatch from this sector in the context of the Conservation objectives of the site will need to be established . Such a requirement may have a seasonal component. However, further work is needed to understand the scale of disturbance that would be caused by wide-spread deployment of the different types of pinger.   |
| Discharge/run-off from land-fill, terrestrial/offshore industries | Contaminants                   | Current exposure within/near the site is unknown   | <p>This pressure cannot be managed effectively at the site level. Most of the relevant pollutants have been effectively phased out of use by action under the OSPAR Convention and, more recently, the EU (e.g. PCBs). However, their chemical stability will lead to them remaining in the marine environment for some time and, consequently, human activities such as dredging may cause the re-release of these chemicals into the environment or introduce other contaminants of which the impacts are poorly known.</p> <p>Any novel sources of potential contamination associated with a new plan or project may be assessed under HRA. It is recognised that further efforts to limit or eliminate PCB discharges to the marine environment may still be needed.</p> |
| Shipping  | Anthropogenic underwater sound | Several large ports along the East coast of England resulting in large vessel shipping routes throughout the site. | The underwater sounds created by large ships are unlikely to cause physical trauma, but could make preferred habitats less attractive as a result of disturbance (habitat displacement, area avoidance). However, additional management is unlikely to be required given current levels within the site and elevated densities of porpoises in this area.  |
| Oil and gas drilling  |                                | Areas licensed for oil and gas extraction in the northern and central parts of the site                            | This is a highly regulated industry. Existing and inactive (exploratory and dry) wells and oil and gas licensed blocks occur within the suite of proposed sites and any future applications would be subject to an HRA.  |
| Dredging and disposal   |                                | Capital dredging and disposal sites in the southern portion of the   | Dredging and disposal can cause disturbance leading to physical and acoustic behavioural changes.  |

|                      |  |   |  |
|----------------------|--|---|--|
|                      |  | site  | However, the risk is considered relatively low and additional management is unlikely to be required  |
| Aggregate extraction |  | Extensive existing licensed and active areas within the site  | Aggregate extraction can cause disturbance leading to physical and acoustic behavioural changes. However, the risk is considered relatively low and additional management is unlikely to be required   |
| Pile driving         |  | Current and licensed areas for offshore wind, including construction and maintenance phases within the site | <p>A European Protected Species (EPS) licence is already required for any construction activity which carries the risk of significant disturbance or injury. As a minimum, developers are required to follow the 'Statutory Nature Conservation Agency protocol for minimising the risk of injury to marine mammals from piling noise'. (<a href="https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/50006/jncc-pprotocol.pdf">https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/50006/jncc-pprotocol.pdf</a>).</p> <p>A Habitats Regulations Assessment (HRA) will be considered for all new developments (coastal and marine) using pile driving within the site or within 26km (see Dahne <i>et al</i> 2013; Tougaard <i>et al</i> 2014) of site boundaries. If additional mitigation (to that required under EPS licence) is required, planning and management of pile driving activities may be needed within the site to ensure the Conservation Objectives are met. There is potential for a reduction or limitation of the disturbance/displacement effects by varying the schedule of piling, particularly if several developments are constructing at the same time and pile driving footprints do not overlap (i.e. maximising area from which porpoise are excluded). Limited spatio-temporal restrictions may be needed.</p> <p>Other examples of mitigation include the use of sound dampers, methods that create a barrier to sound transfer (e.g. bubble curtains) and, more effectively, the use of alternative foundation types (e.g. gravity foundations, suction cups, floating turbines, drilling). Scheduling of activities may minimise cumulative exclusion from areas.</p> |
| Acoustic (including  |  | Seismic exploration   | Some geophysical surveys within 5km of site boundary may require consent   |

|  |                                  |   |  |
|--|----------------------------------|---|--|
| seismic) surveys                       |                                  | activity occurs in the site   | and be subject to HRA.<br>Seismic surveys are likely to require an EPS licence which may specify conditions. As a minimum, it is expected that developers will adhere to the <a href="https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/50005/jncc-seismic-guide.pdf">JNCC Guidelines for minimising the risk of injury and disturbance to marine mammals from seismic surveys</a> (updated August 2010; <a href="https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/50005/jncc-seismic-guide.pdf">https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/50005/jncc-seismic-guide.pdf</a> ) |
| Recreational boating activity          |                                  | Royal Yachting Association (RYA) cruising routes across the extent of the site, focussed along the coast  | Adherence to wildlife codes of conduct is already advocated (e.g the WiSe scheme <a href="http://www.wisescheme.org">http://www.wisescheme.org</a> ). No further management measures are likely to be required.  |
| Acoustic deterrent/ mitigation devices |                                  | Unknown, no consistent areas of usage but maybe used as a mitigation tool during pile driving.  | See pile driving.  |
| Pinger devices                         |                                  | 31 UK registered >12m setnet boats of which 4 use pingers in the area of the site. Use in North Sea on vessels under 12m is unknown but likely low.             | See 'Fisheries (commercial and recreational) with harbour porpoise bycatch'<br>The use of pingers is low/not needed in the site.   |
| Shipping                               | Death or injury by collision     | Several large ports along the East coast of England resulting in busy shipping routes throughout the site, with the highest level of activity in the south.     | Post mortem investigations of harbour porpoise deaths have revealed death caused by trauma (potentially linked with vessel strikes) is not currently considered a significant risk and no additional management is therefore required.   |
| Recreational boating activity          |                                  | RYA cruising routes cross the site, most are coastal  | See 'Shipping' (with death or injury by collision).<br>Boats conducting recreational activity should adhere to wildlife codes of conduct (e.g the WiSe scheme <a href="http://www.wisescheme.org/">http://www.wisescheme.org/</a> ).   |
| Commercial fisheries                   | Removal of target (prey) species | Fisheries targeting prey species such as whiting, herring, mackerel, sandeel and sprat throughout their ranges in the North Sea, fished by UK and EU fisheries. | Commercial species are managed at the larger scale through the CFP.  |

## 6.2 Limitations of the evidence

It is important to note that the information used to catalogue activities occurring within the site is not complete. The available data are drawn from existing monitoring programmes (e.g. the UK's bycatch of protected species monitoring and other European datasets linked to VMS monitoring of fishing vessels) but these have limitations including availability and accessibility at the time of preparing this advice. Caveats with how the data have been collected also need to be understood in order to correctly interpret the information. This can result in the use of expert judgement where sufficient evidence is lacking, but risk is implied. Below are some points to consider alongside the above table in order to ensure the information is not taken out of context:

- **Data availability**
  - Globally, the marine environment is generally far behind the evidence levels of that on land, particularly in offshore areas, mainly due to scale and cost.
  - Sensitivities surround data that has been gathered by industry, and some data are not available for use for advice and management purposes. Often these data become available eventually, but not in time to inform management decisions.
  
- **Fishing: Limitations of fishing Vessel Monitoring System (VMS) data**
  - VMS positional data are transmitted at approximately 2 hour intervals. There is no information transmitted regarding precise vessel activity, therefore assumptions on its activity are often made using the location of the vessel and its speed profile.
  - Fishing vessels under 12m, (and until 2013, vessels under 15m long) are not required to use the VMS, and therefore VMS data tells us nothing regarding the activity of this segment of the fleet. However, relevant data can be obtained from Association of Inshore Fisheries and Conservation (IFCAs) and will be used to develop more detailed guidance to assist with identification of any management measures.
  
- **Contaminants**
  - Although use of many substances that have contaminated the environment is now illegal, re-suspension or reintroduction of pollutants that were used historically occurs. It is also difficult to identify sources of contamination when dealing with highly mobile species.

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## 8 Annex A: Assessment process to establish the significant threats to UK harbour porpoise populations

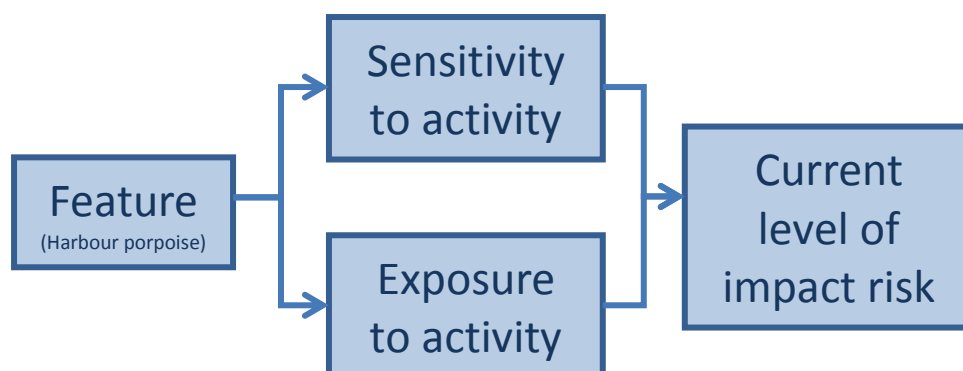
The sensitivity and vulnerability of harbour porpoise was assessed at UK level against the *pressure themes* identified by OSPAR's Intersessional Correspondence Group on Coordination of Biodiversity Assessment and Monitoring (ICG-COBAM)<sup>12</sup> which have been adapted slightly in order to suit the application of a highly mobile species. See Annex B for the definitions of pressures as used for the harbour porpoise assessments.

### Definition of key terms

| Term           | Definition  |
|----------------|---|
| Pressure theme | A group of like-pressures defined by ICG-COBAM  |
| Sensitivity    | A measure of tolerance (or intolerance) to changes in environmental conditions  |
| Vulnerability  | Vulnerability is a measure of the degree of exposure of a receptor to a pressure to which it is sensitive.  |
| Pressure       | The mechanism through which an activity has an effect on any part of the ecosystem'. The nature of the pressure is determined by activity type, intensity and distribution. |
| Impact         | The effects (or consequences) of a pressure on a component.   |
| Impact Risk    | The current risk of impact  |
| Exposure       | The action of a pressure on a receptor, with regard to the extent, magnitude and duration of the pressure.  |
| Activity       | Human social or economic action or endeavours that may create pressures on the marine environment.  |

Source: [jncc.defra.gov.uk/page-6515](http://jncc.defra.gov.uk/page-6515)

### Determining the level of impact risk of harbour porpoise to an activity



### Sensitivity

Harbour porpoises were assessed as sensitive to a pressure when viability of an individual (including physiological stress, reduced fecundity, reduced growth) would be negatively affected and recovery did not take place rapidly (within weeks). The assessment incorporated expert judgement where required and adopted a single threshold to differentiate only between 'sensitive' and 'not sensitive'. The pressures that harbour porpoise are deemed sensitive to are listed in Table A1.

<sup>12</sup> OSPAR 20011: <https://ospar.basecamphq.com/projects/6526112-icg-cobam/log>



**Table A1:** Pressures to which harbour porpoise may be sensitive.

| Pressure Theme                              | Pressures                           | Direct or Indirect impact   |
|---|-------------------------------------|-----------------------------|
| <b>Pollution and other chemical changes</b> | Contamination                       | Indirect – prey and habitat |
|   | Enrichment                          | Indirect - habitat          |
| <b>Other physical pressures</b>             | Litter                              | Direct                      |
|   | Anthropogenic underwater sound      | Direct                      |
|   | Barrier to species movement         | Direct                      |
|   | Death or injury by collision        | Direct                      |
| <b>Biological pressures</b>                 | Introduction of microbial pathogens | Direct                      |
|   | Removal of target species           | Direct                      |
|   | Removal of non-target species       | Direct                      |

## Exposure

The list of pressures to which harbour porpoise is sensitive was combined with evidence of general exposure to these pressures in UK waters to get an understanding of the current level of impact risk; it combined expert knowledge on the overlap in spatial and temporal distributions of activities contributing towards a pressure and harbour porpoise densities, with direct evidence of impact as reported in the literature and from the UK Cetacean Strandings Investigation Programme<sup>13</sup>.

## Current level of impact risk

Caution was applied throughout the assessment process where there was a lack of direct evidence of exposure to an activity; a pressure to which a species was sensitive, was assumed to overlap with that species unless a case could be made to the contrary. In this sense, lack of direct evidence of exposure does not imply the species is not currently at risk. The current level of impact risk of harbour porpoise has not been assessed on a site basis due to uncertainties in exposure, driven by incomplete evidence to support the assessment at the site scale. The following level of impact scores were chosen to represent harbour porpoise vulnerability to activities within UK waters:

| Scores        | Criteria for overlap in space & time between pressure & species | Evidence of impact                                |
|---------------|---|---|
| <b>Low</b>    | None or limited   | No direct evidence in UK waters                   |
| <b>Medium</b> | Some  | Some evidence of an impact occurring in UK waters |
| <b>High</b>   | Widespread  | Good evidence of a significant impact             |

The evidence used to assess the current level of impact is summarised in Table A3 and subsequent reference list.

Activities with a level of impact risk of 'low' have not been considered in the site assessments unless there is evidence to support a significant vulnerability despite the criteria described in the table above. This assessment, although inclusive of expert judgement in order to arrive at the assessment outcomes at UK level, provide a base from which to apply weighting to site based sensitivity assessments, using all available activity data.

<sup>13</sup> UK Cetacean Strandings Investigation Programme: <http://ukstrandings.org/>

**Table A2:** Full assessment of level of impact of activities on harbour porpoise in UK waters.

| <b>Activities</b>   | <b>Pressures</b>                           | <b>Impacts</b>   | <b>Current level of impact risk</b> |
|---|--|--|-------------------------------------|
| Commercial fisheries with bycatch (predominantly static nets)   | Removal of non-target species              | <ul style="list-style-type: none"> <li>Mortality through entanglement/bycatch</li> </ul>   | High                                |
| Discharge/run-off from land-fill, terrestrial and offshore industries   | Contaminants                               | <ul style="list-style-type: none"> <li>Affects on water and prey quality</li> <li>bioaccumulation through contaminated prey ingestion</li> <li>health issues (e.g. on reproduction)</li> </ul>                                     | High                                |
| Noise from shipping, drilling, dredging and disposal, aggregate extraction, pile driving, acoustic surveys, underwater explosion, military activity, acoustic deterrent devices and recreational boating activity | Anthropogenic underwater sound             | <ul style="list-style-type: none"> <li>Mortality</li> <li>Internal injury</li> <li>disturbance leading to physical and acoustic behavioural changes (potentially impacting foraging, navigation, breeding, socialising)</li> </ul> | Medium                              |
| Shipping, recreational boating, renewable energy installations  | Death or injury by collision               | <ul style="list-style-type: none"> <li>Mortality</li> <li>Injury</li> </ul>  | Medium/Low                          |
| Commercial fisheries, bycatch   | Removal of target species                  | <ul style="list-style-type: none"> <li>Reduction in food availability</li> <li>increased competition from other species</li> <li>displacement from natural range</li> </ul>  | Medium                              |
| Agriculture, aquaculture, sewage  | Nutrient enrichment                        | <ul style="list-style-type: none"> <li>Affects on water quality</li> <li>increased risk of algal blooms may present health issues</li> </ul>   | Low                                 |
| Agriculture, aquaculture, sewage  | Organic enrichment                         | <ul style="list-style-type: none"> <li>Affects on water quality</li> <li>increased risk of algal blooms may present health issues</li> </ul>   | Low                                 |
| Waste disposal - navigational dredging (capital, maintenance)   | Physical change (to another seabed type)   | <ul style="list-style-type: none"> <li>Changes in availability of prey species</li> </ul>  | Low                                 |
| Bridges, tunnels, dams, installations, presence of vessels (shipping, recreation)   | Water flow (tidal current) changes - local | <ul style="list-style-type: none"> <li>Changes in location of prey species</li> <li>Displacement of harbour porpoise</li> </ul>  | Low                                 |
| Terrestrial and at-sea 'disposal'   | Litter                                     | <ul style="list-style-type: none"> <li>Mortality through entanglement</li> <li>Ingestion</li> </ul>  | Low                                 |
| Bridges, tunnels, dams, installations, presence of vessels (shipping, recreation)   | Barrier to species movement                | <ul style="list-style-type: none"> <li>Habitat inaccessible</li> <li>potential physiological effects</li> </ul>  | Low                                 |
| Sewage  | Introduction of microbial pathogens        | <ul style="list-style-type: none"> <li>Increased risk of disease</li> </ul>  | Low                                 |

**Table A3:** Evidence used to assess exposure to each pressure to which harbour porpoise is considered sensitive.

Example activities linked to each pressure are listed.

| Key activities linked to pressures  | Pressures                                  | Evidence                             |                         | Key references  |
|---|--|--------------------------------------|-------------------------|---|
|   |  | Spatial overlap (species & pressure) | Post-mortem examination |   |
| Discharge/run-off from land-fill, terrestrial and offshore industries       | <b>Contaminants</b>                        |                                      | ✓                       | Jepson <i>et al</i> 2005; Deaville & Jepson, 2011; ICES, 2015a; Van De Vijver <i>et al</i> 2003; Law <i>et al</i> 2012; Pierce <i>et al</i> 2008; Murphy <i>et al</i> 2015. |
| Agriculture, aquaculture, sewage  | <b>Nutrient enrichment</b>                 | ✓                                    | ✓                       | Craig <i>et al</i> 2013   |
| Agriculture, aquaculture' sewage  | <b>Organic enrichment</b>                  | ✓                                    |                         | Craig <i>et al</i> 2013   |
| Terrestrial and at-sea 'disposal'   | <b>Litter</b>                              | ✓                                    | ✓                       | Deaville and Jepson, 2011   |
| Marine renewable energy   | <b>Electromagnetic changes</b>             | ✓                                    |                         | WGMME, 2012, ICES 2015a   |
| Shipping, drilling, dredging, pile driving, military sonar, seismic surveys | <b>Anthropogenic underwater sound</b>      | ✓                                    |                         | Deaville & Jepson, 2011; Stone & Tasker, 2006; Stone, 2015; Jepson <i>et al</i> 2005; Fernandez <i>et al</i> 2005; Würsig & Richardson, 2009; WGMME, 2012.                  |
| Bridges, tunnels, dams, installations                                       | <b>Barrier to species movement</b>         | ✓                                    |                         | WGMME., 2012; ICES 2015a  |
| Shipping, recreational boating, renewable energy devices                    | <b>Death or injury by collision</b>        | ✓                                    | ✓                       | Deaville & Jepson, 2011; Dolman <i>et al</i> 2006; ICES 2015a   |
| Sewage  | <b>Introduction of microbial pathogens</b> |                                      | ✓                       | Harvell <i>et al</i> 1999; Gulland and Hall, 2007; Van Bresseem <i>et al</i> 2009   |
| Commercial fisheries  | <b>Removal of target species</b>           |                                      | ✓                       | Simmonds and Isaac, 2007; OSPAR QSR 2010; MacLeod <i>et al</i> 2007a, b; Thompson <i>et al</i> 2007; Santos and Pierce, 2003; Pierce <i>et al</i> 2007; ICES 2015a          |
| Commercial fisheries with by-catch  | <b>Removal of non-target species</b>       | ✓                                    | ✓                       | Deaville and Jepson, 2011; Morizur <i>et al</i> 1999; Read <i>et al</i> 2006; Northridge, S. and Kingston, A. 2010; Northridge <i>et al</i> 2013; ICES 2015b                |

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## 9 Annex B: Definitions of Pressures as applied within harbour porpoise SAC Advice on Activities

| <b>Pressures</b>                      | <b>Definition in the context of harbour porpoise advice</b>  |
|---------------------------------------|--|
| <b>Removal of non-target species</b>  | The removal of species not targeted by the fishery; in this case the bycatch (and probable mortality) of harbour porpoise  |
| <b>Contaminants</b>                   | Introduced material capable of contaminating harbour porpoise, prey or habitat important to harbour porpoise, with a negative impact directly or indirectly on porpoises |
| <b>Anthropogenic underwater sound</b> | Introduced noise in a frequency with the potential to cause injury or displace harbour porpoise from their natural range   |
| <b>Death or injury by collision</b>   | Introduction of physical objects; mobile or immobile, that may collide with or result in potential collision of harbour porpoise resulting in injury or mortality        |
| <b>Removal of target species</b>      | Removal of harbour porpoise prey, resulting in increased competition amongst porpoise and other species, and/or displacement from their natural range                    |