



**Harbour Porpoise (*Phocoena phocoena*) possible
Special Area of Conservation:
Bristol Channel Approaches / Dynesfeydd Môr
Hafren**

**Draft Conservation Objectives and
Advice on Activities**

January 2016

Advice under Regulation 18 of The Offshore Marine Conservation (Natural Habitats, &c.) 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).

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Summary of Conservation Objectives and Advice on Activities

The Conservation Objectives and Advice on Activities are set out for the Bristol Channel Approaches/Dynesfeydd Môr Hafren 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), Natural Resources Wales (NRW) 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 improves.

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 Bristol Channel Approaches/ Dynesfeydd Môr Hafren harbour porpoise site, the relevant¹ and competent² authorities should consider human activities within their remit which might affect the integrity of the site.

¹ 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.

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

Crynodeb o Amcanion Cadwraeth a Chyngor ynglŷn â Gweithgareddau

Mae'r Amcanion Cadwraeth a'r Cyngor ynglŷn â Gweithgareddau wedi'u nodi ar gyfer rhywogaeth Atodiad II Ardal Cadwraeth Arbennig posibl (ACAp) Bristol Channel Approaches/Dynesfeydd Môr Hafren, sef y llamhidydd (*Phocoena phocoena*). Mae'r safle'n cwmpasu dyfroedd y glannau (o fewn 12 morfilltir i'r arfordir) a dyfroedd alltraeth (y tu hwnt i 12 morfilltir o'r arfordir) lle mae gan Cyfoeth Naturiol Cymru (CNC), Natural England (NE) a'r Cyd-bwyllgor Cadwraeth Natur i gyd gyfrifoldebau cynghori.

Mae angen trosi'r amcan cyffredinol o gyrraedd neu gynnal Statws Cadwraethol Ffafirol i bob rhywogaeth a math o gynefin sydd wedi'u rhestru yn Atodiadau I a II o'r Gyfarwyddeb Cynefinoedd yn Amcanion Cadwraeth ar lefel safle. Rhaid i'r rhain ddisgrifio'r cyflwr y dylai rhywogaethau a mathau o gynefin o fewn safle ei wireddu er mwyn i'r safle gyfrannu yn y ffordd orau posibl tuag at wireddu Statws Cadwraethol Ffafirol ar lefel genedlaethol, bio-ddaearyddol ac Ewropeaidd. Cafodd yr Amcanion Cadwraeth eu datblygu ar gyfer y nodwedd (y llamhidydd) ledled y rhwydwaith o Ardaloedd Cadwraeth Arbennig posibl sy'n cael ei argymhell i sicrhau cydlynad ar draws y rhwydwaith. Mae hyn yn briodol hefyd i boblogaeth symudol a pharhaus, sy'n crwydro'n eang. Mae'r Cyngor ynglŷn â Gweithgareddau yn benodol i safle ond wedi'i seilio ar asesiad bras o sensitifrwydd y llamhidydd i bwysau o wneuthuriad dyn ar raddfa'r Deyrnas Unedig. Cafodd y cyngor ei ddatblygu gan ddefnyddio'r wybodaeth wyddonol a'r dehongliad arbenigol gorau a oedd ar gael ym mis Tachwedd 2015. Gallai'r cyngor a roddir yma newid wrth i'n gwbyodaeth am y safle ac effaith gweithgareddau dynol wella.

Dylai'r safle gael ei reoli mewn ffordd sy'n sicrhau ei fod yn cyfrannu cymaint â phosibl tuag at gynnal poblogaeth y llamhidydd ar Statws Cadwraethol Ffafirol. Gallai hyn olygu bod angen rheoli gweithgareddau dynol sy'n digwydd ar y safle neu yn y cyffiniau, os ydynt yn debygol o gael effaith niweidiol ar Amcanion Cadwraeth y safle un ai'n uniongyrchol neu'n anuniongyrchol, fel a nodir drwy'r broses asesu. Ar hyn o bryd ni ellir rheoli gweithgareddau a allai effeithio ar brosesau y mae'r llamhidydd yn ddibynnol arnynt, e.e. recriwtio rhywogaethau ysglyfaeth o gynefinoedd cynnal, oherwydd bod y dystiolaeth yn cysylltu nodweddion cynefin ag ysglyfaeth y llamhidydd yn annigonol (neu nid oes unrhyw dystiolaeth o gwbl yn aml). Mae yna rywfaint o wybodaeth am ysglyfaeth llamhidyddion, ond ni wyddom lawer am yr ysglyfaeth y maent yn ei ffafrio tra maent o fewn y safleoedd. Dylid nodi bod y llamhidydd, fel Rhywogaeth a Warchodir gan Ewrop o dan Atodiad IV o'r Gyfarwyddeb Cynefinoedd, eisoes yn cael ei warchod yn llym pryd bynnag y mae mewn dyfroedd Ewropeaidd. Mae sawl mesur rheoli eisoes ar waith felly yn y Deyrnas Unedig.

I gyflawni'r Amcanion Cadwraeth ar gyfer y llamhidydd, dylai'r awdurdodau perthnasol³ a chymwys⁴ yng nghyswllt safle Bristol Channel Approaches/Dynesfeydd Môr Hafren ystyried gweithgareddau dynol o fewn eu cylch gwaith a allai effeithio ar y safle ac ar Amcanion Cadwraeth y safle fel y'u disgrifiwyd.

³ Awdurdodau perthnasol yw'r rhai sydd eisoes yn cyflawni rhyw fath o swyddogaeth reoleiddio forol ac a fyddai felly yn ymwneud yn uniongyrchol â rheoli safle morol.

⁴ Awdurdod cymwys yw unrhyw Weinidog, adran llywodraeth, ymglymerwr cyhoeddus neu statudol, corff cyhoeddus o unrhyw fath neu berson sy'n dal swydd gyhoeddus.

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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.

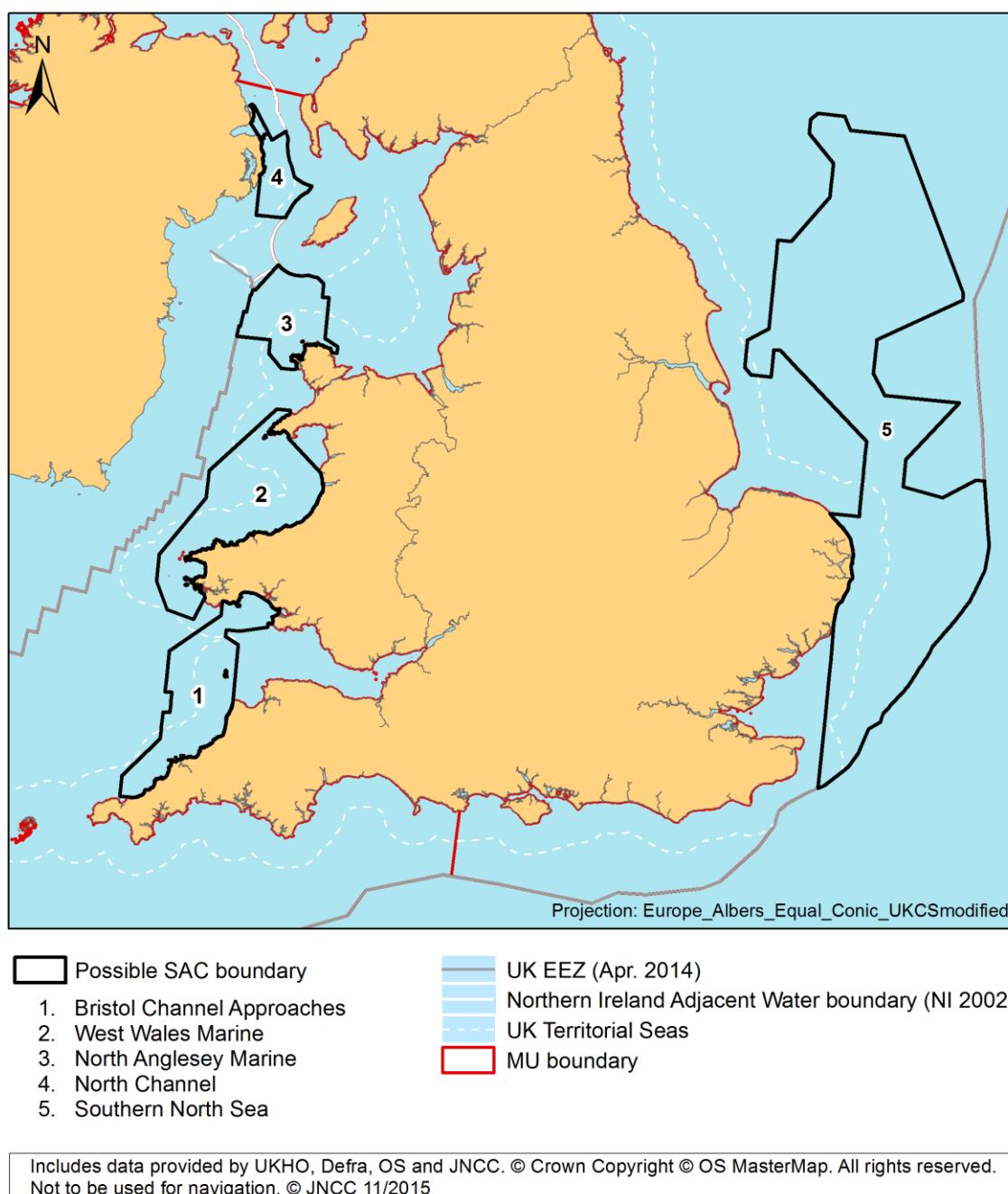


Figure 1: Possible Special Areas of Conservation for the harbour porpoise, *Phocoena phocoena* identified in Northern Ireland, England, Wales and offshore waters. The MU boundary refers to Management Units North Sea and Celtic and Irish Seas.

This advice is for the Bristol Channel Approaches/ Dynesfeydd Môr Hafren site (Figure 1) which is subject to protection under the Habitats Directive as transposed by the Conservation of Habitats and Species Regulations 2010⁵ and the Offshore Marine Conservation Regulations (Natural Habitats, &c.) Regulations 2007⁶ (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 designated⁷. 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 natural variability and the 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 The role of Conservation Objectives

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.

⁵ http://www.legislation.gov.uk/ukxi/2010/490/pdfs/ukxi_20100490_en.pdf

⁶ http://www.legislation.gov.uk/ukxi/2007/1842/pdfs/ukxi_20071842_en.pdf

⁷ This Conservation Objectives/Advice on Activities Reg 18/35 package differs in format from previous Welsh inshore SAC Reg 33/35 packages because it is a single feature site that is cross boundary (inshore and offshore waters).

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 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 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 to 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 Bristol Channel Approaches/ Dynesfeydd Môr Hafren pSAC Conservation Objectives

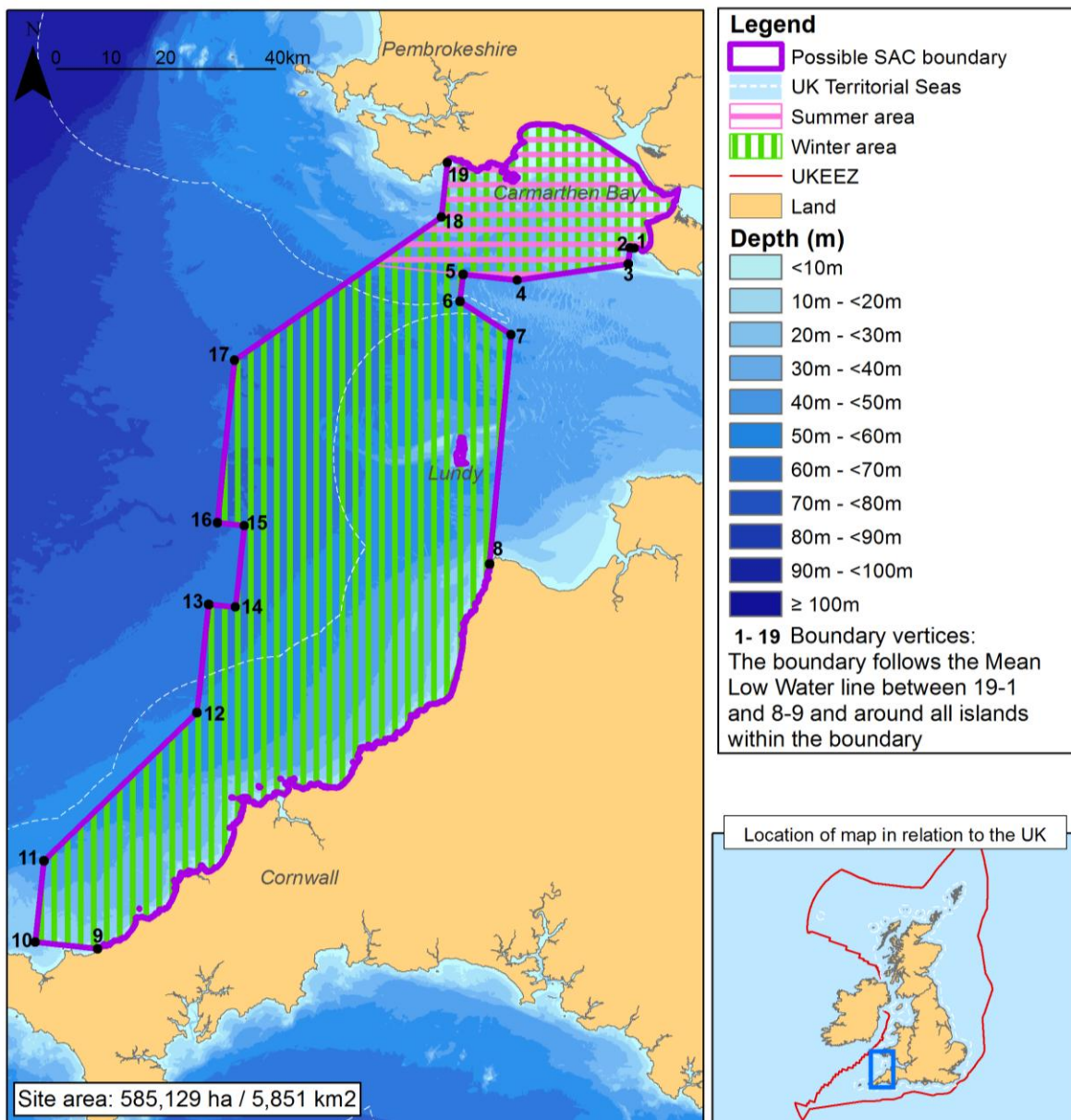
The Bristol Channel Approaches / Dynesfeydd Môr Hafren pSAC extends across the mouth of the Bristol Channel (Figure 2).

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 the whole of the site during winter and in a part of the site in Carmarthen Bay during summer (Figure 2). The seasonality in porpoise distribution should be considered in the assessment of impacts and proposed management.

Bristol Channel Approaches / Dynesfeydd Môr Hafren



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ID	Latitude	Longitude	ID	Latitude	Longitude	ID	Latitude	Longitude
1	51° 33' 50.9" N	04° 20' 01.3" W	8	51° 0' 32.0" N	04° 32' 09.0" W	14	50° 51' 06.0" N	05° 09' 27.8" W
2	51° 33' 48.3" N	04° 20' 44.1" W	9	50° 15' 17.4" N	05° 18' 49.0" W	15	50° 59' 06.7" N	05° 10' 52.6" W
3	51° 32' 12.5" N	04° 20' 28.6" W	10	50° 14' 35.3" N	05° 28' 27.3" W	16	50° 58' 48.7" N	05° 15' 06.3" W
4	51° 28' 26.2" N	04° 37' 07.9" W	11	50° 22' 35.6" N	05° 29' 53.4" W	17	51° 14' 49.8" N	05° 17' 59.2" W
5	51° 27' 52.1" N	04° 45' 44.3" W	12	50° 40' 07.3" N	05° 11' 48.0" W	18	51° 32' 55.6" N	04° 50' 56.4" W
6	51° 25' 11.8" N	04° 45' 17.0" W	13	50° 50' 48.2" N	05° 13' 40.9" W	19	51° 38' 16.5" N	04° 51' 52.1" W
7	51° 23' 05.2" N	04° 36' 17.1" W						

Figure 2: The Bristol Channel Approaches/ Dynesfeydd Môr Hafren 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 UK 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, although their interpretation is contextualised in their contribution to maintaining FCS at a wider scale (EC, 2012). With regard the Bristol Channel Approaches / Dynesfeydd Môr Hafren 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.

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 Bristol Channel Approaches / Dynesfeydd Môr Hafren site has been selected primarily on the basis of its long-term, preferential use by harbour porpoise in contrast to other areas of the UK portion of the Irish and Celtic Seas. 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, 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 guidance⁸ 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*".

⁸ http://ec.europa.eu/environment/nature/conservation/species/guidance/pdf/guidance_en.pdf

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 &c.) Regulations 1994 and its amendments consolidated in The Conservation of Habitats and Species Regulations 2010 for England and Wales.

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, &c.) Regulations 2007 (Offshore Marine Regulations, OMR, as amended in 2009 and 2010) and Regulation 41(2) of the Conservation of Habitats and Species Regulations 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 guidance⁹. 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 that risk 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 (see 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 noise¹⁰. 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 Bristol Channel Approaches / Dynesfeydd Môr Hafren 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 Celtic 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 any impacts within the site translate into effects on the Celtic and Irish Seas Management Unit population are of greatest concern.

⁹ http://jncc.defra.gov.uk/PDF/consultation_epsGuidanceDisturbance_all.pdf

¹⁰ <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 (some of which may have spawning grounds within the Bristol Channel Approaches / Dynesfeydd Môr Hafren site). However, the diet of porpoises specifically when using the site is unknown. In the UK as a whole, the activity which potentially poses a risk to the achievement of this conservation objective 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 Bristol Channel Approaches / Dynesfeydd Môr Hafren site is based on the prediction of 'harbour porpoise habitat' within the Celtic and Irish Seas (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 Bristol Channel Approaches / Dynesfeydd Môr Hafren site are likely to vary seasonally (Figure 2). At the Management Unit scale, 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 Bristol Channel Approaches/ Dynesfeydd Môr Hafren 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 given only where pressures¹¹ 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 the 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

¹¹ See Annex A for definition of key terms

conservation objectives, and thereby focus the attention of Relevant and Competent Authorities and surveillance programmes to areas that may need management measures.

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 presented without prejudice to any assessment that may be required for specific proposals to be considered by a Relevant and/or Competent 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 and/or Competent 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)	Removal of non-target species	<ul style="list-style-type: none"> • Mortality through entanglement/bycatch 	High
Discharge/run-off from land-fill, terrestrial and offshore industries	Contaminants	<ul style="list-style-type: none"> • Affects on water and prey quality • bioaccumulation through contaminated prey ingestion • health issues (e.g. on reproduction) 	High
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"> • Mortality • Internal injury • disturbance leading to physical and acoustic behavioural changes (potentially impacting foraging, navigation, breeding, socialising) 	Medium
Shipping, recreational boating, tidal energy installations	Death or injury by collision	<ul style="list-style-type: none"> • Mortality • Injury 	Medium/Low
Commercial fisheries (reduction in prey resources)	Removal of target species	<ul style="list-style-type: none"> • Reduction in food availability • increased competition from other species • displacement from natural range 	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 the population. The relevant commercial fisheries with harbour porpoise bycatch are 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 812/2004¹² on set net 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

¹² <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:150:0012:0031:EN:PDF>

important, and research in this field should not remain focused on 'old' compounds and 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: Bristol Channel Approaches/ Dynesfeydd Môr Hafren pSAC

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

The Bristol Channel Approaches / Dynesfeydd Môr Hafren site covers an area of 5,851km² and stretches along the north Cornish coast and across the Bristol Channel north towards Carmarthen Bay in Wales. Further detail on the site can be found in the Selection Assessment Document¹³.

¹³ SAC Selection Assessment Document:
<http://jncc.defra.gov.uk/pdf/BristolChannelApproachesSelectionAssessmentDocument.pdf>

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.

Table 2 is an overview of activities occurring within or in proximity to the Bristol Channel Approaches / Dynesfeydd Môr Hafren 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 project) is likely to significantly affect a European Marine site (EMS), Article 6(3) of the Habitats Directive requires that an Appropriate Assessment (AA) 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 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 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 of 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). The Welsh Government is developing an approach for assessing fishing activities in European marine sites in Wales.

Table 2: Activities occurring within/near to the Bristol Channel Approaches/ Dynesfeydd Môr Hafren site to which the harbour porpoise is considered sensitive.

Activities	Pressure	Comment on current level of activity	Management considerations
Fisheries (commercial and recreational) with harbour porpoise bycatch	Removal of non-target (bycatch) species	<p>UK registered vessels >12m: negligible activity within most of the site. Higher effort in the western offshore area of the site.</p> <p>Welsh Vessels <12m (majority of Welsh small scale commercial fleet) that include static nets have minor effort and negligible to no bycatch.</p> <p>English vessels <12m: static net effort in the site is currently unknown. Monitoring data show harbour porpoise bycatch to</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/Welsh Government)</p> <p>The use of pingers as a mitigation measure is required on static nets deployed by vessels >12m in length in ICES areas VII f and g (within which the site straddles) through EU Regulation</p>

		<p>be of greatest concern in UK waters in the South Western Approaches (ICES VIIId-g) (e.g. Northridge et al. 2014). Recreational netting also occurs at a low level of effort along the coast (at least in Wales) with negligible to no bycatch</p> <p>EU registered vessels: little evidence from Vessel Monitoring Systems (VMS) of >12m non-UK vessels currently using static net gears within the site</p>	<p>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 <12m, one option for management could be to extend the pinger requirement to further vessels (having established the risk of bycatch for a particular fishery) deploying static nets within site boundaries. 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.</p>
Discharge/run-off from land-fill, terrestrial/off shore industries	Contaminants	Current exposure within/near the site is unknown	<p>This pressure generally 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, human activities 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	Relatively low levels of shipping through the site, predominantly running parallel to the coast of SW England and SW Wales into Bristol Channel ports (Cardiff, Newport, Barry and Avonmouth). Some aggregate is landed at Burry port in north of the site. Coastal landing sites on the coast of Wales, and an offshore block in the south of the site are used by the MOD	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 compared to other parts of the Celtic Irish Sea Management Unit.
Dredging and disposal		Small overlap of a dredge disposal site in the far east close to the English coast	Dredging and disposal 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

Aggregate extraction		Active aggregate extraction site within Welsh waters (Nobel Bank)	Aggregate extraction can pose disturbance leading to physical and acoustic behavioural changes. However, the risk is considered relatively low and additional management is unlikely to be required
Acoustic (including seismic) surveys		Multibeam surveys carried out across active dredge areas but sub-bottom profiling, sidescan sonar and seismic surveys are not routinely carried out within the site. Acoustic seabed surveys (multibeam, sidescan survey) may be planned in parts of the site	Some geophysical surveys within 5km of site boundary may require consent and be subject to HRA. 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 JNCC Guidelines for minimising the risk of injury and disturbance to marine mammals from seismic surveys (updated August 2010; https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/50005/jncc-seismic-guide.pdf)
Offshore wind/Pile Driving		Whilst a Round 3 Zone falls partly within the pSAC, there are currently no plans for the development of an offshore windfarm here.	No further management required unless new plans or projects come forward.
Military activity		Pendine and Pembrey MOD firing ranges are situated in Carmarthen Bay. Pendine regularly has firing activity directly into the sea whereas activity at Pembrey is usually limited to low flying aircraft and terrestrial target practice. Coastal landing sites on the coast of Wales, and an offshore block in the south of the site are used by the MOD	Activities take place under Range Standing Orders which include measures to reduce the risk of killing, injury and disturbance of marine mammals (for example live firing trials are subject to confirmation that marine mammals are not present in the vicinity of targets).
Recreational boating activity		Royal Yachting Association (RYA) cruising routes throughout the site. Some pockets of higher sailing and racing activity around Tenby, Padstow and between Barnstaple and Lundy Island.	Adherence to wildlife codes of conduct is already advocated (e.g the WiSe scheme http://www.wisescheme.org/).
Acoustic deterrent/mitigation devices		Negligible or not currently present but maybe used as a mitigation tool during pile driving.	See pile driving.
Pinger devices		Requirement on >12m vessels (EC Reg812/2004).	See 'Fisheries (commercial and recreational) with harbour porpoise

		All south west based (e.g ICES area VIIe,f,g,h) >12m vessels have the DDD pingers. But none of the registered set net vessels >12m are known to fish in the site.	bycatch' The use of pingers is low/not needed in the site for >12m fleet sector.
Shipping	Death or injury by collision	Relatively low levels of shipping (see above),	Post mortem investigations of harbour porpoise 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		Cruising routes throughout the site. Some pockets of higher sailing and racing activity around Tenby, Padstow and between Barnstaple and Lundy Island.	See 'Shipping' (with death or injury by collision). Boats conducting recreational activity should adhere to wildlife codes of conduct (e.g the WiSe scheme http://www.wisescheme.org/).
Wet renewable energy installations		South Pembrokeshire and North Cornwall 'Wavehub' wave energy leasing areas exist within the site	It is likely that new tidal range, tidal stream and wave projects would be subject to a Habitats Regulations Assessment (HRA). Additionally, an EPS licence is already required if there is a risk of significant disturbance or injury. Any consented, but not yet built, tidal stream and tidal range developments likely to impact the harbour porpoise features of any new SACs will likely undergo a review of consent. Work is currently underway to develop animal detection systems, e.g. active and passive acoustics to enable monitoring of animal presence and behaviour around devices (e.g. associated with DeltaStream device in Ramsey Sound, Pembrokeshire). These systems might be used to automate a shutdown procedure and prevent collisions with moving parts. In addition, the use of ADDs has been suggested as a mitigation tool to exclude animals from the vicinity of devices.
Commercial fisheries (and recreational set nets)	Removal of target (prey) species	Demersal fisheries operating within the site, targeting species such as flatfish, with a likely bycatch of gobies and other harbour porpoise prey. Also fisheries targeting sandeel, sprat, herring, mackerel, whiting and other round fish. The prey of harbour porpoise when in the site is	Commercial species are managed at the larger scale through the CFP.

		currently unknown. The majority of Welsh fleet are vessels <10m length, i.e. small scale, deploying static nets but with minor to moderate effort.	
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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 long, (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 fisheries regulators and will be used to develop more detailed guidance to assist with identification of any management measures.
 - In Wales, the Scallop fishing fleet (mostly <12m long) have vessel tracking devices (Succorfish), but this fishery does not have harbour porpoise bycatch.
- **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

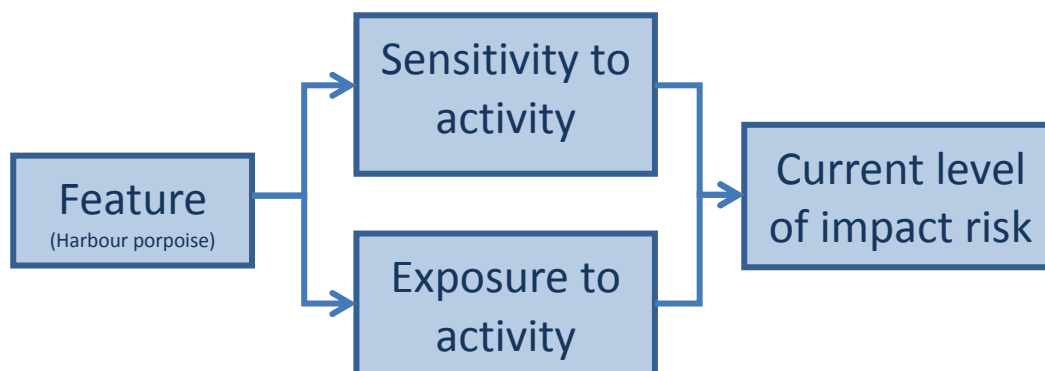
The sensitivity and vulnerability of harbour porpoise was assessed at UK level against the *pressure themes* identified by OSPAR's Intersessional Correspondence Group on Coordination of Biodiversity Assessment and Monitoring (ICG-COBAM)¹⁴ which have been adapted slightly in order to suit the application 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

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.

¹⁴ 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
Pollution and other chemical changes	Contamination	Indirect – prey and habitat
	Enrichment	Indirect - habitat
Other physical pressures	Litter	Direct
	Anthropogenic underwater sound	Direct
	Barrier to species movement	Direct
	Death or injury by collision	Direct
Biological pressures	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 Programme¹⁵.

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
Low	None or limited	No direct evidence in UK waters
Medium	Some	Some evidence of an impact occurring in UK waters
High	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.

¹⁵ UK Cetacean Strandings Investigation Programme: <http://ukstrandings.org/>

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

Activities	Pressures	Impacts	Current level of impact risk
Commercial fisheries with bycatch (predominantly static nets)	Removal of non-target species	<ul style="list-style-type: none"> • Mortality through entanglement/bycatch 	High
Discharge/run-off from land-fill, terrestrial and offshore industries	Contaminants	<ul style="list-style-type: none"> • Affects on water and prey quality • bioaccumulation through contaminated prey ingestion • health issues (e.g. on reproduction) 	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"> • Mortality • Internal injury • disturbance leading to physical and acoustic behavioural changes (potentially impacting foraging, navigation, breeding, socialising) 	Medium
Shipping, recreational boating, renewable energy installations	Death or injury by collision	<ul style="list-style-type: none"> • Mortality • Injury 	Medium/Low
Commercial fisheries, bycatch	Removal of target species	<ul style="list-style-type: none"> • Reduction in food availability • increased competition from other species • displacement from natural range 	Medium
Agriculture, aquaculture, sewage	Nutrient enrichment	<ul style="list-style-type: none"> • Affects on water quality • increased risk of algal blooms may present health issues 	Low
Agriculture, aquaculture, sewage	Organic enrichment	<ul style="list-style-type: none"> • Affects on water quality • increased risk of algal blooms may present health issues 	Low
Waste disposal - navigational dredging (capital, maintenance)	Physical change (to another seabed type)	<ul style="list-style-type: none"> • Changes in availability of prey species 	Low
Bridges, tunnels, dams, installations, presence of vessels (shipping, recreation)	Water flow (tidal current) changes - local	<ul style="list-style-type: none"> • Changes in location of prey species • Displacement of harbour porpoise 	Low
Terrestrial and at-sea 'disposal'	Litter	<ul style="list-style-type: none"> • Mortality through entanglement • Ingestion 	Low
Bridges, tunnels, dams, installations, presence of vessels (shipping, recreation)	Barrier to species movement	<ul style="list-style-type: none"> • Habitat inaccessible • potential physiological effects 	Low
Sewage	Introduction of microbial pathogens	<ul style="list-style-type: none"> • Increased risk of disease 	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	Contaminants		✓	Jepson et al, 2005; Deaville & Jepson, 2011; ICES, 2015a; Van De Vijver et al., 2003; Law et al. 2012; Pierce et al, 2008; Murphy et al, 2015.
Agriculture, aquaculture, sewage	Nutrient enrichment	✓	✓	Craig et al 2013
Agriculture, aquaculture' sewage	Organic enrichment	✓		Craig et al 2013
Terrestrial and at-sea 'disposal'	Litter	✓	✓	Deaville and Jepson, 2011
Marine renewable energy	Electromagnetic changes	✓		WGMME, 2012, ICES 2015a
Shipping, drilling, dredging, pile driving, military sonar, seismic surveys	Anthropogenic underwater sound	✓		Deaville & Jepson, 2011; Stone & Tasker, 2006; Stone, 2015; Jepson et al., 2005; Fernandez et al., 2005; Würsig & Richardson, 2009; WGMME, 2012.
Bridges, tunnels, dams, installations	Barrier to species movement	✓		WGMME., 2012; ICES 2015a
Shipping, recreational boating, renewable energy devices	Death or injury by collision	✓	✓	Deaville & Jepson, 2011; Dolman et al., 2006; ICES 2015a
Sewage	Introduction of microbial pathogens		✓	Harvell et al., 1999; Gulland and Hall, 2007; Van Bresseem et al., 2009
Commercial fisheries	Removal of target species		✓	Simmonds and Isaac, 2007; OSPAR QSR 2010; MacLeod et al 2007a, b; Thompson et al. 2007; Santos and Pierce, 2003; Pierce et al, 2007; ICES 2015b
Commercial fisheries with by-catch	Removal of non-target species	✓	✓	Deaville and Jepson, 2011; Morizur et al., 1999; Read et al., 2006; Northridge, S. and Kingston, A. 2010; Northridge et al. 2013; ICES 2015b

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

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