

Marine Scotland



Habitats Regulations Appraisal of Draft Plan for
Offshore Wind Energy in Scottish Territorial Waters:
Proposed Approach for the Screening and Assessment
of the Short and Medium Term Options

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ISBN: 978-1-78045-057-5 (web only)

The Scottish Government
St Andrew's House
Edinburgh
EH1 3DG

Produced for the Scottish Government by APS Group Scotland
DPPAS11359 (03/11)

Published by the Scottish Government, March 2011

Scottish Government

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Date: January 2011

Project Ref: R/3974/1

Report No: R.1722b

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Version	Details of Change	Authorised By	Date
1	Working Draft	CR Scott	02/11/2010
2	Draft for Comment	C R Scott	24/11/2010
3	Final Draft	C R Scott	07/01/2011
4	Final	C R Scott	21/01/2011

Document Authorisation		Signature	Date
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Summary

In May 2010, a Draft Plan for Offshore Wind Energy (OWE) in Scottish Territorial Waters was published by Marine Scotland (Marine Scotland, 2010a). The purpose of this Draft Plan is to consider the potential of Scottish Territorial Waters to accommodate OWE developments from a national perspective. It made proposals and defined potential areas as short, medium and long-term options for OWE generation.

A Strategic Environmental Assessment (SEA) of the Draft OWE Plan (Marine Scotland, 2010b) identified the potential for a likely significant effect (LSE) on sites designated for their nature conservation interest at a European Level ("European sites"). Accordingly, a Habitats Regulations Appraisal (HRA) of the Draft OWE Plan requires to be undertaken under the Habitats Regulations which implements the EU Habitats Directive in the UK. As Competent Authority, Marine Scotland is carrying out this HRA and will produce an Appropriate Assessment (AA) in fulfilment of obligations under these Regulations.

Pre-screening studies have been undertaken to identify the possible impacts of the short-term and medium-term options (Halcrow 2010 and ABPmer 2010a) to satisfy the requirements of Stages 1 to 3 and 5 of HRA process. These are defined stages of a 13-step process for Plan-level HRAs that has been identified within Scottish Natural Heritage (SNH) guidance (David Tyldesley and Associates 2010). ABP Marine Environmental Research Ltd (ABPmer) has been commissioned by Marine Scotland to complete the remaining 'screening' and 'AA information production' stages of this HRA for both the short-term and medium-term options identified in the Draft OWE Plan. With respect to the long-term options, it has been determined that these do not need to be addressed at this stage because they are too broad in scale and scope to require or allow an HRA to be undertaken.

This report presents a working paper which addresses the requirements for Stage 4 of the HRA for the short-term and medium-term options. It sets out the proposed approach to the screening of issues and assessment stages following completion of the two pre-screening phases of the HRA. In addition to reviewing the possible screening methods this report also:

- Presents the methods for taking account of plan level mitigation measures and re-screening (Stages 6 and 7 of the HRA); and
- Outlines the approach to be adopted in the subsequent AA phases, including the assessment of cumulative and in-combination impacts (Stages 8 to 10 of the HRA).

These methods are described so that they can form the focus for early consultations with the Project Steering Group (PSG) who are overseeing the HRA process. The PSG comprises representatives of Marine Scotland, The Scottish Government Environmental Assessment Team, DG Energy, Scottish Enterprise (SE), Highlands and Islands Enterprise (HIE), SNH, Joint Nature Conservation Committee (JNCC), The Crown Estate (TCE), Scottish Renewables, the Whale and Dolphin Conservation Society (WDCS) and Royal Society for the Protection of Birds (RSPB).

Abbreviations

1SW	1-Sea Winter (Salmon grilse)
AA	Appropriate Assessment
AEOI	Adverse Effect on Integrity
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas
ABPmer	ABP Marine Environmental Research Ltd
BERR	Business, Enterprise and Regulatory Reform
DECC	Department of Energy & Climate Change
DOENI	Department of Environment for Northern Ireland
EC	European Commission
EU	European Union
EIA	Environmental Impact Assessment
HELCOM	Helsinki Commission
HIE	Highlands and Islands Enterprise
HRA	Habitats Regulations Appraisal
HRGN	Habitats Regulations Guidance Note
IROPI	Imperative Reasons for Overriding Public Interest
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effect
MSW	Multi-Sea Winter (Salmon)
N-RIP	National Renewables Infrastructure Plan
NPWS	National Parks and Wildlife Service
ODPM	Office of Deputy Prime Minister
OWE	Offshore Wind Energy
PFSA	Pentland Firth Strategic Area
pSAC	potential Special Area of Conservation
pSPA	potential Special Protection Area
PSG	Project Steering Group
RSPB	Royal Society for the Protection of Birds
R3OWF	Round 3 Offshore Wind Farm
SAC	Special Area of Conservation
SE	Scottish Enterprise
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SG	Scottish Government
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPP	Scottish Planning Policy
SSSI	Sites of Special Scientific Interest
STW	Scottish Territorial Waters
TCE	The Crown Estate
UK	United Kingdom
WAG	Welsh Assembly Government
WDCCS	Whale and Dolphin Conservation Society
WHS	World Heritage Site

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1. Introduction

In May 2010, a Draft Plan for Offshore Wind Energy (OWE) in Scottish Territorial Waters was published by Marine Scotland (Marine Scotland, 2010a). The purpose of this Draft Plan is to consider the potential of Scottish Territorial Waters to accommodate OWE developments from a national perspective. It made proposals and defined potential areas as short, medium and long-term options for OWE generation.

This Draft Plan has been fundamentally shaped by a Strategic Environmental Assessment (SEA) which was undertaken in accordance with the Environmental Assessment (Scotland) Act 2005 (Marine Scotland, 2010b). The SEA identified the potential for significant adverse effects on sites designated for their nature conservation interest at a European Level¹ (hereafter referred to as "European sites") and International Level (namely Ramsar sites). Accordingly, a Habitats Regulations Appraisal (HRA) of the OWE options requires to be undertaken under the Habitats Regulations which implement the EC Habitats Directive in the UK². As Competent Authority, Marine Scotland is carrying out this HRA and will produce an Appropriate Assessment (AA) in fulfilment of obligations under these Regulations.

A separate pre-screening review of the short-term options has already been carried out (Halcrow 2010) and ABP Marine Environmental Research Ltd (ABPmer) has been commissioned by Marine Scotland to undertake the remaining 'screening' and 'AA information production' stages of this HRA. This remaining HRA work will encompass both the short-term and medium-term options identified in the Draft OWE Plan. The location of these option areas is shown in Figure 1 and it is important to note that these options should be viewed as 'areas of search' within which offshore wind energy generation could take place. With respect to the long-term options, it has been agreed in discussion with the Project Steering Group (meeting dated 22 October 2010), that these do not need to be addressed at this stage because they are too broad in scale and scope to require or allow an HRA to be undertaken.

For the first part of this HRA work, a pre-screening study was undertaken to identify the possible impacts of the OWE medium term sites on European/Ramsar sites and satisfy the requirements of Stages 1 to 3 and 5 of the HRA process (ABPmer 2010a). These stages represent the initial parts of a 13-step process for Plan-level HRA work that has been identified in the recently completed SNH guidance (David Tyldesley and Associates 2010). This guidance will be followed throughout this HRA work.

Following completion and consultation on these separately completed short and medium term pre-screening reviews, this report now sets out the proposed approach to the further screening and assessment stages which will be undertaken for integrated Plan-level HRA of both the

¹ Sites designated for their nature conservation interest at a European level comprise designated Special Areas of Conservation (SACs) and classified Special Protection Areas (SPAs), as well as candidate SACs and possible SPAs. Collectively these are referred to European sites while those SACs and SPAs which are wholly or partially marine are referred to as European Marine Sites or European Marine Offshore Sites.

² Each EC Member State is ultimately responsible for implementation of the Directives in their territory and in Scotland, the EC Habitats Directive is transposed through a combination of the Habitats Regulations 2010 (in relation to reserved matters) and the Conservation (Natural Habitats, &c.) Regulations 1994 (as well as Scottish Statutory amendments made between 2004 and 2007).

short and medium term options together. This review of methods meets the requirements for the (discretionary) Stage 4 of the HRA process.

The HRA process for the Draft OWE plan is being overseen by a Project Steering Group (PSG) that comprises representatives of Marine Scotland, The Scottish Government Environmental Assessment Team, DG Energy, Scottish Enterprise (SE), Highlands and Islands Enterprise (HIE), Scottish Natural Heritage (SNH), Joint Nature Conservation Committee (JNCC), The Crown Estate (TCE), Scottish Renewables, the Whale and Dolphin Conservation Society (WDCS) and Royal Society for the Protection of Birds (RSPB). With respect to the long-term options, it has been agreed in discussion with the PSG (meeting dated 22 October 2010), that these do not need to be addressed at this stage because they are too broad in scale and scope to require or allow an HRA to be undertaken.

1.1 Legislative Context and Project Approach

Where a plan or project is not directly connected with or necessary for the management of designated European sites or offshore European sites, including Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), and where the possibility of a likely significant effect (LSE) on these sites cannot be excluded, either alone or in combination with other plans or projects, an Appropriate Assessment (AA) should be undertaken in view of the site's conservation objectives by the Competent Authority in compliance with the Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive). In the UK, it is Government policy (as indicated in the following documents: Scottish Government (SG) 2010, Office of Deputy Prime Minister (ODPM) 2005, Welsh Assembly Government (WAG) 2010, Department of Environment for Northern Ireland (DOENI) 1997), that these requirements are also extended to the consideration of effects on sites that are proposed for designation such as proposed SPAs (pSPAs) and possible SACs (pSACs), and this would also include any proposed extensions or additions to existing European sites.

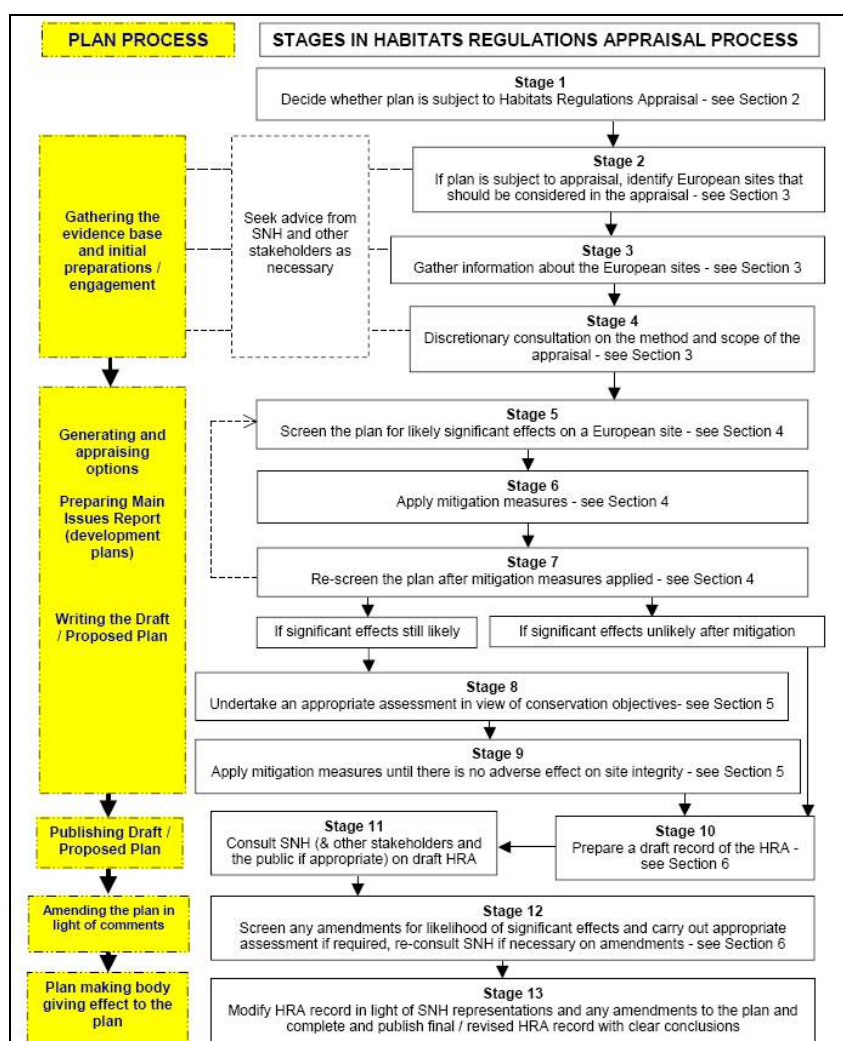
In Scotland, it is also a matter of policy as set out in the February 2010 Scottish Planning Policy document (SG, 2010) that international Ramsar sites³ are 'also Natura sites and/or Sites of Special Scientific Interest and are protected under the relevant statutory regimes'. Therefore, in Scotland, where the interests of Ramsar sites correspond with those of overlapping European sites, there is no need to consider them separately. In the rest of the UK it is also a matter of policy that Ramsar sites should receive the same protection as designated SPAs and SACs. In recognition of this, sites protected either by law under the Habitats Regulations, or by Government policy, are referred to throughout the HRA process as European/Ramsar sites.

When evaluating the effects on these designated sites as part for the HRA process, if Marine Scotland, as Competent Authority, cannot conclude that the draft OWE plan will not have an adverse effect on the integrity of a European/Ramsar site (either alone or in combination with other plans or projects) the plan can only be adopted if it has been ascertained that there are no alternative solutions and it is necessary for Imperative Reasons for Overriding Public

³ Ramsar sites are wetlands designated under the Ramsar Convention on Wetlands of International Importance, especially as waterfowl habitat.

Interest (IROPI), including those of a social or economic nature⁴. In such cases, compensatory measures must be taken to ensure that the overall coherence of the network of Natura 2000 sites is maintained.

For this HRA, an iterative and auditable process will be followed to ensure that there is as much clarity as possible in the process and also to ensure that the relevant documentation can be readily accessed, interpreted and interrogated. In particular, as noted above, this iterative process draws upon the agreed guidance for undertaking HRAs for plans in Scotland which has been set out in the report produced on behalf of SNH by David Tyldesley and Associates (2010). This guidance document sets out the 13 stages to be pursued in a flow diagram format and this figure is reproduced here in Image 1.



(David Tyldesley and Associates 2010)

Image 1. Key stages of HRA process for plans

⁴ Article 6 of the Habitats Directive also states that, where the site concerned hosts a priority natural habitat, type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest.

In outline the HRA for the OWE Draft Plan will cover these 13 stages in the following iterative steps:

- **Pre-screening Reports:** Two reports by Halcrow (2010) and ABPmer (in prep) covered **Stages 1 to 3 and 5** of the HRA process for the short and medium term options respectively. These act as an initial 'sifting' exercise for which the aim is to identify the relevant European/Ramsar sites and interest features for which there is a potential for a likely significant effect (LSE) (or where such a LSE cannot be excluded) and then ensure that these sites are taken forward into the assessment process.
- **Working Paper (this document):** This technical note covers the discretionary **Stage 4** by setting out (for consultation with the PSG) the methods to be adopted for the screening of issues and AA phases of the HRA (see Section 1.3).
- **Draft Screening Review and AA Information Report:** In light of the agreements reached on the working paper, the **Stage 5** LSE judgments will be revisited to formally scope the assessment. Then the information for AA (**Stages 8 to 10**) will be prepared which considers the impact pathways⁵, habitat and species sensitivities and the effects on site integrity at Plan level. To ensure full transparency in the process, this report will include all the findings from the screening and assessment work (**Stages 1 to 10**) as a single iterative and coherent document covering both the short and medium term options for OWE in the Draft Plan.
- **Consultations with Stakeholders (Steering Group) and Final AA Information Report:** To cover **Stages 11 to 13** the draft Screening Review and AA Information Report will be forwarded to the PSG for consultation and a final assessment document produced in the light of this consultation work. The final AA will be produced by Marine Scotland as the Competent Authority.

1.2 Objectives of Working Paper

The main objectives and structure of this working paper are as follows:

- Section 2: Presents the methods (for consultation with the PSG) to be pursued for the screening of particular features within different designated sites for inclusion in the AA;
- Section 3: Presents the methods for taking account of plan level mitigation measures; and
- Section 4: Outlines the approach to be adopted in the subsequent AA phases, including the assessment of cumulative and in-combination impacts.

2. HRA Stage 4 and 5 - Methods for Screening

2.1 Introduction

This section reviews the methods, criteria and considerations that can be applied to review the pre-screening results and undertake the next screening stages of the HRA process. These

⁵ i.e. the mechanisms by which an activity arising from the offshore windfarm developments (that are proposed within Plan) could affect a relevant habitat or species

next stages involve selecting the final list of the sites and interest features which are to be 'screened into' the AA either because there is a LSE or because a LSE cannot be excluded via the identified impact pathways. The impact pathways and impacting activities are listed in Appendix A of the pre-screening report (ABPmer 2010a). Therefore, this next screening stage of the process determines which of these impact pathways needs to be taken into the assessment process because they represent a LSE.

It should be noted that LSE is not defined in the Habitats Regulations. The English Nature (EN) Habitats Regulations Guidance Note 3 (EN 1999) identifies LSE as a more than '*de minimis*' change or, in other words, any effect "that may reasonably be predicted as a consequence of a plan or project that may affect the conservation objectives of the features for which the site was designated, but excluding trivial or inconsequential effects". The European Court Waddenzee judgement⁶ provides further clarification on this aspect where it concludes that 'any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site's conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects'. Furthermore, the same judgement adds 'where a plan or project not directly connected with or necessary to the management of a site is likely to undermine the site's conservation objectives, it must be considered likely to have a significant effect on that site. The assessment of that risk must be made in the light *inter alia* of the characteristics and specific environmental conditions of the site concerned by such a plan or project.'

Given the need for a high level of certainty to meet Habitats Regulations requirements, there is a presumption in favour of 'screening issues in' at this stage, following the precautionary approach. This will be important also for undertaking any detailed assessments (at this Plan-level or in future Project-level assessment work) where there needs to be sufficient confidence in the evidence base and that the delivery of projects under the plan can be sufficiently controlled to avoid adverse effect on integrity. This will include consideration both of the potential flexibilities in the plan (location and scale of development) as well as specific and proven additional mitigation measures where necessary. When considering the relevant screening methods to determine LSE (as presented in this report), it is therefore understood that there again needs to be a presumption in favour of including rather than excluding interest features and designated sites in the HRA process at this stage.

This precautionary approach is also enshrined in the process by which judgments are to be made (during the subsequent AA) about whether the integrity of sites are affected. In particular, under the Habitats Regulations, there is a need for a high level of certainty in the assessment conclusions (also following the precautionary principle). This is also highlighted within the Waddenzee judgement which concluded that 'a plan or project [that is] likely to have significant effect on the site is only to be authorised if it is ascertained that it will not adversely affect the integrity of the site (i.e. where no reasonable scientific doubt remains as to the absence of such effects).

⁶ Landelijke Vereniging tot Behoud van de Waddenzee and Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij, C-172/02, [2005] Env LR 14.

In this context, the review below considers the approaches to be taken for screening each of the following groups of habitats and species:

- Coastal, intertidal and subtidal habitats and associated species (Section 2.2);
- Bird Species (Section 2.3);
- Marine Mammal species (Section 2.4);
- Migratory Fish and Freshwater Pearl Mussel (Section 2.5); and
- Otter (Section 2.6).

This review and the preceding pre-screening report focused on qualifying interest features of the designated sites. As advised by SNH, at the next stage, further consideration will also be given to components of individual qualifying interest features within marine SACs (e.g. sparring (the European smelt *Osmerus eperlanus*) is a fish of conservation concern listed as a typical species of habitat features within the Forth of Tay and Eden SAC).

For each of the groups listed above, precedents that were followed for two previous Plan-level HRAs are described (as requested by the PSG). These precedents are:

- The Pentland Firth Strategic Area (PFSA) HRA (ABPmer 2010b and 2010c) which related to the wave and tidal energy leasing round and
- The Round 3 Offshore Wind Farm (R3OWF) HRA (Entec 2009a and 2009b) which related to the plan for nine large-scale windfarm developments around the UK.

In both cases TCE were the lead competent authority with responsibility for producing the AA. As the R3OWF plan dealt with offshore wind energy generation it will be of greatest relevance to the OWE Draft Plan HRA, however, both studies are considered to provide valuable guidance to screening approaches in this case. This review of precedents has been undertaken to ensure that the HRA for the OWE Draft Plan builds upon and learns from this previous work. Equally, it will help to ensure that this HRA does not depart from agreed methods and relevant guidance unless there is a clear rationale for doing so in the context of the specific issues associated with the OWE Draft Plan.

2.2 Coastal, Intertidal and Subtidal Habitats and Associated Species

2.2.1 Introduction

A large number of UK European/Ramsar sites (355) were identified within the pre-screening process for the medium term options (ABPmer 2010a), on the basis that they have coastal, intertidal and subtidal habitats and associated species qualifying interests and these will be brought forward into the next phase of the screening process. The broad-scale approach that was taken at pre-screening, screened in all the European/Ramsar sites including those SACs with coastal marine habitat interest features that lie within 100km of the medium term options areas. This process will also have captured almost all designated sites that lie within 100km of the short term option areas although the pre-screening work for these options was carried out separately (Halcrow 2010). For the future HRA work this 100km boundary will be adjusted to ensure that it also lies 100km from all short term option areas and any new sites that are encompassed by this process will be identified.

As set out in the pre-screening report for the medium term options (ABPmer 2010a), the 100km boundary has been applied because it defines a quantifiable and objective area that is likely to encompass many of the mobile species interest features (fish, seabirds and mammals) within designated sites which could be indirectly affected by the medium term OWE options. However, it has not been used to limit further review of more distant locations or to presume that all relevant features within this area for which impact pathway exists are necessarily affected. In particular, it is recognised that impacts (especially to foraging and migratory bird qualifying interests that are reviewed below) may extend to sites beyond this 100km boundary and this aspect will need to be considered throughout the HRA process.

During pre-screening, those SACs that were within the 100km area but had only inland (non-coastal) freshwater or terrestrial habitat and species qualifying interests were screened out. In the next stages of the HRA it will be possible to reduce this list for each of the short and medium term option areas based on a more detailed consideration about whether there is a LSE. In particular, a closer evaluation can be made about whether the wind energy development could have a direct or indirect effect on the qualifying habitat and species interests of the designated sites that were brought into the assessment at pre-screening. The direct impacts are those that occur to the qualifying habitats and the non-mobile species that they support, at locations where devices or cables are installed (with the non-mobile including prey species for mobile species). The indirect effects to habitats and the non-mobile species that they support could occur through alterations in the physical environment or the water quality conditions from changes to the hydrodynamic conditions and sediment transport pathways.

Such impacts to habitats, species and water quality conditions will be relevant to the screening of many of the SAC, SPA and Ramsar sites either because the habitats and species themselves are qualifying features (or are components of qualifying features). It will also be relevant where the habitats and the species they support play a key role in also supporting qualifying birds, marine mammals, fish interests of these designated areas. An outline approach for undertaking this next phase of screening is set out below in Section 2.2.3. However, in advance of this, and to provide a context for this review and an understanding of the precedents, a brief overview of the methods that were applied to screen and scope habitats for the R3OWF and PFSA HRAs (Section 2.2.2) is presented.

2.2.2 Precedents for Plan-level Screening

The full list of the impact pathways by which coastal, intertidal and subtidal habitats and the non-mobile species they support can be directly and indirectly affected by offshore windfarm developments were set out in Appendix A (Tables A1 and A2⁷) of the pre-screening report. The methods used to screen for such impacts during the two previous Plan-level HRAs are detailed below.

⁷ During the subsequent screening and re-screening phases of the HRA, these and other Appendixes A tables were updated and revised. To avoid confusion and repetition, these tables (in their post screening updated format) are now shown in Appendix A of the Appropriate Assessment Information Report ([ABPmer R.1722c](#)).

2.2.2.1 Round 3 Offshore Wind Farm HRA

Direct effects on coastal habitats will occur where there is a spatial overlap between the designated site boundary and proposed development footprint. For the R3OWF HRA therefore, Entec (2009a) screened in all those sites where there is a spatial overlap between a designated site and either a development zone (in this case the Round 3 areas) or a proposed cable alignment. For all such sites it could not be concluded that there was no LSE and therefore the relevant habitats and/or species qualifying features of such designated sites were screened in.

In terms of the potential for indirect effects on habitats and species, it was concluded that there would be no LSE arising from hydrodynamic changes (erosion), sediment disturbance and transport (including any adverse effects from suspended sediment increase, water quality/toxicity or smothering) at any designated site that lies more than the distance of one tidal ellipse⁸ away from a cable route or a zone boundary. This was based on evidence from plume studies that even fine particles mobilised from the sea bed settle out again to a large extent within the distance of one tidal excursion. While a plume may be visible beyond this point the concentrations of suspended solids are usually within the range of natural variation and much of the visible plume is due to lipids from damaged benthic animals (Coastline Surveys Ltd 1998 and Clay *et al.*, 2008). This observation was supported by wave and sediment processes studies carried out for the Round 1 and Round 2 offshore windfarms. It was also concluded in this R3OWF screening report that any noise disturbance to invertebrates would also be confined to an area that is no more than one tidal ellipse from a cable route or zone boundary. This issue of noise impacts to invertebrate species have not been screened into this OWE Draft Plan HRA⁹.

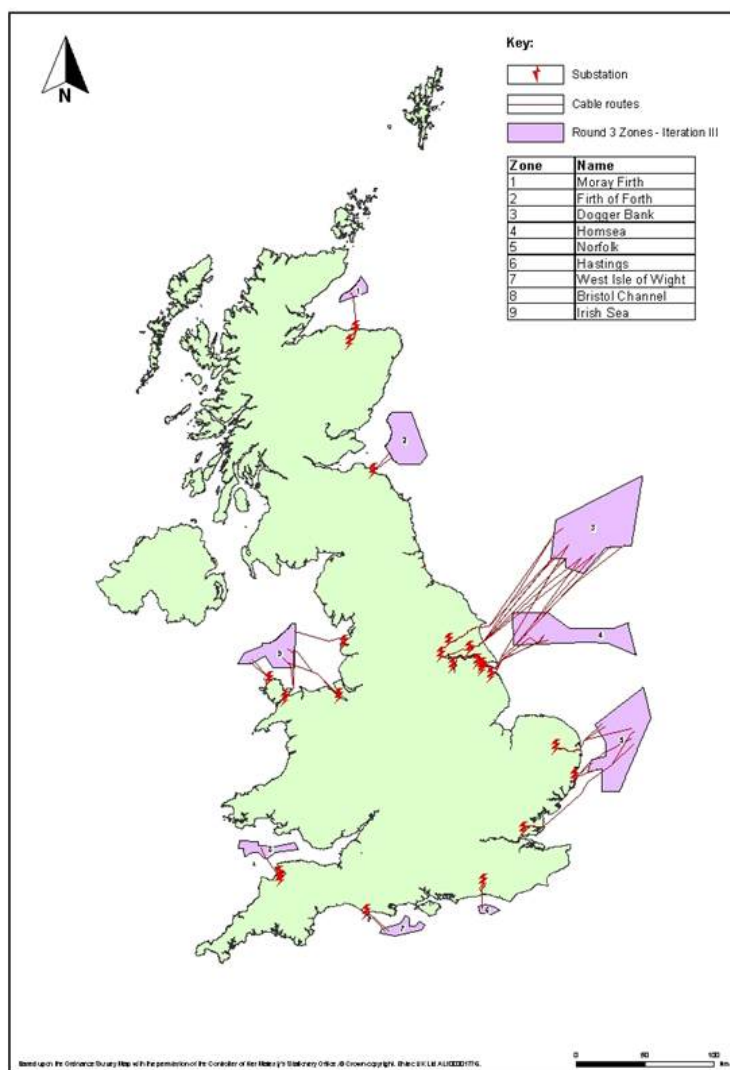
Entec (2009a) also cited a study into the environmental effects of cabling for offshore windfarms (BERR 2008) which indicated that sediments suspended by cabling activities do not travel large distances from the cable location, and that the distance travelled is largely influenced by the type of sediment mobilised and the strength of the tidal flows (i.e. the tidal excursion). Studies and modelling undertaken for Round 1 and 2 offshore windfarms were also identified which have shown that cabling during optimum tidal conditions results in a depositional footprint for fine sediments in the order of 200m either side of the cable. On the basis of this research, it was concluded that the only sites that were potentially at risk of causing an indirect LSE on habitats or non-mobile species (due to sediment mobilisation and re-deposition) were those within one tidal excursion (tidal ellipse) around the zone boundary or the cable routes, using a data for a mean spring tide to ensure a precautionary approach. This approach was considered to be precautionary as it is based on transport of fine sediment and where the seabed is sandy, the transport distance will be less.

⁸ The distance defined by a single tidal excursion has also been defined as encompassing the 'far-field' effects of windfarm devices as opposed to the near-field effects which have been defined as 10 times the diameter of the devices (Wilson *et al* 2010).

⁹ As discussed further in the sections below the issue of noise effects in the HRA for the Draft OWE Plan will be confined to consideration of impacts upon fish and mammal qualifying interest and will not be linked to tidal excursion distances in this manner.

To consider the effects of cable alignments and landfall this Entec (2009a) study made broad but informed assumptions about the cable routes and landfall positions. It was assumed that all windfarms will connect directly to the mainland with no use of offshore interconnectors and, to inform this, studies by the National Grid and Electricity Networks Strategy Group (ENSG 2009) were used to identify likely landfalls and substation connections.

Image 2 illustrates the options considered in this study. It was recognised, though, that zone developers could choose alternative cable routes which may have a lower impact on environmental features and/or European/Ramsar sites and it was not possible to assess all conceivable cable routes. It was noted that any assumptions about cable positions (and indeed other aspects of the proposals such as turbine locations, turbine types and capacity) within the plan-level HRA would need to be verified and their relevance addressed as part of project-level HRAs.

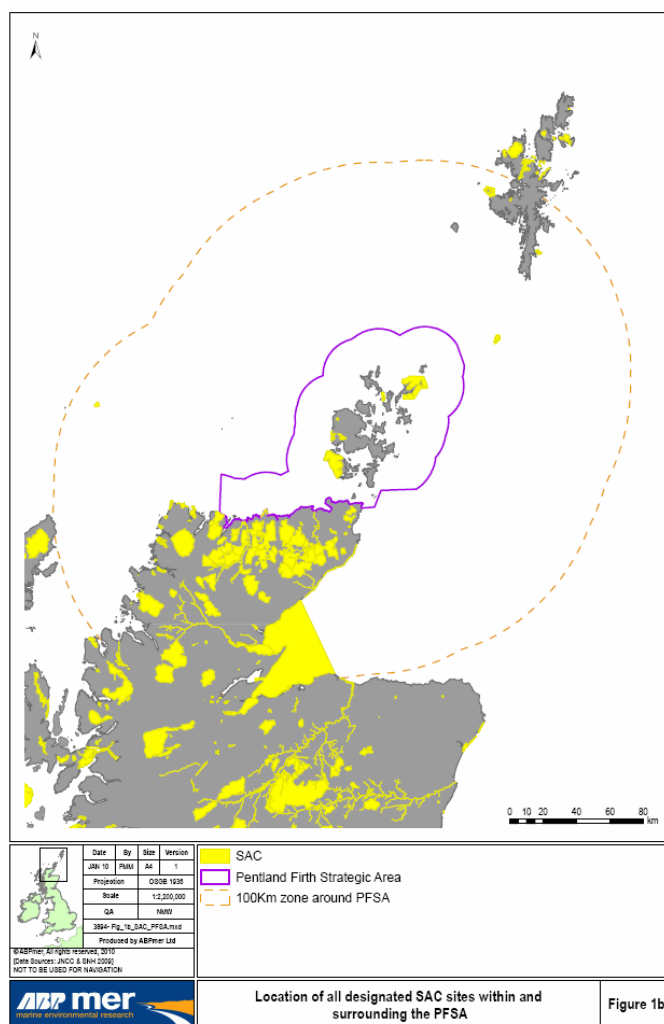


(Entec 2009a)

Image 2. Options considered for R3OWF export cable routes based on studies by National Grid and ENSG

2.2.2.2 Pentland Firth Strategic Area HRA

For the PFSA a 100km boundary was used in the pre-screening phase and all sites within that zone were included (see Image 3). For the next screening phase, the approach used was essentially same as that applied for the R3OWF HRA but geared toward assessing the effects of the wave and tidal energy generating devices and arrays. All relevant designated sites within the PFSA boundary were screened in because of they spatially overlapped with the development zone and thus could be directly affected. To address the potential indirect effects the distance of one tidal excursion was determined around the border of the whole PFSA area. Then, any designated sites that lay within one tidal ellipse distance from the PFSA boundary was also included. Those SAC sites that supported habitats and non-mobile species qualifying interests but which lay outside of this tidal ellipse distance were excluded. It remained the case though, in the absence of project level information, that all designated sites within the PFSA and within the tidal ellipse boundary could be subject to direct and/or indirect effect from the wave and tidal energy leasing round and therefore all these sites were taken forward into the assessment phase of the HRA.



(ABPmer 2010a)

Image 3. Pentland Firth Strategic Area (PFSA) and 100km screening zone

For the PFSA study, the issue of cable alignments and landfall positions was not addressed in the same manner as for the R3OWF work. In consultation with the key stakeholders it was agreed that 'there would be sufficient flexibility in terms of the options that are available for cable alignment and landfall position to ensure that effects on terrestrial or freshwater European/Ramsar sites can be readily avoided at a project level'. It was noted also that there could be no absolute guarantee of European/Ramsar sites being avoided and therefore it was recognised that terrestrial and freshwater sites which were excluded at the Plan-level HRA on this basis may need to be considered at project-level HRA if grid connectivity options/constraints do not allow such sites to be avoided. In this context, the sites where an effect was considered to be most likely were those closest to the shoreline. For this reason the marine habitats within coastal SAC sites in the PFSA were scoped into the assessment. This included sites with supralittoral dune habitats due to the functional link between coastal processes and wind-borne sediment transport mechanisms for dune formation. However, the remaining SACs within the 100km boundary around the PFSA (which support other non-mobile supralittoral and inland habitat features) were removed from the scope due to the absence of any hydrodynamic or ecological connectivity with the coastal or inshore environment. This included the vegetated sea cliff features and the coastal lagoons. Also the individual non-mobile supralittoral and inland habitat interest features within coastal SACs were also highlighted as being unaffected by the proposed PFSA Plan.

2.2.3 Screening Methods Review

It is proposed that the methods presented in the previous sections for assessing direct and indirect LSE on habitats and non-mobile species are also applied here for the OWE Draft Plan HRA. With respect to the direct impacts from the installation of the wind turbines, this will apply to those few locations where there is a clear spatial/physical overlap between the option areas and the boundaries of European/Ramsar sites. For such option areas it will not be possible to conclude that there is no LSE. This will also apply to any options areas where the export cable routes or landfalls will cross through a designated site. However, it is recognised that a further understanding about the likely areas of cable alignment and landfall location will be required to determine this.

To determine whether there is a potential for an indirect effect on habitats and non-mobile species, a UK-wide hydrodynamic model will be run to determine the distances covered by one tidal excursion throughout the coastal and offshore waters within which the short of medium option areas are located. This will describe the changes in tidal ellipse shape across this whole area. The reasons for using tidal ellipse distance have been presented above under the review of the R3OWF HRA approach. Essentially, however, the nature of the tide is such that its movement is typically described as an almost closed ellipse this means that it can be viewed as a package of water will move to and fro over one tidal cycle, typically along a dominant axis, returning to almost the same position.

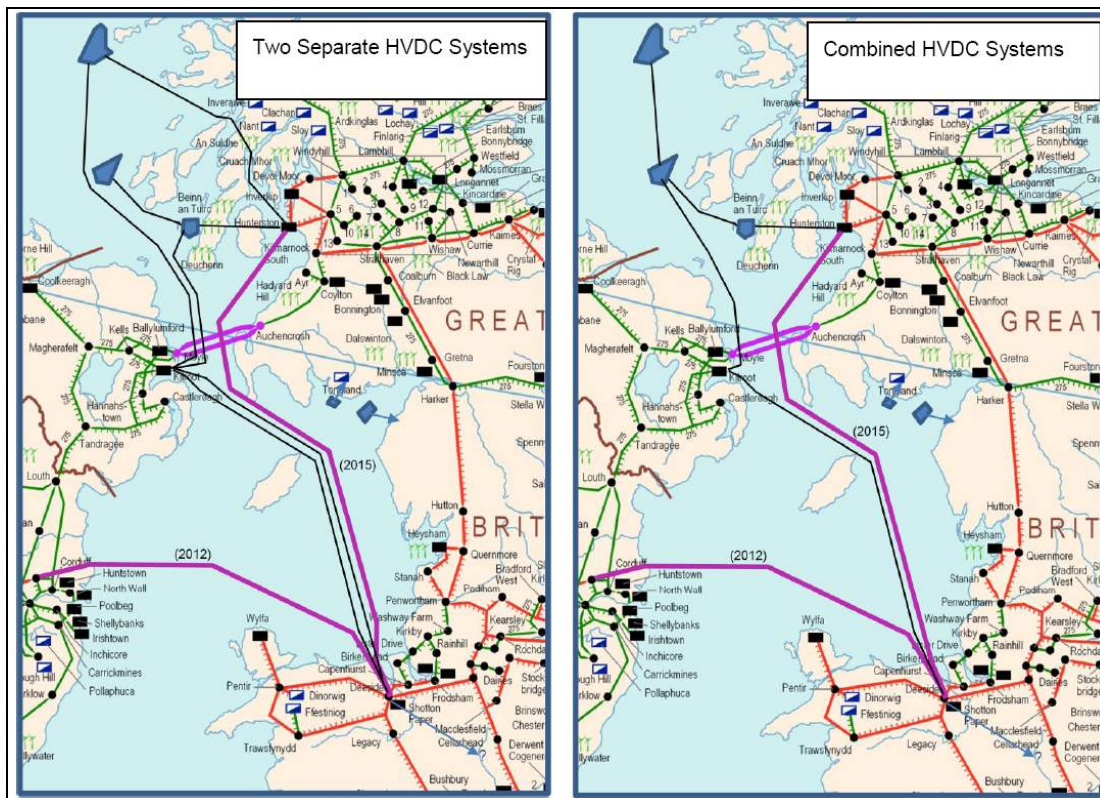
Thus the shape and distance of the tidal ellipse reflects the path followed by this parcel of water (and material suspended within it) over one excursion. A map of tidal ellipses from a UK-wide hydrodynamic model is shown in Figure 2. Using this map, the nearest ellipses surrounding the boundary of the short of medium option 'areas of search' will be selected and will then be 'moved' to that nearest boundary point to determine how far, and in which direction, a parcel of

water will move from this edge to then return. Once this is done, a boundary line will be drawn around the limit of the tidal excursion that is defined. This new boundary will define a zone of potential indirect effect for each of the short and medium term options and, where possible, can be used to describe the same for potential cable routes. However, in considering both the direct and indirect effects of the cable infrastructure network, it is recognised that the alignment of cable routes and the positions of landfalls have yet to be determined. This will mean that defining areas of potential indirect effect around possible cable routes will not be possible for most if not all sites and in the light of this uncertainty it is likely to be necessary to adopt a precautionary approach to meet the requirements of the Habitats Regulations ¹⁰.

Although robust information defining the location of cable alignments is limited, it is clear that, some studies are available that can be used to indicate some generic potential options. For instance a Transmission Capital (2010) study for TCE identifies options to deal with energy outputs from the west coast short term option areas of Argyle Array, Islay, Kintyre, Wigtown and Solway Firth. This study provides a possible indication of where cable alignments and landfall location may occur for windfarms in this part of the Scottish coastline although it is recognised that, at this time, there are no defined routes for these or other short or medium term options areas. This study concludes that two or more extra high voltage direct current (HVDC) cable circuits would be needed in addition to two offshore cable projects identifies in the Energy Network Strategy Group report (ENSG 2009). It also identifies connection points across UK at Hunterston, Deeside, Kilroot, Tongland and Broughton Moor (see Image 4). During the assessment, other relevant documents detailing potential options will be reviewed to determine whether 'areas of search' can be identified for cable alignments and landfall positions. This will include the Scoping Reports for the proposed short-term options areas; as well as the Offshore Development Information Statement (National Grid 2010), the Scottish Executive's review of the cross border electricity transmission options (SE 2007) and the Scottish Territorial Waters Offshore Windfarms East and west coast studies (Royal Haskoning 2009a and 2009b). It is recognised though these reviews (e.g. east and west coast grid studies) were commissioned for option appraisal purposes and these potential options may change as developer's progress with detailed design of the Short Term sites. Therefore, notwithstanding the availability of such information, it is likely that uncertainty will remain at the next screening and assessment phase of this HRA about the regions of direct and indirect effect from the cable routes. This uncertainty will need to be considered within the screening process and the assessments and it will need to be accommodated as part of the determinations that made about are proposed manner of the plan's implementation to ensure that there is no adverse effect on the integrity of designated sites. For the purposes of screening, this uncertainty will probably mean that it will not be possible to identify clear cable alignment locations (or even broad areas of search where such alignments could possible occur). In that event, to achieve the high level of certainty required under the Habitats

¹⁰ Initial reviews of the scoping reports for the short-term options that have been undertaken already as part of the next screening and assessment process have confirmed this initial view. Only two of the available scoping reports (Near na Gaoithe and Forth Array) provide any indication of cable routes or landfall points. Therefore, while some indication of areas of search around cable alignments has been possible for these two options it has not been possible at all for the other 32 short and medium term option areas. Even for these two option areas though the cable alignments may be subject to change (and at this time the proposed developer for the Forth Array is not pursuing this option). Therefore and the information used in this Plan-level HRA does not assume anything or place any commitment to developers to follow the alignments used. Therefore the cable alignments will need to be reviewed and reconsidered as part of project-level HRA screening for any/all of the 34 option areas.

Regulations, the screening process will need to be based solely on the 100km boundary that was used at pre-screening without any further re-screening.



(Transmission Capital 2010)

Image 4. Preferred grid designs for connecting to 5 proposed offshore windfarms

2.2.3.1 Summary of the proposed screening process

To summarise the approach described above, an iterative series of tasks has been identified to encompass the proposed LSE screening work. This will be undertaken for each of the 34 short and medium terms options. This process has been developed from the review of approaches taken during previously Plan-level HRAs (as described above) and through consultation with the PSG.

- **Step 1:** Agree the list of relevant qualifying features with the PSG and screen out non-coastal habitats and species. This element has largely been completed during the production of the pre-screening report and also during consultations on the early draft of this working paper, however, it is possible that further refinements may be required during subsequent phases of the HRA process (e.g. including species that are components of individual 'estuary' qualifying interest features).
- **Step 2:** Identify the best understanding about possible cable alignments and landfall positions to make assumptions and, if possible, identify 'areas of search' for these locations (as noted in preceding section, the first indications from the assessment review work are that this understanding will be insufficient to define areas with the high level of certainty required under the Habitats Regulations).

- **Step 3:** Screen in all designated sites and associated habitat and non-mobile species interest features (recognising that these will include prey species for non-mobile birds, fish and marine mammals) that will be directly affected. This will be where there is spatial overlap between the short and medium term options areas or with any defined areas of search for cable alignments and landfalls.
- **Step 4:** Undertake a review of tidal excursion patterns around the boundaries of each of the 34 short and medium term option areas as well as any defined areas of search for cable alignments. Then draw a new boundary at a distance of tidal ellipse from these boundaries where it is possible to do so with the requisite certainty (noting the information limitations sets out above).
- **Step 5:** Screen in all designated sites and associated habitat and non-mobile species interest features (recognising that these will include prey species for non-mobile birds, fish and marine mammals) that could be indirectly affected because they lie at distances of less than one tidal excursion from any short and medium term options areas or from any defined areas of search for cable alignments and landfalls.
- **Step 6:** Alter the pre-screening tables to indicate the coastal, intertidal and subtidal qualifying features that have been screened in or out for each of the 34 short and medium term option areas. Identify any designated sites that can be screened in or out on the basis of the above review (i.e. because there is no LSE for any of their qualifying interest features).
- **Step 7:** Record the findings on the screening maps that will be prepared for each of the 34 short and medium term option areas and any defined areas of search for cable alignments.

2.3 Bird Species

2.3.1 Introduction

A large number of UK European/Ramsar sites were identified within the pre-screening process on the basis of their bird qualifying interests and these will be brought forward into the next phase of the screening process. The broad-scale approach that was taken at pre-screening, screened in all the European/Ramsar sites with bird qualifying interest features that lie within 100km of the medium term options areas but excluding species for which there was no LSE with the Draft OWE Plan because they are entirely resident within inland terrestrial habitats, do not forage at sea and do not migrate internationally. Following this review, there are a number of steps that can be undertaken to edit this list so that only sites and features for which there is a LSE are taken forward into the AA process. An outline approach for undertaking this screening is set out below in Section 2.3.3. However, in advance of this, and to provide a context for this review and an understanding of the precedents, an overview of the methods that were applied to screen and scope bird species for the R3OWF and PFSA HRAs (Section 2.3.2) is presented.

2.3.2 Precedents for Plan-level Screening

The full list of the impact pathways by which habitats can be affected by offshore windfarm developments were set out in Appendix A (Tables A1 and A2) of the pre-screening report. The main sources of impact to bird populations include the potential for collision (during either

offshore foraging excursions or during annual migratory movements) but other key impacts will be the direct and indirect effects on habitats as well as disturbance effects during construction or operational phases of the work. The methods used to screen for such impacts during the two previous Plan-level HRAs are detailed below.

2.3.2.1 Round 3 Offshore Wind Farm HRA

For the R3OWF screening work (Entec 2009a), the first stage of the screening process for bird qualifying interests was to screen out those bird species that were at no risk of impact through the development of offshore windfarms or associated coastal infrastructure as part of the Round 3 plan. The species eliminated from the process were those that are entirely resident within the UK (i.e. do not migrate) and do not forage at sea. This included species associated with coastal areas, provided these areas are more than one tidal excursion from any of the cable routes (and thus outside the zone of potential direct disturbance or indirect effects on supporting habitat and prey species).

For Ramsar sites, those species that appear in the Ramsar selection Criteria 5 or 6 (i.e. the Ramsar site supports a waterbird assemblage or a population of international importance of a migratory species), including species' populations identified subsequent to designation for possible future consideration under Criterion 6, were used to identify Ramsar sites for inclusion in the screening process. Possible marine SPAs and extensions to existing SPAs were also included where they are likely to support foraging seabirds regularly using flight paths between the SPA and likely breeding colonies which cross Round 3 development zones.

A list of 103 migratory and seabird species were identified as being at risk from Round 3 activities. The list of UK SPAs and Ramsar sites which have been identified as supporting populations of these birds (including all sites with internationally important assemblages of waterfowl and seabirds) was presented. There were also a very large number of transnational sites that support breeding or migratory populations of species that could be affected by Round 3 activities. In view of their approach to the screening work (see below) it was not considered appropriate to list all these sites.

The sensitivities of relevant bird species to activities from the R3OWF were listed and tabulated and only those that relate to the direct and indirect effects on habitats and those sensitivities related to disturbance during cable laying/removal within SPAs and Ramsar sites were used to conclude whether there will be a LSE on the avian interest of the site at the screening stage. For those sensitivities that related to the operation of turbines (collision with turbine blades, the barrier effects to bird movements that can be caused by turbines and noise/visual disturbance relating to turbine operation), Entec (2009a) observed that there is a dearth of empirical data demonstrating the level of effect on individual birds and/or populations in offshore windfarms, although there are some notable exceptions to this rule. Even when information gathered at onshore windfarms is used to supplement the knowledge base, there was considered to be insufficient data on the majority of species (particularly seabirds) to reach any reasoned conclusion and hence an LSE must be assumed.

Furthermore, Entec (2009a) noted that there is little information regarding the distribution of birds at sea, especially foraging seabirds. In order to undertake a robust assessment, the linkages between birds, potential zones of development and SPAs/Ramsar sites need to be understood. It was also noted that it was important to understand the number of birds using the zones in respect both of SPA and biogeographic populations but that, unfortunately, this information is not readily available and is only likely to be captured in a structured and usable format following focused survey effort. With a lack of quantifiable data on impacts and a dearth of information on geographical distribution, there was considered to be no basis for a reasoned assessment to be undertaken either during the screening process or subsequent AA of the Round 3 Plan. Entec (2009a) therefore concluded that it is appropriate to rely upon HRA work at the project-level.

2.3.2.2 Pentland Firth Strategic Area HRA

For the PFSA work, in the pre-screening, all the SPAs and the one Ramsar Site that were within the PFSA and the surrounding 100km boundary were included. In the next stage of screening all seabird interest feature species that lie within the PFSA itself were included because these birds will forage and loaf in coastal and offshore waters within the PFSA. At this stage, species that are confined to terrestrial habitats were excluded and these were Hen Harrier, Short-eared Owl and Peregrine Falcon.

To further consider which of the sites outside the PFSA (both within and beyond the surrounding 100km boundary) needed to be brought into the assessment, the British Trust for Ornithology (BTO) carried out a review of the seabird foraging and 'at sea' data for the PFSA areas. They then provided advice about the additional interest features and sites that needed to be brought into the scope (especially the SPA and Ramsar sites that lie outside the PFSA boundary). As a result of this review and the advice received from consultees, consideration was given in the first instance to reviewing sites that supported Gannet, Fulmar and Manx Shearwater because these species forage over the greatest distances and could potentially forage in PFSA even from sites beyond the 100km boundary that might have been missed at first screening.

In addition to these sites, the inland Caithness and Sutherland Peatlands SPA was included because it supports Black-throated Diver, Red-throated Diver and Common Scoter and lies at the boundary of the PFSA. The Mousa SPA on the Shetland Islands (which lies 70km from PFSA boundary to the north-west) was also included. This site supports Artic tern and Storm Petrel. The evidence at that time indicated that these species forage over comparatively short distances (quoted as 25km and <50km respectively) and these may not use the PFSA area. However, this site and these interest feature species were included at screening stage on a precautionary basis pending further assessment work.

The other sites outside the PFSA (in the Shetland Island or the North Coast of the Scottish mainland) were considered but not included because they support bird species that would not forage within PFSA at levels that are likely to have a LSE based on the location of these sites and the expected foraging distances of the relevant interest feature species that they support.

2.3.3 Screening Methods Review

Following the pre-screening report for the OWE Draft Plan (ABPmer 2010a), all SPA sites and all their associated bird interest species within 100km of the medium term option areas were initially included irrespective of whether they undertake coastal and offshore movements. Then, following the approaches taken for the previous HRAs, for the next stage of pre-screening, bird species were excluded where they will not be affected by the OWE Draft Plan because they are entirely resident within inland terrestrial habitats and do not forage at sea and do not migrate internationally (i.e. they are entirely resident within the UK). These bird species were Western Capercaillie, Scottish Crossbill, Golden Eagle (where this species is a qualifying features of inland non-coastal designated sites), Fair Isle Wren, Red-billed Chough and the Eurasian Marsh Harrier. SNH also confirmed that a number of bird species that are qualifying interests of SPAs as breeding populations only could also be screened out at this first stage. These birds species are Hen Harrier, Merlin, Eurasian Dotterel, Spotted Crake, Grey Heron, Little Stint, Curlew Sandpiper, Osprey, Peregrine and Short-eared Owl.

The next stage will be to consider the foraging behaviour of coastal and offshore bird colonies (whether these are overwintering or breeding populations). In particular the distances over which waterbirds forage will be a critical consideration. To inform this review, it will be possible to begin by drawing upon the review of seabird foraging distances that was undertaken by BTO as part of the PFSA HRA work (ABPmer 2010b). This study identified the maximum distances seabird of seabird foraging based on review of studies including RSPB (2000), Furness & Tasker (2000), Thaxter *et al.* (2010) and Roos *et al.* (2010) along with the UK Seabirds at Sea data (JNCC 2009). It was found that most birds typically forage within 100km of breeding site with the exception of the following species (for which the foraging distances are highlighted in brackets): Razorbill (150km); Guillemot (123km); Puffin (137km); Fulmar (245km); Gannet (540km); Manx Shearwater (330km). During the next phase of the HRA work, these distances will be reviewed as part of a further review of available information and based on advice received from SNH. For this review, the Birdlife International seabird foraging database (<http://seabird.wikispaces.com>) will act as the source of relevant information and the maximum foraging distances for key species will be identified. The list of species is expected to be as follows (with the maximum foraging distances are highlighted in brackets): -

- Atlantic Puffin (200km);
- Black-legged Kittiwake (200km).
- Common Guillemot (200km);
- Common Scoter (200km).
- Manx Shearwater (400km).
- Northern Fulmar (664km); and
- Northern Gannet (640km).

Those bird qualifying features that do not forage in offshore waters (but instead only feed within coastal/intertidal habitats) could theoretically be excluded where their foraging habitats will not be directly or indirectly affected. Thus, the approach that will be adopted for assessing direct and indirect habitats effects will be applied and those birds that feed in coastal habitats that are greater than one tidal excursion from any of the option areas or from any potential cable route

will be excluded. However, it is noted that many of these species are migratory and so the effects on these species during their migratory movements will need to be addressed. In addition, it is recognised that several species may move between sites outwith the main migratory periods. Waterfowl for instance may relocate to other sites during periods of adverse weather during the winter months. Therefore, it is likely that few if any bird qualifying features are likely to be excluded solely the basis that their main foraging habitats are not directly or indirectly affected by the proposed Draft OWE Plan.

The issue of how to deal with migratory birds is a key one for this HRA and it is understood that there is a limited amount of robust data on this aspect. This is recognised within the SEA (Marine Scotland, 2010b) which records that there is a lack of accurate data showing migratory routes as confirmed via correspondence with the RSPB and SNH. It also noted however, that the Wildfowl and Wetlands Trust (WWT) are researching migration routes of several bird species in relation to proposed UK windfarm sites. The WWT work included mapping routes of Greenland Barnacle Geese, Greenland White-fronted Geese and Whooper Swans (Griffin *et al.*, 2010) from or along the west coast of Scotland to Iceland and Svalbard Barnacle Geese routes from South-West Scotland to Norway and Svalbard. Geese and swans were the focus for this research as they tend to fly at less than 100m above sea level and could be at risk of collision with wind turbines. The destinations outside of the UK where tagged birds migrate to and from Scotland is reproduced in Table 1.

Table 1. Principal recovery locations for likely focal bird species for the SEA

Species	Principal Recovery Locations of Ringed Birds Outside of Mainland UK
Arctic Skua	Concentrated around Orkney and Shetland Isles
Arctic Tern	Concentrated around Orkney and Shetland Isles, Scandinavia, W Africa
Barnacle Goose (Nearctic)	Iceland, Greenland, Svalbard
Black-legged Kittiwake	USA, Greenland, Faroes, Continental Europe
Brent Goose (light bellied, E. Canada)	Svalbard
Common Tern	Continental Europe , Ireland, W Africa
Common Guillemot	Continental Europe, Scandinavia, Ireland, Orkney and Shetland Isles, Iceland
Corncrake	Unrecorded in Bird Atlas
European Storm Petrel	Ireland, Iceland, Faroe Islands, Scandinavia, Portugal, S Africa
European Shag	Ireland, Faroe Islands, Continental Europe, Scandinavia
Great Northern Diver	Unrecorded in Bird Atlas
Greenland White fronted Goose	Iceland, Greenland, Orkney
Herring Gull	Ireland, Orkney, Shetland Isles
Manx Shearwater	Ireland, Continental Europe
Migrating waterbirds	Various destinations
Northern Gannet	Ireland, Iceland, Continental Europe, Orkney, Shetland Isles, northern Scandinavia, NW Africa
Pink-footed Goose	Iceland, Greenland
Razorbill	Continental Europe, Scandinavia, Ireland, Orkney and Shetland Isles
Whooper Swan	Ireland, Western Isles, Orkney

(Marine Scotland, 2010b)

This table is derived from information within the BTO Migration Atlas Project report and is presented within the SEA Environmental Report (Marine Scotland, 2010b). As recognised within the SEA document, this information does not specifically describe the migration routes but presents a useful collection of ringing recovery information 'for birds that fly to and from Scotland (not necessarily from other parts of the UK)'. As part of the screening and assessment work the scientific literature relating to migratory pathways will be further reviewed to provide further information on the routes that are taken. However, even in advance of such a review, it is recognised that identifying distinct flyway routes will be difficult both because of the nature and limitations of available information on this subject and because these movements are likely to occur across broad fronts rather than along clearly definable routes.

The approach to be taken for making a judgment about LSE in relation to migrating birds will therefore require further consideration and ongoing consultation. However, there is no plan to include transnational sites. This is on the basis that, having included all the bird qualifying features affected across the defined 100km area (and beyond in some instances) during pre-screening, there is not expected to be any additional effect to birds in sites other member states. The only exception would be where there are bird qualifying species within member states sites that could migrate internationally through the 100km area but which would not also be a qualifying species for sites in the UK. There are not expected to be any such species that have not already captured by the above process.

2.3.3.1 Summary of the proposed screening process

To summarise the approach described in the preceding section, an iterative series of tasks has been identified to encompass the proposed LSE screening work. This will be undertaken for each of the 34 short and medium terms options. This process has been developed from the review of approaches taken during previously Plan-level HRAs (as described above) and through consultation with the PSG.

- **Step 1:** Agree the list of relevant qualifying features with the PSG and screen out birds qualifying features interest features where they are confined to inland terrestrial habitats and do not migrate internationally. This element has largely been completed during the production of the pre-screening report and also during consultations on the early draft of this working paper, however, it is possible that further refinements may be required during subsequent phases of the HRA process.
- **Step 2:** Identify the best understanding about possible cable alignments and landfall positions to make assumptions and, if possible, identify areas of search for these locations (as noted in preceding section, the first indications from the assessment review work are that this understanding will be insufficient to define areas with the high level of certainty required under the Habitats Regulations).
- **Step 3:** Screen in the birds qualifying species that forage over distances of >100km (Atlantic Puffin, Black-legged Kittiwake, Common Guillemot, Common Scoter, Manx Shearwater, Northern Fulmar and Northern Gannet) and could potentially feed within or across the short or medium term options areas. This will screen in some designated sites that support these species but lie outside the 100km boundary zone (and have not previously been identified in the pre-screening review).

- **Step 4:** Screen out birds species interest features (and where possible the relevant designated sites) that forage on the coastal zone but at distances of greater than one tidal excursion from the short or medium term options areas or from any possible cable routes (but recognising that these species may still be affected during migratory movements).
- **Step 5:** Review flyway data to identify any overlap of migratory routes with short or medium term options areas to identify sites (both in UK and rest of Europe) for which LSE on features are possible.
- **Step 6:** Consult further with PSG to agree the strategy for identifying the LSE on migratory bird species in the context of available information and the past approaches detailed above.
- **Step 7:** Alter the pre-screening tables to indicate the bird species qualifying features that have been screened in or out for each of the 34 short and medium term option areas. Identify any designated sites that can be screened in or out on the basis of the above review (i.e. because there is no LSE for any of their qualifying interest features).
- **Step 8:** Record the findings on the screening maps that will be prepared for each of the 34 short and medium term option areas and any defined areas of search for cable alignments.

2.4 Marine Mammal Species (Cetaceans and Seals)

2.4.1 Introduction

A large number of UK European/Ramsar sites were identified within the pre-screening process on the basis that they have marine mammal qualifying interests and these will be brought forward into the next phase of the screening process. The broad-scale approach that was taken at pre-screening, screened in all the European/Ramsar sites with marine mammal qualifying interest features that lie within 100km of the medium term options areas. Following this review, there are a number of steps that can be undertaken to edit this list so that only sites and features for which there is a LSE are taken forward into the AA process. An outline approach for undertaking this screening is set out below in Section 2.4.3. However, in advance of this, and to provide a context for this review and an understanding of the precedents, an overview is presented of the methods that were applied to screen and scope bird species for the R3OWF and PFSA HRAs (Section 2.4.2).

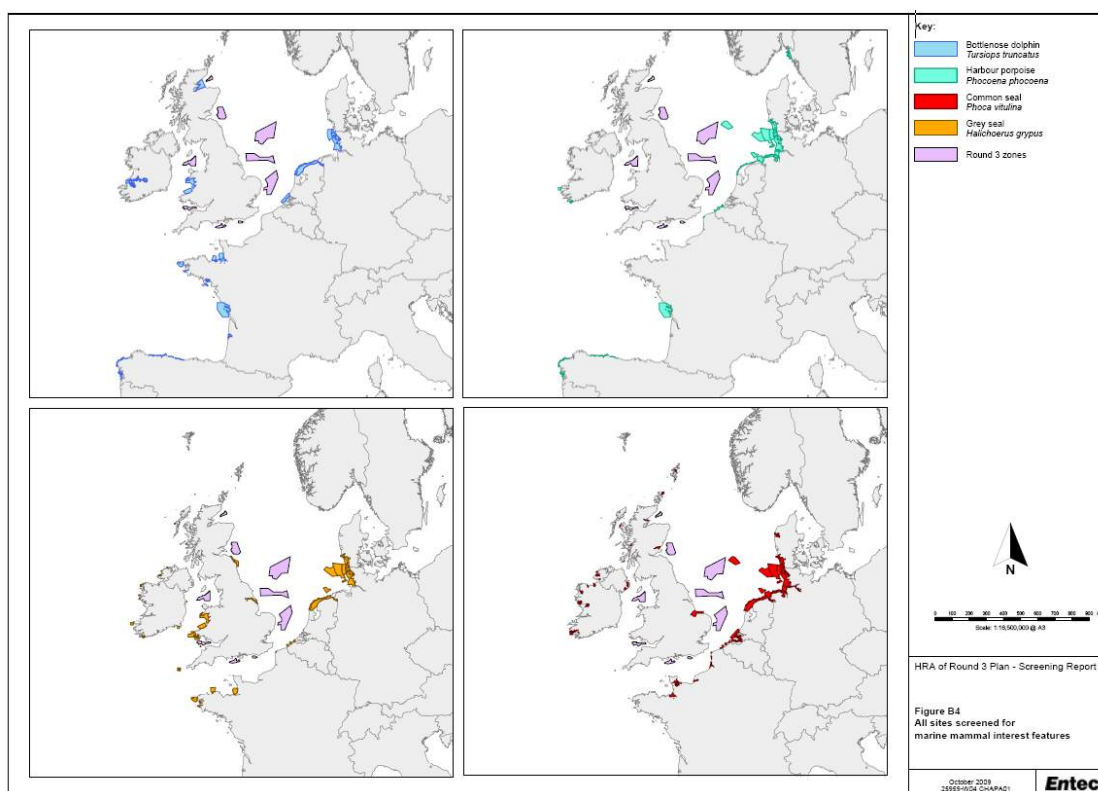
2.4.2 Precedents for Plan-level Screening

The full list of the impact pathways by which marine mammals can be affected by offshore windfarm developments were set out in Appendix A (Tables A1 and A2) of the pre-screening report. One of the key considerations will be the effects of noise (including especially from piling during installation but also from operational noises during operation and decommissioning). In addition there are the risks of collision with the vessels that access the site during survey, construction, maintenance and decommissioning and there are also potential risks from habitat displacement and impacts upon prey distribution. The methods used to screen for such impacts during the two previous Plan-level HRAs are detailed below.

2.4.2.1 Round 3 Offshore Wind Farm HRA

For the purposes of the R3OWF pre-screening study (Entec 2009a), and in the light of the consultations that were held during it, all UK sites with marine mammals were scoped into the assessment along with a large number of transnational sites. For common and grey seals the other European sites included those that west of the Skagerrak (north of Denmark) and north of Brest (France). This was on the basis that seals generally stay within reach of coastal haul out sites but that tracking of individuals had shown that they can feed up to several hundred kilometres offshore (SMRU 2006). This encompassed an area that was greater than 300km from the nearest Round 3 area (see Image 2 for R3OWF locations). For bottlenose dolphin and harbour porpoise the same study screened in sites that were west of the Kattegat (between Denmark and Sweden) and north of Porto (Portugal) which were some 600-700km from the nearest Round 3 area. The larger selection area for these species was warranted because cetaceans range over much greater areas than seals but those species in the Baltic or Mediterranean were unlikely to be affected by the R3OWF plan.

Following pre-screening 105 designated sites with marine mammal interest features were identified of which, 24 were UK SACs, one was a UK Ramsar Site (Humber Estuary where there is a breeding colony of grey seals) and 80 were transnational SACs in Belgium, Germany, Denmark, Spain, France, Ireland, the Netherlands and Sweden. Image 5 shows the sites that were screened in for marine mammal qualifying interests as part of the R3OWF HRA.



(Entec 2009a)

Image 5. Sites screened in for marine mammal qualifying interests as part of the R3OWF HRA

In the screening/scoping phase Entec gave further consideration to the interlinked factors of:

- *The likelihood of presence of a significant number (in terms of populations associated with sites for which they are interest features) of each species in the vicinity of development zones or cable routes; and to*
- *The likelihood of effects on individuals of that species if they are present in the vicinity of development zones or cable routes (the main potential for effect on marine mammals is from underwater noise), taking account of the mitigation measures that have been written into the Plan.*

However, given the need to investigate noise effects further as well as the sensitivity of marine mammals and the distances over which they roam, all sites were taken forward into the AA stage which it was not possible to conclude that there would be no LSE. As a further guide to the OWE Draft Plan screening work the findings from the detailed study that was then undertaken for the AA (Entec 2009b) are outlined below. This review shows the ranges of the four marine mammal species that were reviewed.

Bottlenose Dolphin

Of the transnational sites which have bottlenose dolphin as an interest feature, it was concluded that individuals from 9 sites on the Western German and Dutch coasts and the northern French coast may interact with the Round 3 sites of the eastern UK. It was found that there was a lack of scientific evidence about the distribution of these species and that there was an insufficient understanding about the migration patterns of this species (or whether they migrate at all) which meant that an effect on these transnational sites could not be ruled out. For these sites, plan-level mitigation measures to control noise levels were identified to ensure that there would be no 'adverse effects on their integrity' (AEOI). For the two UK sites in Wales (Cardigan Bay and Llyn Peninsula) similarly plan level mitigation was identified to ensure that there would be no AEOI. For the one site in Scotland (Moray Firth) no adverse effects of plan were identified but it was noted that a project-level HRA was needed and, as part of that mitigation measures will need to be implemented to ensure no AEOI. All other sites were considered to be too distant for there to be an adverse effect. The evidence, for instance, indicates that populations on the west coast of Spain, France and Ireland do not overlap with Round 3 zones.

Harbour Porpoise

Within the AA it was recognised that, the distribution and behaviour of harbour porpoise is better understood than for bottlenose dolphin with some studies describing clear population boundaries for this species. This evidence meant that a judgment of no AEOI was reached for 22 of the transnational sites for which this species is an interest feature. The exceptions were 5 Belgian sites and 1 French site for which there was limited scientific information on migratory patterns for the harbour porpoises and which were relatively close to the R3 Zone 5 (which lies off the East Anglian coast). For these 6 sites, plan-level mitigation measures to control noise levels were identified to ensure that there would be no AEOI. It was noted also that the Dogger Bank is a draft SAC (dSAC) for which the potential interest features could include harbour porpoise (as well as grey seal and common seal and sandbanks which are slightly covered by

the sea at all times). Impacts to this site may need to be addressed once this site is proposed and if harbour porpoise is confirmed as a qualifying feature.

Common Seal

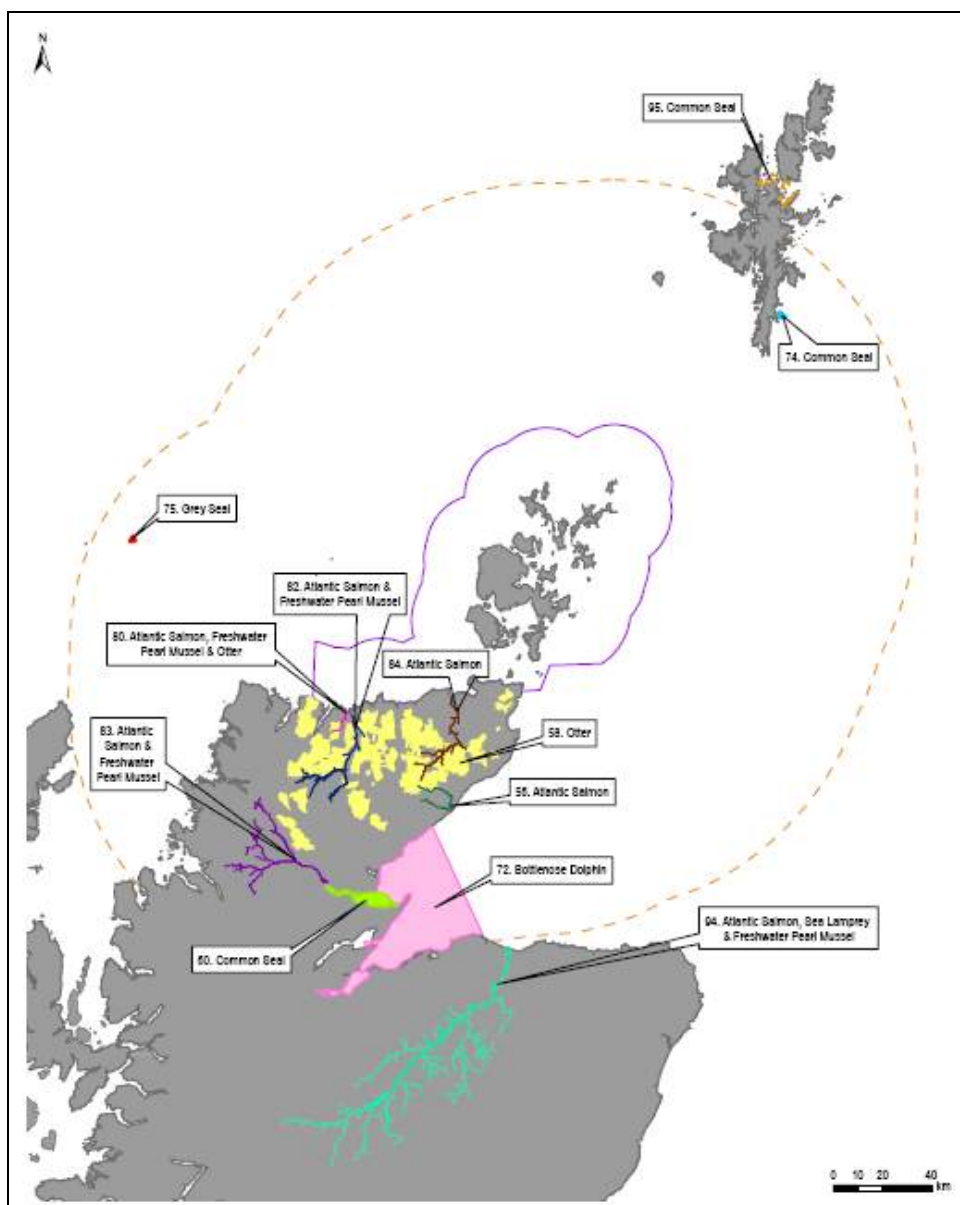
Within the R3OWF AA, it was noted that common seals travel, on average, 50km to foraging areas with some tagged individuals having been found up to 150km from the haul-out sites (with a few foraging even further) for up to a couple of days at a time. On this basis it was concluded that all the sites in the UK except those on the north-west of Scotland could be adversely affected by one or more of the Round 3 zones. However, it remained unclear with available evidence, whether significant proportions of the SAC populations would frequent these zones. Therefore, plan-level mitigation measures were identified for all UK sites to minimise any adverse effects with the measures requiring to be defined further at project level. Given the distances involved it was considered to be highly unlikely that common seals from transnational SACs would be adversely affected with the exception of Dogger Bank in German Waters.

Grey Seal

Within the R3OWF AA, it was noted that grey seals travel up to a few hundred kilometres for a couple of days at a time. On this basis it was concluded that all the sites in the UK except those on the north-west of Scotland and the Isles of Scilly could be adversely affected by one or more of the Round 3 zones. However, it remained unclear with available evidence, whether significant proportions of the SAC populations would frequent these zones. Therefore, plan-level mitigation measures were identified for all UK sites to minimise any adverse effects with the measures requiring to be defined further at project level.

2.4.2.2 Pentland Firth Strategic Area HRA

The approach taken for the PFSA pre-screening and scoping was to use a 100km boundary around the leasing round area and screen in all the sites supporting bottlenose dolphin, grey seal or common seal interest features that lie within that boundary. Based on advice received from SNH all the sites with marine mammal, grey seal and common seal interest features within the 100km area were included within the assessment. This included the Moray Firth SAC (bottlenose dolphin interest feature) which was located outside the PFSA but within the 100km external screening area. It also included five sites with common or grey seal interest features of which two were inside the PFSA area (Sanday SAC and Faray and Holm of Faray Sac) while a further three were at North Rona SAC, Mousa SAC and Dornoch Firth and Morrich More SAC. The approach of setting a 100km boundary was adopted based on: the lessons that were learned from the preceding R3OWF HRA work; a review of cetacean and seal behaviour (across the PFSA particularly) and the feedback received during consultations with key stakeholders including SNH. SNH also recommended that the Yell Sound SAC in Shetland (common seal interest feature) which lies just outside this boundary was also included (thus six sites were considered in total). All the designated sites that were selected through this screening process were assessed equally within the AA which was informed by a separate review of evidence relating to marine mammal activities in the PFSA. For all sites, marine mammal feature mitigation measures at plan level had been identified before the HRA or were introduced into the plan in the light of the assessment's findings to ensure that there was no adverse effect on the integrity of any of these sites.



(ABPmer 2010b)

Image 6. SAC Sites and interest features outside the PFSA that were scoped into the assessment phase of the HRA

In summary therefore, a boundary of approximately 105km was applied for the PFSA HRA (i.e. the original 100km pre-screening boundary with some surrounding sites) to address risk to all marine mammal interest features. No other transnational or UK sites were included (the nearest transnational sites were some 800-1000km away). A 100km boundary was again applied for the pre-screening of the OWE draft plan and, building on the PFSA and R3OWF precedents, the following section provide an overview of cetacean and seal ecology/behaviour to inform decisions about how the pre-screened sites should now be screened and scope prior to an AA.

2.4.3 Screening Methods Review

Within the OWE Draft Plan HRA it will necessary to consider the effects on grey seal, common seal and bottlenose dolphin (which are the three species which are qualifying interest features of UK SACs and were identified during the pre-screening process¹¹). Further details about the ecology and behaviour of these species are presented below and then a summary of the proposed screening approach (based on that applied for the PFSA HRA) is outlined.

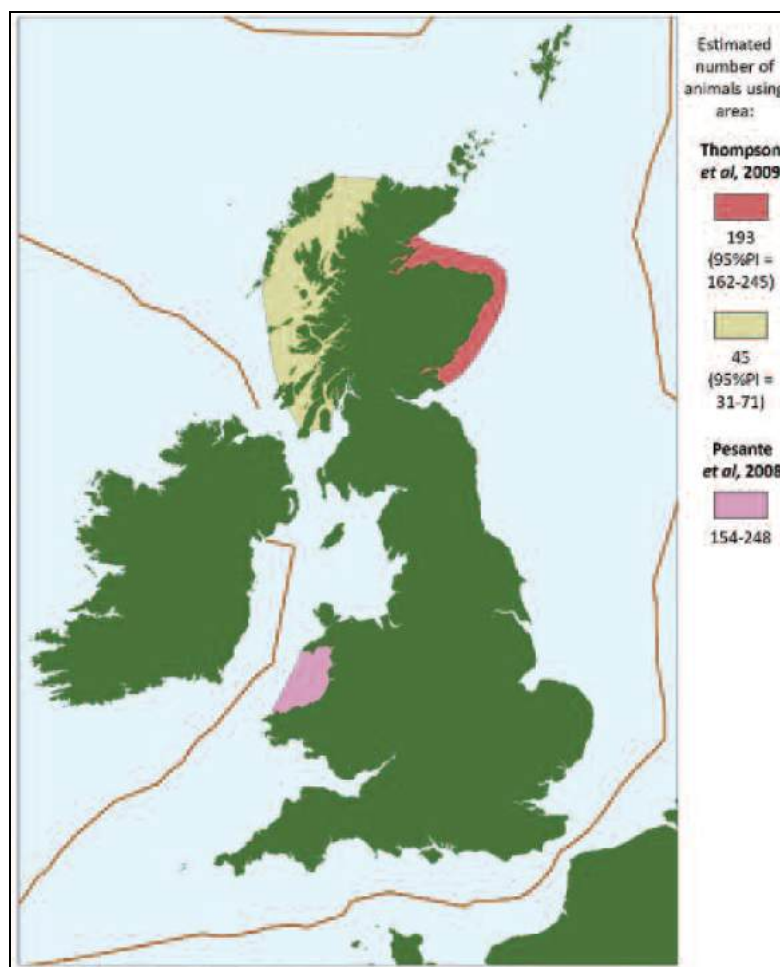
Bottlenose Dolphin

Within the 100km area used for pre-screening, the only site with bottlenose dolphin as an interest feature was the Moray Firth SAC (as was the case for the PFSA HRA). The Moray Firth is part of the core range of the only known resident population of bottlenose dolphin in the North Sea (Scottish Executive, 2007). As noted above, scientific understanding about the offshore distribution of these species is limited although the evidence is that the Moray Firth SAC population are most frequently sighted within the inner Moray Firth with occasional observations from further offshore in the North Sea (DECC, 2009). It is also known that they range across the coastal waters south of the Moray Firth. They typically reach St Andrews Bay but are also sighted within the Firth of Forth and north east England (WDCS 2010).

In the 1980s, the core of the population's known range was focused in the inner Moray Firth but since the early 1990s, the population's range has expanded south such that the whole stretch of coastal waters to the Firth of Forth is considered to be a critical habitat for this species (WDCS 2010). Surveys along the southern coast of the Moray Firth from 2001-2005 encountered bottlenose dolphins along the majority of this coastline, primarily in waters <25m depth (Robinson *et al.*, 2007). The abundance estimates for this population range from 75-200 individuals from 1990-2002 but are subject to considerable uncertainty (Thompson *et al.*, 2004). The abundance of bottlenose dolphin in the SCANS-II around the Northern Isles and Moray Firth has been estimated at 412 individuals and, most recently, the numbers on the east coast of Scotland has been estimated at 193 (WDCS 2010).

Occasional North Sea offshore observations may indicate that these animals are also distributed offshore for at least for part of the year (Reid *et al.*, 2003; SMRU, 2007). However, understanding of their offshore distribution is poor due to limited survey effort away from the coast. A recent review by WDCS (2010) actually identifies two forms of bottlenose dolphin; an offshore and a coastal form although little is known about the offshore forms and their relationships with coastal forms. Occasional visual and acoustic surveys in offshore waters of the Moray Firth have encountered very few bottlenose dolphins (Hastie *et al.*, 2003, Talisman Energy (UK) Limited, 2006, SCANS-II 2008). The Whale and Dolphin Conservation Society conducted surveys of the outer Moray Firth in 2008 and recorded no bottlenose dolphin sightings, with the main cetaceans recorded consisting of harbour porpoise and minke whale (WDCS, 2009).

¹¹ Harbour porpoise is non-qualifying presence in a number of sites (e.g. Sanday SAC, Moray Firth SAC, Mousa SAC, Papa Stour SAC and Yell Sound SAC) and is not included in the assessment scope. It is though a qualifying species in other European sites.



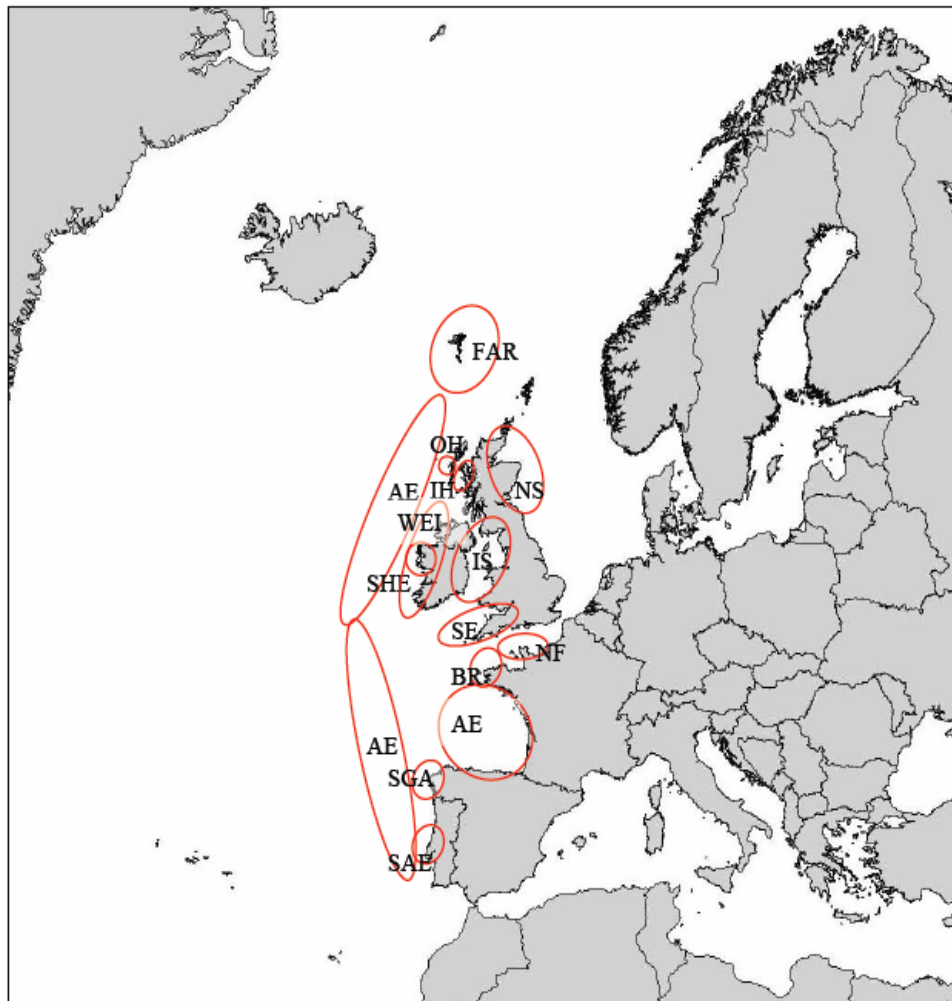
(WDCS 2010 and citations)

Image 7. Bottlenose dolphin abundance estimates

The distribution of bottlenose dolphin (based on current understanding of near-shore population and community structure) was also reviewed by the ASCOBANS/HELCOM¹² small cetacean population structure workshop (Evans and Teilmann, 2009). This proposed separate management units for a range of populations (recognising though that it is quite possible that some areas have overlapping communities with different movement patterns). Image 8 shows these areas with the 'North Sea (NS) area being relevant to the Bottlenose Dolphins using Eastern Scotland from Caithness to the borders with England (and including the Moray Firth). This North Sea area is also illustrated in greater detail in Figure 3.

For the screening of Bottlenose dolphin therefore it is recommended, that the area in which the Moray Firth population are most frequently sighted (see Images 7 and 8) acts as a basis for spatially screening selected short and medium term options areas. Therefore, this interest feature will be relevant mainly for the short and medium term options areas that are located off the eastern Scottish coastline.

¹² Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS)/ Helsinki Commission (HELCOM).



(Evans and Teilmann, 2009)

Image 8. Proposed management units for cetacean populations

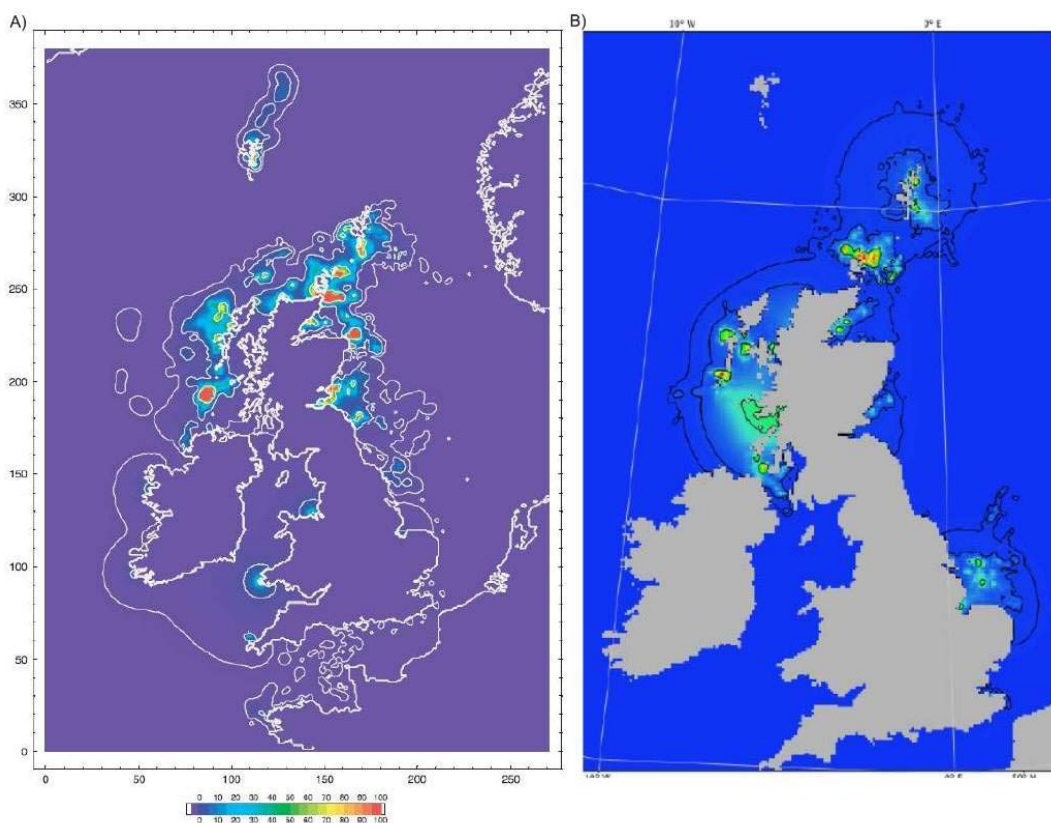
Grey and Common Seal

The movements of seals and the distances over which they move from their breeding and haul out sites is better understood than for cetacean species and it is possible to draw upon a range of studies that have been made the movements of seals fitted with satellite tags (Matthiopoulos *et al.*, 2004; Sharples *et al.*, 2008; Cunningham *et al.*, 2009; McConnell *et al.*, 1999; Tollit *et al.* 1998 and Thompson *et al.* 1996). These studies show that there is a distinct difference between the distances that are covered by grey and common seals from their haul-out sites. In summary the key observations for each species have been as follows:

- **Grey Seals** have been recorded up to 2100km from haul out sites and Farne Islands and Moray Firth grey seals have been recorded visiting sites in Pentland Firth and Orkney (Orkney is approximately 400km from the Farne Islands). In general however most tagged seals stay close to the coast (mean 39.8km for a foraging trip) with an average of 43% of a seal's time spent within 10 km of a haul-out site; and

- Common or Harbour Seals** typically cover shorter distances and generally move to alternative haul-out sites within a range of 75km although travel over 100km has been recorded. Most seals forage up to 60km from their haul-out site with half of the trips being within 25 km of a haul-out site. Most common seals returned to the same haul-out site from which they departed.

Given these movements it is recommended that the approach adopted for the PFSA HRA is used here for the screening of grey and common seal interest features. Essentially, this means taking forward all those sites that have been identified at the pre-screening stage and does not involve further considerations of marine mammal qualifying interests from outside of the UK (due to the distance between the OWE Draft plan option areas and the transnational designated sites).



(Matthiopoulos et al 2004, Sharples *et al* 2008 and DECC 2009)

Image 9. Estimated usage of the marine environment by grey (A) and common (B) seal

2.4.3.1 Summary of the proposed screening process

To summarise the approach described above, an iterative series of tasks has been identified to encompass the proposed LSE screening work. This will be undertaken for each of the 34 short and medium terms options. This process has been developed from the review of approaches taken during previously Plan-level HRAs (as described above) and through consultation with the PSG.

- **Step 1:** Agree the list of relevant qualifying features with the PSG. This element has been completed during the production of the pre-screening report and also during consultations on the early draft of this working paper.
- **Step 2:** Identify the best understanding about possible cable alignments and landfall positions to make assumptions and, if possible, identify areas of search for these locations (as noted in preceding section, the first indications from the assessment review work are that this understanding will be insufficient to define areas with the high level of certainty required under the Habitats Regulations).
- **Step 3:** Screen in all designated sites and associated seal species interest features that lie within 100km of any short and medium term options areas or of any defined areas of search for cable alignments .
- **Step 4:** Screen in the Moray Firth SAC and associated bottlenose dolphin interest features for short and medium term options areas or for any defined areas of search for cable alignments that lie within the North Sea Population Management unit (see Figure 3).
- **Step 7:** Alter the pre-screening tables to indicate the marine mammal species qualifying features that have been screened in or out for each of the 34 short and medium term option areas. Identify any designated sites that can be screened in or out on the basis of the above review (i.e. because there is no LSE for any of their qualifying interest features)
- **Step 8:** Record the findings on the screening maps that will be prepared for each of the 34 short and medium term option areas and any defined areas of search for cable alignments.

2.5 Anadromous Fish and Freshwater Pearl Mussel

2.5.1 Introduction

A number of UK European/Ramsar sites were identified within the pre-screening process on the basis that they have anadromous fish qualifying interests and these will be brought forward into the next phase of the screening process. The broad-scale approach that was taken screened in all the European/Ramsar sites that lie within 100km of the medium term options areas.

The species that are relevant are the anadromous fish (i.e. those which live mainly at sea but spawn in freshwater) which are listed under Annex 1 of the Habitats Directive: Atlantic salmon (*Salmo salar*); allis shad (*Alosa alosa*); twaite shad (*Alosa fallax*); sea lamprey (*Petromyzon marinus*) and river lamprey (*Lampetra fluviatilis*). One potentially relevant catadromous species (i.e. lives in freshwater but returns to the sea to spawn) is the European eel (*Anguilla anguilla*). This is not listed in Annex I of the Habitats Directive, but it does form part of the qualifying criteria for some Ramsar sites. However, this species was not included as a qualifying species in any of the Ramsar sites that were identified at pre-screening and therefore only the anadromous species will be considered further as part of this HRA.

In addition, those designated sites with freshwater pearl mussel as a qualifying features were also added. This is because, while this is a sessile freshwater species, it relies on the anadromous Atlantic Salmon for dispersion during its larval phases and, therefore, any major declines in Atlantic Salmon populations (the impact pathways for anadromous fish being relevant) could translate to an indirect effect on this species also. Based on the past work, a proposed approach for undertaking the screening for these sites is set out below in Section 2.5.3. However, in advance of this, and to provide a context for this review and an understanding of the precedents, an overview is presented of the methods that were applied to screen and scope bird species for the R3OWF and PFSA HRAs (Section 2.5.2).

2.5.2 Precedents for Plan-level screening

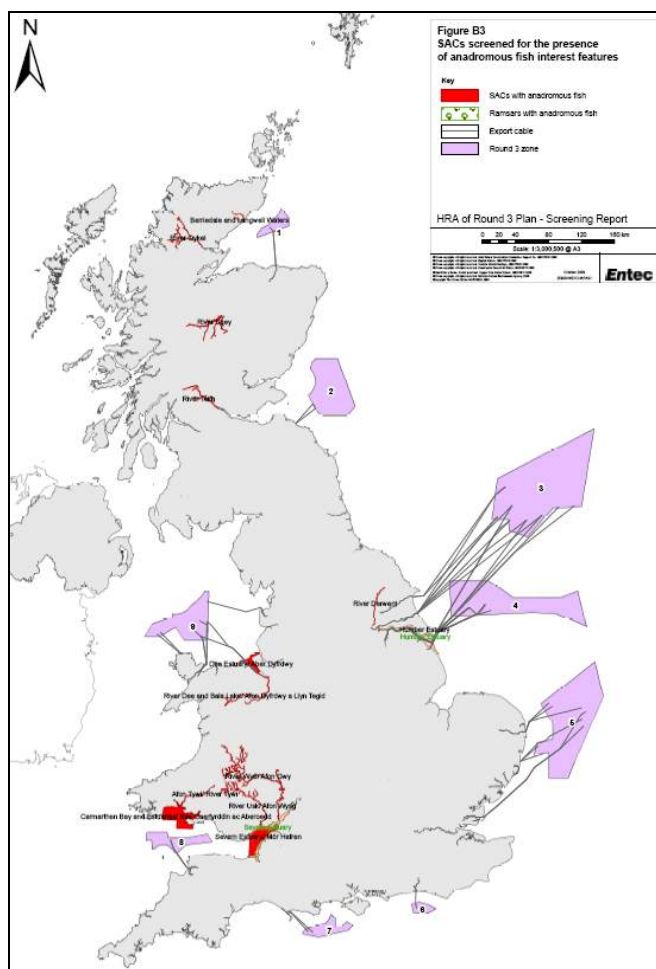
The full list of the impact pathways by which anadromous fish qualifying interests and, by association, freshwater pearl mussel qualifying features can be affected by offshore windfarm developments were set out in Appendix A (Tables A1 and A2) of the pre-screening report. One of the major issues for these species will be the effects of noise on fish qualifying interests during the construction and also operational phases of the work. In addition, the effects of changes to habitat, reductions in prey availability or alterations in water quality conditions (turbidity increases) are among the other key consideration. The methods used to screen for such impacts during the two previous Plan-level HRAs are detailed below.

2.5.2.1 Round 3 Offshore Wind Farm HRA

Within the R3OWF HRA, the SACs and Ramsar sites in the UK which support anadromous fish qualifying species were identified and taken into the assessment process. In addition, the catadromous eel (as qualifying criteria of the Severn Estuary Ramsar site) was also included. Thus both types of migratory fish species were collectively referred to as diadromous.

Relevant estuarine and freshwater SACs were initially included in the pre-screening scope where a Round 3 zone is located within an estuarine area through which these diadromous fish must pass to reach these rivers, or where cable routes may affect such an estuary. Using these criteria, it was found that Zones 1, 2, 3, 4, 8 and 9 (as shown in Image 2) were associated with estuaries of SAC rivers that have migratory fish as interest features and were included in the screening process. No transnational sites were included on this list, as no cables make landfall on the continent and it was assessed that no Round 3 zones were close enough to mainland Europe to impede migration at sea of diadromous fish.

The subsequent screening in of direct and indirect effects (from turbidity) on diadromous fish species was undertaken based on the same approach as for habitats and non-mobile species. Thus, direct effects were identified where there is spatial overlap between cable laying routes and the designated sites (no direct effects from zones themselves will occur given their location), while indirect effects were identified where there is overlap with the tidal ellipse around these cable routes or around the R3OWF zones (Entec 2009a). It was recognised though that the effect of noise required further consideration based on migratory routes, predicted noise levels and fish sensitivities. This aspect was therefore taken forward into the assessment phase.



(Entec 2009a)

Image 10. SACs screened for the presence of anadromous fish interest features

2.5.2.2 Pentland Firth Strategic Area HRA

For the PFSA HRA, it was noted that there is limited information, on the distribution and migratory routes of anadromous fish in coastal waters and therefore the screening of sites with these interest features was based largely on the advice received from SNH. The three riverine SAC sites that support Atlantic Salmon and which lie along the landward boundary of the PFSA (i.e. the north coast of Scotland) were included because salmon will clearly pass through the PFSA to reach these sites. In addition, SNH recommended that two other sites were added to the scope. :

- The River Oykel SAC (which lies outside the PFSA and within the 100km buffer zone) which has Atlantic Salmon Qualifying Interests; and
- The River Spey SAC (which lies just beyond the 100km boundary) which supports Atlantic Salmon and Sea Lamprey interest features.

Also following previous advice from SNH that was provided as part of the R3OWF HRA work, freshwater pearl mussel was also included in the assessment scope where relevant sites

supported both this species and Atlantic salmon as interest features. As discussed above, this was due to the important role that salmon play in the life cycle of the pearl mussel. These two interest features are found at four sites where a LSE of Atlantic Salmon has previously been identified: the River Naver, River Borgie, River Spey and River Oykel SACs.

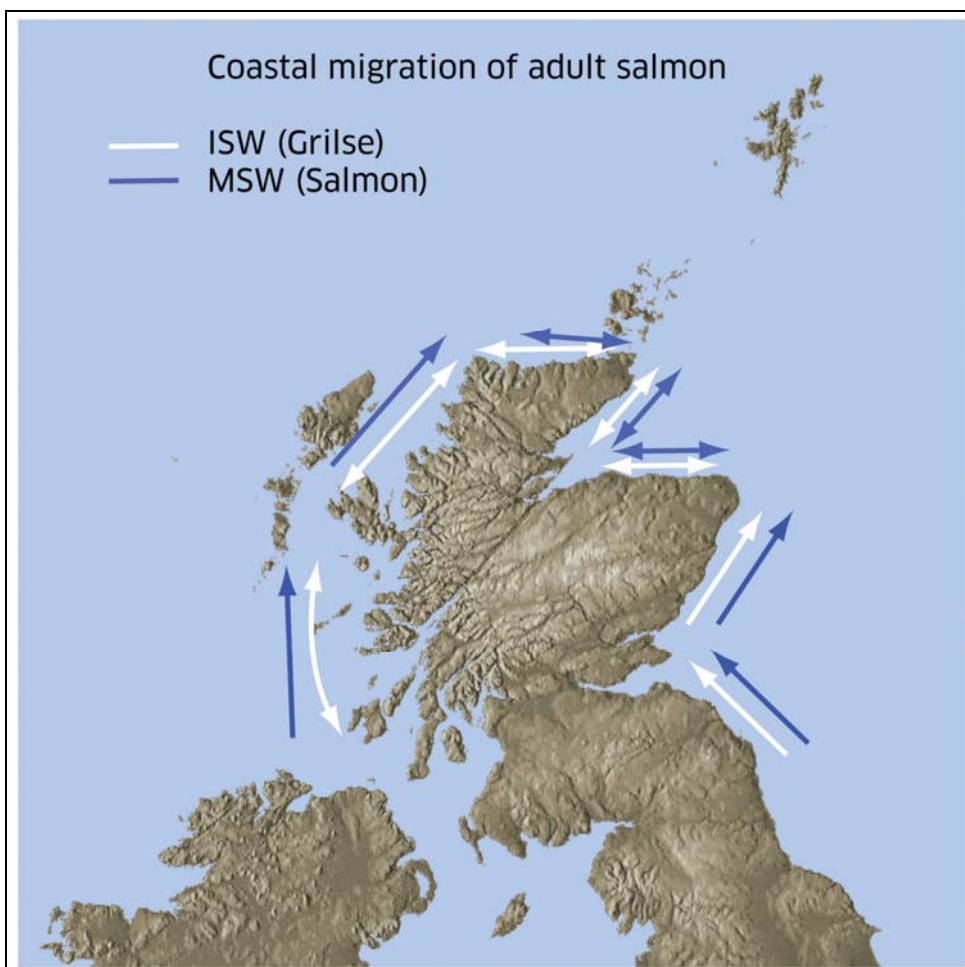
2.5.3 Screening Methods Review

As noted above, the screening methods that were applied for the R3OWF and the PFSA HRA were broadly the same but had slight differences which, to some degree reflects the differences in the Plans and the greater risk posed to anadromous fish species from dynamic underwater tidal devices that were proposed as part of the PFSA plan (i.e. as opposed to static structure proposed for the windfarm projects). In general terms, the initial screening of the PFSA was more broad ranging and included a greater spatial extent of sites (including those at and beyond the 100km boundary) as opposed to the R3OWF HRA (which focused on areas where the windfarms might hamper the migration of fish through species estuarine environments). For the screening of the short and medium term sites for the Draft OWE Plan an approach is proposed which essentially integrates both of these methods. In the first instance all sites supporting anadromous fish and freshwater pearl muscle interest features have been screened in across the 100km area surrounding the medium term option areas. To further screen these the latest understanding about fish migration patterns around the Scottish coast will be used to understand the relative position, and thus potential influence, of each of the short and medium term option areas along these migration pathways.

Following a review of available evidence (on Atlantic salmon and European eel) Malcolm *et al.* (2010) suggested a conceptual model on how Scottish salmon reaching the coast subsequently migrate towards their natal river (revising a previous model by Shearer (1992)). The revised model proposes that multi-sea winter (MSW) salmon and 1 sea-winter (1SW) grilse return both to the north and west coasts of Scotland, and may even reach the north east coast directly having passed Orkney and Shetland. In general this wide geographic distribution of potential arrival locations gives variable and apparent random directions of migration. After they reach the coast they move towards their home rivers, giving apparently variable patterns of migration for a given tagging position. Given that MSW salmon rivers dominate the north and east coasts, the dominant direction of movement for MSW fish caught on the west will be north and east. However, for grilse, the pattern of movement would depend on where they reach the shoreline and where their native river was located. For the east coast rivers south of Aberdeenshire the pattern appears clearer, with fish generally moving in a northward direction from the Northumberland coast, in agreement with Shearer (1992).

While there is a recognition that gaps in understanding clearly remain about how salmon (and especially smolts) migrate, this is considered to be the best available scientific understanding and this conceptual model to the screening process for the OWE Draft Plan. To do this the coastal regions of Scotland have been divided into five regions as shown in Figure 4. It is then possible to use these regions (alongside the location of the SACs which have anadromous fish and freshwater pearl mussel qualifying interests) to understand the extent to which short or medium term option areas might influence migrations. Based on these five regions, the proposed screening principles are

- Areas in the 'South West' will need to screen in SACs within this region only. This is because anadromous fish will enter from the north mainly and are unlikely to pass through this area to get to other SACs (even if they enter from the south they clearly won't pass any other windfarm areas that are part of the Draft OWE Plan).
- Areas in the 'West' will need to screen in SACs across all the regions surrounding the Scottish mainland (NB Shetland doesn't have SAC designated for anadromous fish interests). This is because fish passing through this part of the coastline could move on to any of the designated SACs.
- Areas in the 'North' and in 'Shetland' will need to screen in SACs in both the north and east. This is because fish passing through these regions are likely to be coming predominately from the north and then moving on to the SAC locations along these northern and eastern coasts.
- Areas in the 'East' will need to screen in SACs within this region only (i.e. where the majority of SACs are located). This is because fish passing through this regions, from which ever direction they have arrived, are less likely to be moving through this region to SACs in other locations. It is recognised that the risk of impact is likely to be greater here given the proximity of the areas to the majority of designated sites.



(Malcolm *et al.*, 2010)

Image 11. Dominant directions of travel for Atlantic salmon in Scottish coastal

2.5.3.1 Summary of the proposed screening process

To summarise the approach described above, an iterative series of tasks has been identified to encompass the proposed LSE screening work. This will be undertaken for each of the 34 short and medium terms options. This process has been developed from the review of approaches taken during previously Plan-level HRAs (as described above) and through consultation with the PSG.

- **Step 1:** Agree the list of relevant qualifying features with the PSG. This element has been completed during the production of the pre-screening report and also during consultations on the early draft of this working paper.
 - **Step 2:** Identify the best understanding about possible cable alignments and landfall positions to make assumptions and, if possible, identify areas of search for these locations (as noted in preceding section, the first indications from the assessment review work are that this understanding will be insufficient to define areas with the high level of certainty required under the Habitats Regulations).
 - **Step 3:** Screen in all designated sites and associated anadromous fish interests that will be directly affected. This will be where there is spatial overlap between the short and medium term options areas or with any defined areas of search for cable alignments and landfalls.
 - **Step 4:** Screen in all designated sites and anadromous fish interests species interest features that could be indirectly affected because they lie at distances of less than one tidal excursion distance from any short and medium term options areas or from any defined areas of search for cable alignments and landfalls.
 - **Step 5:** Screen in anadromous fish for those short and medium term option areas (including cable route areas where known) that have the potential to affect fish migration around the coast and into designated estuaries or rivers. The approach to be taken here will depend upon the region in which the areas, and any possible cable routes, are located (as described above and shown in Figure 4). The approach will be as follows:
 - Areas in the 'South West' will need to screen in SACs within this region only;
 - Areas in the 'West' will need to screen in SACs across all regions (NB Shetland doesn't have SAC designated for anadromous fish interests);
 - Areas in the 'North' and in 'Shetland' will need to screen in SACs in the north and east regions; and
 - Areas in the 'East' will need to screen in SACs within this region only (although the risk of impact is likely to be greater here given the proximity of the areas to the majority of designated sites).
- This approach will be applied for salmon and lamprey species (noting that lamprey SACs are all located in the 'South West' and 'East' while Salmon SACs are present across all regions including Northern Ireland).
- **Step 6:** Screen in freshwater pearl mussel for those short and medium term option areas (including cable route areas where known) using the approach adopted in Step 5 but recognising in this case that Atlantic salmon don't need to be a qualifying feature of the SAC for a site to be screened in.

- **Step 7:** Alter the pre-screening tables to indicate the anadromous fish and freshwater pearl mussel qualifying features that have been screened in or out for each of the 34 short and medium term option areas. Identify any designated sites that can be screened in or out on the basis of the above review (i.e. because there is no LSE for any of their qualifying interest features).
- **Step 8:** Record the findings on the screening maps that will be prepared for each of the 34 short and medium term option areas and any defined areas of search for cable alignments.

2.6 Otter

2.6.1 Introduction

At the pre-screening stage several European/Ramsar sites were included in the HRA. This approach screened in all European/Ramsar sites including SACs with otter features within 100km of the medium term options areas. In the next stages of the HRA it will be possible to revisit this list based on a more detailed consideration about whether there is a LSE. An outline approach for undertaking this next screening is set out below in Section 2.6.3. However, in advance of this, and to provide a context for this review and an understanding of the precedents, a brief overview of the methods that were applied to screen and scope habitats for the R3OWF and PFSA HRAs (Section 2.6.2) is presented.

2.6.2 Precedents for Plan-level screening

The full list of the impact pathways by which otter can be affected by offshore windfarm developments were set out in Appendix A (Tables A1 and A2) of the pre-screening report. In particular, the OWE Draft Plan has the potential to affect otter populations directly where cable alignments and landfall infrastructure cause damage to key habitats or shelters at or near the shoreline or from collision with vessels moving to and from the site. There is also the potential for indirect effects through visual disturbance. The methods used to screen for such impacts during the two previous Plan-level HRAs are detailed below.

2.6.2.1 Round 3 Offshore Wind Farm HRA

Within the R3OWF screening review (Entec 2009a) it was concluded that otter are most likely to be affected by disturbance at the coast and within estuaries with the relevant impact pathway being 'increased vessel activity at ports where shipping activity is currently infrequent or absent'. During the initial pre-screening review therefore, the sites with otter as a qualifying species were included if they fell within one tidal excursion of a cable route or zone, on the basis that this distance would never be less than the distance over which disturbance (by noise or human activity) could affect this species¹³.

¹³ While it is fully understood how direct and indirect impacts to habitats and water quality could occur within one tidal excursion of a cable route or zone, it is not clear how this translated to noise and human activity effects in this case. It should be noted for the OWE Draft Plan the issue of noise effects (on fish and mammals) will not be linked to tidal excursion distances in this manner.

2.6.2.2 Pentland Firth Strategic Area (Wave and Tidal Energy) HRA

During the PFSA screening and assessment, it was recorded (based on SNH advice about the impacts of development on otter (SNH 2010) as well as relevant Regulation 33 documents (SNH 2006)) that otter are vulnerable to the loss of their shelters (including those on the shoreline) and to loss of habitat which, in turn, can leave them more exposed to disturbance effects. Therefore, habitat damage and disturbance are interlinked factors. For the purposes of the PFSA therefore, both the impacts from visual disturbance (from vessels and other activities during survey work, construction, maintenance and decommissioning) and the presence of operational structures or visiting vessels (which could result in collision and/or mortality) were considered. However, as noted above, the PFSA study did not address landfill impacts and therefore, while it addressed the impacts to habitats from devices on coastal foraging grounds, it did not consider the direct impacts to coastal habitats and shelters from cable alignments.

Also in the PFSA assessment it was noted that, the distances offshore that foraging occurs is not clear but it is unlikely to be beyond water depths of greater than 10m (the depth at which they are identified as being at risk of entanglement in pots/creels). It was also identified that otter move large distances along riverine habitats (some are known to use 20km or more of river habitat) but that they also tend to be very territorial. The guidance on undertaking surveys to assess impacts upon this species (SNH 2010) suggests that distances of 200-250m are appropriate. During the PFSA HRA screening and scoping study (ABPmer 2010b), advice was sought from SNH (Rob Raynor Species Advisor) as to the distances over which otters may forage in order to identify which sites may be subject to a LSE from the Plan. It was recommended that a 10km boundary represents an appropriate buffer distances beyond which a plan or project would be unlikely to have a significant effect. This was the approach adopted for the PFSA HRA.

2.6.3 Screening Methods Review

For the OWE screening work it is proposed that a 10km boundary is identified around designated sites for which otter are an interest feature (based on the approach that was adopted for the PFSA projects). The evidence and guidance that is available would point to this being a highly precautionary approach and it is recognised that, in general terms, the risk to otter from wind turbines are lower than they are for mobile tidal devices (given that the former are static underwater) during a project's operational phases at least. -

2.6.3.1 Summary of the proposed screening process

To summarise the approach described above, an iterative series of tasks has been identified to encompass the proposed LSE screening work. This will be undertaken for each of the 34 short and medium terms options. This process has been developed from the review of approaches taken during previously Plan-level HRAs (as described above) and through consultation with the PSG.

- **Step 1:** Identify the best understanding about the possible cable alignments and landfall positions to make assumption and, if possible, identify areas of search for these locations. As noted above, the first indications from the assessment review work are that this understanding will be insufficient to define areas with the high level of certainty required under the Habitats Regulations.
- **Step 2:** Screen in or out for those short and medium term option areas (including cable route areas where known) that lie at distances of less than 10km from the designated sites.
- **Step 3:** Alter the pre-screening tables to indicate the other qualifying features that have been screened in or out for each of the 34 short and medium term option areas. Identify any designated sites that can be screened in or out on the basis of the above review (i.e. because there is no LSE for any of their qualifying interest features)
- **Step 4:** Record the findings on the screening maps that will be prepared for each of the 34 short and medium term option areas and any defined areas of search for cable alignments.

3. HRA Stages 6 and 7 – Approach to Mitigation Measures and Re-Screening

Once the above process has been undertaken and a revised list of sites and features has been obtained, Stages 6 and 7 of the process will be pursued to re-screen this list and finalise the scope the AA. For this two-step process the generic impacts of the draft OWE plan (see Tables A1 and A2 in Appendix A of the ABPmer pre-screening report will be reviewed and compared against a set of initial standard mitigation measures.

These initial mitigation measures are set out in the SEA Environmental Report (Marine Scotland, 2010b) which considers strategic level and project level mitigations. The following strategic mitigation measures were identified to ensure that the adverse effects of the draft Plan are avoided or minimised:

- There may be a requirement to remove further options from the Plan on the basis of the findings of a strategic level HRA. This would assess the likely significant effects of the draft Plan on internationally protected sites (SPAs, SACs and Ramsar Sites). It may be necessary to change the draft Plan where adverse effects on European nature conservation sites are identified in this process, and other forms of mitigation are considered insufficient to avoid such effects arising.
- Continue communications (consultation and participation) with the SEA consultation authorities (SEPA, SNH and Historic Scotland), regulators, key organisations (e.g. Scottish Fishermen's Federation), developers (including those that have been awarded exclusivity leases for areas inside STW), Offshore Wind Industry Group and the public to seek appropriate site-specific mitigation. Developers must be engaged in the process as early as possible together with the shipping and commercial fishing industries to develop appropriate mitigation.

- Consider the potential requirement to identify and provide habitat to help offset non-designated/nationally designated habitat losses resulting from offshore windfarm development.
- Consider the implementation and scheduling of components of offshore wind projects within STW (in combination with other planned offshore developments) to minimise strategic adverse impacts on species (e.g. migratory fish, marine mammals etc, habitats and landscape), including consideration of the cumulative and in-combination effects with other identified schemes, projects or activities;
- Undertake the further work recommended at the strategic level.

The Project Level Mitigation pertaining to impacts to 'water'; 'geology sediments and coastal processes' and 'biodiversity, flora and fauna' were as follows:

- **Water:** Further assessment work is required for all options to reduce uncertainty regarding potential impacts on water quality (including Shellfish Waters). This includes a recommendation for hydrodynamic and water quality modelling at project level.
- **Water:** Specific impacts during construction, operation and decommissioning should be reduced through the selection and use of appropriate methods to reduce pollution risks, e.g. through the use of best practice marine construction procedures for prevention and control of spillages and discharges of harmful substances (such as antifouling agents, sacrificial anodes, biocides, grouts etc) to the marine environment; for sediment mobilisation and associated turbidity and secondary impacts to avoid unacceptable impacts on marine and benthic fauna.
- **Geology Sediments and Coastal Processes:** Further assessment work is required for all options to reduce uncertainty regarding potential impacts on coastal processes. This includes a recommendation for sediment dynamic modelling at project level
- **Geology Sediments and Coastal Processes:** Optimise the location and arrangement of structures and their arrangement during the design process to mitigate any issues of erosion or deposition and resulting impacts on sensitive receptors.
- **Biodiversity, Flora and Fauna:** Key areas for species and habitats of nature conservation (e.g. legally designated sites, Important Bird Areas, flight corridors and migratory routes) and fisheries value (e.g. spawning grounds) should be avoided, where known, through the positioning and subsequent design of the development.
- **Biodiversity, Flora and Fauna:** Specific impacts on species and habitats (including fisheries) should be reduced through appropriate design (e.g. minimising footprint of the development to minimise loss or damage to seabed habitat), and selection and use of appropriate construction (e.g. timing to avoid key seasons; selection of low noise and minimal vibration installation technologies; utilisation of 'soft start' practices for plant and vessels to minimise disturbance and allow mobile species to move away from areas of disturbance) and operation methods (e.g. use of noise attenuation technologies);
- **Biodiversity, Flora and Fauna:** Further work is required at a strategic and project level to determine impacts on international nature conservation sites – to be assessed through the HRA process.

These measures may allow certain impact pathways to be removed but it is recognised that this may not result in any of the identified interest features or designated sites being excluded

from the scope on the basis that other impact pathways remain. This is because of the inherent uncertainties that are associated with project developments and the need to adhere to the precautionary principle. During the assessment phase that follows therefore additional mitigation measures will be developed which are appropriate to address impacts to the integrity of designated sites as far as possible.

4. HRA Stages 8 to 10 - Methods for Assessment

4.1 Introduction

For this plan level assessment, it is recognised that there is often limited information on the precise location and scale of development or about the relevant construction methods and associated activities. This is particularly the case for medium term options areas where there is no information available beyond an indication of site location and area. The assessment will therefore take account of the likely range of development options and activities based on available information, including possible scales of development and the possible position of cable alignments and cable landfalls). These will then be used to assess the potential envelope of change to determine the potential effects on features and any requirements for restrictions on development or for additional mitigation measures. Documentation of these constraints and the requirements for additional mitigation measures will be very important in providing the audit trail as the plan is implemented. In particular, this approach provides transparency in the process and ensures that developers are fully aware of any European/Ramsar constraints associated with particular locations or activities and also provides confidence in delivering the requirements of the Habitats Regulations.

The screening process matrices will identify where features within individual sites are at risk of LSE and the detailed assessment will build on this by considering the particular environmental pressures/changes that give rise to these risks and provide a generic assessment of the impact having regard to site conservation objectives.

4.2 Key Stages of the Assessment Process

For the assessment work an iterative process will be pursued. The individual steps of this process are set out in the following sections. As described in the preceding section, this report provides the information that is needed by Marine Scotland, as competent authority, to carry out an AA for the PFSA Leasing Round. For the AA, the Scottish Government are required to ascertain that the Plan will not adversely affect the integrity of any European/Ramsar sites. This judgment needs to be made in the context of the Conservation Objectives for the relevant European/Ramsar sites.

To prepare the information that is needed for this AA, a step-wise process will be undertaken and, where relevant, tabular outputs produced that clearly summarise the findings. The information will be presented according to the relevant features that are affected and divided into the following sections:

- Coastal, Intertidal and subtidal habitats and associated species;
- Bird species;
- Marine mammal species (Cetaceans and Seals);
- Migratory Fish and Freshwater Pearl Mussel; and
- Otter;

4.2.1 Step 1: Identify European/Ramsar Sites and Features to be Considered

At the first stage of the assessment process, the list of the interest features (and the relevant European/Ramsar sites) that need to be considered within the AA because there is a LSE (or because the potential for a LSE cannot be excluded). Maps will be produced which show where these sites and features are located relative to the short and medium term options areas. This matrix or table-based approach will be taken to illustrate the findings. Such an approach was also taken for the PFSA screening work which identified the relevant features and the relevant European/Ramsar sites. For the OWE HRA however, it will also be necessary also to tabulate the designated sites and features that are pertinent to each of the medium term options areas. This is because the short and medium term options areas cover a wide area of Scottish territorial waters (unlike the PFSA which was large but localised) and this means that not all of the interest features or all of the screened designated sites need to be addressed for all the short or medium term options areas.

4.2.2 Step 2: Review Interest Feature Sensitivities

Following the initial audit of interest features in Step 1, a review of the sensitivities of these qualifying habitats and species (i.e. their intolerance from damage or death from an external factor) will be undertaken and tabulated. This review will identify the external factors or environmental changes which influence these sensitivities and, where possible, will also present initial details about the draft Plan activities that will, or might, cause these changes. These sensitivities will be reviewed under the following relevant standard '*categories of operations which may cause deterioration or disturbance*' (UK Marine SAC project 2001) which are typically applied within Regulation 33 advice documents:

- **Physical loss** (of habitats) from removal or smothering;
- **Physical damage** (of habitats and species) from siltation, erosion or physical injury/death;
- **Indirect (non-physical) disturbance** from noise or visual presence and reduced availability or displacement of species (including prey);
- **Toxic contamination** from the introduction of synthetic compounds, introduction of non-synthetic contaminants;
- **Non-toxic contamination** from nutrient enrichment, organic enrichment, changes in suspended sediment and turbidity, changes in salinity or changes to the thermal regime; and
- **Biological disturbance** from introduction of microbial pathogens, the introduction of invasive non-native species and translocation or from selective extraction of selected species.

4.2.3 Step 3: Review the Draft OWE Plan Activities to Which Features are Sensitive

Based on the information about habitat and species sensitivities, the individual draft Plan activities that might affect the relevant features are reviewed and tabulated. Each relevant interest feature is considered and the activities are identified from the information within the draft OWE Plan as well as from previous, strategy and assessment documents (in particular the Scottish Marine Renewables Strategic Environmental Assessment (SEA) and the R3OWF HRA). For each feature, the factors to which they are sensitive are tabulated against the activities which are known to, or could, cause a relevant environment change. For ease of reference and consistency, standard Natura 2000 sensitivity categories will be used to inform the assessments, linked to specific development activities. For example, noise disturbance from vessel activity during survey work would be classified as a form of non-physical disturbance etc.

In these tables, a judgment is also made about the level of risk (low, medium or high) of the features being damaged or disturbed by the changes that arise via each of the relevant impact pathways. These judgments about risk are based on information provided in preceding studies (in particular the Scottish Marine Renewables and the OWE Draft Plan SEAs) which were in turn based on a range of preceding literature reviews, research projects and previous project examples. For many of the more common impact pathways (e.g. contaminant release or damage to habitats) the levels of risk cited in these strategic documents and used in this assessment are well understood. Other pathways are less well understood (e.g. collision risk for migrating birds in particular) and within this assessment the levels of risk are, necessarily, informed by expert judgment in the absence of an established evidence base. In these latter cases the risks are often identified as being relatively uncertain because of the paucity of available information¹⁴. In order to ensure that this process is clear and transparent, the reasons for a given level being assigned will be provided with reference to empirical evidence where possible.

Also, in these sensitivity tables, the stages in the implementation process for individual projects at which the impact pathways are relevant (i.e. survey, construction, operation or decommissioning) are also shown. The risks associated with each of these stages are then also indicated in these tables.

4.2.4 Step 4: Assessment of the Effects of the Draft OWE Plan on European/Ramsar Sites

Prior to assessing the effects arising from each of the impact pathways identified in Steps 1 to 3, the Conservation Objectives for each of the relevant European/Ramsar sites will be identified¹⁵ and presented. For some sites generic conservation objectives may need to be used. Based on these specific and generic objectives, the potential effects on each site via each of the impact pathways will be reviewed and an initial view taken (and advice provided in

¹⁴ It should be noted that, while there are variations in risk, and differences in the level of certainty associated with those risks (and that it is important that these are understood), a precautionary approach has been taken (in line with the Habitats Regulations) for the assessment of impacts and the determination of mitigation measures (see following sections) which means that all potential impact pathways are addressed irrespective of these variations.

¹⁵ From the online sources such as the SNHi, Sitelink <http://www.snh.org.uk/snhi/> and www.snh.org.uk, and through consultation with SNH.

advance of the formal judgment that is to be made by Marine Scotland, in consultation with the key stakeholders for the AA) about and the effect on site integrity of the proposed Plan both alone and in-combination with other extant plans or projects. The views expressed about the effects on site integrity will be based on: current scientific understanding; the proposed manner in which the Plan is to be implemented and the proposal for mitigation measures to avoid or reduce impacts. Where the information indicates that there could be an effect on integrity based on application of the draft plan and accompanying environmental/mitigation measures, then proposals will be presented for revised Plan-level mitigation measures that should be adopted to avoid such an effect.

4.2.4.1 Report production

The assessment process will be presented as a single coherent, transparent document with the assessment and results presented in a series of tables and matrices. Separate tables will be prepared for individual features (or grouped features) which provide an assessment of impact (whether there is an adverse effect on integrity) for each activity/environmental change taking account of both plan level generic mitigation measures (based on information in the SEA Environmental Reports) and with any necessary additional mitigation measures/controls in place. The assessment will thus provide a clear audit trail which will identify:

- European/Ramsar feature and site combinations where there is no LSE (and are not progressed beyond the screening phase);
- European/Ramsar feature and site combinations where there is a LSE but an adverse effect on integrity can be avoided through restrictions on the location and/or scale of development or through implementation of additional mitigation measures; and
- Any European/Ramsar feature and site combinations where it cannot be ascertained that an adverse effect on integrity can be avoided.

4.3 Cumulative and In-Combination Impacts

The draft AA Report will also identify the potential cumulative and in-combination effects associated with plan implementation, flag up particular risks and document how these issues should be taken forward through project level HRA. In particular, given the uncertainties that exists about the scale and location of development and the timing of development (particularly for the medium term sites), it must be recognised that there are significant difficulties in undertaking detailed in-combination assessments. The approach adopted in previous strategic HRAs is to recognise these limitations and this approach is advocated here. These past assessments have sought to identify the potential for in-combination issues to arise from multiple developments within the plan and also to identify the range of other plans and projects that might potentially interact with the plan being assessed, with more detailed assessment being remitted to project level.

The key plans and programmes that would need to be considered in this context include:

- The draft N-RIP2 plan;
- Certain existing OWE developments and the R3 OWE plan (e.g. Moray Firth, Firth of Forth);

- Demonstrator projects (e.g. Beatrice, Aberdeen);
- Waterfront regeneration projects (e.g. Edinburgh and Dundee);
- Bo'ness foreshore redevelopment;
- Dundee, Grangemouth, Rostyth and Leith Biomass projects;
- Middle Bank, Firth of Forth – licensed aggregate extraction area;
- Onshore windfarms;
- Increased vessel activity from all sources (no specific plan), including offshore development and shipping from other ports;
- ISLES project;
- The Pentland Firth Strategic Area (PFSA) plan for wave and tidal developments;
- Proposals for additional wave and tidal development lease areas (e.g. Western Isles, Shetland etc);
- Proposals for the offshore grid and other proposed cable routes;
- Container transshipment hub at Scapa Flow;
- Other proposals included within the emerging Pentland Firth Marine Spatial Plan; and
- Oil & gas development activities.
- National Planning Framework for Scotland 2: and
- Proposal for a new coal fired power station at Hunterston.

The assessment documents will set out the expectations that exist for project level HRAs to provide clarity on how HRA issues will be incorporated in post plan adoption, project level assessments.

5. References

ABPmer, 2010a. Habitats Regulations Appraisal of Draft Plan for Offshore Wind Energy in Scottish Territorial Waters: Pre-Screening Review of the Medium Term Options. ABP Marine Environmental Research Ltd, Report No. R.1722a.

ABPmer, 2010b. Screening and Scoping Review for the Pentland Firth Strategic Area (PFSA) Leasing Round Habitats Regulations Assessment. Report for The Crown Estate January 2010; ABP Marine Environmental Research Ltd, Report No. R.1601.

ABPmer, 2010c. Report to Inform Appropriate Assessment for the Pentland Firth Strategic Area (PFSA) Leasing Round. Report for The Crown Estate February 2010; ABP Marine Environmental Research Ltd, Report No. R.1602.

ABPmer, 2007. Implications of New Conservation Designations for Key Business Activities. ABP Marine Environmental Research Ltd, Report No. R.1394. Report for The Crown Estate.

BERR 2008. Review of cabling techniques and environmental effects applicable to the offshore wind farm industry – Technical Report. BERR. [cited in Entec UK Ltd, 2009a]

Coastline Surveys Ltd 1998. Marine aggregate mining benthic and surface plume study. US Marine Minerals Management Service [cited in Entec UK Ltd, 2009a]

Clay N., Bray N. and Hesk P. (2008) Maximising beneficial reuse through the use of a novel dredging contract. *Terra et Aqua*, 111, 13-20. [cited in Entec UK Ltd, 2009a]

Cunningham, L., Baxter, J.M., Boyd., I.L., Duck, C.D., Lonergan, M., Moss, S.E., McConnell, B. (2009). Harbour seal movements and haul-out patterns: implications for monitoring and management. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 19 398-407.

David Tyldesley and Associates, 2009. The Habitats Regulations Assessment of Local Developments. Revised Draft Guidance for Natural England February 2009.

David Tyldesley and Associates, 2010. Habitats Regulations Appraisal of Plans. Guidance for Plan-making Bodies in Scotland Version 1.0, August 2010 Ref 1739

DECC 2009. UK Offshore Energy Strategic Environmental Assessment: Future Leasing for Offshore Wind Farms and Licensing for Offshore Oil & Gas and Gas Storage.

Department of Environment for Northern Ireland (DOENI) 1997. Planning Policy Statement 2 (PPS2) Planning and Nature Conservation. June 1997

Electricity Networks Strategy Group, 2009. Our electricity transmission network: A vision for 2020. March 2009

English Nature 1999. Habitats Regulations Guidance (HRGN) Note 3. The Determination of Likely Significant Effect under The Conservation (Natural Habitats &c) Regulations 1994 (November 199)

Entec UK Ltd, 2009a. Habitats Regulations Assessment of the Round 3 Plan. Screening Report, Report for The Crown Estate October 2009.

Entec UK Ltd, 2009b. Habitats Regulations Assessment of the Round 3 Plan. Information to Inform an Appropriate Assessment, Report for The Crown Estate December 2009.

Evans, P.G.H. and Teilmann, J. (editors) (2009) Report of ASCOBANS/HELCOM Small Cetacean Population Structure Workshop. ASCOBANS/UNEP Secretariat, Bonn, Germany. 140pp.

Furness, R.W. & Tasker, M.L. (2000). Seabird-fishery interactions: quantifying the sensitivity of seabirds to reductions in sandeel abundance, and identification of key areas for sensitive seabirds in the North Sea. *Marine Ecology Progress Series*, 202, 253-264.

Griffin L., Rees E., and Hughes B 2010. The Migration of Whooper Swans in Relation to Offshore Wind Farms Final Report to COWRIE Ltd. March 2010 (COWRIE Project Code: SWAN-06-08)

Halcrow, 2010. The Plan for Offshore Wind Energy in Scottish Territorial Waters. Pre-Screening for Appropriate Assessment. June 2010.

Hastie GD, Barton TR, Grellier K, Hammond PS, Swift RJ, Thompson PM, Wilson B 2003. Distribution of small cetaceans within a candidate Special Area of Conservation; implications for management. *Journal of Cetacean Resource Management* 5: 261-266.

JNCC (2009). UK Seabirds at Sea Summary data, on-line resource. <http://seamap.env.duke.edu> . Accessed on January 19, 2010, JNCC Seabirds at Sea Team.

Lambkin, D.O., Harris, J.M., Cooper, W.S., Coates, T., Coastal Process modelling for Offshore Windfarm Environmental Impact Assessment: Best Practice Guide (COWRIE COAST-07-08)

Malcolm, I. A., Godfrey, J and Youngson, A.F.2010. Review of migratory routes and behaviour of Atlantic Salmon, sea trout and European eel in Scotland's coastal environment: implications for the development of marine renewables. *Scottish Marine and Freshwater Science* Vol 1 No 14 (draft report Published by Marine Scotland Science)

Marine Scotland, 2010a. Draft Plan for Offshore Wind Energy in Scottish Territorial Waters. Published by Marine Scotland, May 2010.

Marine Scotland, 2010b. Strategic Environmental Assessment (SEA) of Draft Plan for Offshore Wind Energy in Scottish Territorial Waters: Volume 1: Environmental Report. Published by Marine Scotland, May 2010

Matthiopoulos J, McConnell B, Duck C, Fedack M 2004. Using satellite telemetry and aerial counts to estimate space use by grey seals around the British Isles. *Journal of Applied Ecology* 41: 476-491.

McConnell BJ, Fedak MA, Lovell P, Hammond PS (1999) Movements and foraging areas of grey seals in the North Sea. *Journal of Applied Ecology* 36, 573-590.

National Grid Econnect. Round 3 Offshore Wind Farm Connection Study, report for The Crown Estate, v1.0. [Cited in Entec UK Ltd, 2009a. Habitats Regulations Assessment of the Round 3 Plan. Screening Report, Report for The Crown Estate October 2009.]

National Grid 2010 Offshore Development Information Statement. September 2010

Office of Deputy Prime Minister (ODPM) 2005. Planning Policy Statement 9: Biodiversity and Geological Conservation ISBN 0-11-75394-6

Reid J.B., Evans P.G.H., Northridge S.P., 2003. Atlas of Cetacean distribution in north-west European waters, 76 pages, colour photos, maps. Paperback, ISBN 1 86107 550 2

Robinson KP, Baumgartner N, Eisfeld SM, Clark NM, Culloch RM, Haskins GN, Zapponi L, Whaley AR, Weare JS, Tetley MJ 2007. The summer distribution and occurrence of cetaceans in the coastal waters of the outer southern Moray Firth in northeast Scotland (UK). *Lutra* 50(1): 19-30

Roos, S., Humphreys, L., Wernham, C. & Burton, N. 2010. Informing the Appropriate Assessment of the Pentland Firth Strategic Area Leasing Ground.

Royal Haskoning 2009a Scottish Territorial Waters Offshore Wind Farms - East Coast Discussion Document - Cumulative Effects September 2009 Cumulative Effects Studies 9V3255

Royal Haskoning 2009b Scottish Territorial Waters Offshore Wind Farms - West Coast Discussion Document - Cumulative Effects September 2009 Cumulative Effects Studies 9V3255

Royal Society for the Protection of Birds (RSPB) 2000. The development of boundary selection criteria for the extension of breeding seabird special protection areas into the marine environment. Discussion paper presented by BirdLife International to the Meeting of the Biodiversity Committee (BDC), OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic, Vlissingen, 20-24 November, 2000.

SCANS-II (2008) Small Cetaceans in the European Atlantic and North Sea. Final Report to the European Commission under project LIFE04NAT/GB/000245. Available from Sea Mammal Research Unit, University of St. Andrews, 54pp.

Scottish Executive 2007. Scottish Marine Renewables: Strategic Environmental Assessment (SEA). Report prepared for the Scottish Executive by Faber Maunsell and Metoc PLC.

Scottish Government 2010. Scottish Planning Policy SPP 2010 February 2010 ISSN 1741 1203

SNH (2010) Otter and Development - Scottish Wildlife Series. Online site accessed January 2010 <http://www.snh.org.uk/publications/on-line/wildlife/otters/default.asp>

SNH, (2006). Dornoch Firth and Morrich More Special Area of Conservation. Advice under Regulation 33(2) of The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

Sharples RJ, Matthiopoulos J, Hammond PS 2008 Distribution and movements of Harbour seals around the coast of Britain. Report to the Department of Energy and Climate Change (DECC). Sea Mammal Research Unit, St Andrews, UK, 65pp.

Shearer, W.M. 1992 The Atlantic salmon: Natural history, exploitation and future management. Fishing News Books, Oxford, ISBN 0-85238-188-3. [Cited in Malcolm 2010]

SMRU 2006. Advice to the Special Committee on Seal 2006 (Cited in Entec UK Ltd, 2009a)

SMRU 2007. Potential impact of Oil and Gas Exploration and Development on SACs for bottlenose dolphins and other marine mammals in the Moray Firth and Cardigan Bay/Pembrokeshire. Report to the Department of Trade and Industry. Sea Mammal Research Unit (SMRU), University of St. Andrews, UK, 13pp.

Talisman Energy (UK) Limited 2006. Beatrice Wind Farm Demonstrator Project: Environmental Statement.

Thaxter, C.B., Wanless, S., Daunt, F., Harris, M.P., Benvenuti, S., Watanuki, Y., Grémillet, D. & Hamer, K.C. 2010. Influence of wing loading on trade-off between pursuit-diving and flight in common guillemots and razorbills. *Journal of Experimental Biology*.

Thompson PM, Lusseau D, Corkrey R, Hammond PS 2004. Moray Firth bottlenose dolphin monitoring strategy options. Scottish Natural Heritage commissioned report No. 079 (ROAME No.F02AA409), 21pp.

http://www.snh.org.uk/pdfs/publications/commissioned_reports/ReportNo079.pdf

Thompson PM, McConnell BJ, Tollit DJ, Mackay A, Hunter C, Racey PA (1996) Comparative distribution, movements and diet of harbour and grey seals from the Moray Firth, NE Scotland. *Journal of Applied Ecology* 33 1572-1584.

Tollit, D.J., Black, A.D., Thompson, P.M., Mackay, A., Corpe, H.M., Wilson, B. Van Parijs, S.M., Grellier, K and Parlane, S. 1998. Variations in harbour seal *Phoca vitulina* diet and dive-depths in relation to foraging habitat. *J. Zool., Lond* 244, 209-222.

Transmission Capital 2010 West Coast Offshore Wind. A report into grid connection options and developer co-ordination issues. Summary Report for The Crown Estate (TCE) March 2010

UK Marine SAC Project (2001) Proposed list of categories of operations which may cause deterioration or disturbance to interest features.

http://www.ukmarinesac.org.uk/activities/ports/ph2_2_4_1.htm

Welsh Assembly Government 2010. Planning Policy Wales Chapter 5 Conserving and Improving Natural Heritage and the Coast

Wernham C.V., Toms M.P., Marchant J.H., Clark J.A., Siriwardena G.M. & Baillie S.R. (eds.)

2002 The Migration Atlas: movements of the birds of Britain and Ireland. Poyser, London

ISBN 0-7136-6514-9 <http://www.bto.org/research/projects/atlas.htm>

Wilson, J.C., Elliott M., Cutts N.D, Mander L., Mendão V., Perez-Dominguez R., & Phelps A. 2010. Coastal and Offshore Wind Energy Generation: Is It Environmentally Benign? *Energies* 2010, Vol 3, pp. 1383-1422; ISSN 1996-1073

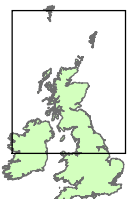
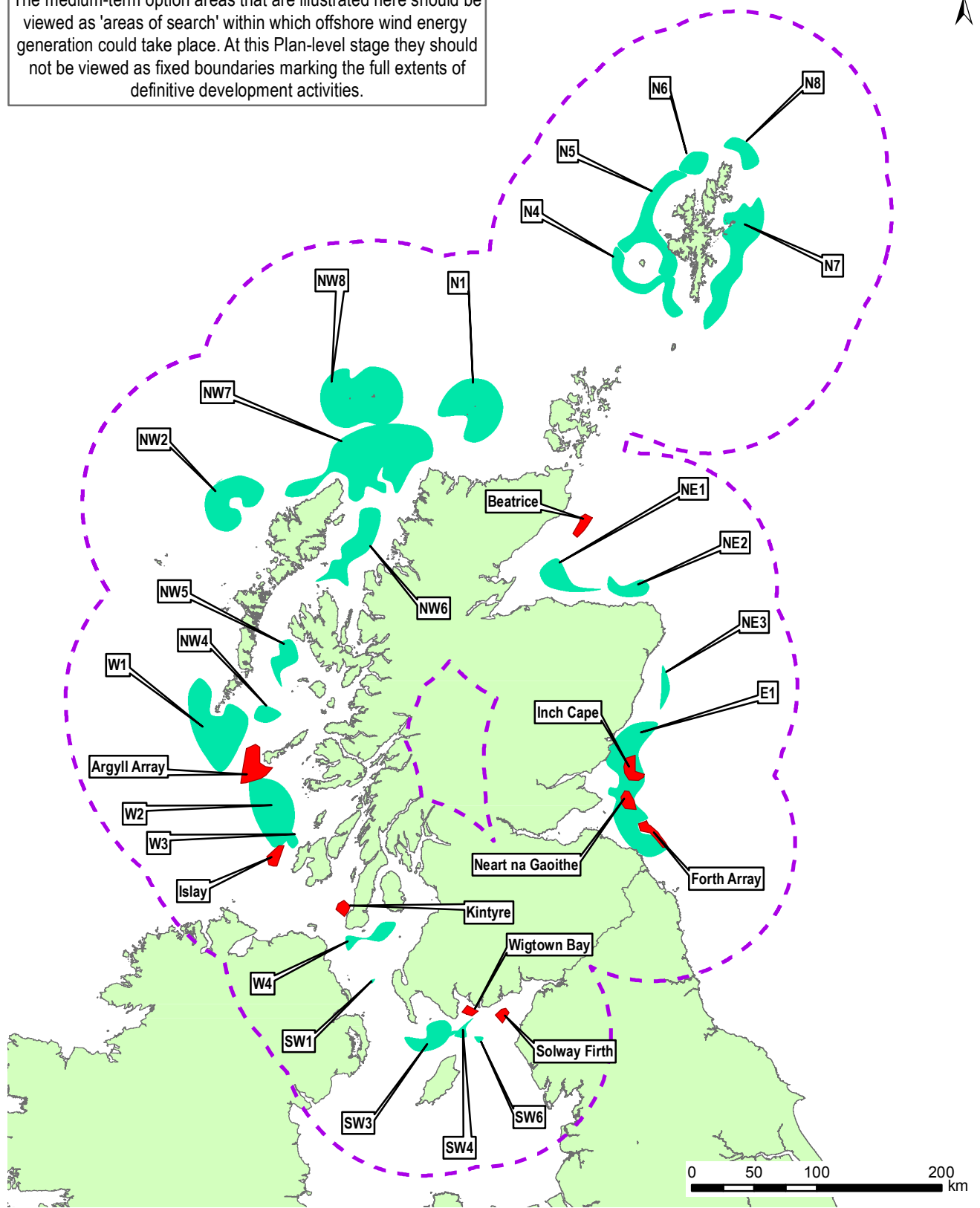
WDCS, (2009). Outer Moray Firth Cetacean Research 2008. Project Report for the BBC Wildlife Fund.

WDCS 2010. Toward Marine Protected Areas for Cetaceans in Scotland, England and Wales. A scientific review identifying critical habitat and key recommendations.

Figures



The medium-term option areas that are illustrated here should be viewed as 'areas of search' within which offshore wind energy generation could take place. At this Plan-level stage they should not be viewed as fixed boundaries marking the full extents of definitive development activities.



Date	By	Size	Version
Nov 10	FMM	A4	1
Projection		OSGB 1936	
Scale		1:4,500,000	
QA		NMW	
8974-fig1_Medium_term_options.mxd			
Produced by ABPmer Ltd			

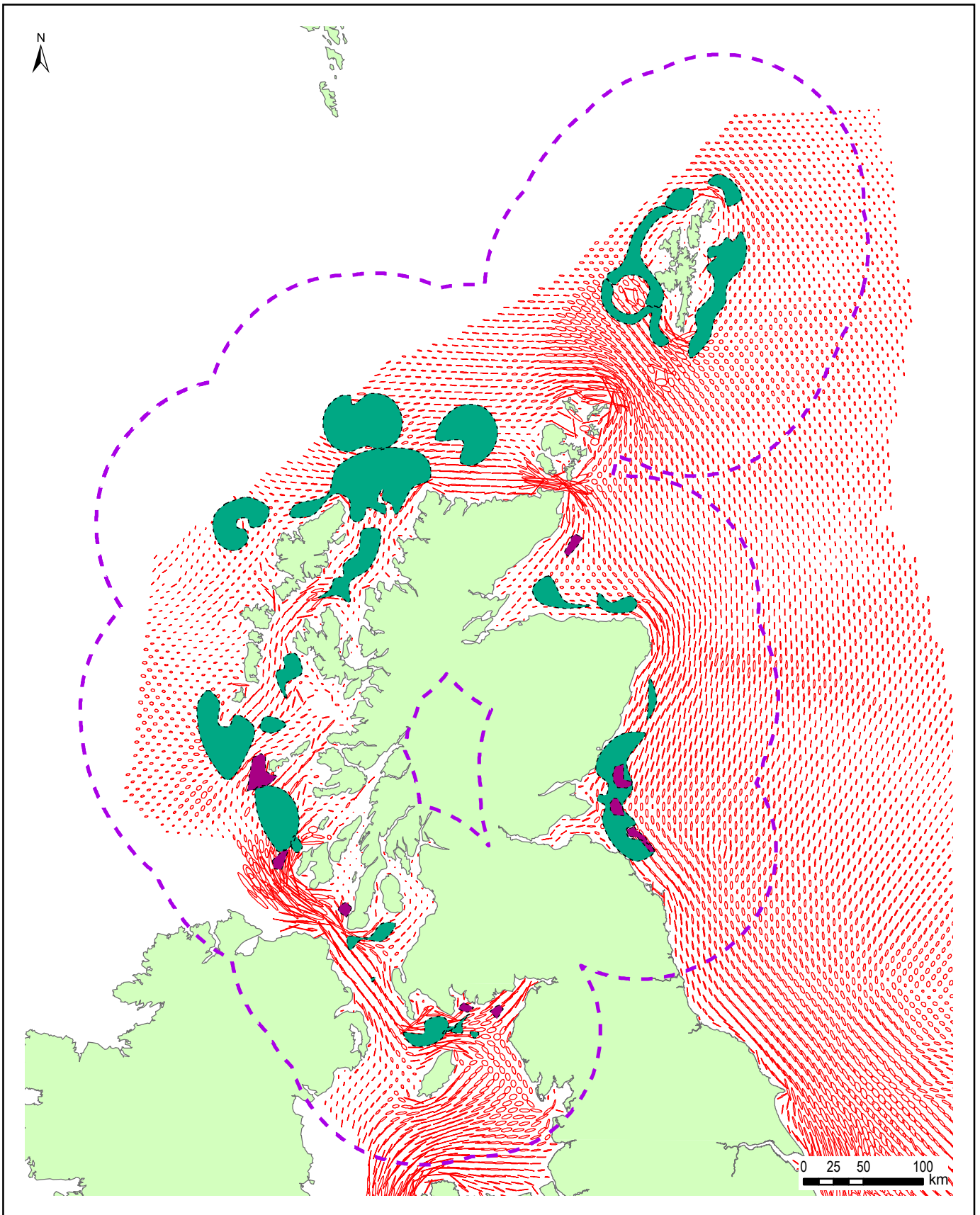
- Medium term options for Offshore Wind Energy
- Short term options for Offshore Wind Energy
- 100Km zone around medium term options

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 Data Sources: Scottish Government, 2010
 NOT TO BE USED FOR NAVIGATION



Short & medium term options for Offshore Wind Energy

Figure 1



	Date	Nov 10	By	FMM	Size	A4	Version	1	
	Projection	OSGB 1936							
	Scale	1:4,500,000							
	QA	Draft							
	3974 - fig2_tidal_ellipse.mxd								
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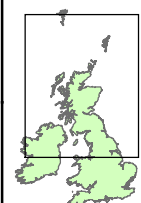
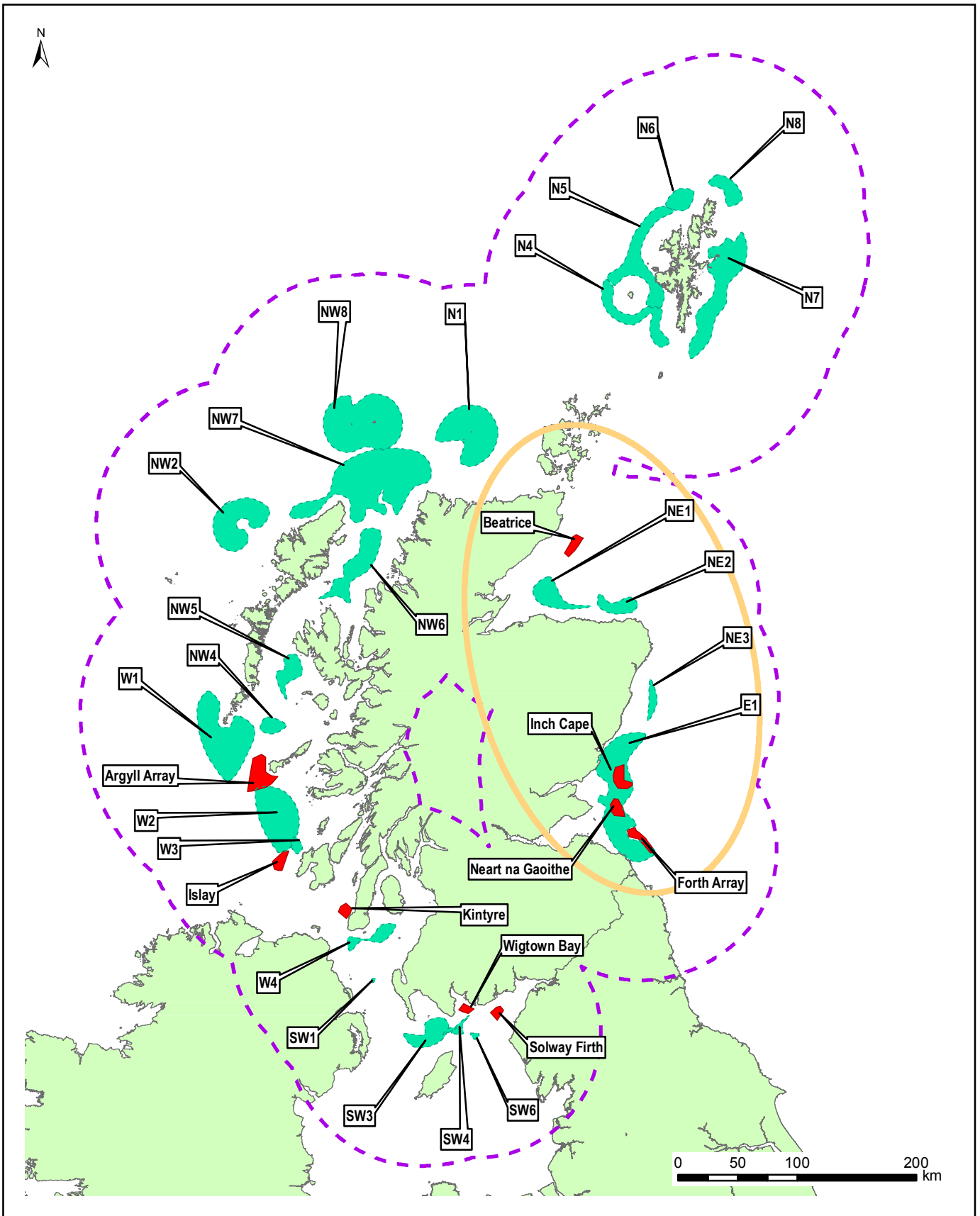
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- Medium term option area of search
- Short term option area of search
- 100Km zone around medium term options
- Spring tidal excursion ellipses



Tidal ellipse mapping to be used for screening indirect habitat and water quality effects

Figure 2



Date	By	Size	Version
Nov 10	FMM	A4	1
Projection		OSGB 1936	
Scale		1:4,500,000	
QA		NMW	
3974-fig3_mammals.mxd			
Produced by ABPmer Ltd			

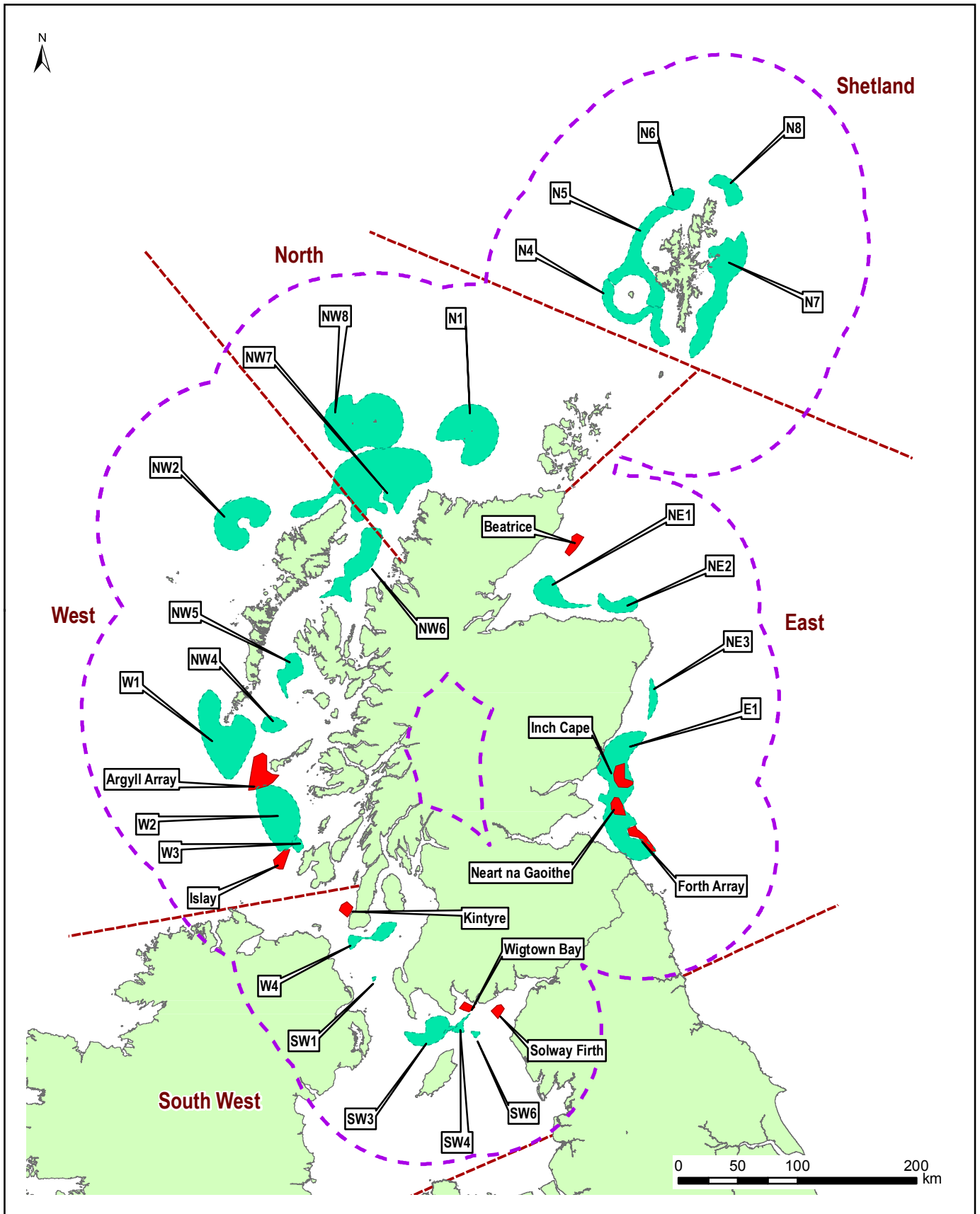
- Medium term options for Offshore Wind Energy
- Short term options for Offshore Wind Energy
- 100Km zone around medium term options
- Moray Firth bottlenose dolphin management unit

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Extent of proposed management unit to be used for screening Moray Firth bottlenose dolphin qualifying interests.

Figure 3



	Date	By	Size	Version
	Nov 10	FMM	A4	1
	Projection		OSGB 1936	
	Scale		1:4,500,000	
	QA		NMW	
	3974-fig4_anadromous_fish_regions.mxd			
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- Medium term options for Offshore Wind Energy
- Short term options for Offshore Wind Energy
- 100Km zone around medium term options
- Anadromous fish region boundaries



Location and extent of coastal regions to be used for screening anadromous fish qualifying interests

Figure 4



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ISBN: 978-1-78045-057-5 (web only)

APS Group Scotland
DPPAS11359 (03/11)

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