

APPLICATION FOR A MARINE LICENCE UNDER PART 4 OF THE MARINE (SCOTLAND) ACT 2010 AND UNDER PART 4 OF THE MARINE AND COASTAL ACCESS ACT 2009 (AS AMENDED) TO CONSTRUCT AND OPERATE 5 FLOATING WIND TURBINES IN THE BUCHAN DEEP, APPROXIMATELY 25 KM OFF THE COAST OF PETERHEAD, NORTH EAST SCOTLAND

MARINE SCOTLAND'S CONSIDERATION OF A PROPOSAL AFFECTING DESIGNATED SPECIAL AREAS OF CONSERVATION ("SACs") OR SPECIAL PROTECTION AREAS ("SPAs")

SITE DETAILS:

Hywind Scotland Pilot Project ("Hywind") approximately 25 km off the North East coast of Scotland near Peterhead

FILE REF:

Appropriate Assessment Conclusion

Marine Scotland Licensing Operations Team ("MS-LOT") concludes that, based upon the content of the following assessment the proposed Hywind Development will not, on its own or in combination with other developments already licensed (including the Forth and Tay offshore wind farms) adversely affect the integrity of the Buchan Ness to Collieston Coast SPA, Fowlsheugh SPA, Forth Islands SPA or Moray Firth SAC (where each SPA or SAC is taken as a whole), provided that the conditions set out in 3d are complied with.

Following Marine Scotland Science ("MSS") advice, MS-LOT consider that the most up to date and best scientific evidence available has been used in reaching the conclusion that any decision to approve the Hywind Development will not adversely affect the integrity of the sites concerned and are satisfied that no reasonable scientific doubt remains.

Introduction

This is a record of the Appropriate Assessment ("AA") for the Hywind Development and associated offshore transmission works. The assessment has been undertaken by MS-LOT and MSS on behalf of the Scottish Ministers. This assessment is required to be undertaken under Council Directive 92/43/EEC on the conservation of natural habitats of wild fauna and flora ("the Habitats Directive") and Council Directive 79/409/EEC on the conservation of wild birds (as amended, and codified by Directive 2009/147/EC of the European Parliament and of the Council) ("the Wild Birds Directive") as implemented, in particular, by Regulation 25 of the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 for projects beyond 12 nautical miles ("nm") from the mainland of Scotland and by Regulation 48 of the Conservation (Natural Habitats, &c.) Regulations 1994 for projects within 12 nm of the mainland before the Scottish Ministers may decide to give consent to the development. As the Hywind Development is located out with 12 nm and the transmission works are located within 12 nm, both sets of regulations ("the Habitats Regulations") apply to this assessment.

MS-LOT, on behalf of the Scottish Ministers as the 'competent authority' under the Habitats Regulations, has to be satisfied that the project will not adversely affect the integrity of any European protected sites (SACs and SPAs) before it may grant a licence for the project. The precautionary principle requires to be applied when complying with obligations under the Habitats Regulations and in preparing an AA. In accordance with the ECJ case of *Waddenzee* MS-LOT may only authorise a development if they are certain that it will not adversely affect the integrity of European protected sites; and "that is the case where no reasonable scientific doubt remains as to the absence of such effects".

Consultation

A detailed AA has been undertaken and the Joint Nature Conservation Committee (“JNCC”) and the Scottish Natural Heritage (“SNH”) - jointly referred to as the Statutory Nature Conservation Bodies (“SNCBs”) - have been consulted, as is required, under the Habitats Regulations. Those Regulations allow for the competent authority to consult the general public on the AA if they consider it appropriate. This has not been done as the general public have already had the opportunity to respond to the Application through the Environmental Impact Assessment (“EIA”) process where information regarding the potential impacts on European protected sites was available in the Environmental Statement (“ES”) and Habitats Regulations Appraisal (“HRA”) report provided for Hywind. No representations were received from members of the public raising concerns about Natura issues, therefore it is not deemed appropriate to consult the general public further. Consultation responses regarding Natura issues were received from the Royal Society for the Protection of Birds, Scotland (“RSPB Scotland”), the Scottish Wildlife Trust (“SWT”) and the Dee District Salmon Fishery Board (“DeeDSFB”). RSPB Scotland recognised the benefits of siting arrays further offshore in deeper waters where there are likely to be fewer ecological sensitivities. However, in spite of RSPB’s overarching support for such technologies their view was that the Hywind Application must be considered in the context of the eight commercial scale offshore wind sites that were granted consent in 2014 in the firths of Moray, Forth and Tay. RSPB Scotland hold major reservations over the environmental assessments supporting these consents and are extremely concerned about the cumulative and in-combination impacts to important and internationally protected seabird populations, specifically on Scotland’s east coast. The consents for four of these developments (those in the Forth and Tay region including Inch Cape (“ICOL”), Seagreen Alpha (“SAWEL”), Seagreen Bravo (“SBWEL”) and Neart na Gaoithe (“NnGOWL”)) are currently subject to judicial review. Should these existing consents remain unchanged the RSPB Scotland object to the Hywind Development for the following reasons:

- The cumulative and in-combination environmental impacts, arising primarily from existing consents for offshore wind in the Forth and Tay, are unacceptable to the RSPB and in their view inappropriate environmental assessment methods have been relied upon.
- Impacts on draft marine Special Protection Areas (“dSPAs”) have not been considered.

Full details of the RSPBs concerns relating to the Forth and Tay offshore wind farms are addressed in [Appendix 1 of the Forth and Tay offshore wind farm AA](#)

SWT acknowledged that renewable energy production will play a key role in reducing Scotland’s carbon emissions, which will ultimately help to reduce climate change impacts on biodiversity. SWT is encouraged to see the novel design of ‘floating wind’, in particular the reduction in noise during the installation stage (by eliminating the need for drilling/piling), and the potential for wind energy exploitation in previously inaccessible, deeper waters. With regards to ornithology SWT consider that Marine Scotland must consider the conclusions of the pending judicial review of the ‘Forth and Tay’ wind proposals before reaching a conclusion to the Hywind Scotland Pilot Park. Marine Scotland are however not aware when the judgement will be made on the judicial review and until such a time Marine Scotland operate business as usual.

The DeeDSFB advised that the closest SACs with diadromous fish qualifying interests whose migratory routes have the potential to pass through the Hywind development area are the River Dee SAC (40 km) and South Esk (80 km). Some concerns were raised relating to increased noise and vibration during construction and possible electromagnetic fields (EMF)

associated with the cabling of the wind farm during operation. MSS advised that they did not anticipate any major issues with either constructional or operational noise, and that any effects from EMF would be limited by cable burial. The SNCBs noted that no piling will take place and that increased turbidity due to construction would be of short duration and reduce quickly in this high energy environment. In relation to EMF, the SNCBs advised that DECC has recommended that cables be buried to at least 1.5 m, depending on the suitability of the substrates (DECC, 2011). The SNCBs welcome the burial of the cable to this depth where possible, particularly in shallow waters (below 20 m). The SNCBs advised that, with the above mitigation, there will be no significant impacts to fish of conservation concern from the Hywind Development, therefore these SACs are not considered further in this assessment.

The Whale and Dolphin Conservation (“WDC”) were consulted on the ES, however no response was received.

A map showing the locations of the Hywind Development (and other offshore wind farms already consented on the east coast of Scotland) along with the European protected sites which are considered in this assessment is presented below.

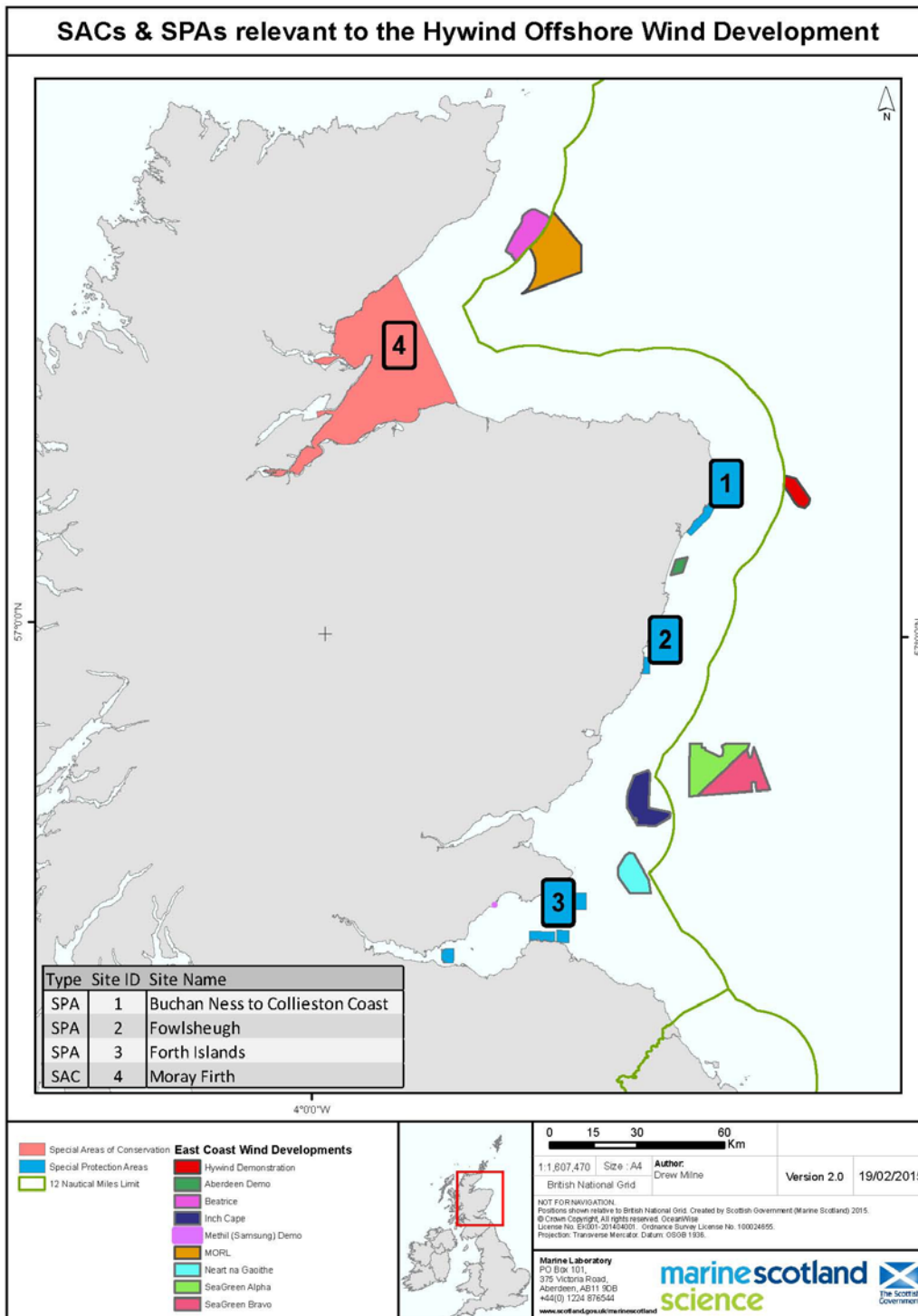


Figure 1: Locations of the Hywind Demonstrator (and the other offshore wind farms included in the in-combination assessment) along with the European protected sites which are considered in this assessment.

Section 1a. provides links to the Scottish Natural Heritage Interactive (“SNHi”) website where the background information on the sites being considered in this assessment is available. Section 1b. details the qualifying features of the SACs and SPAs in this assessment. The conservation objectives being considered are detailed in section 1c. For the qualifying interests where likely significant effect (“LSE”) has been identified (section 3b), the

appropriate assessment addresses whether or not the relevant conservation objectives will be achieved. This enables a conclusion to be made in relation to whether or not the Hywind proposal, either alone or in combination with other projects (i.e. the Forth and Tay offshore wind farms), will adversely affect the integrity of the sites which have been assessed.

1a. Name of Natura site affected & current status available from:

1. Buchan Ness to Collieston Coast SPA http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8473
2. Fowlsheugh SPA http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8505
3. Forth Islands SPA http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8500
4. Moray Firth SAC http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8327

1b. European qualifying interests & whether priority/non-priority:

<p>1. Buchan Ness to Collieston Coast SPA</p> <ul style="list-style-type: none"> • Fulmar (breeding) • Guillemot (breeding) • Herring gull (breeding) • Kittiwake (breeding) • Shag (breeding) • Seabird assemblage (breeding) 	<p>2. Fowlsheugh SPA</p> <ul style="list-style-type: none"> • Fulmar (breeding) • Guillemot (breeding) • Herring gull (breeding) • Kittiwake (breeding) • Razorbill (breeding) • Seabird assemblage (breeding)
<p>3. Forth Islands SPA</p> <ul style="list-style-type: none"> • Arctic tern (breeding) • Common tern (breeding) • Cormorant (breeding) • Fulmar (breeding) • Gannet (breeding) • Guillemot (breeding) • Herring gull (breeding) • Kittiwake (breeding) • Lesser black-backed gull (breeding) • Puffin (breeding) • Razorbill (breeding) • Roseate tern (breeding) • Sandwich tern (breeding) • Shag (breeding) • Seabird assemblage (breeding) 	<p>4. Moray Firth SAC</p> <ul style="list-style-type: none"> • Bottlenose dolphin • Subtidal sandbanks

1c. Conservation objectives for qualifying interests:

In their [scoping advice](#) the SNCBs advised that it is important to recognise that the conservation objectives primarily offer site-based protection and that some of the objectives will not directly apply to species when they are not present within the boundaries of the SPA or SAC in question. This is particularly true of objectives **(i)**, **(v)** and **(vi)** which relate to the supporting habitats within the SPA.

Objective **(iii)** however – maintenance of the population of the bird species as a viable component of the SPA – will be relevant in most cases because:

It encompasses direct impacts to the species, such as significant disturbance to qualifying bird interests when they're out with the SPA.

It addresses indirect impacts such as the degradation or loss of supporting habitats which are out with the SPA but which help to maintain the population of the bird species of the SPA in the long-term.

Conservation Objectives

Buchan Ness to Collieston Coast, Fowlsheugh and Forth Islands SPAs – breeding seabirds

(i) to avoid deterioration of their habitat or (ii) significant disturbance to them, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the species; and

To ensure that the following are maintained in the long term:

(iii) Population of the species as a viable component of the site*.

(iv) Distribution of the species within site.

(v) Distribution and extent of habitats supporting the species.

(vi) Structure, function and supporting processes of habitats supporting the species.

repeat of (ii) No significant disturbance of the species.

*As the potential effects of the proposed development, as identified, occur outside the SPA itself, any disturbance to the qualifying interests is only considered to be significant in terms of the relevant conservation objective if it could undermine the conservation objectives relating to population viability.

Moray Firth SAC - Bottlenose dolphin

(i) to avoid deterioration of their habitat or (ii) significant disturbance to them, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and

To ensure for the qualifying species that the following are established then maintained in the long term:

(iii) Population of the species as a viable component of the site.*

(iv) Distribution of the species within site.

(v) Distribution and extent of habitats supporting the species.

(vi) Structure, function and supporting processes of habitats supporting the species.

repeat of (ii) No significant disturbance of the species.

*As the potential effects of the proposed development, as identified, occur outside the SAC itself, any disturbance to the qualifying interests is only considered to be significant in terms of the relevant conservation objective if it could undermine the conservation objectives relating to population viability.

PROPOSAL DETAILS

2a. Proposal Title

Hywind Offshore Pilot Project, 25 km off the east coast of Peterhead

2b. Advice from the SNCBs

MS-LOT received advice from the SNCBs regarding the Hywind project on 3rd July 2015, MS-LOT consulted the SNCBs on a draft assessment of the main species of concern (puffin, gannet and kittiwake) and received further advice on the 3rd, 18th and 24th of September 2015. The advice is available to view on the website at: <http://www.gov.scot/Topics/marine/Licensing/marine/scoping/Hywind>.

2c. Details of proposed operation:

The proposed Hywind Pilot Park is located approximately 25 km off the coast at Peterhead, North East Scotland just outside the 12 nm territorial water limit. The project includes construction, installation, operation and maintenance activities. The project will involve the installation of five 6 MW wind turbine generator (“WTG”) units and will be expected to produce up to 135 GWh per year of electricity. The turbines will be positioned between 800 to 1,600 m apart and attached to the seabed by a three-point mooring spread and anchoring system. Three anchors will be required per turbine and the radius of the mooring system will extend 600 to 1,200 m out from each turbine. The anchor and mooring system could be installed up to 18 months prior to the turbines being installed.

The turbines will be connected by inter-array cables which may require stabilisation in some locations. The export cable, which will transport electricity from the Pilot Park to shore at Peterhead, will be buried where seabed conditions allow. Where this is not possible cable protection in the form of concrete mattresses and rock will be required. Both the inter-array and export cables will have 33 kV transfer voltage. The export cable is planned to come ashore at Peterhead and connect to the local distribution network at SSE Peterhead Grange substation. The onshore Project infrastructure will comprise an underground cable approximately 1.5 km in length and a small switchgear yard facility close to Peterhead Grange substation (Figure 2).

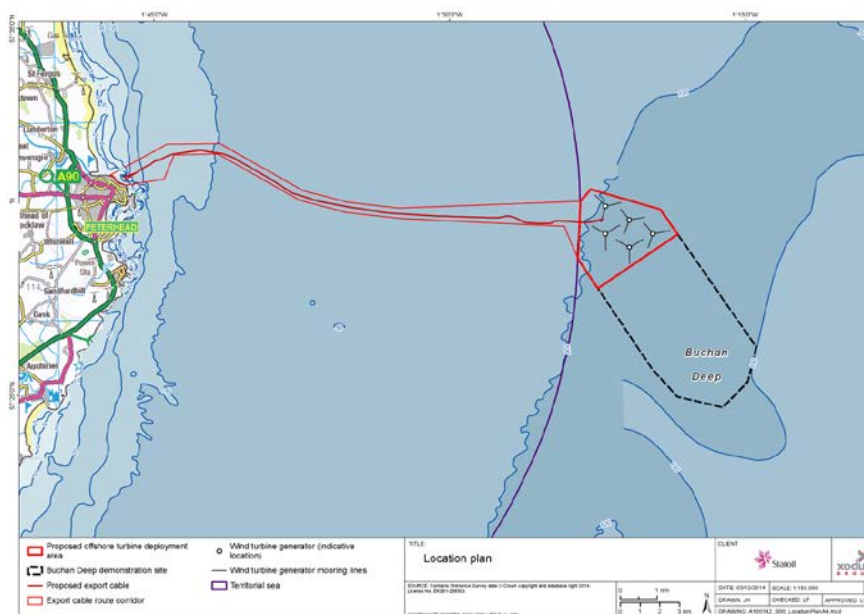


Figure 2. Location of the Hywind Pilot Park Project (figure from the Hywind ES)

In addition to the proposed Pilot Park area and associated offshore and onshore infrastructure, the project will use a deep water inshore area, to assemble the turbines prior to installation. The location of this inshore assembly is still to be decided; however, suitable facilities on the west coast of Norway have been identified. Once assembled, the turbines will be towed in an upright position from the assembly point to the turbine deployment area in the Buchan Deep.

Hywind aims to begin onshore construction in 2015 / 2016 followed by offshore construction in 2016 / 2017. This will allow for final commissioning of the Pilot Park in 2017. The Pilot Park is expected to have an operational life of 20 years and decommissioning will commence in the late 2030's. During the operational phase the Pilot Park will be serviced from a base most likely in Peterhead. The main features of the turbines are summarised in Figure 3 below.

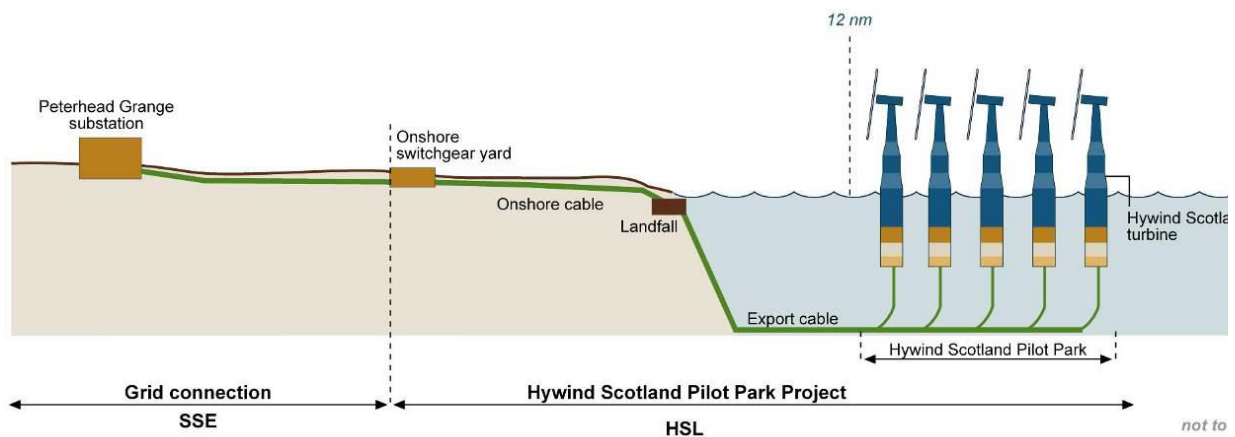


Figure 3. Key components of the Hywind Scotland Pilot Park Project (figure from the Hywind ES)

Full project details are available in the [Hywind ES](#).

ASSESSMENT IN RELATION TO REGULATION 25 OF THE OFFSHORE MARINE CONSERVATION (NATURAL HABITATS, &C.) REGULATIONS 2007 AND REGULATION 48 OF THE CONSERVATION (NATURAL HABITATS, &C.) REGULATIONS 1994

3a. Is the operation directly connected with or necessary to conservation management of the site?:

The operations are not connected with or necessary to conservation management of the sites.

3b. Is the operation likely to have a significant effect on the qualifying interest?

Birds

In section 2.4 of their HRA report Hywind identified a list of species/SPAs where LSE could not be ruled out. From this initial list the SNCBs in their advice dated 3rd July 2015, advised that LSE could not be ruled out for the following species/SPAs:

- herring gull (Buchan Ness to Collieston Coast SPA, collision risk)
- northern gannet (Forth Islands SPA, collision risk)
- black-legged kittiwake (Buchan Ness to Collieston Coast SPA, Fowlsheugh SPA, collision risk)
- common guillemot (Buchan Ness to Collieston Coast SPA, displacement)
- razorbill (Fowlsheugh SPA, displacement),
- Atlantic puffin (Forth Islands SPA) and
- seabird assemblages.

The remaining species listed in the SPA citations in 1b are scoped out of further consideration in this AA as no LSE was identified - these species were either not recorded in significant numbers on-site, or else there is no pathway for significant impact and/or there is no connectivity with any SPAs.

Marine Mammals

In section 3 of their HRA report Hywind rule out LSE for all marine mammal species. Grey seal was the most frequently observed seal and third most frequently observed marine mammal during the project specific European Seabirds At Sea ("ESAS") surveys. Grey seal is a qualifying feature of three SACs located sufficiently close that individuals from those populations could potentially forage within the project area, namely the Isle of May SAC, Berwickshire and North Northumberland coast SAC and the Faray and Holm of Faray SAC. However based on the large distances between these SACs and the project area (over 150 km) there is little chance that individuals from SAC populations will be present in the project area and therefore impacted by the project. There are several SACs designated for harbour seal along the east coast, all of which are located sufficiently far from the project study area that there is very little chance that individuals from the SAC populations would be impacted by the project. The SNCBs and MSS advised no LSE for grey or harbour seals.

In their HRA report Hywind stated that the Moray Firth SAC, located approximately 115 km from the project area is one of two sites in the United Kingdom ("UK") designated to protect resident/semi-resident populations of bottlenose dolphin. Whilst 115 km is well within the foraging range of this highly mobile species, long-term studies conducted in the area suggest the species is primarily distributed along the nearshore, with the majority of sightings occurring in depths of less than 20 m and within 2 km of the coast. This observation was borne out in the site-specific ESAS surveys, during which no bottlenose dolphin were observed. As such, it is very unlikely that the project area and surrounding waters where there could be impacts on mammals are used by this species, and thus, very unlikely that they may be impacted.

The SNCBs did not agree with this conclusion for bottlenose dolphin. The SNCBs acknowledged that there were no bottlenose dolphins observed in the offshore WTG site however concluded that there is the potential for LSE from the cable-laying activities close to the coast. There is potential for disturbance to bottlenose dolphins, which travel along this coast between the Moray Firth and the East coast as far south as the Forth/Tay estuaries, from a number of sources: vessel noise, geophysical surveys, trenching and rock/mattress placement.

The sandbank habitat qualifying interest listed in the SAC citation in 1b is scoped out of further consideration in this AA as no LSE was identified.

3c. Appropriate assessment of the implications for the site in view of the site's conservation objectives.

Ornithology

The assessment for birds is based on the project description summarised in Section 2c above, and the wind farm parameters used in the collision risk modelling presented in Section 11.5.3 of the Hywind Environmental Statement.

1. The Scope of In Combination Effects

For certain species, where considered appropriate, in-combination effects have also been considered from projects further afield:

Aberdeen Bay Offshore Wind farm - to be located 2 to 4.5 km off the coast at Blackdog, Aberdeenshire, comprising 11 turbines with a generating capacity of up to 100 MW. This development was consented in 2013 construction has not yet commenced, consent is for a period of 22 years. This proposal is relevant to consider in respect of kittiwake at Buchan Ness to Collieston Coast SPA and Fowlsheugh SPA.

Methil Wind Turbine – located on the coast at Methil, Fife. A single turbine with a generating capacity of up to 7 MW. This development is currently operating and has consent to operate for a period of up to 5 years. This proposal is relevant to consider in respect of gannet at Forth Islands SPA.

Blyth Offshore Wind farm – located just off the Northumberland coast, comprising 2 turbines with a generating capacity of 4 MW. This small development has been operating since 2000. This proposal is relevant to consider in respect of gannet at Forth Islands SPA.

Blyth Offshore Wind Demonstration Site - located just off the Northumberland coast, comprising 15 turbines with a generating capacity of up to 100 MW. This development was consented in 2013. This proposal is relevant to consider in respect of gannet at Forth Islands SPA.

Teesside Offshore Wind farm – located off the coast of Teesside, England, comprising 27 turbines with a generating capacity of 62 MW. Construction was completed in 2013, and the turbines are currently operating. This proposal is relevant to consider in respect of gannet at Forth Islands SPA.

The SNCBs in their advice to MS-LOT dated 6th June 2014 regarding the Forth and Tay wind farms assessment agreed with the inclusion of the above developments in the in-combination assessment. In addition to those above, the developments below also require consideration for the in-combination assessment for Hywind.

Neart na Gaoithe Offshore Wind Farm – to be located approximately 15.5 km to the east of Fife Ness in the outer Firth of Forth, comprising up to 75 turbines with a maximum generating capacity of 450 MW. Consent was granted in October 2014, construction has not

yet commenced, consent is for a period of 25 years.

Inch Cape Offshore Wind Farm – to be located 15 km to the east off the Angus coastline, to the east of the Firth of Tay, comprising up to 110 turbines with a maximum generating capacity of 784 MW. Consent was granted in October 2014, construction has not yet commenced, consent is for a period of 25 years.

Seagreen Alpha and Seagreen Bravo – to be located 27 km and 38 km to the east off the Angus coastline respectively, comprising up to 75 turbines each, with a maximum generating capacity of 525 MW each. Consent was granted in October 2014, construction has not yet commenced, consent is for a period of 25 years.

The Forth and Tay wind farms (Nearth na Gaoithe, Inch Cape and Seagreen) are relevant to consider in respect of:

- Black-legged kittiwake at Buchan Ness to Collieston Coast SPA and Fowlsheugh SPA;
- Northern gannet at Forth Islands SPA;
- Herring gull at Buchan Ness to Collieston Coast SPA;
- Atlantic puffin at Forth Islands SPA;
- Common guillemot at Buchan Ness to Collieston Coast SPA;
- Razorbill at Fowlsheugh SPA.

Dogger Bank Creyke Beck A & B, and Teeside A & B – these projects are located on Dogger Bank approximately 130 km off the coast of Yorkshire. Creyke Beck was granted consent in February 2015, and is for up to 400 turbines with a generating capacity of up to 2.4 GW. Consent was granted to Teeside A & B in August 2015, also for up to 400 turbines and a total generating capacity of up to 2.4 GW. These proposals are relevant to consider in respect of gannet at Forth Islands SPA.

Kincardine Offshore wind demonstrator – this development is a commercial demonstrator site which will use floating foundation technology. Located south-east of Aberdeen, 15 km from the coastline. The project which is in the pre-application stage is for 6-8 turbines with a maximum generating capacity of 50 MW. The in-combination effects from this project are not being considered in the AA for Hywind. A further AA will be required for the Kincardine project prior to any consent being granted and that AA will take account of the in-combination effects of Hywind and the other projects above as appropriate.

Forthwind offshore wind demonstrator - this development is a commercial demonstrator site, to be located 1.5 km from the Fife coastline near Methil. The application was received by MS in July 2015 and is currently being considered. The proposal is for 2 turbines with a maximum generating capacity of 9 MW. The in-combination effects from this project are not being considered in the AA for Hywind. A further AA will be required for the Forthwind project prior to any consent being granted and that AA will take account of the in-combination effects of Hywind and the other projects above as appropriate.

2. Assessment Methods

Background information on the bird species considered in this assessment can be found at <http://seabird.wikispaces.com/>.

As detailed in section 1c, as the potential effects identified occur outside of the SPAs themselves, the relevant conservation objective for each qualifying interest is to “ensure the population of the species as a viable component of the site” is maintained in the long term. In order to assess the potential effects of the Hywind Development, alone and in

combination, on the achievement of this conservation objective the assessments for relevant species involved the estimation of the level of predicted effect, and the setting of a precautionary level of acceptable change to the population given the statutory requirements. Where it can be shown that the populations of all qualifying interests of concern can be maintained within the thresholds of change it can be concluded that the proposed developments will not adversely affect site integrity.

The main effects to bird species are due to:

- a. Collision with Turbines (of greatest relevance to species which may regularly fly at the same height as the rotating blades e.g. gulls and gannet), and
- b. Displacement and Barrier Effects resulting in birds either being displaced from foraging areas or having to fly around a wind farm to reach a foraging area (of greatest relevance to species with more limited foraging ranges or greater flight energetic costs e.g. kittiwake and puffin).

I. Collision with Turbines

Hywind presented Band Collision Risk Model (“CRM”) outputs in their ES, and the SNCBs and MSS support the use of the Band CRM. Band (2012) provides guidance on how to use the CRM for seabird species in respect of offshore wind farms. It includes a ‘basic’ model (Options 1 and 2) and an ‘extended’ version (Option 3) as described below:

Option 1 – The ‘Basic’ model. It assumes a uniform distribution of flight heights and collision risk between lowest and highest levels of the rotors. It also uses figures for the proportion of birds at risk height derived from site-specific surveys.

Option 2 – As Option 1 but the proportion of birds at risk height is derived from modelled flight height data. Johnston et al, (2014 *corrigendum*) provides the most up to date information on modelled flight heights and effectively supersedes the previous flight height model (Cook *et al*, 2012).

Option 3 – The ‘Extended’ model. This differs methodologically from the ‘Basic’ model in that it does not assume that the density of flying birds is uniform across all heights between the minimum and maximum rotor swept height. Instead, this option uses flight height values for specific height bands (1 m flight bands by default) from modelled data to calculate collision rate in each part of the rotor swept area and then integrates that across the rotor disk. It accounts for a number of factors that change with height across the rotor swept area which together result in the collision risk varying with height. For example, the breadth of the circle (and therefore the number of birds flying through the circle) varies with height and the collision risk on transit through the swept area also depends on height (due to for example, variation in rotor speed across the radius). If the density of birds in flight also varies with height (as observed in most seabird species) rather than being uniform, then the result is a different number of predicted collisions than if the flight height distribution were assumed to be uniform (as in Options 1 and 2). The author of the Band model has clearly stated that the extended model undertakes the more correct calculation and should be used in preference over the basic model where appropriate flight height data allow (emailed note to Avoidance Rate Review project steering group received 14/05/14).

Option 4 – As Option 3 above, but with flight height data obtained for the site under consideration.

A review of available data on avoidance behaviour by seabirds around wind farms undertaken by the British Trust for Ornithology (“BTO”) recommended that, based on

available information for black-legged kittiwake and northern gannet, it was not possible to calculate appropriate avoidance rates for these species to be used with the extended version of the band CRM (Cook *et al*, 2014). This recommendation was supported by the SNCBs in their [Joint Response](#).

The SNCBs advised that for black-legged kittiwake, an avoidance rate of 98.9% i.e. lower than the 99.2% recommended by the BTO for use with the Basic version of the CRM should be used. However, MSS advice in December 2014 was that until new information became available the recommendations made by the BTO, which they consider are precautionary, in terms of CRM version and avoidance rates should be followed.

The SNCBs also advised that collision estimates be calculated for avoidance rates assuming +/- 2 standard deviations ("SD"). Whilst the resultant avoidance rates are presented below (Tables 1 and 4), the assessment does not rely upon the collision rates that would result from the use of the +/- 2 SD avoidance rates. At this stage the assessment merely notes that the BTO indicated that their recommended avoidance rates were precautionary, and considered that the avoidance rate for kittiwake assuming a 2 SD ranged from 97.8% to >100%, and for gannet ranged between 98.7% to 99.1%. The utility of uncertainties around estimated avoidance rates may increase when incorporated into probabilistic collision risk models.

The Forth and Tay assessment for collision mortality was based on the Extended version (Option 3) of the Band model as this was considered to be the most appropriate at the time based on the evidence available. Since that assessment was completed the BTO avoidance rate review which was commissioned by Marine Scotland has recommended that for kittiwake and gannet it has not been possible to recommend avoidance rates using the Extended version of the Band model. As the BTO report is now considered to represent the best available evidence the assessment method differs from that used in the Forth and Tay assessment for kittiwake and gannet as detailed below.

Comparison of the percentage of flights at risk height obtained from site specific survey data with those presented in Johnston *et al*, 2014 was made by Hywind, and the justification for the use of site specific flight height data is presented in Caloo 2014b. For black-legged kittiwake and northern gannet, this appropriate assessment uses the site specific flight height data as recommended by Caloo 2014b, and used in the Hywind ES. For gannet, use of the generic (Johnston *et al*, 2014) flight height data would not have made any difference to the collision estimates used, whilst for kittiwake would have resulted in slightly lower collision estimates being used (see Table 8 of Caloo 2014b).

For black-legged kittiwake and northern gannet, collision estimates used in this assessment are calculated using the Basic version of the model, site specific flight height data, and the avoidance rates recommended by the BTO. In order to undertake the assessment of in combination effects, collision estimates for the recently consented Forth and Tay wind farms ([see Forth and Tay AA](#)) were also recalculated using the Basic version of the CRM and BTO recommended avoidance rates.

The scope of the appropriate assessment includes the effects of the offshore windfarm projects during the breeding season on the breeding populations. The population consequences of the collision risk effects on breeding adults resulting in changes to both adult survival rates and productivity rates are considered.

II. Displacement and Barrier Effects

It is recognised that increased activity in a sea area, or the establishment of structures such as wind farms, has the potential to displace birds. Initial monitoring of other European

offshore wind farms shows contrasting results between species and for the same species, (e.g. Leopold *et al.*, 2011, Canning *et al.*, 2012, Furness *et al.*, 2013). Most of this monitoring focuses on the non-breeding season as this is when the wind farms being monitored were considered to have greatest impact. There is little available data to inform assessment of displacement / barrier effects to seabirds during the breeding season. There is limited understanding of the individual or population level consequences of displacement or barrier effects, via increased energetic costs, reduced nest attendance or provisioning of chicks.

The scale of the Hywind project, in combination with the foraging behaviour of many of the seabird species of potential concern makes it appropriate for a qualitative assessment of displacement and barrier effects to be undertaken for the majority of species. Where this is not possible, the method used in the Moray Forth ([see e.g. Beatrice offshore wind farm AA](#)) and for Atlantic puffin in the Forth and Tay ([see Forth and Tay AA](#)) has been used to quantify effects. The latter approach allows effect on adult survival or productivity to be estimated.

III. Acceptable level of Effect

The thresholds of acceptable change identified for species / SPA combinations of interest are based on the same approaches used by the Forth and Tay regional assessment ([see Forth and Tay AA](#)). For kittiwake the effect on productivity from adult collision mortality based on the new CRM option and AR advised by the BTO has been taken into account when setting the adult survival threshold. For the other species/SPA combinations (where less concern from the SNCBs has been raised) the assessment addresses the potential impacts from Hywind qualitatively.

Estimated effects and thresholds of acceptable change are presented within this assessment using a number of metrics in order to aid understanding of the implications of the Hywind project either alone or in combination with other relevant projects.

3. Consideration of SPAs and Qualifying Interests where LSE was Identified

I. Herring gull: Buchan Ness to Collieston Coast SPA

The MSS estimated collision estimate for adult herring gull at Hywind was 0.4 adults per breeding season. The most recent population estimate from 2007 is 6,158 individuals. The SNCBs in their advice dated 3rd July 2015 noted that there are a small number of herring gull collisions (mainly out with the breeding season) and advised that the total number of collisions attributed to Hywind is relatively small compared to the overall size of the populations. Following apportioning of collisions, these values alone are not sufficient to increase mortality rates to a level that would suggest an adverse effect on site integrity. Collision risk modelling carried out for the Forth and Tay wind farms identified practically no effects upon herring gull at Buchan Ness to Collieston Coast SPA. At Aberdeen Bay offshore wind farm the breeding season adult mortality was predicted to be 11 birds of which 2 birds were attributed to Buchan Ness to Collieston Coast SPA.

MS-LOT concludes that the Hywind project will not adversely affect the site integrity of the Buchan Ness to Collieston Coast SPA with respect to herring gull, either alone or in combination with the Forth and Tay offshore wind farms and Aberdeen Bay offshore wind farm.

II. Northern gannet: Forth Islands SPA

Due to the small size of the Hywind project and the wide ranging foraging trips undertaken by gannet (mean 93 km, mean max foraging range 229 km) it is assumed that displacement

and barrier effects upon the SPA population will be negligible. In their advice dated 3rd July 2015, the SNCBs advise that emerging evidence shows gannets to be highly susceptible to disturbance and being displaced from offshore wind farms (Leopold et al, 2013, Vanerman et al, 2013), however given the small footprint of the Hywind Development, they anticipate displacement impacts from this development alone to have a small effect on gannet.

The BTO concluded ([page 135 of the BTO Avoidance Rate Report](#)) for gannet that based on the currently available information, only avoidance rates for the Basic version of the Band model could be recommended. The SNCBs produced a response to the BTO review recommendations, advising that the rate advised by the BTO should be used for gannet, and MSS advised that the BTO recommendations should be followed. The BTO recommended and SNCBs advised avoidance rates for gannet, alongside +/- 1 and 2 standard deviations, are presented in Table 1. For gannet, the application of +/- 2 SD would result in collision rates approximately 14% above or below the mean values presented.

Table 1: Northern gannet Avoidance Rates recommended for use with the Basic version of the Band model by the BTO and advised by the SNCBs.

Source	Gannet				
	Avoidance Rate	-/+ 1SD		-/+ 2SD	
BTO & SNCB	0.989	0.988	0.990	0.987	0.991

For this assessment, the avoidance rates for gannet recommended by the BTO (and advised by the SNCBs) have been used with the Basic version (option 1) of the Band collision risk model to estimate collision rates (Table 2). It is clear from the collision estimate of 4 adults per breeding season for gannet that in isolation the Hywind project will have no adverse effect on site integrity for the Forth Islands SPA.

Table 2: Collision estimates from Hywind for gannet at Forth Islands SPA assuming the BTO recommended (and SNCBs & MSS advised) avoidance rates.

Species	SPA	SPA Population (Inds.)	Collision Risk Model	Avoidance Rate	Hywind collision estimate (ads during breeding season)	Estimated Hywind collision mortality as% of SPA population
Gannet	Forth Islands	150000	Basic	98.9%	4	-0.004

In order to undertake a cumulative assessment that includes the recently consented Forth and Tay wind farms, collision estimates for the Forth and Tay have been recalculated using the BTO recommended avoidance rates, and the Basic version (Option 2) of the Band model (for an explanation of why modelled flight height was used for the Forth and Tay rather than site specific see page 67 of the Forth and Tay AA). The results from the collision estimate recalculations for the recently consented Forth and Tay wind farms are incorporated in the revised summary of cumulative effects upon each SPCHAMBER OF A of interest (Table 3). This summary incorporates both displacement effects and those

resulting from collision mortality. For gannet, the Centre for Ecology and Hydrography (“CEH”) displacement model (Searle *et al.* 2014) estimated mortality effects per breeding season for each Forth and Tay wind farm and these have been summed (total of 42) and included within the individual project effects.

Application of the BTO advised gannet avoidance rate of 98.9% with the Basic version of the CRM results in an estimate collision mortality from Hywind of 4 adult birds per breeding season, and in combination with the Forth and Tay wind farms a cumulative total of 1009 adult birds per breeding season (Table 3). This is below the cumulative total assumed for the Forth and Tay cumulative assessment of 1169 (and very substantially less than the mortality of 1827 based on the SNCBs previous advice to apply 98% avoidance rate with the Basic version of the CRM). For the Forth and Tay assessments, both the SNCBs and MSS advised a threshold for gannet at Forth Islands SPA of 1300 adults per year. The cumulative total for gannet including Hywind is well below this threshold.

Table 3: *Estimated combined wind farm effects as percentage of SPA population and number of individuals from collision mortality and displacement on gannet from Hywind in isolation and in combination with recently consented offshore wind farms in the Forth and Tay. For context, estimated effects are presented for the original regional assessment undertaken for the Forth and Tay, as well as those assuming the BTO recommended avoidance rates that have been used for this assessment.*

	Gannet			
	Forth Islands			
SPA population (individuals)	110964			
CRM Model	Basic		Extended	
Avoidance Rate	98.9%		95%	
	No. Inds	% SPA	No. Inds	% SPA
F&T AA Cumulative Effect	1005	-0.91	1169	-1.05
F&T AA Cumulative Counterfactual of Population Size (CPS)	82%		79%	
Hywind Effect	4	0.00		
F&T + Hywind Cumulative Effect	1009	-0.91		
F&T + Hywind Cumulative CPS	82%			

The cumulative effect of 1009 adult gannet collisions per breeding season would result in a counterfactual of population size (“CPS”) after 25 years of 0.82 i.e. 82% of the population forecast to be present after 25 years would be present should the estimated collision rate occur. This compares to a CPS of 0.79 estimated for the Forth and Tay regional assessment, which assumed 95% avoidance rate with the Extended version of the model.

The gannet collision estimate is precautionary in that it does not consider attraction of gannets to vessels (inflating density estimates), the assumption that all birds identified as adult plumaged during surveys were adult and breeding birds, and in the use of the BTO

recommended avoidance rates which the authors indicated were precautionary. The population level effects are precautionary as they are based on a density independent model. Wind farm effects on gannet during the non-breeding season have been considered within the assessment in a qualitative manner due to the lack of a method for apportioning effects during the non-breeding season and on immature age classes to the SPA population. A recent paper (Cleasby et al 2015) has suggested that gannet flight heights may be greater than in currently available flight height distribution (e.g. Johnston et al 2014). This would result in a greater proportion of birds flying at risk height, and therefore greater collision rates than estimated using published flight height distribution data. A number of questions exist over the methods and results presented in Cleasby et al 2015 (see Appendix 1) and the SNCBs have indicated that they are unable to advise on the use of information contained within the paper until clarification is provided on a range of matters (see emails from SNCBs to MS-LOT dated 24.10.15 and to the paper's author Hamer dated 21.10.15). The questions relate to validation of the barometric altimeter data, flight height estimates, at sea densities, and collision modelling and at present it is far from clear if or how the paper's findings could be applied in any assessment. It is also far from clear how the issues identified could be resolved, and over what timescale. Due to the issues identified above, it would be inappropriate to simply multiply existing gannet collision estimates by the values discussed in Cleasby et al. Whilst acknowledging that uncertainty in flight height distribution exists, as discussed above, this Appropriate Assessment is based on a number of precautionary assumptions; the at sea density estimates of gannets used in the CRMs; that all adult plumaged birds are assumed to be part of the breeding population; and density independent population models. Marine Scotland consider that there are outstanding questions regarding the approach adopted by Cleasby et al, and that the associated scientific uncertainties do not enable a consensus view on how to apply the results beyond the consideration given in Appendix 1 of this assessment at this point in time. MS are certain that the Hywind Development in combination with other projects will not adversely affect the integrity of the Forth Islands SPA with respect to gannet; and that is the case where no reasonable scientific doubt remains.

The cumulative total of collisions for gannet using the basic Band model are presented in the appropriate assessments for Blyth Offshore Wind Demonstrator undertaken by the Marine Management Organisation ("MMO") in 2013, for Blyth Offshore Demonstration project combined with the existing offshore turbines at Blyth and the Teesside project. The annual predicted mortality is 30, with the assessment recording that breeding birds would be most likely to be from Bass Rock which is within the Forth Islands SPA. This is a low number when considered against the identified threshold of 1300. The Aberdeen Bay appropriate assessment records up to 17 collisions per year for the Aberdeen Offshore Wind Farm using the basic Band model, and indicates that the majority of these birds are likely to be from Troup Head on the Moray coast. SNH have advised the Planning Inspectorate that the magnitude of effects to Forth Islands SPA from the Dogger Bank Teesside A & B projects during the breeding season is in the order of 1% of the effects associated with the Forth and Tay projects, which is approximately 14 collisions per year.

ICOL have intimated that their design envelope will be revised downward. A number of options have been provided by ICOL, the worst case of which in terms of collision estimates (ICOL scenario B) would result in gannet collisions at ICOL reducing by 35%, and the cumulative total by more than 12%. However, this has not been taken into consideration by this assessment when making conclusions on site integrity.

In their advice dated 3rd July 2015, the SNCBs advised that adverse effect on site integrity could not be ruled out for Forth Islands SPA with respect to gannet, due to the in-combination effects with the Forth and Tay offshore wind farms, for which the SNCBs have previously advised that predicted impacts from consented developments exceed levels that would allow a conclusion of no adverse impact on site integrity. Following consideration of a

re-assessment completed by MSS of the predicted impacts from the Forth and Tay wind farms, using the Basic Band model and the BTO recommended avoidance rates, the SNCBs changed their position and on 3rd September 2015 concluded no adverse effect on site integrity as the revised collision mortality for gannet brings the predicted total mortality apportioned to this population below previously advised thresholds.

As the predicted effects are well below the identified threshold MS-LOT concludes that the Hywind proposal will not adversely affect the site integrity of the Forth Islands SPA with respect to gannet, either alone or in-combination with the recently consented Forth and Tay Offshore Wind Farms, Aberdeen Bay Offshore Wind Farm, Blyth Offshore Wind Demonstrator, the constructed Blyth and Teesside Offshore Wind Farm developments, and the consented projects on Dogger Bank.

III. Black-legged kittiwake: Fowlsheugh SPA, Buchan Ness SPA

Due to the small size of the Hywind project and the wide ranging foraging trips undertaken by kittiwake (mean max foraging range 60 km) it is assumed that displacement and barrier effects upon all of the SPA populations will be negligible. In their advice dated 3rd July 2015, the SNCBs advise that given the small footprint of the Hywind Development, they anticipate displacement impacts from this development alone to have a small effect on kittiwake.

The BTO concluded ([page 135 of the BTO Avoidance Rate Report](#)) for kittiwake that based on the currently available information, only avoidance rates for the Basic version of the Band model could be recommended. The SNCBs produced a response to the BTO review recommendations, advising that the “all gulls” rate should be used for kittiwake, though the rationale behind the disregarding the BTO’s considered recommendations is not clear. MSS advised that until additional relevant information became available, the avoidance rates recommended by the BTO should be applied for all species. The BTO recommended and SNCBs advised avoidance rates for kittiwake, alongside +/- 1 and 2 standard deviations, are presented in Table 4. Assuming the avoidance rates recommended by the BTO, for kittiwake, the application of +/- 2 SD would result in collision rates between zero and approximately 2.7 times the mean value presented.

Table 4: Kittiwake Avoidance Rates for use with the Basic model recommended by the BTO and advised by the SNCBs.

Source	Collision Risk Model	Avoidance Rate	Kittiwake			
			-/+ 1SD		-/+ 2SD	
BTO	Basic	0.992	0.985	0.999	0.978	1.006
SNCB	Basic	0.989	0.988	0.990	0.987	0.991

For this assessment, the rates recommended by the BTO have been used with the Basic version of the Band collision risk model and site specific flight height data to estimate collision rates (Table 5). For information, the estimates assuming the SNCBs advised avoidance rates are also presented. It is clear from the collision estimates for kittiwake that in isolation the Hywind project will have no adverse effect on site integrity for any of the SPAs under consideration.

Table 5: Collision estimates from Hywind for kittiwake at Fowlsheugh and Buchan Ness to Collieston Coast SPAs assuming the BTO recommended (and MSS advised), and the SNCBs advised avoidance rates.

Species	SPA	SPA Population (Inds.)	Collision Risk Model	Avoidance Rate	Hywind collision estimate (ads during breeding season)
Kittiwake	Fowlsheugh	18674	BTO Basic	99.2%	2
			SNCB Basic	98.9%	3
	Buchan Ness	25084	BTO Basic	99.2%	7
			SNCB Basic	98.9%	10

In order to undertake a cumulative assessment that includes the recently consented Forth and Tay wind farms, collision estimates for the Forth and Tay have been recalculated using the BTO recommended avoidance rates, and the Basic version (Option 2) of the Band model. These results are presented in the summary of cumulative effects upon each SPA of interest (Table 6). This summary incorporates both displacement and barrier effects, and adult mortality and productivity effects resulting from collision mortality. Due to synergies within the CEH displacement modelling (Searle *et al.* 2014), for kittiwake the cumulative displacement effects for the Forth and Tay windfarms are not the sum of the individual project effects. For ease of comparison, the estimated effects assuming 95% avoidance rate and the Extended version of the collision risk model that was used in the Forth and Tay regional assessment are also presented. Finally, estimated effects assuming the SNCBs advised avoidance rates have also been presented.

Black-legged kittiwake: Fowlsheugh SPA

For Fowlsheugh SPA application of the BTO advised kittiwake avoidance rate of 99.2% with the Basic version of the CRM results in an estimated collision mortality from Hywind of 3 adult birds per breeding season, or <0.01% of the SPA population. Application of the BTO recommended avoidance rates to the Forth and Tay windfarms results in their effects on Fowlsheugh SPA reducing from the 1.14% reduction in adult survival assumed in that regional assessment, to 0.94%. The Hywind project does not increase the cumulative effect upon the SPA from 0.94% of the SPA population based on effects from the Forth and Tay wind farms only. Application of the SNCBs advised avoidance rate of 98.9% for kittiwake, would result in a cumulative effect total of 1.16% i.e. only fractionally higher than the value assumed in the Forth and Tay regional AA (1.14%).

The in combination productivity effect on Fowlsheugh SPA from the Forth and Tay wind farms in combination with Hywind was an estimated reduction in productivity of 2.14% (1.67% from the CEH displacement model plus a precautionary 0.57% reduction based on the CRM adult mortality estimates).

Table 6: *Estimated combined wind farm adult kittiwake mortality effects as percentage of Fowlsheugh SPA population and number of individuals resulting from collision and displacement effects from Hywind in isolation, and in combination with recently consented offshore wind farms in the Forth and Tay. For context, estimated effects are presented for the original regional assessment undertaken for the Forth and Tay as well as those assuming the BTO recommended avoidance rates that have been used for this assessment. The productivity effects assumed in this assessment are also presented (see text).*

Fowlsheugh : Kittiwake						
SPA population (Individuals)	18674					
	Hywind		F&T Cumulative		Hywind + F&T CIA	
	% SPA	Inds	% SPA	Inds	% SPA	Inds
Displacement effects (CEH displacement model, flat prey map)						
Adult survival	0.00	0	-0.35	-66	-0.35	-66
Chick survival	0.00	0	-1.67	-156	-1.67	-156
Collision Effects (Band CRM)						
Option 3 95% (as in F&T Assessment)			-0.81	-151		
Option 2 98.9% (SNCB advice)	0.00	-4	-0.80	-150	-0.80	-154
Option 2 99.2% (BTO recommendation)	0.00	-3	-0.58	-109	-0.58	-112
Total Effects						
Adult Survival (F&T AA, Extended CRM, 95%)			-1.14	-212		
Adult Survival (SNCB advised Basic CRM, 98.9%)	0.00	-4	-1.16	-216	-1.16	-220
Adult Survival (BTO recommended Basic CRM, 99.2%)	0.00	-3	-0.94	-175	-0.94	-178
Productivity effect assumed (1.67%+0.57% based on 99.2% AR)	0.00	0	-2.24	-418	-2.24	-418

For the Forth and Tay assessments, both the SNCBs and MSS advised a threshold for kittiwake at Fowlsheugh SPA of a 1.3% reduction in adult survival and a 2.3 % reduction in productivity.

Based on the population forecasts from the CEH Population Viability Analysis (“PVA”) report, the estimated adult mortality and productivity effects described above would result in a CPS value of between 0.62 and 0.82 (based on the CEH displacement model scenarios that assumed 1% adult survival + 1% productivity, or 2% adult survival and 5% productivity respectively). For context, the CEH population model forecasts that after 25 years the Fowlsheugh kittiwake population will decline by 85% in the absence of any wind farm effects. The RSPB have suggested previously that climate change is a key driver of declines in UK seabird populations, including kittiwake, and this has been supported by a number of studies (Carroll et al 2015; Frederiksen et al 2007).

Black-legged kittiwake: Buchan Ness SPA

Application of the BTO advised kittiwake avoidance rate of 99.2% with the Basic version of the CRM results in an estimate collision mortality at Buchan Ness SPA from Hywind of 7 adult birds per breeding season, or <0.01% of the SPA population (Table 7).

Application of the BTO recommended avoidance rate for kittiwake of 99.2% with the Basic version of the collision risk model results in the cumulative effects on Buchan Ness SPA from the Forth and Tay wind farms reducing from the 0.07% reduction in adult survival assumed in that regional assessment, to 0.05%.

The addition of the Hywind effects to the in combination assessment does not meaningfully increase the cumulative effect upon the SPA from 0.05% reduction in adult survival of the SPA population assumed in the Forth and Tay regional assessment. Application of the SNCBs advised avoidance rate of 98.9% for kittiwake, would result in a cumulative effect total of a 0.07% reduction on adult survival of the SPA population.

The productivity effect estimated for the Forth and Tay wind farms in combination with Hywind was negligible.

Table 7: *Estimated combined wind farm adult kittiwake mortality effects as percentage of Buchan Ness SPA population and number of individuals resulting from collision and displacement effects from Hywind in isolation, and in combination with recently consented offshore wind farms in the Forth and Tay. For context, estimated effects are presented for the original regional assessment undertaken for the Forth and Tay as well as those assuming the BTO recommended avoidance rates that have been used for this assessment. The productivity effects assumed in this assessment are also presented (see text).*

Buchan Ness : kittiwake						
SPA population (Individuals)	25084					
	Hywind		F&T Cumulative		Hywind + F&T CIA	
	% SPA	Inds	% SPA	Inds	% SPA	Inds
Displacement effects (CEH displacement model, flat prey map)						
Adult survival	0.00	0	0.00	0	0.00	0
Chick survival	0.00	0	0.00	0	0.00	0
Collision Effects (Band CRM)						
Option 3 95% (as in F&T Assessment)			-0.07	-17		
Option 2 98.9% (SNCB advice)	0.00	-10	-0.07	-17	-0.07	-27
Option 2 99.2% (BTO recommendation)	0.00	-7	-0.05	-12	-0.05	-19
Total Effects						
Adult Survival (F&T AA, Extended CRM, 95%)			-0.07	-17		
Adult Survival (SNCB advised Basic CRM, 98.9%)	0.00	-10	-0.07	-17	-0.07	-27
Adult Survival (BTO recommended Basic CRM, 99.2%)	0.00	-7	-0.05	-12	-0.05	-19
Productivity effect assumed	0.00	0	0.00	0	0.00	0

For the Forth and Tay assessments, both the SNCBs and MSS advised a threshold for kittiwake at Buchan Ness SPA of a 1.6% reduction in adult survival and a 3.2 % reduction in productivity. The estimated magnitude of effect from Hywind in combination with the consented Forth and Tay wind farms is well below these thresholds.

The cumulative effect of a loss of 19 adult kittiwake during the breeding season (with the magnitude of the effect changing relative to changes in the size of the population over time) would result in a CPS after 25 years of >0.99 i.e. >99% of the population forecast to be present after 25 years in the absence of any wind farm effects would be present should the estimated wind farm effects occur. This compares to a CPS of 0.99 estimated for the Forth and Tay regional assessment, which assumed 95% avoidance rate with the Extended version of the model. A CPS value of 0.99 is derived when the SNCB advised avoidance rate of 98.9% is used rather than the BTO recommended rate of 99.2%.

The kittiwake collision estimate is precautionary in that it does not consider attraction of kittiwake to vessels (inflating density estimates), and in the use of the BTO recommended avoidance rates which the authors indicated are precautionary. The population level effects are precautionary as they are based on a density independent model. Wind farm effects on kittiwake during the non-breeding season have been considered within the assessment in a qualitative manner due to the lack of a method for apportioning effects during the non-breeding season and on immature age classes to the SPA population.

Other projects whose potential for cumulative effects are given more qualitative consideration are the offshore wind demonstration projects at Aberdeen Bay and Methil. Collision risk modelling has been undertaken for these sites using the Basic Band model. The Methil turbine is estimated to have less than 2 kittiwake collide per year. At Aberdeen Bay Offshore Wind farm the breeding season adult mortality was predicted to be 25 birds which is attributable to Buchan Ness to Collieston Coast SPA (19 birds) and Fowlsheugh SPA (6 birds), equating to 0.008% of the populations at each SPA.

ICOL have intimated that their design envelope will be revised downward. A number of options have been provided by ICOL and the worst of these in terms of estimated collisions (ICOL scenario B), would result in kittiwake collisions at ICOL reducing by more than 30%, and the cumulative total by c. 4%. However, this has not been taken into consideration by this assessment when making conclusions on site integrity.

On the 3rd July 2015 the SNCBs advised that adverse effect on site integrity could not be ruled out for Fowlsheugh SPA with respect to kittiwake, due to the in-combination effects with the Forth and Tay offshore wind farms, for which the SNCBs have previously advised that predicted impacts from consented developments exceed levels that would allow a conclusion of no adverse effect on site integrity. Following their consideration of the MSS re-assessment of the predicted impacts on kittiwake using the Basic Band model and the BTO and SNCBs recommended avoidance rates, the SNCBs on the 3rd September maintained their position that adverse effect on site integrity could not be ruled out as in their view the predicted effects exceeded the identified threshold. In addition the SNCBs advised that there may be an “unknown” amount of additional mortality out with the breeding season which is not accounted for so that thresholds should not be regarded as limits that can be approached as closely as possible. Following a teleconference between MSS and the SNCBs on the 21st September 2015, to discuss the kittiwake predicted mortality, further advice was received on the 24th September 2015. The SNCBs accepted the mortality figures for kittiwake estimated by MSS and agreed that these were below the threshold applied in the Forth and Tay AA. The SNCBs did advise that the kittiwake population at Fowlsheugh is in decline and that, while the drivers of this decline are unclear, additional mortality over and above that from the consented Forth & Tay wind farms will further contribute to the decline.

As the predicted effects (using both the MSS advised and SNCBs advised avoidance rates) are well below the identified thresholds MS-LOT conclude that the Hywind proposal will not adversely affect the site integrity of the Fowlsheugh or Buchan

Ness to Collieston Coast SPAs with respect to kittiwake, either alone or in combination with the recently consented Forth and Tay Offshore Wind Farms, Aberdeen Bay Offshore Wind Farm and the constructed Methil turbine. MS-LOT consider that there is adequate precaution built into the assessment, and that the predicted effects are sufficiently below the identified threshold so that considering the potential for impacts out with the breeding season would not change this conclusion.

IV. Common guillemot: Buchan Ness to Collieston Coast SPA

Hywind, in their HRA document estimate the effects of displacement during the breeding season on guillemot in a precautionary way. Assumptions are made that all displaced birds are adults and the breeding attempt fails if birds are displaced, and the general displacement rate for birds is also set at 50%. The SNCBs advised that using this precautionary approach, they do not consider there to be an adverse impact on site integrity from the project alone.

The AA for the Forth and Tay developments concluded that there would be negligible effects from displacement on the Buchan Ness to Collieston Coast SPA. The Aberdeen Bay development estimates displacing between 30 and 298 guillemots during the breeding season. For the Hywind project it is estimated up to 85 guillemots will be displaced during the breeding season, resulting in a cumulative effect of 249 displaced birds (when taking the mid-point of the estimated range for the Aberdeen Bay wind farm). Hywind estimated that this equates to a reduction in breeding success of up to 1.9% (but note highly precautionary methods) .

Due to the high densities of auks during the post-fledging dispersal period, MSS has also considered potential effects at this time within this assessment. During August 2013, the upper 95% confidence limit of guillemots in the Hywind site +1 km buffer was 3,169 individuals. The appropriate Biologically Defined Minimum Population Scales (“BDMPS”) during this time is 1,616,306 birds of all ages, or 921,294 adults (Furness, 2015), suggesting that the population estimate for the Hywind site + 1 km buffer represented 0.2% or 0.3% of the relevant reference population respectively. The size of the Hywind project in combination with the highly mobile nature of guillemots during the non-breeding season indicates that the displacement and barrier effects on adults would not be significant.

During July, up to 18% of guillemots observed during the post-fledging period were seen accompanying dependent young, reducing to 1% during August. Whilst not able to fly when still dependent upon the adult, fledged guillemots disperse relatively rapidly over large distances (Camphuysen, 2002; Pennington et al., 2004). It is therefore reasonable to conclude that once operational the Hywind project will not have a significant negative effect upon the SPA. There is the risk that any construction activities during July-August may have the potential to negatively impact post-fledging birds. Hywind installation is expected to be carried out over a 21 month period, although the period of time that vessels will be on site is significantly less than this. The Hywind ES anticipates that the mooring system will be installed first, this is expected to take between 15-20 days. Following this it is estimated to take 8 hours to connect each of the 5 turbines to the mooring lines. Installation of the inter array cabling is expected to take between 10 to 15 days. The SNCBs in their advice dated 3rd July 2015 advised that disturbance by shipping is not likely to result in an adverse effect on site integrity, however suggested mitigation in the form of a vessel management plan to manage scheduled maintenance, construction and decommissioning traffic during July/August, when it is possible that post-breeding adult and chick dispersal is occurring and significant numbers of birds are at risk of being disturbed around the structures.

MS-LOT conclude that the Hywind proposal will not adversely affect the site integrity

of the Buchan Ness to Collieston Coast SPA with respect to guillemot, either alone or in-combination with the recently consented Forth and Tay Offshore Wind Farms or Aberdeen Bay Offshore Wind Farm if the conditions specified in section 3d are complied with.

V. Razorbill: Fowlsheugh SPA

Hywind used the same assumptions as guillemot (see above) when estimating displacement effects on razorbill, so again their assessment was precautionary, and the SNCBs advised that they do not consider there to be an adverse impact on site integrity from the project alone.

The AA for the Forth and Tay developments concluded that there would be practically no effects from displacement on the Fowlsheugh SPA. The Aberdeen Bay development estimates displacing between 3 and 30 razorbill during the breeding season. For the Hywind project it is estimated up to 4 razorbill will be displaced during the breeding season, resulting in a cumulative effect of 21 displaced birds (when taking the mid-point of the estimated range for the Aberdeen Bay wind farm). Hywind estimated that this equates to a reduction in breeding success of up to 0.6% (but note highly precautionary methods).

Due to the high densities of auks during the post-fledging dispersal period, MSS has also considered potential effects at this time within this assessment. During August 2013, the upper 95% confidence limit of razorbill in the Hywind site +1 km buffer was 1,085 individuals. The appropriate BDMPS population during this time is 591,874 birds of all ages, or 337,368 adults (Furness, 2015), suggesting that the population estimate for Hywind + 1 km buffer represented 0.2% or 0.3% of the relevant reference population respectively. The size of the Hywind project in combination with the highly mobile nature of razorbill during the non-breeding season indicates that the displacement and barrier effects on adults would not be significant.

During July, up to 19% of razorbills observed during the post-fledging period were seen accompanying dependent young, reducing substantially by early August, and to zero in late August 2014. Whilst not able to fly when still dependent upon the adult, fledged razorbills disperse relatively rapidly over large distances. It is therefore reasonable to conclude that once operational the Hywind project will not have a significant negative effect upon the SPA. There is the risk that any construction activities during July-August has the potential to negatively impact the post-fledging birds. Hywind installation is expected to be carried out over a 21 month period, although the period of time that vessels will be on site is significantly less than this. The Hywind ES anticipates that the mooring system will be installed first, this is expected to take between 15-20 days. Following this it is estimated to take 8 hours to connect each of the 5 turbines to the mooring lines. Installation of the inter array cabling is expected to take between 10 to 15 days. The SNCBs in their advice dated 3rd July 2015 advised that disturbance by shipping is not likely to result in an adverse effect on site integrity, however suggested mitigation in the form of a vessel management plan to manage scheduled maintenance, construction and decommissioning traffic during July/August, when it is possible that post-breeding adult and chick dispersal is occurring and significant numbers of birds are at risk of being disturbed around the structures.

MS-LOT conclude that the Hywind proposal will not adversely affect the site integrity of the Fowlsheugh SPA with respect to razorbill, either alone or in-combination with the recently consented Forth and Tay Offshore Wind Farms or Aberdeen Bay Offshore Wind Farm if the conditions specified in section 3d are complied with.

VI. Atlantic puffin: Forth Islands SPA

For Atlantic puffin, this assessment uses the same 'common currency' approach used in the [Forth and Tay regional assessment](#), and for the cumulative assessment combines the estimated effects from Hywind with those presented in appendix 4 of the Forth and Tay regional assessment. The application of the SNH apportioning tool suggested that 64% of breeding adult puffin present at Hywind were from the Forth Islands SPA, approximately 150 km to the South. The maximum foraging distance reported for puffin was 200 km, with a mean max foraging range of 105 km in Thaxter et al (2012). In the CEH displacement model for the Forth and Tay region (including the Forth Islands SPA), a maximum foraging range of 105 km was deemed appropriate for the species. The combination of the relatively high number of birds found in the Hywind area and the site's distance from Forth Islands SPA, makes it highly likely that a greater proportion of birds observed at the Hywind site were either immature or non-breeding adults than was assumed in the Forth and Tay regional assessment (35% non-breeding and/or immature). However, this assessment assumes the same values as in the Forth and Tay, and so should be viewed as highly precautionary. This assessment also assumes a displacement rate of 60% within the development footprint and 1 km buffer, and so ignores any reduction in displacement rate that may result from lower turbine density or reduced wind farm profile ([SNCB advice on Forth and Tay dated 17th June 2014](#), [4th July 2014](#) & [16th July 2014](#)).

In recognition of the distance between the Hywind project and the Forth Islands SPA (a round trip of 300 km to/ from Hywind), it is assumed for puffin that the barrier effects from the project will be small in comparison to those estimated in the CEH Forth and Tay displacement model. The relatively small scale of the Hywind project (15 km²), alongside the large distance from the Forth Islands SPA, would suggest that the displacement effects from the Hywind project would also be less than those estimated in the Forth and Tay displacement model. For this assessment (Table 7) it is therefore assumed that of the breeding adult birds from the Forth Islands SPA that are displaced by the Hywind project, either 10% will die or 40% will fail to breed successfully (the precautionary values used in the Forth and Tay AA were 50% and 100% respectively due to the closer proximity of those projects to the SPA). This is considered to be highly precautionary considering the distance between Hywind and the SPA, and the size of the Hywind project. The SNCBs advice of September 3 2015 suggested that a similar reduction on effects upon puffin due to distance from the SPA should be adopted for Seagreen Alpha and Seagreen Bravo. However, this appropriate assessment assumes within the common 'currency approach' for puffin the same level of effect at Seagreen Alpha and Bravo as was assumed in the Forth and Tay regional Assessment, and so should be seen as adding further precaution to the assessment.

Table 8: Displacement/barrier effects on Atlantic puffin at Forth Islands SPA from Hywind in isolation and in combination with the consented Forth and Tay offshore wind farms

	Hywind		Forth & Tay Regional Assessment	Cumulative Total	SPA Populatio (inds)
Mean Seasonal Max		138		13681	100564
Proportion displaced	0.6	83		6389	
Prop SPA	0.64	53		6264	
Prop non-breeding and/or immature	0.35	34		4072	
Prop Die	0.1	3	2021	2024	
Prop fail to breed successfully	0.4	14	4043	4054	

It is clear from Table 8 that in isolation the Hywind project, with a highly precautionary

estimated effect of an additional 3 dead adults or 14 pairs that fail to breed successfully, will not adversely affect the integrity of the Forth Islands SPA.

The in combination effects from Hywind and the Forth and Tay wind farms are also considered by MSS to be acceptable. Population modelling carried out for puffin by MacArthur Green (Trinder 2014) in relation to the Forth and Tay wind farms demonstrated that magnitudes of change due to displacement do not increase the risk of the population declining during the period of effects to levels that differ meaningfully from baseline conditions.

On the 3rd July 2015 the SNCBs advised that adverse effect on site integrity could not be ruled out for Forth Islands SPA with respect to puffin, due to the in-combination effects with the Forth and Tay offshore wind farms, for which the SNCBs have previously advised that predicted impacts from consented developments exceed levels that would allow a conclusion of no adverse impact on site integrity. Following their consideration of the MSS assessment of the predicted impacts on puffin the SNCBs on the 3rd September maintained their position that adverse effect on site integrity could not be ruled out as in their view the predicted effects exceed the level which they considered acceptable.

The AA for the Forth and Tay concluded no adverse effect on site integrity having considered the different assessment methods used by MSS and the SNCBs. MS-LOT considered that the justification provided by MSS on the use of the common currency for estimating effects and the MacArthur Green model for looking at the population consequences used the best available evidence and the most suitable techniques. The Hywind project is adding only a very small additional effect to that already predicted from the Forth and Tay wind farms. MS-LOT conclude that the Hywind proposal will not adversely affect the site integrity of the Forth Islands SPA with respect to puffin, either alone or in-combination with the recently consented Forth and Tay Offshore Wind Farms.

Marine Mammals

VII. Bottlenose dolphin: Moray Firth SAC

No piling operations will take place as part of the Hywind Development and noise levels are unlikely to exceed injury/disturbance levels for bottlenose dolphin. The SNCBs in their advice dated 3rd July 2015 agreed with the conclusions reached by Hywind that the risk of injury or disturbance to marine mammals is low. They also agreed with the assessments of the risk of entanglement and of corkscrew fatalities.

Within inshore waters, SNH do not agree with the ES conclusion of no LSE on bottlenose dolphins from the Moray Firth SAC. Whilst there are few, if any, bottlenose dolphins observed / likely to be within the offshore wind farm site, the same is not true of the cable route. There is potential for disturbance to bottlenose dolphins, which travel along this coast between the Moray Firth and the East coast as far south as the Forth/Tay estuaries, from a number of sources: vessel noise, geophysical surveys, trenching and rock/mattress placement. However, due to the temporary nature of the activity, and the relatively localised nature of the disturbance (and low risk of injury), SNH advise that there would be no adverse impact on site integrity.

All the offshore wind farms consented thus far by Scottish Ministers have been identified as having LSE on the bottlenose dolphin qualifying feature of the Moray Firth SAC. The only one of these which may overlap time wise with the installation of the Hywind cable is the Beatrice offshore wind farm. A comprehensive cumulative assessment was undertaken in

the Forth and Tay regional assessment which included modelling work by Prof Paul Thompson on the effects of disturbance from the offshore wind farms on the bottlenose dolphin population. The conclusion was that there would be no adverse effect on site integrity of the Moray Firth SAC. MS-LOT consider that the installation of the Hywind cable will not add to the effects predicted on the bottlenose dolphin population in any measurable way. In addition consented port developments and dredging operations in the Moray Firth all have strict licencing conditions to mitigate against impacts on marine mammals.

MS-LOT conclude that the Hywind proposal will not adversely affect the site integrity of the Moray Firth SAC with respect to bottlenose dolphin, either alone or in combination with the recently consented offshore wind farms in the Forth and Tay and Moray Firth or any port developments or dredging operations in the Moray Firth.

Consideration of draft designations

Scottish Ministers are currently considering advice received from the SNCBs on sites suitable for designation as SPAs and SACs, these sites are currently given “draft” status (dSPAs and dSACs). Once Ministers have agreed the case for the draft designations to be the subject of a public consultation, the proposals will be given the status of ‘pSPA and pSAC’ and will receive policy protection from that point forward until a decision on classification of the sites are made. This policy protection for proposed sites is provided by Scottish Planning Policy (paragraph 210), the UK Marine Policy Statement (paragraph 3.1.3) and the National Marine Plan for Scotland (paragraph 4.45).

Regulation 27(1) of the Offshore Marine Conservation (natural Habitats, &c.) Regulations 2007 requires that:

“Where, before the date on which a site becomes a European offshore marine site, a competent authority has decided to undertake, or has given any consent, permission or other authorisation for, a plan or project to which regulation 25(1) would apply if it were to be considered at that date, the authority must as soon as reasonably practicable after that date review its decision, or as the case may be, consent, permission or other authorisation.”

Therefore if these sites become designated and LSE is identified then it will be necessary to complete a further AA and depending on the findings of the AA, either affirm, modify or revoke the consent.

In their email of 3rd September 2015 the SNCBs advised that there was the potential for connectivity of the Hywind project with:

- Forth Bay Complex dSPA with respect to gannet, puffin and manx shearwater;
- Ythan Estuary dSPA (for the cable route) with respect to sandwich tern; and
- Moray Firth dSAC (for the cable route) with respect to harbour porpoise.

The SNCBs advised that they will not be in a position to provide further advice on potential impacts from the Hywind Development on the draft designations until the draft conservation objectives have been finalised following the consultation.

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Conclusions

Having determined that the Hywind Development will not have a negative effect on the constitutive elements of the sites concerned, on having regard to the reasons for which the sites were designated and their associated conservation objectives, MS-LOT concludes that the proposed development will not, on its own or in combination with other developments already licensed (including the Forth and Tay offshore wind farms) adversely affect the integrity of the Buchan Ness to Collieston Coast SPA, Fowlsheugh SPA, Forth Islands SPA or Moray Firth SAC (where each SPA or SAC is taken as a whole), subject to the compliance of conditions.

Following MSS advice, MS-LOT consider that the most up to date and best scientific evidence available has been used in reaching the conclusion that any decision to approve the Hywind Development will not adversely affect the integrity of the sites concerned and are satisfied that no reasonable scientific doubt remains.

3d. Conditions required.

The conditions below relate to natura concerns as well as covering interests. The conditions here are written in their complete form and so may also refer to non-natura interests. Where reference is made to other conditions these are numbered as per the condition numbers which will be used in the marine licence if the licence is to be granted.

1). Project Environmental Monitoring Programme (“PEMP”)

The Licensee must, no later than 6 months or at such a time as agreed with the Licensing Authority, prior to the Commencement of the Works, to submit a PEMP, in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation by the Licensing Authority with the Joint Nature Conservation Committee (“JNCC”), the Scottish Natural Heritage (“SNH”), Marine Scotland Science (“MSS”), the Dee District Salmon Fishery Board (“DeeDSFB”) and any other ecological advisors or organisations as required at the discretion of the Licensing Authority. The PEMP must be in accordance with the Application as it relates to environmental monitoring.

The PEMP must set out measures by which the Licensee must monitor the environmental

impacts of the Works. Monitoring is required throughout the lifespan of the Works where this is deemed necessary by the Licensing Authority. Lifespan in this context includes pre-construction, construction, operational and decommissioning phases.

Monitoring must be done in such a way as to ensure that the data which is collected allows useful and valid comparisons between different phases of the Works. Monitoring may also serve the purpose of verifying key predictions in the Application. Additional monitoring may be required in the event that further potential adverse environmental effects are identified for which no predictions were made in the Application.

The Licensing Authority may agree that monitoring may be reduced or cease before the end of the lifespan of the Works.

The PEMP must cover, but not be limited to the following matters:

- a) Pre-construction, construction (if considered appropriate by the Licensing Authority) and post-construction monitoring surveys as relevant in terms of the Application and any subsequent surveys for:
 1. birds;
 2. non-native species;
 3. diadromous fish;
 4. benthic communities; and
 5. seabed scour and local sediment deposition.

- b) The participation by the Licensee in a National Strategic Bird Monitoring Framework (“NSBMF”) and surveys to be carried out in relation to regional and / or strategic bird monitoring which may include but not necessarily limited to:
 1. the avoidance behaviour of breeding seabirds around turbines;
 2. flight height distributions of seabirds at wind farm sites;
 3. displacement of auk species from wind farm sites; and
 4. effects on survival and productivity at relevant breeding colonies.

All initial methodologies for the above monitoring must be approved, in writing, by the Licensing Authority and, where appropriate, in consultation with the Forth and Tay Regional Advisory Group (“FTRAG”), referred to in condition 3.2.1.4 of this licence. Any pre-consent surveys carried out by the Licensee to address any of the above species may be used in part to discharge this condition subject to the written approval by the Scottish Ministers.

The PEMP is a live document and must be regularly reviewed by the Licensing Authority, at timescales to be determined by the Licensing Authority, in consultation with the FTRAG to identify the appropriateness of on-going monitoring. Following such reviews, the Licensing Authority may, in consultation with the FTRAG, require the Licensee to amend the PEMP and submit such an amended PEMP, in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation with FTRAG and any other ecological, or such other advisors as may be required at the discretion of the Licensing Authority. The PEMP, as amended from time to time, must be fully implemented by the Licensee at all times.

The Licensee must submit written reports and associated raw data of such monitoring surveys to the Licensing Authority at timescales to be determined by the Licensing Authority in consultation with the FTRAG. Subject to any legal restrictions regarding the treatment of the information, the results are to be made publicly available by the Licensing Authority, or by such other party appointed at their discretion.

Reason: To ensure that appropriate and effective monitoring of the impacts of the development is undertaken

2). Environmental Management Plan (“EMP”)

The Licensee must, no later than 6 months or at such a time as agreed with the Licensing Authority, prior to the Commencement of the Works, submit an EMP, in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation by the Licensing Authority with the JNCC, SNH, SEPA, Aberdeenshire Council (“AC”) and any such other advisors or organisations as may be required at the discretion of the Licensing Authority.

The EMP must set out a mechanism for the approval process for all proposed updates to the EMP. This must include, but not be limited to, a programme for the consideration of the consultation on, and any subsequent grant of approval of the proposed updated EMP, to be agreed in writing between the Licensee and the Licensing Authority.

The EMP must provide the over-arching framework for on-site environmental management during the phases of the Works as follows:

- a) all construction as required to be undertaken before the Final Commissioning of the Works; and
- b) the operational lifespan of the Works from the Final Commissioning of the Works until the cessation of electricity transmission (environmental management during decommissioning is addressed by condition 3.2.2.3).

The EMP must be in accordance with the Application as it relates to environmental management measures. The EMP must set out the roles, responsibilities and chain of command of any Licensee personnel, any contractors or sub-contractors in respect of environmental management for the protection of environmental interests during the construction and operation of the Works. It must address, but not be limited to, the following over-arching requirements for environmental management:

- a) mitigation measures to prevent significant adverse impacts to environmental interests, as identified in the Application and pre-consent and pre-construction surveys, and include the relevant parts of the Construction Method Statement (“CMS”);
- b) a completed Written Scheme of Investigation (“WSI”) approved by Historic Scotland;
- c) pollution prevention measures and contingency plans;
- d) management measures to prevent the introduction of marine non-native marine species;
- e) measures to minimise, recycle, reuse and dispose of waste streams; and
- f) the methods for responding to environmental incidents and the reporting mechanisms that will be used to provide the Licensing Authority and relevant stakeholders (including, but not limited to, the JNCC, SNH, SEPA, Maritime and Coastguard Agency (“MCA”) and the Northern Lighthouse Board (“NLB”)) with regular updates on construction activity, including any environmental issues that have been encountered and how these have been addressed.

The Licensee must, no later than 3 months prior to the Final Commissioning of the Works, submit an updated EMP, in writing, to cover the operation and maintenance activities for the Works to the Licensing Authority for their written approval. Such approval may be given only following consultation with the JNCC, SNH, SEPA, AC and any such other advisors or

organisations as may be required at the discretion of the Licensing Authority. The EMP must be regularly reviewed by the Licensee and the FTRAG (refer to condition 3.2.1.4) over the lifespan of the Works, and be kept up to date (in relation to the likes of construction methods and operations of the Works in terms of up to date working practices) by the Licensee in consultation with the FTRAG.

The EMP must be informed, so far as is reasonably practicable, by the baseline surveys undertaken as part of the Application and the PEMP.

Reason: To mitigate the impacts on the Natura interests during construction and operation.

3). Forth and Tay Regional Advisory Group (“FTRAG”)

The Licensee must participate in the FTRAG established by the Licensing Authority for the purpose of advising the Licensing Authority on research, monitoring and mitigation programmes for, but not limited to, non-native species, ornithology, marine mammals and commercial fish species. Should a Scottish Strategic Marine Environment Group (“SSMEG”) be established (refer to condition 3.2.1.5), the responsibilities and obligations being delivered by the FTRAG will be subsumed by the SSMEG at a timescale to be determined by the Licensing Authority.

Reason: To ensure effective environmental monitoring and mitigation is undertaken at a regional scale

4). Scottish Strategic Marine Environment Group (“SSMEG”)

The Licensee must participate in any SSMEG established by the Licensing Authority for the purposes of advising the Licensing Authority on research, monitoring and mitigation programmes for, but not limited to, non-native species, ornithology, marine mammals and commercial fish species.

Reason: To ensure effective environmental monitoring and mitigation is undertaken at a national scale

5.) National Research and Monitoring Strategy for Diadromous Fish (“NRMSD”)

The Licensee must, to the satisfaction of the Scottish Ministers, participate in the monitoring requirements as laid out in the NRMSD so far as they apply at a local level. The extent and nature of the Licensee’s participation is to be agreed by the Scottish Ministers in consultation with the FTRAG.

Reason: To ensure effective monitoring of the effects on migratory fish at a local level.

6). Construction Programme (“CoP”)

The Licensee must, no later than 6 months or at such a time as agreed with the Licensing Authority, prior to the Commencement of the Works, submit a CoP, in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation by the Licensing Authority with the JNCC, SNH, SEPA, MCA, NLB, AC and any such other advisors or organisations as may be required at the discretion of the Licensing Authority.

The CoP must set out:

- a) the proposed date for Commencement of the Works;
- b) the proposed timings for mobilisation of plant and delivery of materials, including details of onshore lay-down areas;
- c) the proposed timings and sequencing of construction work for all elements of the Works infrastructure;
- d) contingency planning for poor weather or other unforeseen delays; and
- e) the scheduled date for Final Commissioning of the Works.

The Licensee must, prior to the Commencement of the Works, provide a copy of the final CoP, and any subsequent revisions as agreed by the Licensing Authority, to BP Exploration Operating Company Limited (“BP”), Defence Geographic Centre (“DGC”) and the Ministry of Defence (“MOD”).

Reason: To confirm the timing and programming of construction.

7). Construction Method Statement (“CMS”)

The Licensee must, no later than 6 months or at such a time as agreed with the Licensing Authority, prior to the Commencement of the Works, submit a CMS, in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation by the Licensing Authority with the JNCC, SNH, SEPA, MCA, NLB, AC and any such other advisors or organisations as may be required at the discretion of the Licensing Authority. The CMS must set out the construction procedures and good working practices for constructing the Works. The CMS must also include details of the roles and responsibilities, chain of command and contact details of company personnel, any contractors or sub-contractors involved during the construction of the Works. The CMS must be in accordance with the construction methods assessed in the Application and must include details of how the construction related mitigation steps proposed in the Application are to be delivered.

The Works must, at all times, be constructed in accordance with the approved CMS (as updated and amended from time to time by the Licensee). The CMS must, so far as is reasonably practicable, be consistent with the Development Specification and Layout Plan (“DSLPL”) the EMP, the Vessel Management Plan (“VMP”), the Navigational Safety Plan (“NSP”), the Cable Plan (“CaP”) and the Lighting and Marking Plan (“LMP”).

Reason: To ensure the appropriate construction management of the development, taking into account mitigation measures to protect Natura interests

8). Vessel Management Plan (“VMP”)

The Licensee must, no later than 6 months or at such a time as agreed with the Licensing Authority, prior to the Commencement of the Works, submit a VMP, in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation by the Licensing Authority with the JNCC, SNH, MCA, NLB, CAA, AC and any such other advisors or organisations as may be required at the discretion of the Licensing Authority.

The VMP must include, but not be limited to, the following details:

- a) the number, types and specification of vessels required;
- b) working practices to minimise disturbance to auk species during July / August;
- c) how vessel management will be coordinated, particularly during construction but also during operation;

- d) location of working port(s), how often vessels will be required to transit between port(s) and the Site and indicative vessel transit corridors proposed to be used; and
- e) any required aviation lighting fitted to turbines during tow to site.

The confirmed individual vessel details must be notified to the Licensing Authority in writing no later than 14 days prior to the Commencement of the Works, and thereafter, any changes to the details supplied must be notified to the Licensing Authority, as soon as practicable, prior to any such change being implemented in the construction or operation of the Works.

The VMP must, so far as is reasonably practicable, be consistent with the CMS, the DSLP the EMP, the PEMP, the Navigational Safety Plan (“NSP”), and the Lighting and Marking Plan (“LMP”).

Reason: To mitigate disturbance to birds

9). Operation and Maintenance Programme (“OMP”)

The Licensee must, no later than 6 months or at such a time as agreed with the Licensing Authority, prior to the Commencement of the Works, submit an OMP, in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation by the Licensing Authority with the JNCC, SNH, SEPA, MCA, NLB, AC and any such other advisors or organisations as may be required at the discretion of the Licensing Authority. The OMP must set out the procedures and good working practices for the operations and maintenance of the WTG, substructures, and cable network of the Works. Environmental sensitivities which may affect the timing of the operation and maintenance activities must be considered in the OMP.

The OMP must, so far as is reasonably practicable, be consistent with the EMP, the PEMP, the VMP, the NSP, the CaP and the LMP.

Reason: To safeguard Natura interests during operation of the offshore generating station.

10). Cable Plan (CaP)

The Licensee must, no later than 6 months, or at such a time as agreed with the Licensing Authority, prior to the Commencement of the Works, submit a CaP, in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation by the Licensing Authority with the JNCC, SNH, AC, MSS, MCA, and the SFF and any such other advisors or organisations as may be required at the discretion of the Licensing Authority. The CaP must be in accordance with the Application.

The CaP must include but not be limited to the following:

- a) details of the location and cable laying techniques for the export cable and inter-array cable;
- b) the results of survey work (including geophysical, geotechnical and benthic surveys) which will help inform cable routing;
- c) a pre-construction survey for Annex 1 habitat and priority marine features to inform cable micro-siting and installation methods in consultation with the Licensing Authority and their advisors;
- d) technical specification of all cables, including a desk based assessment of attenuation of electromagnetic field strengths and shielding;
- e) a burial risk assessment to ascertain if burial depths can be achieved. In locations where this is not possible then suitable protection measures must be provided;
- f) methodologies for surveys of the cables through the operational life of the Works

where mechanical protection of cables laid on the sea bed is deployed. Suitable mitigation should be put in place where hazards have been identified caused by cable burial or protection, i.e., over trawling;

- g) methodologies for inter array cable inspection with measures to address and report to the Licensing Authority any exposure of any cables; and
- h) ensure that the new pipeline which is to be laid for the Carbon Capture Project from Peterhead power station to the existing gas pipeline that runs from the Goldeneye platform to St. Fergus is taken into consideration.

Reason: To ensure Natura issues are considered for the location and construction of the cables.

10). Environmental Clerk of Works (“ECoW”)

Prior to the Commencement of the Works, and for the duration of the Works, the Licensee must at its own expense, and with the approval of the Licensing Authority in consultation with the JNCC and SNH, appoint an independent ECoW. The ECoW must be appointed in time to review and approve the final draft version of the first plan or programme submitted under this consent to the Licensing Authority for approval, until the Final Commissioning of the Works.

The Licensee will provide a detailed ECoW Scope of Works for consideration and approval by the Licensing Authority. The Scope of Works will set out, as a minimum:

- i. Roles and Responsibilities;
- ii. Resourcing;
- iii. Reporting Mechanisms; and
- iv. Post Construction Monitoring.

The responsibilities of the ECoW must include, but not be limited to:

- a) quality assurance of final draft version of all plans and programmes required under this licence;
- b) provide advice to the Licensee on compliance with licence conditions, including the conditions relating to the CMS, the EMP, the PEMP, the OMP, the CaP and the VMP;
- c) monitor compliance with the CMS, the EMP, the PEMP, the OMP, the CaP and the VMP; permits, legislation and guidance associated with this licence;
- d) report back to the Licensing Authority who will respond to instances of non-compliance, in consultation with relevant stakeholders;
- e) provide reports on point c) above to the Licensing Authority at timescales to be determined by the Licensing Authority; and
- f) inducting site personnel on the Site / the Works environmental policy and procedures.

The ECoW role may be carried out by a party appointed by the Licensee or a third party to carry out an equivalent role pursuant to other consents or licences granted in relation to the Works and subject to the written approval of the Licensing Authority.

Reason: To ensure that appropriate and effective monitoring of the impacts of the Development is undertaken

Name of assessor	Jared Wilson
Date	22 nd October 2015
Name of approver	Gayle Holland
Date	27 th October 2015

Appendix 1: MSS Summary of “Three dimensional tracking of a wide-ranging marine predator: flight heights and vulnerability to offshore wind farms” by Ian R Cleasby^{1,2}, Ewan D Wakefield^{1,3}, Stuart Bearhop², Thomas W Bodey², Stephen C Votier⁴ & Keith C Hamer¹

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MSS 07.10.15

1. This paper was published in the Journal of Applied Ecology on September 28 2015.
2. The study tagged gannets at the Bass Rock during mid-June to mid-August between 2010 and 2012.
3. In total 55 birds were tagged with GPS loggers, with some birds tagged in multiple years, giving a total of 107 tagging events.
4. Barometric pressure altimeters were deployed on a total of 16 birds during 2011 and 2012 to collect flight height data during foraging and commuting behaviour. Eleven of these birds foraged within or transited through either the Mainstream or Inch Cape wind farm sites.
5. GPS data from tagged birds were used to distinguish foraging, commuting and resting behaviours, and produce at sea usage maps.
6. Gannet density estimates were produced for two recently consented wind farms in the Forth and Tay (Mainstream and Inch Cape but named “A” and “B” in the paper).
7. Flight height distributions were produced for gannet based on the altimeter data, with flight heights during commuting flights lower than those during foraging (when gannets plunge dive).
8. Flight height data were used to estimate the number of gannet collisions during the April-September breeding season at the Mainstream and Inch Cape sites. Wind turbine parameters used in the paper were taken from Band 2012 and are not the consented wind turbine generator specifications .
9. Collision estimates were calculated for Mainstream and Inch Cape assuming the consented number of turbines, and cumulative totals of collisions presented.
10. Comparison was made of the number of collisions estimated using the flight height data from the Cleasby paper and the previously published flight height estimates (Cook et al, 2012 and Johnston et al, 2014).
11. The estimated gannet collisions using flight height data from this study were 6 to 12 times higher than those estimated from previously existing flight height data (Cook et al, 2012 and Johnston et al, 2014).
12. The authors indicate that the aim of the paper is to “investigate the importance of accurate flight height assessments” and not to “predict potential cumulative impact”.
13. The authors recommend that a minimum air gap between sea surface and turbine blade tip of 30 m be set for areas where a high risk of collisions exists.
14. The authors recommend that GPS and barometric pressure data be used to produce spatially specific information on behaviour and flight heights to inform collision risk modelling.

MSS comments on “Three dimensional tracking of a wide-ranging marine predator: flight heights and vulnerability to offshore wind farms” by Cleasby et al, 2015.

In order to better understand how the collision estimates presented in Cleasby et al had been calculated (and ignoring the issues raised above), on September 15th MSS requested additional information from the correspondence author Keith Hamer (Leeds University), and a similar request to Keith Hamer cc'ing Ian Cleasby (Exeter University) and Ewan Wakefield (RSPB) was made on September 29th. The information requested was provided on October 6th 2015. Taking in to consideration the Cleasby paper and the additional information subsequently provided by the authors, a number of issues remain:

- I. The paper attempts to provide a proof of concept of the technologies and methods deployed, compare flight heights across different behaviours, produce flight height distributions, and then undertake a comparison of collision risk model outputs. This is extremely ambitious for one paper, and the level of detail on each of these aspects is therefore limited.
- II. The level of detail presented in the paper is substantially less than would be expected from information presented as part of a licence application, or to inform an appropriate assessment.
- III. 107 GPS tagging events occurred over 3 years, this involved only 55 individuals. Bootstrapping i.e. running the model repeatedly with different subsets of the data removed, could be used to assess the influence of individual birds on the results obtained, and produce confidence intervals that could be compared with those produced by the Generalized Additive Mixed Models (“GAMMs”).
- IV. The sample sizes used in the study for flight height estimation were small (16 birds with altimeters, 11 of which entered the wind farms under consideration), and individual gannets have been shown to exhibit consistency in foraging behaviour across years, suggesting that a representative sample of the Bass Rock gannet population of 150,000 birds may not have been achieved. As with the GPS data, bootstrapping may have helped identify the influence of individuals on results obtained.
- V. What were the sexes of the tagged birds, and what influence could this have on the conclusion reached by the study considering the sexes have been shown to exhibit different behaviours? This may be particularly relevant considering the small sample sizes involved.
- VI. The flight height data are repeated samples over time from the sample of birds and are highly likely to be temporally correlated, but this does not appear to have been addressed in the paper. Not accounting for this correlation is likely to result in confidence values being produced that are too narrow i.e. an increased chance of false significant results being obtained. If this is the case, the validity of the conclusions reached in the paper are uncertain.
- VII. Flight height and wind farm usage data collected from gannets tagged during mid-June to mid-August has been extrapolated out across the entire April to September breeding season. Gannet foraging behaviour is known to change during the breeding season (as demonstrated by the at sea survey abundance estimates presented in the wind farm environmental statements

and as also acknowledged in the discussion section of the manuscript), and therefore the validity of this extrapolation is unclear. Based on at sea surveys, Gannet densities are greatest during the mid-summer period, and so the approach taken by the authors will result in an overestimate of gannet abundance, and therefore collisions.

- VIII. The flight height distributions presented in the paper are the sum of all measurements within individual height bands and do not appear to account for the fact that they will be temporally correlated. This has the potential to significantly affect the flight height distribution and therefore resultant collision rate.
- IX. Flight height distributions are not presented in the paper in a format that allows them to be examined or compared with existing flight height data. Presentation of flight height distributions in the same format as Johnston et al 2014 for all flights, foraging flights and commuting flights (alongside confidence intervals) would allow the data to be assessed more thoroughly. This would also allow validation of the CRM outputs presented in the paper to be undertaken.
- X. It was only possible to replicate the collision estimates presented in the paper following provision of additional information by the authors, highlighting the lack of information presented and resultant lack of clarity.
- XI. A single flight height distribution using data pooled from the two wind farm locations has been used in the CRMs due to the limited number of height measurements available (962 height measurements, from 11 individuals). This limited sample size became apparent on the provision of additional information from the authors. It underlines the need to account for individual effects on the results obtained, and also the preliminary, proof of concept nature of the work. It would be most helpful to get a clearer breakdown of the sample sizes obtained from the various technologies and sampling regimes, how many foraging vs commuting bouts were registered for each, how many estimates of barometric pressure at 0m above the level (P_0) were obtained for each GPS resolution, etc.
- XII. As the data were pooled across the two wind farms, it is unclear why data from out with the wind farm locations were not also included.
- XIII. An accompanying uncertainty map should be provided with Figure 6 of the paper as without this the GAMM outputs cannot be properly interpreted.
- XIV. The authors suggest a disparity between flight height distributions obtained during this study and those found previously e.g. Johnston et al 2014. Putting to one side the issues raised above, in order to determine whether such a difference does exist, the flight height distributions plus associated uncertainties should be compared, rather than single values compared.
- XV. A key component of the flight height estimation method is using the correct P_0 value but there seems to be no assessment of the sensitivities of the flight height estimates to the assumptions being made in the estimation of P_0 values.
- XVI. For high resolution GPS data (1/s), it is unclear whether waiting until 5 seconds after the flight period began will lead to underestimates of P_0 , and therefore overestimates of flight heights. The discarding of pressure estimates 3 seconds following a dive event, in addition to the 5 seconds above, suggest that a bird may have been in flight for 8 seconds when the P_0 value is taken. It is therefore unclear whether the assumption made by the authors that “at

- this point the bird would still be flying at low altitude” is valid, and the potential for this to result in systematic overestimates in flight height appears to remain.
- XVII. The $r=0.58$ value indicates a much lower level of correlation than may be expected from two technologies that are estimating a fixed parameter (bird height). A more robust comparison of the variation in altimeter flight heights from GPS and altimeter loggers would provide reassurance that height estimate accuracy was consistent over space and time.
- XVIII. Only limited information is provided on the measurement/ estimation of flight heights and potential sources of error. The project focus was a proof of concept for the technologies but little information on validation is provided, and no assessment of the sensitivities of the results to the uncertainties or potential errors are provided.
- XIX. A range of mitigation measures are used by Scottish Government to reduce the potential negative effects from offshore wind farms on seabirds. This includes raising the air gap to reduce collision risk. The 22 m minimum air gap referred to in the paper refers to that used to mitigate against potential impacts on recreational vessels (yachts), and the air gaps for three of the recently consented Forth and Tay wind farms is greater than this (Near na Gaoithe 30.5m from lowest astronomical tide (“LAT”) (which is equivalent to approximately 25.5m from highest astronomical tide (“HAT”)) and Seagreen Alpha and Bravo 29.8-42.7m from LAT (which is equivalent to approximately 24.8 and 37.7m from HAT).
- XX. The project and subsequent paper should be seen as an important step in the development of methods for increasing our understanding of gannet foraging behaviour and risk of collision with wind turbines. However, due to limitations inherent to such ‘proof of concept’ projects it would be premature to base decisions on the outputs from this ‘paper.
- XXI. To maximise the usefulness and relevance of future DECC SEA studies, MSS recommend that project steering groups are established, and more comprehensive reports are produced that are able to more thoroughly explore the relevant issues. This does not mean that peer reviewed publications that focus on particular components of the work should not also be key deliverables.
- XXII. DECC have extended the gannet tagging project beyond 2014. MSS agree that the work has the potential to help inform advice and assessments in the future and would strongly recommend that the studies be continued, and additional strategic studies be undertaken e.g. the MS project “How High do Birds Fly?”, monitoring of adult survival and productivity at Bass Rock, etc. The Scottish Offshore Renewables Research framework (“SpORRAn”) will assist the identification of research priorities within Scotland.
- XXIII. The authors’ recommendation is to gather similar data for potentially sensitive species (gannet, kittiwake, large gulls) and colonies. Whilst there are relatively few (reasonably accessible) gannet colonies in Scotland, there are a large number of relevant (and less accessible) colonies for other potentially sensitive species. How the extended timescales required to gather sufficient data match with those of the potential developers wishing to submit licence applications is unclear. A strategic approach to data collection and analysis would be required.

