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SCOTTISH MINISTER'S ASSESSMENT OF THE PROJECT'S IMPLICATIONS FOR DESIGNATED SPECIAL AREAS OF CONSERVATION ("SAC"), SPECIAL PROTECTION AREAS ("SPA") AND PROPOSED SPECIAL PROTECTION AREAS ("pSPA") IN VIEW OF THE SITES' CONSERVATION OBJECTIVES

APPLICATION FOR CONSENT UNDER SECTION 36 OF THE ELECTRICITY ACT 1989 (AS AMENDED) AND FOR MARINE LICENCES UNDER THE MARINE (SCOTLAND) ACT 2010 FOR THE CONSTRUCTION AND OPERATION OF THE INCH CAPE OFFSHORE WIND FARM AND ASSOCIATED OFFSHORE TRANSMISSION INFRASTRUCTURE

SITE DETAILS: INCH CAPE OFFSHORE WIND FARM AND EXPORT CABLE CORRIDOR BOUNDARY – APPROXIMATELY 15 - 22 KM EAST OFF THE ANGUS COASTLINE

Name	Assessor or Approver	Date
[redacted]	Assessor	08/02/2019
[redacted]	Assessor	11/01/2019
[redacted]	Approver	14/03/2019

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SECTION 1: BACKGROUND

1. Introduction

1.1 This appropriate assessment ("AA") relates to the application ("the Application") submitted by Inch Cape Offshore Limited ("ICOL" or the Company") for consent under section 36 ("s.36") of the Electricity Act 1989 (as amended) ("the Electricity Act 1989") and marine licences under the Marine (Scotland) Act 2010 to construct and operate an offshore generating station and associated offshore transmission infrastructure, approximately 15-22km east off the Angus coastline ("the Development"), comprising up to 72 wind turbine generators ("WTGs").

1.2 The assessment has been undertaken by Scottish Ministers and is required under regulation 48 of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) and regulation 63 of the Conservation of Habitats and Species Regulations 2017 (herein collectively referred to as "the Habitats Regulations"). This AA is in accordance with Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ("the Habitats Directive") and Council Directive 2009/147/EC on the conservation of wild birds ("the Birds Directive"). Scottish Ministers, as the competent authority under the Habitats Regulations, must be satisfied that the Development will not adversely affect the integrity of any European site or European offshore marine site (special areas of conservation ("SAC") and special protection areas ("SPA")), either in isolation or in-combination with other plans or projects, before they can grant consent for the Development.

1.3 A detailed AA has been undertaken and Scottish Natural Heritage ("SNH") has been consulted.

2. AA Conclusion

2.1 This AA concludes that there will be no adverse effects on the site integrity of the Forth Islands SPA, Fowlsheugh SPA, St Abb's Head to Fast Castle SPA, Buchan Ness to Collieston Coast SPA, Outer Firth of Forth and St Andrew's Bay Complex pSPA, Moray Firth SAC, Firth of Tay and Eden Estuary SAC, Berwickshire and North Northumberland Coast SAC or Isle of May SAC (where each SAC, SPA or pSPA is taken as a whole) from the Development either in isolation or in-combination with other plans or projects, providing the conditions set out in Section 4 are complied with.

2.2 Scottish Ministers consider that the most up to date and best scientific evidence available has been used in reaching the conclusion that the Development will not adversely affect the integrity of these sites and are satisfied that no reasonable scientific doubt remains.

3. Background to including assessment of proposed SPAs

3.1 The Scottish Ministers are currently in the process of identifying a suite of new marine SPAs in Scotland. In 2014, advice was received from the statutory nature conservation bodies ("SNCBs") on the sites most suitable for designation and at this stage they became draft SPAs ("dSPA"). Once the Scottish Ministers have agreed the case for a dSPA to be the subject of a public consultation, the proposal is given the status of proposed SPA ("pSPA") and receives policy protection, which effectively offers the sites the same level of protection as designated sites, from that point forward until a decision on classification of the site is made. This policy protection for pSPAs is provided by Scottish Planning Policy (paragraph 210), the UK Marine Policy Statement (paragraph 3.1.3) and Scotland's National Marine Plan (paragraph 4.45).

3.2 It is not a legal requirement under the Habitats Directive or the Habitats Regulations for this assessment to assess the implications of the Development on any pSPAs. Nevertheless, this AA includes an assessment of implications upon these sites in accordance with domestic policy. The Scottish Ministers are required to consider article 4(4) of the Birds Directive in respect of pSPAs. The considerations under article 4(4) of the Birds Directive are separate and distinct to the considerations which must be assessed under this Habitats Directive assessment but they are, nevertheless, set out within this AA (see paragraphs 0 and 0).

3.3 In accordance with the Habitats Regulations, the Scottish Ministers, acting as soon as reasonably practicable following the formal designation of the pSPA, will review their decisions if the Development is authorised. If required, this will include a supplementary AA being undertaken concerning the implications of the Development on the site as designated (as the site is currently a pSPA, at present, the conservation objectives are in draft form and will be finalised at the point that the site is designated).

4. Details of proposed operation

4.1 ICOL has submitted two separate marine licence applications in respect of the generating station and the transmission works under part 4 of the Marine (Scotland) Act 2010. In addition, ICOL has submitted an application for s.36 consent under the Electricity Act 1989 in respect of the Development. A full description of the Development can be found in Chapter 7 of the Environmental Impact Assessment Report ("EIA Report") (as submitted in August 2018). The s.36 consent and marine licences applied for are for a period of 50 years.

4.2 ICOL proposes to construct and operate a large-scale offshore wind farm and associated offshore transmission infrastructure, located 15-22km east off the Angus coastline. The Development will consist of a maximum of 72 WTGs. In addition to the WTGs, up to two offshore substation platforms ("OSPs") are proposed. Up to two offshore export cables

("OECs") will be individually buried or protected until landfall at Cockenzie, East Lothian.

4.3 ICOL previously received s.36 consent and associated marine licences to construct and operate the Inch Cape Offshore Wind Farm in October 2014 ("the Original Consent"). At the time of granting the Original Consent a combined AA ("the 2014 AA") was completed for the Original Consent, Neart na Gaoithe Offshore Wind Farm, Seagreen Alpha Offshore Wind Farm and the Seagreen Bravo Offshore Wind Farm (collectively known as the "Forth and Tay Developments"). The Forth and Tay Developments were all subject to judicial review proceedings, and although the consents have been upheld, the projects have not been built out.

4.4 In March 2018, Neart na Gaoithe Offshore Wind Limited ("NnGOWL") submitted a s.36 consent application and marine licence applications in respect of the revised design for the Neart na Gaoithe Offshore Wind Farm and transmission infrastructure ("NnGOWL Development"). NnGOWL was subsequently granted a s.36 consent and marine licences in December 2018 for the revised design.

4.5 In August 2018, Seagreen Wind Energy Limited ("Seagreen") submitted a s.36 consent application and marine licence applications, in respect of the revised designs for the Seagreen Alpha and Seagreen Bravo Offshore Wind Farms (referred to herein as "Seagreen Alpha" and "Seagreen Bravo", respectively, or, collectively, as the "Seagreen Developments"). Seagreen has not submitted marine licence applications for the transmission infrastructure, as the marine licences issued in 2014 are still valid, and this part of the Seagreen Developments has not changed.

4.6 Unless otherwise specified, within this AA, references to the 2018 NnGOWL application and the Seagreen applications are references to the 2017 scenarios for these projects, as these projects were considered by ICOL as detailed in scoping reports submitted by NnGOWL and Seagreen in 2017. Where specified expressly, this AA will also refer to the s.36 consents previously granted in 2014 for the NnGOWL Development and the Seagreen Developments.

4.7 The 2014 AA concluded that the Forth and Tay Developments would not adversely affect the integrity of any European sites or European offshore marine sites, either in isolation or in-combination with other plans and projects.

4.8 ICOL submitted a scoping report and a request for a scoping opinion to Scottish Ministers in April 2017. Following consultation with statutory consultees and other stakeholders, the Scottish Ministers issued a scoping opinion in respect of the Development on 28 July 2017 ("Scoping Opinion"), advising on the scope of assessment required in respect of the Application. Separate addendums to the Scoping Opinion providing advice on the marine mammal and ornithology aspects of the scoping

report were issued on 3 August 2017 and 10 August 2017 respectively. The Scoping Opinion included advice on the Habitats Regulations Appraisal ("HRA") requirements and advised that information to inform the HRA ("HRA Report") must be submitted in conjunction with the EIA Report.

4.9 The Application has been developed and proposed in order to take advantage of technological developments in the intervening time period since the Original Consent was granted. **Table 1** below provides a summary of the parameters of the design envelopes for the Development and the Original Consent.

Table 1 Comparison of the Development and Original Consent Envelope Parameters

Design Envelope Parameter	**Development**	**Original Consent**
Maximum number of WTGs	Up to 72	Up to 110
Blade tip height (above Lowest Astronomical Tide ("LAT")	Up to 291 metres	Up to 215 metres
Rotor diameter	Up to 250 metres	Up to 172 metres
Foundations and Substructures	Includes: Jacket and driven piles (including monopiles), jacket and suction piles, jacket and drilled piles, jacket and gravity based and gravity base.	Includes: Jacket and driven piles, jacket and suction piles, jacket and drilled piles, jacket and gravity based and gravity base.
Maximum energy capacity of hammer	5,000kJ	1,200kJ
Inter-array cables length	Up to 190km	Up to 353km
Offshore Substation Platforms ("OSPs")	Up to 2	Up to 5
Number of Export Cables	Up to 2	Up to 6

4.10 The final foundation and substructure options for the WTGs and OSPs have not yet been selected and the final selection will be based on various technical, environmental and economic factors (including, but not limited to, water depth, whole life economics and compatibility with WTGs). The following options are outlined in the EIA Report:

- Jacket and driven piles;
- Jacket and suction piles;
- Monopiles;
- Jacket and gravity bases; and
- Gravity base structures.

4.11 Where substructures have piled foundations, the EIA Report assumes that there will be a maximum of two concurrent piling activities occurring simultaneously within the Development area. The following design envelope parameters for piling activities have been assessed:

Table 2 Piling parameters (WTG jacket substructure)

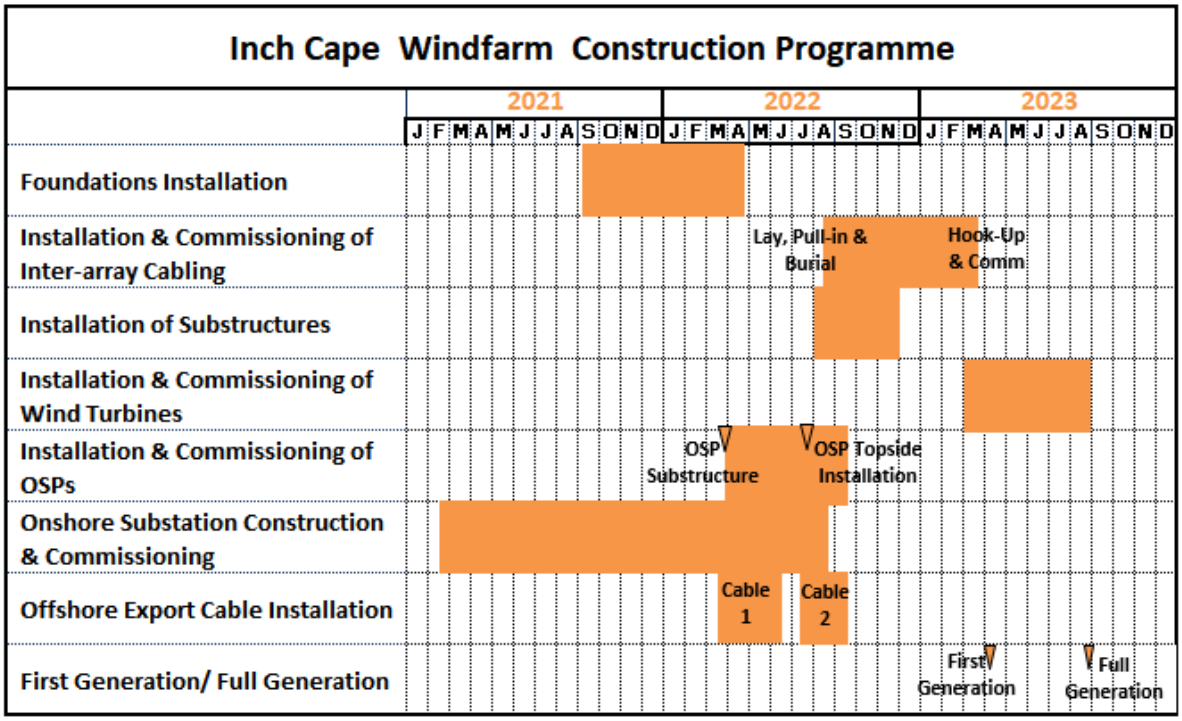
Design Parameter	**Value (Maximum or Range)**
Drilling/piling events (WTGs)	288 (Four piles per WTG)
Maximum seabed penetration	70 metres
Maximum energy capacity of hammer	2,400kJ
Maximum blow energy	1,080 – 2,160kJ
Aggregate pile diameter	12 metres
Total piling duration (hours/pin pile) (highest expected)	2.6 hours

Table 3 Piling parameters (monopile scenario)

Design Parameter	**Value (Maximum or Range)**
Monopile diameter (mm)	12,000mm
Hammer capacity	5,000 kJ
Max. blow energy	2,250 - 4,500kJ
Total piling duration (hours/monopile)	4-6 hours

4.12 An indicative construction programme is included in Chapter 7 of the EIA Report and is set out in **Figure 1** below. Construction activities are anticipated to start around 2021, with works taking approx. 24 months over a 3 year period. Please note, however, that the durations in orange below are shown for illustration purposes and activities will not be continuous throughout these windows. Further, overall durations may increase or decrease, the sequence of activities may change and the start and/or finish date may also change.

Figure 1 Indicative Construction Schedule



4.13 **Table 4** below provides details of the anticipated duration of the main construction activities.

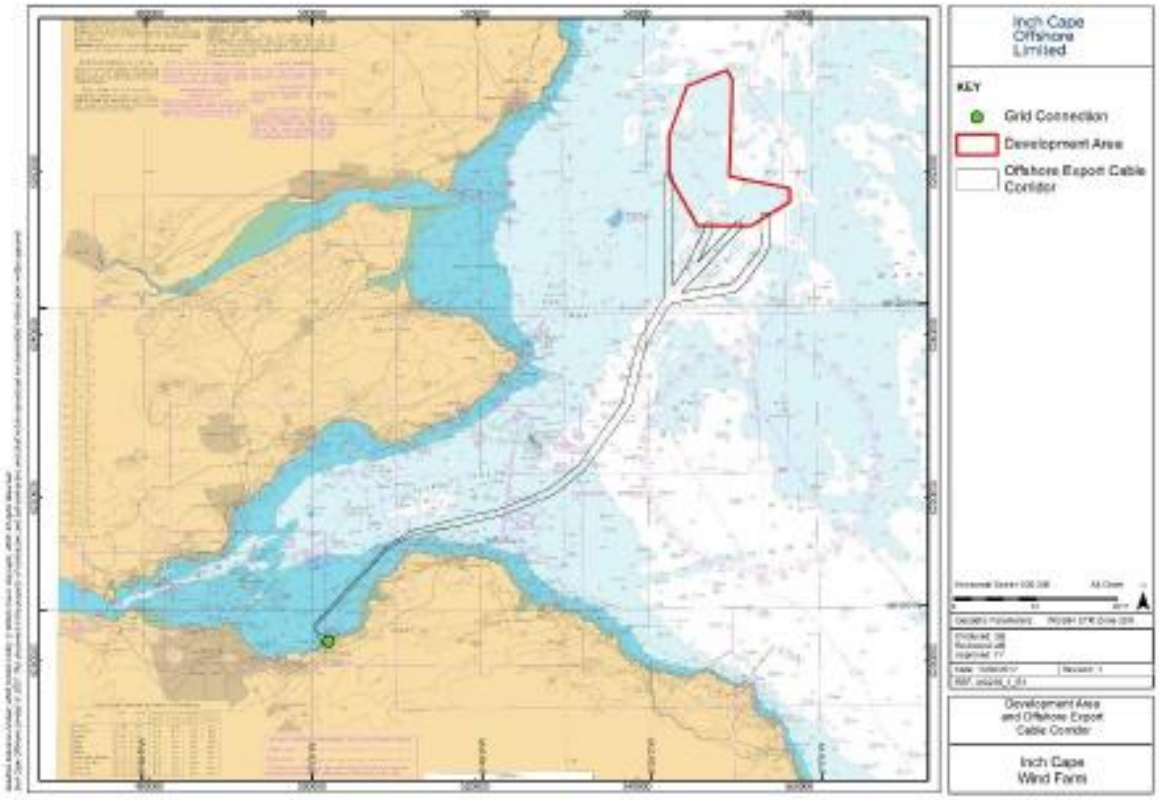
Table 4 Main construction activities and anticipated durations

Main construction activity	Anticipated duration
Foundation installation and associated site preparation	9 months
Inter-array cable installation	12 months
Installation of substructures	6 to 9 months
Installation and commissioning of WTGs	6 to 9 months
Installation and commissioning of OSPs	6 months
Export cable installation (excluding intertidal)	9 months
Intertidal cable installation	6 months

4.14 **Figure 2** below provides a chart detailing the Development area, including the Offshore Export Cable Corridor.

Figure 2 Chart of Generating Station and Cable Corridor

Source: EIA Report http://marine.gov.scot/sites/default/files/volume_1a_chapters_1-11.pdf



5. Consultation

5.1 ICOL submitted its Application, including the EIA Report and HRA Report, on 15 August 2018. Scottish Ministers accepted the Application and sent copies of it to SNH and other relevant consultees on 21 August 2018 for a minimum 30 day consultation period.

5.2 Detailed comments were received from SNH, the Royal Society for the Protection of Birds Scotland ("RSPB Scotland") and Whale and Dolphin Conservation ("WDC"). Marine Scotland Science ("MSS") provided scientific advice on the information provided.

6. Main points raised during consultation

6.1 The main points by each of the respondents that included HRA specific comments are summarised below. Copies of all consultation responses received by Scottish Ministers can be accessed here.

6.2 SNH

6.2.1 Ornithology

6.2.1.1 In its response to the consultation dated 28 September 2018, SNH advised that impacts from the Development would be less than the impacts from the Original Consent.

6.2.1.2 SNH advised that there would be no adverse effect on the site integrity of any SPA or pSPA as a result of the Development in isolation.

6.2.1.3 SNH provided further detailed comments on the impact assessment methodology presented in the EIA Report and HRA Report. SNH stated that the approach to calculating collision risk impacts followed the advice outlined in the Scoping Opinion and the flight height data utilised was of good quality.

6.2.1.4 SNH stated that the approach taken to Population Viability Analysis ("PVA") ignores the proportion of birds that are not included in the SPA populations and, therefore, the regional PVAs are precautionary.

6.2.1.5 SNH stated that the use of Band 2 Collision Risk Model ("CRM") outputs in the PVA is precautionary. SNH advised that the use of Option 1 outputs would have produced smaller effects for the Development in isolation.

6.2.1.6 SNH stated that assessment presented regarding the predicted impacts over 25 and 50 years indicates that there is a greater confidence in the assessment over the 25 year period.

6.2.1.7 SNH advised that there would be no adverse effect on the site integrity of the following SPAs and pSPA from the Development in-combination with the other Forth and Tay Developments:

- Forth Islands SPA – herring gull, Atlantic puffin, common guillemot;
- Fowlsheugh SPA – herring gull, common guillemot;
- St Abb's Head to Fast Castle SPA – herring gull, common guillemot;
- Buchan Ness to Collieston Coast – common guillemot; and
- Outer Firth of Forth and St Andrews Bay Complex pSPA – all qualifying seabird interests.

6.2.1.8 SNH submitted an objection to the proposed Development due to the predicted effects of the Development in-combination with the other Forth and Tay Developments. SNH advised that, in its view, the Development in-combination with the s.36 consents granted in 2014 for the NnGOWL Development and the Seagreen Developments would have an adverse effect on the site integrity as follows:

- Forth Islands SPA – with respect to northern gannet, black-legged kittiwake (resulting from collision risk) and razorbill (displacement); and
- Fowlsheugh SPA – with respect to black-legged kittiwake (collision risk) and razorbill (displacement).

6.2.1.9 On 28 September 2018, SNH advised that the Development could have an adverse effect on the site integrity of the St Abb's Head to Fast Castle SPA in respect of kittiwake in-combination with the other Forth and Tay Developments. This was clarified on 24 January 2019, when SNH advised that it was unable to conclude that there would be no adverse effect on site integrity due to the scale of the predicted impacts, the small

size of kittiwake population at the St Abb's Head to Fast Castle SPA, the ratio of impacted to un-impacted population sizes (for both 25 and 50 years) presented and the continuing decline of kittiwake populations.

6.2.1.10 SNH did acknowledge the reduction in adverse effects from the Development, when compared to effects predicted for the Original Consent.

6.2.1.11 SNH subsequently provided advice on the draft AA on 24 January 2019, advising that the plus 1 standard deviation shown in Thaxter et al (2012)[1] should be applied to mean maximum foraging ranges when considering the Forth and Tay Developments as part of the in-combination assessment. SNH advised that, in all cases where Forth and Tay Developments were deemed to be outwith the mean maximum foraging range, the distances beyond the mean maximum. range were small and fell well within the plus 1 standard deviation. SNH advised that the values presented in Thaxter are estimates and may result in cumulative effects being underestimated. Where relevant, a qualitative assessment of species outwith the mean maximum foraging range, but within the plus 1 standard deviation, has been included within this AA.

6.2.2 Marine Mammals

6.2.1 SNH provided advice in relation to the approach taken to the cumulative impact assessment of east coast offshore wind farm construction on bottlenose dolphin (Moray Firth SAC) and grey seal (Isle of May SAC) on 26 September 2018. This advice considered the iPCOD Cumulative Impact Assessment Report provided by SNH and concluded that displacement from pile driving/blasting may affect the size and growth of the bottlenose dolphin population off the east coast of Scotland in the short term, however, the outputs suggested that the size of this effect is likely to be small over the modelled period. Further, the iPCOD Cumulative Impact Assessment Report concluded that there is likely to be no effect on the grey seal population of the Forth and Tay as a result of pile driving or blasting activity. The report assessed the impacts from the Development, the NnGOWL Development, the Seagreen Developments and in relation to offshore wind farms for Beatrice, Moray East and Moray West. Blasting activity in relation to the Aberdeen Harbour Expansion Project was also considered (although not for grey seal).

6.2.2 In its advice of 28 September 2018 in response to the Application, SNH stated that the predicted cumulative Permanent Threshold Shift ("PTS") zones presented in the EIA Report are large and are of concern. However, SNH further stated that these issues can be addressed further through post-consent mechanisms, should any new consent be granted.

[1] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

6.2.3 SNH stated that it welcomed the inclusion of the analyses for underwater noise modelling using both the 1% and 0.5% conversion factors, which converts hammer energy into acoustic noise. SNH advised that it considers the 1% conversion factor to be preferable and that the chosen conversion factor should reflect the appropriate degree of precaution, in light of the current levels of uncertainty.

6.2.4 SNH stated that it agrees with the conclusions presented in the EIA Report regarding the magnitudes of impacts. SNH advised that there would be no adverse effect on the site integrity of the following SACs, provided appropriate mitigation is implemented through consent and/or licence conditions:

- Moray Firth SAC - bottlenose dolphin;
- Firth of Tay and Eden Estuary SAC – harbour seal;
- Isle of May SAC – grey seal; and
- Berwickshire and North Northumberland Coast SAC – grey seal.

6.3 RSPB Scotland

6.3.1 RSPB Scotland submitted an objection to the proposed Development on 9 October 2018. RSPB Scotland stated that the Development represents a considerable reduction in the predicted impacts of the Original Consent on seabird populations. However, RSPB Scotland stated that the Development, in-combination with the other Forth and Tay Developments would result in population scale effects which would constitute an adverse effect on the integrity of relevant SPAs.

6.3.2 RSPB Scotland stated that the impacts of the Development could result in an adverse effect on the site integrity of the Forth Islands SPA, St Abb's Head to Fast Castle SPA and Fowlsheugh SPA, in respect of kittiwake. Further, RSPB Scotland advised that the predicted impact on the gannet qualifying interest of the Firth of Forth SPA was significant. RSPB Scotland advised that a lack of empirical data to inform the displacement assessment for the auk species means that predicted effects should be treated with caution.

6.3.3 RSPB Scotland stated that the estimates of flight altitude recorded at the site for kittiwake and gannet are considerably lower than the figures provided in the literature[2] and that it did not agree that sufficient justification and explanation has been provided regarding this issue. RSPB Scotland acknowledged that the issues regarding flight height estimates would not be of concern if Option 2 is utilised.

6.4 WDC

6.4.1 WDC stated, in its response dated 4 October 2018, that it had concerns regarding noise outputs and noise reduction technologies utilised during the construction of offshore marine renewable energy developments.

[2] Johnstone et al., corrigendum, 2014.

WDC highlighted the noise reduction report commissioned by the World Wildlife Fund, *A Positive Future for Porpoises and Renewables*[3] (September 2016) may be of particular interest to Scottish Ministers.

[3] Available here: http://assets.wwf.org.uk/downloads/a_positive_future_for_porpoises_and_renewables___wwf_2016.pdf (Last accessed 18/10/2018).

SECTION 2: INFORMATION ON NATURA SITES

7. Background information and qualifying interests for the relevant Natura sites

7.1 This section provides links to the SNH Interactive website, where background information on the sites being considered in this assessment is available. The qualifying interests for the sites are listed below at Table **6** and the conservation objectives at

Table **7**. Figure 3 provides a chart of the SPAs, pSPA and SACs considered within this AA.

Table 5 Name of Natura sites affected and current status

SPA:

Forth Islands SPA

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8500

Fowlsheugh SPA

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8505

St Abb's Head to Fast Castle SPA

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8579

Buchan Ness to Collieston Coast SPA

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8473

SAC:

Moray Firth SAC

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8327

Firth of Tay and Eden Estuary SAC

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8257

Berwickshire and North Northumberland Coast SAC

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8207

Isle of May SAC

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8278

pSPA:

Outer Firth of Forth and St Andrews Bay Complex pSPA
http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=10478

Table 6 European qualifying interests

Forth Islands SPA

- Arctic tern (*Sterna paradisaea*), breeding
- Common tern (*Sterna hirundo*), breeding
- Cormorant (*Phalacrocorax carbo*)*, breeding
- Gannet (*Morus bassanus*), breeding
- Guillemot (*Uria aalge*)*, breeding
- Herring gull (*Larus argentatus*)*, breeding
- Kittiwake (*Rissa tridactyla*)*, breeding
- Lesser black-backed gull (*Larus fuscus*), breeding
- Puffin (*Fratercula arctica*), breeding
- Razorbill (*Alca torda*)*, breeding
- Roseate tern (*Sterna dougallii*), breeding
- Sandwich tern (*Sterna sandvicensis*), breeding
- Shag (*Phalacrocorax aristotelis*), breeding
- Seabird assemblage, breeding

*indicates assemblage qualifier only

Fowlsheugh SPA

- Fulmar (*Fulmarus glacialis*)*, breeding
- Guillemot (*Uria aalge*)*, breeding
- Herring gull (*Larus argentatus*)*, breeding
- Kittiwake (*Rissa tridactyla*), breeding
- Razorbill (*Alca torda*)*, breeding
- Seabird assemblage, breeding

St Abb's Head to Fast Castle SPA

- Guillemot (*Uria aalge*)*, breeding
- Herring gull (*Larus argentatus*)*, breeding
- Kittiwake (*Rissa tridactyla*)*, breeding
- Razorbill (*Alca torda*)*, breeding
- Shag (*Phalacrocorax aristotelis*)*, breeding
- Seabird assemblage, breeding

Buchan Ness to Collieston Coast SPA

- Fulmar (*Fulmarus glacialis*)*, breeding
- Guillemot (*Uria aalge*)*, breeding
- Herring gull (*Larus argentatus*)*, breeding
- Kittiwake (*Rissa tridactyla*)*, breeding
- Shag (*Phalacrocorax aristotelis*)*, breeding
- Seabird assemblage, breeding

Moray Firth SAC

- Subtidal sandbanks

- Bottlenose dolphin (*Tursiops truncatus)*

Firth of Tay and Eden Estuary SAC

- Estuaries
- Intertidal mudflats and sandflats
- Subtidal sandbanks
- Harbour seal (*Phoca vitulina)*

Berwickshire and North Northumberland Coast SAC

- Intertidal mudflats and sandflats
- Reefs
- Sea caves
- Shallow inlets and bays
- Grey seal (*Halichoerus grypus)*

Isle of May SAC

- Reefs
- Grey seal (*Halichoerus grypus)*

Outer Firth of Forth and St Andrews Bay Complex pSPA

- Red-throated diver (*Gavia stellata)*, non-breeding
- Little gull (*Hydrocoloeus minutus),* non-breeding
- Common tern (*Sterna hirundo)*, breeding
- Gannet (*Morus bassanus)*, breeding
- Arctic tern *(Sterna paradisaea),* breeding
- Guillemot (*Uria aalge)*, breeding and non-breeding
- Slavonian grebe (*Podiceps auritus),* non-breeding
- Eider (*Somateria mollissima)*, non-breeding
- Long-tailed duck (*Clangula hyemalis)*, non-breeding
- Common scoter (*Melanitta nigra)*, non-breeding
- Velvet scoter (*Melanitta fusca),* non-breeding
- Goldeneye (*Bucephala clangula),* non-breeding
- Red-breasted merganser (*Mergus serrator)*, non-breeding
- Manx shearwater (*Puffinus puffinus)*, breeding
- Razorbill (*Alca torda)*, non-breeding
- Puffin (*Fratercula arctica),* breeding
- Black-headed gull (*Chroicocephalus ridibundus)*, non-breeding
- Common gull (*Larus canus),* non-breeding
- Herring gull (*Larus argentatus),* breeding and non-breeding
- Kittiwake (*Rissa tridactyla),* breeding and non-breeding
- Shag (*Phalacrocorax aristotelis),* breeding and non-breeding
- Waterfowl assemblage, non-breeding
- Seabird assemblage, breeding and non-breeding

Table 7 Conservation objectives

SPA:

Forth Islands SPA, Fowlsheugh SPA, St Abb's Head to Fast Castle SPA and Buchan Ness to Collieston Coast SPA

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

i. Population of the species as a viable component of the site
ii. Distribution of the species within site
iii. Distribution and extent of habitats supporting the species
iv. Structure, function and supporting processes of habitats supporting the species
v. No significant disturbance of the species

SAC:

Conservation Objectives for the following Qualifying Habitats:

SAC	**Qualifying Habitat(s)**
Moray Firth SAC	Subtidal Sandbanks
Firth of Tay and Eden Estuary SAC	Estuaries Intertidal mudflats and sandbanks Subtidal sandbanks
Berwickshire and North Northumberland Coast SAC	Intertidal mudflats and sandflats Reefs Sea caves Shallow inlets and bays
Isle of May SAC	Reefs

To avoid deterioration of the qualifying habitats (listed above) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving the favourable conservation status for each of the qualifying features; and

To ensure for the qualifying habitat that the following are maintained in the long term:

i. Extent of the habitat on site
ii. Distribution of the habitat within site
iii. Structure and function of the habitat
iv. Processes supporting the habitat
v. Distribution of typical species of the habitat
vi. Viability of typical species as components of the habitat
vii. No significant disturbance of typical species of the habitat

Conservation Objectives for the following Qualifying Interests:

SAC	Qualifying Interest(s)
Firth of Tay and Eden Estuary SAC	Harbour seal
Berwickshire and North Northumberland Coast SAC	Grey seal
Isle of May SAC	Grey seal

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, 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 maintained in the long term:

i. Population of the species as a viable component of the site
ii. Distribution of the species within site
iii. Distribution and extent of habitats supporting the species
iv. Structure, function and supporting processes of habitats supporting the species
v. No significant disturbance of the species

Conservation Objectives for the following Qualifying Interests:

SAC	Qualifying Interest(s)
Moray Firth SAC	Bottlenose dolphin

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, 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:

i. Population of the species as a viable component of the site
ii. Distribution of the species within site
iii. Distribution and extent of habitats supporting the species
iv. Structure, function and supporting processes of habitats supporting the species
v. No significant disturbance of the species

pSPA:

Outer Firth of Forth and St Andrews Bay Complex pSPA (Draft Conservation Objectives)

The following conservation objectives are still in draft form and have not yet been finalised.

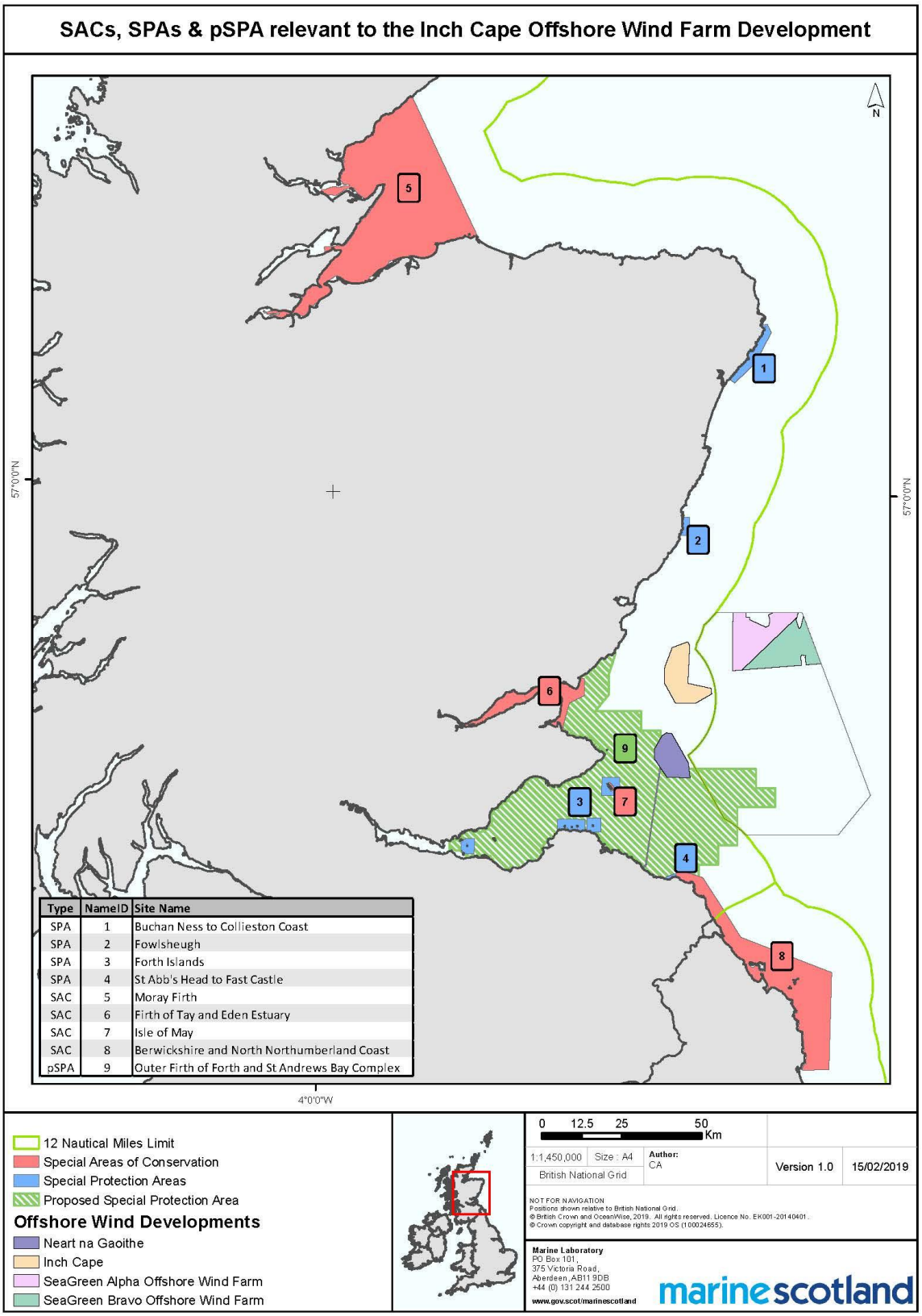
To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that

the integrity of the site is maintained in the long-term and it continues to make an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species.

This contribution will be achieved through delivering the following objectives for each of the site's qualifying features:

a. Avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long-term;
b. To maintain the habitats and food resources of the qualifying features in favourable condition.

Figure 3 SPAs, pSPA and SACs considered within this AA



SECTION 3: ASSESSMENT IN RELATION TO REGULATION 48 OF THE CONSERVATION (NATURAL HABITATS, &C.) REGULATIONS 1994 AND REGULATION 63 OF THE CONSERVATION OF HABITATS AND SPECIES REGULATIONS 2017

8. Requirement for appropriate assessment

8.1. Is the operation directly connected with or necessary to conservation management of the site?

8.1.1 The operation is not directly connected with or necessary to conservation management of the site.

8.2. Is the operation likely to have a significant effect on the qualifying interests?

8.2.1 The Scoping Opinion identified likely significant effects ("LSEs") on the following qualifying interests of the SAC, SPA and pSPA;

8.2.2 <u>MARINE MAMMALS</u>

8.2.2.1 Moray Firth SAC
- Bottlenose dolphin

8.2.2.2 Firth of Tay and Eden Estuary SAC
- Harbour seal

8.2.2.3 Berwickshire and North Northumberland Coast SAC & Isle of May SAC
- Grey seal

8.2.2.4 The HRA Report (marine mammals, section 2.2) identified that there could be a LSE on the qualifying interests of the above SACs. The following key potential effects were considered:

- Displacement/injury from piling; and
- Disturbance from increased noise from geophysical survey systems.

8.2.2.5 In its advice of 28 September 2018, SNH advised that there will be LSEs on the qualifying interests listed above arising from disturbance and displacement during the construction phase of the Development, in particular piling activities with the installation of the WTG and OSP foundations.

8.2.3 <u>ORNITHOLOGY</u>

8.2.3.1 Forth Islands SPA
- Gannet
- Kittiwake
- Herring gull

- Puffin
- Guillemot
- Razorbill

8.2.3.2 Fowlsheugh SPA
- Kittiwake
- Herring gull
- Guillemot
- Razorbill

8.2.3.3 St Abb's Head to Fastcastle SPA
- Kittiwake
- Herring gull
- Guillemot
- Razorbill

8.2.3.4 Buchan Ness to Collieston Coast SPA
- Kittiwake
- Guillemot

8.2.3.5 Outer Firth of Forth and St Andrews Bay Complex pSPA
- Gannet
- Kittiwake
- Herring gull
- Puffin
- Guillemot
- Razorbill

8.2.4 The Scoping Opinion stated that these SPAs/species should be scoped in due to connectivity. PVA was required for the Buchan Ness to Collieston Coast SPA and St Abb's Head to Fast Castle SPA if the cumulative effects from the Forth and Tay Developments were estimated to be more than a reduction in annual adult survival of 0.2%.

8.2.5 The OEC overlaps with the pSPA, however the Development site does not. The HRA Report calculated that, 85% of the 83km OEC overlaps with the pSPA. The total area of the pSPA is 2,720.68km^2. The potential impacts identified in the HRA Report were direct disturbance/displacement, indirect disturbance of seabed habitats and/or prey species of seabirds and loss of seabed habitats. Potential impacts from displacement and barrier effects as a result of the presence of the Development and of collisions with the rotor blades of the WTGs on gannet, kittiwake, herring gull, guillemot, razorbill and puffin were considered via the assessments undertaken for the breeding colony SPAs, as advised in the Scoping Opinion.

8.2.6 The pSPA was not at the "proposed" stage at the time of the 2014 AA. Whilst most of the construction impacts have been scoped out of the assessment for the designated SPAs, the construction impacts on the pSPA arising from the installation of the OEC are considered within this

AA. During the construction and decommissioning phases of the Development, there is the potential for LSEs on the qualifying interests of the pSPA due to potential impacts on prey availability.

8.2.7 The HRA Report (Ornithology, Table 3.10) identified that there would be LSEs on the qualifying interests of the pSPA and SPAs listed above during the operational and maintenance phase of the proposal. The Scoping Opinion advised that the impacts of relevance were collision risk, and displacement and barrier effects, and that for the existing breeding colony SPAs the primary focus of the assessment should be in relation to the conservation objective to maintain "the population of the species as a viable component of the site".

8.2.8 In its consultation response, dated 28 September 2018, SNH confirmed that the proposal had a LSE on a number of qualifying interests of the Forth Islands SPA, Fowlsheugh SPA, St Abb's Head to Fastcastle SPA, Buchan Ness to Collieston Coast SPA, Firth of Tay and Eden Estuary SAC, Berwickshire and North Northumberland Coast SAC, Isle of May SAC and Outer Firth of Forth and St Andrews Bay Complex pSPA.

8.2.9 Scottish Ministers agree with the advice provided by SNH and have undertaken an AA for the qualifying interests and sites listed above.

9. Appropriate assessment of the implications for the Development site in view of the site's conservation objectives.

9.1 The following assessment is based upon the information contained in the HRA Report and the advice received from SNH and MSS. Consideration has also been given to the other consultation responses detailed above. Consideration of the effect on site integrity for each European site or European offshore marine site and qualifying interest(s) follows below.

9.2 For each of the qualifying interests the worst case scenario ("WCS") has been considered and details of the WCS has been provided in the HRA Report. For the ornithology in-combination assessment the WCS is considered to be the Development in-combination with the s.36 consents granted in 2014 for the NnGOWL Development and the Seagreen Developments. Other smaller scale projects included in the in-combination assessment are as described at Appendix 1 of this AA.

9.3 Marine mammal SACs – Moray Firth SAC, Berwickshire and North Northumberland Coast SAC, Isle of May SAC and Firth of Tay and Eden Estuary SAC

9.3.1 The EIA Report provides a full explanation of the assessment methods used in Chapter 10 of the EIA Report, and this information also informs the HRA Report. The marine mammal assessments firstly undertake noise propagation modelling based on the WCS for pile driving, with the caveat that the occurrence of WCS situation across the whole site is not credible. The assessment also considers the 'most likely' scenario to provide useful context. The WCS scenario presented for pile driving

potentially utilises a maximum blow energy in the order of twice that presented for the 'most likely' scenario (for both pin piles and monopiles). Full details of the piling strategy are set out in the EIA Report, at section 10.5.1 of Chapter 10.

9.3.2 Following the gatecheck process, further discussion took place between ICOL, Marine Scotland Licensing Operations Team ("MS-LOT"), MSS and SNH regarding the conversion factor to be used for the noise propagation modelling. It was agreed that the outputs of the noise propagation modelling using both the 0.5% and 1% conversion factors to convert hammer energy to acoustic noise should be presented in the final EIA Report for context. It was, however, agreed that the outputs of the modelling using the 0.5% conversion factor could be used to inform the rest of the marine mammal assessment, provided that the differences in the size of the noise impact contours using the two conversion factor rates would not result in a material difference in terms of the significance of effects. ICOL presented the outputs using both conversion factors and based on advice from SNH and MSS, MS-LOT subsequently confirmed that the outputs of the modelling undertaken demonstrated no increase in the significance of effects on any marine mammal species and that, therefore, the further marine mammal assessment could be based on the outputs of the modelling using the 0.5% conversion factor.

9.3.3 An estimation of the numbers of individuals likely to be displaced or experience permanent threshold shift ("PTS") from pile driving was then provided. The predicted estimate of individuals that experience PTS in their audible hearing range provides a proxy for injury, and the estimated number at risk of disturbance is also calculated. Lastly, the population level consequences of these effects were estimated using the iPCoD framework ("interim Population Consequences of Disturbance"). The assessment results are provided for the Development alone (Table 3.1 of HRA Report) and in-combination with other offshore wind farm projects (Tables 4.1 – 4.4 of HRA Report). The Aberdeen Harbour Expansion Project ("AHEP"), for which use of explosive blasting was assessed, is also included.

9.3.4 The assessment methods used for marine mammals differ from those that informed the 2014 AA in a number of ways. For example, there are differences in the model used for noise propagation by ICOL and the one used to inform the 2014 AA. The thresholds for onset of PTS and disturbance use the NOAA (2016)[4] thresholds whereas the Southall *et al* (2007)[5] thresholds, which are also presented as part of the ICOL

[4] NOAA (2016) Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. (U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-55, 178 p. National Marine Fisheries Service).

[5] Southall, B., Bowles, A., Ellison, W., Finneran, J., Gentry, Ro., Greene Jr., C., Kastak, D., Ketten, D., Miller, J., Nachtigall, P., Richardson, W., Thomas, J. and Tyack, P. (2007). Marine Mammal Noise Exposure Criteria: Initial Scientific recommendations. (Aquatic Mammals. 33(4): 411-521).

appraisal, were exclusively relied upon previously. The previous assessment estimated the population consequences using a different population model to the one used in the iPCoD framework. There are also differences in the WCS piling strategies (e.g., number of piling events, hammer energies, timing and duration of piling).

9.3.5 Advice provided by SNH and MSS highlights a number of issues that provide relevant context for this AA. The modelling presented by ICOL is precautionary. The results are sensitive to assumptions relating to WCS, particularly with respect to information presented on the other developments considered in-combination.

9.3.6 SNH raised concerns in relation to noise, noting that these may be addressed once the construction timeframes for other offshore developments become clearer. SNH considers that submission of a piling strategy to Scottish Ministers for approval prior to the commencement of piling could mitigate the potential impacts. This piling strategy can be informed by monitoring of other Scottish offshore wind farms which have been built out.

9.3.7 BOTTLENOSE DOLPHIN – Moray Firth SAC

9.3.7.1 The EIA Report references the bottlenose dolphin population as being estimated to be 195 individuals (95% 162 – 253). The potential for the un-impacted population size to grow and for the current favourable status of the SAC population are noted.

9.3.7.2 Table 3.1 of the HRA Report identifies the WCS for the project alone to have an effect of displacing 8 individuals (scenario of monopiles and construction using and two construction pile-driving vessels), with no individuals assessed to experience PTS.

9.3.7.3 ICOL presented information on the population consequences based on the outputs of the iPCoD framework. Population level modelling indicated that displacement from pile driving is unlikely to affect the size or growth of the bottlenose dolphin population off the east coast of Scotland (either alone or in-combination).

9.3.7.4 SNH provided advice on 26 September 2018 on the assessment of cumulative impacts on bottlenose dolphin and grey seal from the construction of east coast offshore wind farms, in addition to its project specific advice for the Development, which was received on 28 September 2018. SNH's assessment identified a WCS where the population consequence described by the ratio of impacted to un-impacted population size was 0.94 after 24 years, and the ratio of impacted to un-impacted growth rate was 0.99. The WCS using the centile of the un-impacted population that matches the 50th centile of impacted population was 0.43, reflecting the considerable overlap in the confidence intervals for the un-impacted and impacted scenarios. SNH advice of 26 September considers these impacts to be small.

9.3.7.5 SNH advised on 28 September 2018 that there is no adverse effect on site integrity. Its advice takes account of the precautionary nature of the assessment and the requirement for conditions that will ensure mitigation of the potential effects of PTS and disturbance during the construction period.

9.3.7.6 In reaching their conclusion Scottish Ministers have considered the conservation objectives, the population at the site, the predicted levels of effect and population consequences, the fact that the effects are less than in 2014, the precaution in the assessment methods and the advice from SNH. Scottish Ministers conclude that the Development, subject to the appliance of conditions, will not adversely affect the site integrity of the Moray Firth SAC with respect to bottlenose dolphin, either alone or in-combination with the other Forth and Tay Developments, the Moray Firth offshore wind farms, AHEP and the other projects detailed in Appendix 1.

9.3.8 GREY SEAL - Berwickshire and North Northumberland Coast SAC and Isle of May SAC

9.3.8.1 The EIA Report estimates the number of animals from the East Coast Scotland Seal Management Unit area ("ECMA") at risk of onset of PTS and disturbance. The appraisal references the latest population estimate for grey seals in this area as 15,950 (95%CI 13,329-19,854). For the purposes of this assessment the population of the ECMA is taken to be the population of both SACs. The growth and favourable status of this population is noted.

9.3.8.2 For the Development, taken alone, between zero and 47 animals are estimated to be at risk of PTS depending on the foundation type (pin pile or monopile) and the criteria used (NOAA or Southall). The number estimated to be at risk of disturbance from the Development alone varies from 431 (most likely scenario using pin piles and a single vessel) to 1236 (WCS using monopiles and 2 construction pile-driving vessels). For the in-combination assessment, ICOL assumes 25% of the animals predicted to develop PTS were lost from the population or 'harvested'), this would equate to between zero and 12 individuals (Tables 4.1 & 4.3 of HRA Report).

9.3.8.3 In its advice of 26 September, SNH verified the conclusions reached by ICOL, finding that the effects on the East Coast Seal Management Unit were negligible.

9.3.8.4 SNH advised on 28 September 2018 that there will be no adverse effect on site integrity to grey seals as a qualifying interest of the Berwickshire and North Northumberland Coast SAC and Isle of May SAC, subject to the implementation of conditions. Its opinion takes account of the precautionary nature of the assessment and the requirement for conditions that will provide further mitigation of the potential effects of PTS and disturbance during the construction period.

9.3.8.5 In reaching their conclusion, Scottish Ministers have considered the conservation objectives, the population at the site, the predicted levels of effect and population consequences, the fact that the effects are less than in 2014, the precaution in the assessment methods and the advice from SNH. Scottish Ministers conclude that the Development, subject to the appliance of conditions, will not adversely affect the site integrity of the Berwickshire and North Northumberland Coast SAC and Isle of May SAC with respect to grey seal, either alone or in-combination with the other Forth and Tay Developments, and the other projects detailed in Appendix 1.

9.3.9 HARBOUR SEAL - Forth of Tay and Eden Estuary SAC

9.3.9.1 The HRA Report estimates in Table 3.1 that for the Development alone no animals will experience PTS based upon the NOAA criteria (or 1.5 animals using Southall criteria). The number displaced varies from 9 for the most realistic case scenario using pin-piles and a single construction vessel to 20 using monopiles and two construction pile-driving vessels. The in-combination level assessment identified no discernible effects on the population.

9.3.9.2 SNH advised on 28 September 2018 that harbour seals are predicted to experience very low PTS and disturbance and the impacts are less than those predicted for the Original Consent.

9.3.9.3 SNH advised that there will be no adverse effect on site integrity to harbour seals as a qualifying feature of the Forth of Tay and Eden Estuary SAC, subject to the implementation of conditions.

9.3.9.4 In reaching their conclusion Scottish Ministers have considered the conservation objectives, the population at the site, the predicted levels of effect and population consequences, the fact that the effects are less than in 2014, the precaution in the assessment methods and the advice from SNH. Scottish Ministers conclude that the Development, subject to the appliance of conditions, will not adversely affect the site integrity of the Forth of Tay and Eden Estuary SAC with respect to harbour seal, either alone or in-combination with the other Forth and Tay Developments, and the projects detailed in Appendix 1.

9.4 Seabird SPAs - Forth Islands SPA, Fowlsheugh SPA, Buchan Ness to Collieston Coast SPA, St Abb's Head to Fast Castle SPA and Outer Firth of Forth and St Andrews Bay Complex pSPA

9.4.1 The Scoping Opinion directed that the primary focus of the HRA Report should be the conservation objectives relating to the maintenance of the relevant qualifying species as a viable component of the sites. As also directed, further justification was provided in the HRA Report regarding why other conservation objectives were less relevant. Consideration was also given to pSPA conservation objective (b), relating to deterioration of habitat, in relation to construction impacts.

9.4.2 The EIA Report provides a full explanation of the assessment methods (see Chapter 11, section 11.7 onwards). The ornithology assessments firstly estimated the predicted levels of effect (collision and/or displacement, depending on the species). Secondly, the numbers of individuals that are affected for each species assigned to age classes (e.g. breeding adults and non-breeding juveniles). These individuals are then apportioned to SPA breeding colonies. Lastly, where advised through the Scoping Opinion, the population level consequences of these effects were estimated using PVA. PVA was undertaken assuming both a 25 year and 50 year operational life. The assessment results are provided for the Development in isolation and in-combination with the Forth and Tay Developments and other offshore wind farm projects and proposals identified in Chapter 11, paragraph 189 of the EIA Report and section 1.3.2 of the HRA Report. Further detail on the projects considered in-combination by Scottish Ministers is provided at Appendices 1 and 2 of this assessment.

9.4.3 Differences with the 2014 Assessment

9.4.3.1 The assessment methods used for ornithology differ from the assessment methods that informed the 2014 AA in a number of ways. For example, Option 2 of the Band 2012 collision risk model was used in the current assessment for kittiwake and gannet compared with Option 3 in 2014. Different avoidance rates have been used in the collision risk assessment, based on agreement on more appropriate avoidance rates.

9.4.3.2 With regards to displacement and barrier effects in 2014, the Centre for Ecology and Hydrology ("CEH") Searle *et al* 2014[6] model was used. This model simulates the movements of individual birds from breeding colonies. The model estimates changes to adult survival and productivity based on estimated changes in adult body mass and provisioning rates of chicks. Data from tagged individuals is used in the model. In this assessment, the use of the matrix approach for displacement estimates the percentage of birds displaced from the Development area and from that the percentage of those displaced adults that do not survive. This more simplistic approach was advised in the Scoping Opinion and is informed by data on seabird densities collected at the development sites.

9.4.3.3 The population consequences of the effects have been assessed using a different approach to population modelling in these assessments. The 2014 AA was informed by Bayesian state-space models produced by CEH. These assessments are informed by stochastic leslie-matrix PVAs.

9.4.3.4 For the collision risk assessment, two design options (the 40 WTG design and the 72 WTG design) for the Development were considered as the WCS, as detailed in **Table 8** below. The WCS differed depending on the

[6] Searle, K., Mobbs, D., Butler, A., Bogdanova, M., Freeman, S., Wanless, S. & Daunt, F. (2014) Population consequences of displacement from proposed offshore wind energy developments for seabirds breeding at Scottish SPAs (CR/2012/03). (Final Report to Marine Scotland Science).

species being assessed. Both design options incorporate fewer WTGs than included within the 2014 design, whilst the greater hub heights result in greater clearance above the sea surface. The hub heights presented for the two design options were average values taken across the whole Development area, due to variations in water depth across the whole Development area, which could result in an underestimation of impacts resulting from collision risk. ICOL, however, has committed to ensuring that the range of hub heights used in the as-constructed Development do not exceed the WCS presented for gannet, herring gull or kittiwake (see further, paragraph 27 of Appendix 11C).

Table 8 Wind farm parameters for the 2017 design options considered in the CRM

Parameter	40 WTG design	72 WTG design
Hub height (relative to MSL) (m)	152.6	116.1
Rotor diameter (m)	250	167
Height to upper blade tip (relative to MSL) (m)	277.6	199.6
Height to lower blade tip (relative to MSL) (m)	27.6	32.6
Maximum blade width (m)	7.8	6.0
Rotor speed (rpm)	5.72	8.72
Pitch	10	10
Monthly percentage of time operational	80	80

9.4.3.5 A table detailing the differences between the methods used in the 2014 AA and this AA is included at Appendix 3 to this AA.

9.4.4 In-combination assessment – approach

9.4.4.1 The Scoping Opinion required that two different in-combination assessments with the Forth and Tay Developments were undertaken. These were as follows:

Table 9 In-combination assessment scenarios

Scenario 1
Quantitatively for the Development in isolation and in-combination with the WCS (for each species) from: • The NnGOWL Development (2014, as consented) or the NnGOWL Development (2017 scoping report); • The Seagreen Developments (2014, as consented) or the Seagreen Developments (2017 scoping report); and • Qualitative assessment of the breeding season effects from other wind farms.

Scenario 2
Quantitatively for the Development in isolation and in-combination with: • The NnGOWL Development (2017 scoping report); • The Seagreen Developments (2017 scoping report); and • Qualitative assessment of the breeding season effects from other wind farms.

9.4.4.2 The HRA Report concluded that the outputs from the in-combination assessment for the 2014 as-consented NnGOWL Development and Seagreen Developments represented the worst-case scenario. The in-combination impacts with the European Offshore Wind Deployment Centre, Hywind Scotland Pilot Park, Kincardine Floating Offshore Wind Farm and Forthwind Offshore Wind Demonstration Project were considered by ICOL during the breeding season. Details of the other projects considered qualitatively in this AA are included in Appendix 1. During the non-breeding season impacts of an additional 25 offshore wind farms situated in the North Sea ("North Sea Developments") were also considered for gannet and kittiwake (these are listed in full at Appendix 2).

9.4.4.3 A summary of the design envelope parameters for the s.36 consents granted in 2014 and the 2018 s.36 consent applications for the NnGOWL Development and the Seagreen Developments is included at paragraphs **12.4.1.1.2** and **12.4.1.1.1** of Appendix 1.

Table 10 Summary of in-combination scenarios presented in the HRA Report

Impact	**Worst Case Design Scenario**	**Justification**
In-combination collision impacts	Breeding season: Development and the NnGOWL Development and the Seagreen Developments (both scenarios) and Hywind, Kincardine, EOWDC and Forthwind. Non-Breeding Season: Forth and Tay Developments and more distant North Sea Developments included for kittiwake and North Sea Developments and offshore windfarms in the English Channel for gannet.	Species from breeding SPA colonies are within the mean maximum foraging range of the Forth and Tay Developments but not more distant projects. This approach was recommended in the Scoping Opinion.

In-combination impacts arising from displacement	Breeding Season: Development and the NnGOWL Development and the Seagreen Developments. Non-Breeding Season: For guillemot and razorbill displacement effects from the NnGOWL Development and the Seagreen Developments were included.	Displacement and mortality rates as per Scoping Opinion guidance. This approach was recommended in the Scoping Opinion.

9.4.5 GANNET – Forth Islands SPA, Outer Firth of Forth and St Andrews Bay Complex pSPA

9.4.5.1 Forth Islands SPA – Gannet – Development in isolation

9.4.5.1.1 The Forth Islands SPA has the largest colony of gannet in the UK. The SPA population is reported to be increasing in size with the last census (2014) estimating the population being 75,259 pairs (compared with a population of 21,600 pairs at the time of designation in 1990). The gannet qualifying feature of the SPA is considered to be in a favourable condition (SNH, 2017b).[7] During the breeding season birds from the colony range widely across the North Sea, at times travelling as far as the Norwegian coast (Hamer et al. 2007).[8] Regular feeding movements occur to the north-east of the colony with concentrations of feeding locations off north-east Scotland (Hamer et al. 2011).[9] Outwith the breeding season, gannets disperse widely across the North Sea and move southward with birds wintering in the Bay of Biscay and off West Africa.

9.4.5.1.2 The Development area, including the offshore transmission infrastructure and the 2km buffer zone, does not overlap with the boundary of the Forth Islands SPA, therefore, potential impacts arise from the presence of individuals from the colony within the Development area. In its HRA Report, ICOL presented collision risk modelling using the methodologies outlined in the Scoping Opinion (and detailed in Appendix 3). This

[7] SNH (2017b). Sitelinks. Scottish Natural Heritage https://gateway.snh.gov.uk/sitelink/index.js (Last accessed 07/02/2019).

[8] Hamer K.C., Humphreys E.M., Garthe S., Hennicke J., Peters G., Grémillet D., Phillips R.A., Harris M.P. & Wanless S. (2007) Annual variation in diets, feeding locations and foraging behaviour of Gannets in the North Sea: flexibility, consistency and constraint. (Marine Ecology Progress Series, 338, 295-305).

[9] Hamer, K.C., Holt, N. & Wakefield, E. (2011). The distribution and behaviour of northern gannets in the Firth of Forth and Tay area. A review on behalf of the Forth and Tay Offshore Wind Developers Group. Institute of Integrative & Comparative Biology, University of Leeds.

assessment considered two 2017 design options (40 and 72 WTG, as detailed in section 3.1 of Appendix 11C). The CRM predictions calculated for the breeding season were apportioned between the Forth Islands SPA and Troup Head colony population (see further, Appendix 11B of the EIA Report) (Troup Head is the only gannet colony other than Bass Rock within mean maximum foraging range of the Development and 2km buffer). Collision estimates were apportioned to age classes based on at-sea observation data specific to each wind farm, the number of adult collisions during the breeding season were amended according to a 10% assumed sabbatical rate (as advised in the Scoping Opinion).

9.4.5.1.3 The predicted impacts presented in the HRA Report stated that the majority of impacts on gannet arising from the Development in isolation were predicted for the breeding adult population, when using Option 2 of the Band model and a 98.9% avoidance rate. Based on this, a total of 98 adults per year were estimated to be impacted during the breeding season, corresponding to 0.07% and 0.23% of the current and citation population sizes.

Table 11 Estimated collision impacts for Forth Islands SPA gannet from the Development in isolation

Seasonal period	Estimated number of collisions		
	Breeding adults	Immature birds	Juvenile birds
Breeding	94	2	1
Autumn passage	1.6	<0.1	0.1
Spring passage	2.4	<0.1	0.0

9.4.5.1.4 PVA was undertaken by ICOL for 25 and 50 year periods. For the baseline projections, additional mortality was incorporated at intervals of 25 individuals (up to a maximum of 1,500), with the collision estimates matched to the closest higher additional mortality value. The additional mortality values incorporated into the PVA model assumed a 97:3 ratio of adults to immatures. The PVA concluded that there would be no decrease in the current population, with a continued increase in the population over the next 25 and 50 years. Over 25 years, it is predicted that the population will have increased from its current level to 86,265 pairs, with no wind farms present. The additional mortality from collision arising from the Development in isolation may cause a reduced level of population increase, with a future predicted population of 84,827 pairs after 25 years. After 25 years, the median of the ratio of the impacted to un-impacted population size form the Development in isolation is 0.983 (n.b. ratio values are referred to in the HRA Report as the counterfactuals). After 50 years, the ratio value is 0.967. The ratio of the population growth rate for the Development-alone showed minimal reduction (with a value of 0.999).

9.4.5.1.5 SNH advised that the Development taken alone would not result in an adverse effect on site integrity to the Forth Islands SPA with respect to gannet.

9.4.5.2 Forth Islands SPA – Gannet – Development in-combination

9.4.5.2.1 This AA is based upon the WCS, which means that the Development is assessed in-combination with the s.36 consents granted in 2014 for the NnGOWL Development and the Seagreen Developments. The estimated impacts of the 2017 proposals for the NnGOWL Development and the Seagreen Developments on gannet are substantially less than the values used in this AA.

9.4.5.2.2 The HRA Report estimated that 659 breeding adults would be impacted by collision mortality during the breeding season from the Development in-combination with the s.36 consents granted in 2014 for the NnGOWL Development and the Seagreen Developments, corresponding to 0.46% and 1.65% of the current and citation population sizes respectively.

9.4.5.2.3 CRM was also presented for the WCS plus the passage period collision estimates from the North Sea Developments and other offshore wind farms in the English Channel. The inclusion of these impacts, substantially increased these impacts (particularly for the autumn passage period – when 63% of the Forth Islands SPA population is assumed to migrate through the North Sea – as opposed to 27% during the spring passage period). However, the total impacts estimated during the autumn and spring passage periods remained lower than the breeding season impacts, with the combined passage period adult collisions being less than 20% of the adult collisions estimated during the breeding period. The cumulative total of adult gannets predicted to be impacted is 775 birds, corresponding to 0.5% and 1.8% of the current and citation population sizes respectively.

Table 12 Estimated collisions for Forth Islands SPA gannet for Development in-combination with other plans and projects

Development	**Seasonal period**	**Breeding adults**
Forth and Tay	Breeding	659
Forth and Tay	Autumn passage	13.5
Other North Sea and Channel		56.3
Total autumn passage		**69.8**
Forth and Tay	Spring passage	26.1
Other North Sea and Channel		20.2
Total spring passage		**46.3**
Total	**All seasons**	**775**

9.4.5.2.4 Impacts from a range of other offshore wind farms within mean maximum foraging range of the Forth Islands SPA gannet population were

considered in the HRA Report. The additional mortality predicted from these projects was deemed to be extremely small, relative to the population of the Forth Islands SPA, representing a small addition to the in-combination impacts presented above. These projects are detailed in Appendix 1 to this AA.

9.4.5.2.5 The cumulative total number of individuals experiencing annual mortality is assessed to be 775, which is less than the cumulative total of 1,169 estimated in the 2014 AA.

9.4.5.2.6 PVA undertaken by ICOL indicated relatively small predicted reductions in end population size for in-combination assessment with the other Forth and Tay Developments after both 25 years (median of the ratio of the impacted to un-impacted population size of 0.914) and 50 years (0.835). When the passage period collisions for all age classes from the North Sea Developments and offshore wind farms in the English Channel were considered, the PVA outputs represented a 10% reduction in the 25 year projected population size (0.903) and less than a 20% reduction in the 50 year projected population size (0.809). The ratio of the population growth rate for the 25 and 50 year periods was represented by a value of 0.966 for both time periods. The population projections for all scenarios showed that the end population size was much greater than the population size at citation. The HRA Report therefore concluded that the effects of the Development in isolation and in-combination would not hinder the achievement of the conservation objectives of the Forth Islands SPA with respect to gannet.

9.2.5.2.7 SNH advised that there would be an adverse effect on the site integrity of the Forth Islands SPA with respect to gannet as a result of the Development in-combination with the other Forth and Tay Developments.

9.4.5.3 Outer Firth of Forth and St Andrews Bay Complex pSPA – Gannet – Development in Isolation and In-combination

9.4.5.3.1 The Scoping Opinion advised that the assessment carried out for gannet at the Forth Islands breeding colony SPA could also be applied to the pSPA, and a separate assessment for the gannet qualifying feature at the pSPA was not required.

9.4.5.3.2 SNH advised that there would be no adverse effect on the site integrity of the Outer Firth of Forth and St Andrews Bay Complex pSPA in respect of gannet as a result of the Development in isolation or in-combination with the other Forth and Tay Developments.

9.4.5.4 Gannet – Precaution in the Assessment

9.4.5.4.1 There are a number of precautionary assumptions made in this AA which mean that the estimated cumulative collision total and their population consequences are highly likely to be over-estimates.

9.4.5.4.2 For example, the seabird collision avoidance study undertaken at Thanet offshore wind farm lends support to the view that the avoidance rates used in this assessment are likely to be highly precautionary (Skov *et al*, 2018).[10]

9.4.5.4.3 The research at Thanet has also provided valuable information on bird flight speeds. The Scoping Opinion advised that flight speed data for use in CRM be taken from published data (Pennycuick 1997;[11] Alerstam et al. 2007).[12] These flight speeds are based on very small sample sizes (32 gannet). The laser rangefinder track data collected at Thanet recorded by Skov et al. (2018) offers species-specific empirical data on flight speeds from large numbers of individuals (683 gannet). This information was not available at the time of the Application, however the Seagreen EIA Report estimates that using the flight speeds recorded at Thanet would reduce gannet collisions by 6%. MSS have advised that the reduction in estimated number of collisions indicated by Seagreen is correct.

9.4.5.4.4 The EIA Report presented the predicted collisions risk impacts using Option 1 (which uses site-specific flight height estimates), in addition to the Option 2 outputs. The outputs of Option 1 predicted that a significantly lower percentage of gannets would be at potential collision height and therefore subject to collision impacts. The Option 2 estimates for the breeding period were three and two and a half times greater than for Option 1 for the 72 and 40 WTG designs respectively. In its advice, SNH stated that the description of the flight height data included in the EIA Report demonstrates that the site-specific flight height data is of good quality. SNH stated that the argument for the use of the Option 1 outputs presented was compelling. The RSPB however raised questions regarding the justification for the lower flight heights recorded from the site specific data. This AA is based on Option 2 of the Band model which uses generic flight heights, recognising that this is a very precautionary approach.

9.4.5.4.5 Further precaution is built into the PVA undertaken for the Forth Islands SPA. The in-combination PVAs were run assuming commencement of development for the other Forth and Tay Developments in 2014, not accounting for growth in the population that has taken place in the intervening time. Further precaution is included in the apportioning of age classes for the Development in-combination with the other North Sea Developments, which were undertaken using a greater weighting

[10] Skov, H., Heinanen, S., Norman, T., Ward, R.M., Mendez-Roldan, S. & Ellis, I. 2018. ORJIP Bird Collision and Avoidance Study. Final report – April 2018. The Carbon Trust. United Kingdom.

[11] Pennycuick, C.J., 1997. Actual and 'Optimum' Flight Speeds: Field Data Research. The Journal of Experimental Biology, 200, pp. 2355-2361.

[12] Alerstam, T., Rosén, M., Bäckman, J., Ericson, P.G. & Jellgren, O. (2007). Flight speeds among bird species: allometric and phylogenetic effects. PLoS Biology, 5(8), e197.

towards the adult age class (see further, HRA Report paragraph 99 onwards).

9.4.5.4.6 The WCS assessment completed by ICOL for the 50 year operational life of the Development in-combination with the Forth and Tay Developments ("50 Year Assessment") assumes a 50 year operational life, within the PVA, for the NnGOWL Development and the Seagreen Developments, whereas the s.36 consents granted in 2014 for these projects were only for 25 years. Therefore the in-combination 50 Year Assessment substantially over-estimates the effects.

9.4.5.4.7 Lastly, basing this assessment on the WCS for the NnGOWL Development and the Seagreen Developments (i.e., the s.36 consents for these projects granted in 2014) is very precautionary because they are unlikely to be constructed. If their current proposals were used in this assessment it would substantially reduce the effects associated with those projects.

9.4.5.5 Gannet – Conclusions

9.4.5.5.1 Based on the information presented in the EIA Report and the HRA Report, SNH advised on 28 September 2018 that the Development will have an adverse effect on site integrity for gannet as a qualifying interest of the Forth Islands SPA in-combination with the s.36 consents granted in 2014 for the NnGOWL Development and the Seagreen Developments.

9.4.5.5.2 In reaching their conclusion, Scottish Ministers have considered the conservation objectives, populations at the sites, predicted levels of effect and population consequences, the fact that the effects are less than in 2014, the precaution in the assessment methods and the advice from SNH. Scottish Ministers conclude that, subject to the appliance of conditions, there will be no adverse effect on the site integrity of the Forth Islands SPA or Outer Firth of Forth and Tay Bay Complex pSPA in respect of the gannet qualifying interest as a result of the Development in isolation or in-combination with the other Forth and Tay Developments or projects detailed in Appendices 1 and 2.

9.4.6 KITTIWAKE – Forth Islands SPA, Fowlsheugh SPA, St Abb's Head to Fast Castle SPA, Buchan Ness to Collieston Coast SPA and Outer Firth of Forth and St Andrews Bay Complex pSPA

9.4.6.1 Scottish kittiwake populations have experienced significant declines over the last 30 years and this decline was highlighted in advice received from both SNH and RSPB Scotland. The reasons for the decline are uncertain, although factors such as climate change and changes to prey distribution are very likely to be key drivers. The results of the modelling for collision and displacement impacts were presented in the HRA Report, as per the Scoping Opinion.

9.4.6.2 During the breeding season, kittiwake from other breeding colonies, which may not be SPAs, may also be present within the Development

area and, therefore, at risk from collision and displacement impacts. The potential impacts on all non-SPA breeding colonies and across all SPA colonies, for which kittiwake is a qualifying interest, within the mean maximum foraging range have been apportioned to take account of the presence of these birds.

9.4.6.3 The HRA Report presents the outputs of the collision risk modelling, completed using the methodologies outlined in the Scoping Opinion, which considered the maximum design envelope of 72 WTGs. Displacement effects were also assessed using the matrix approach and in addition displacement effects were also explored using the Seabird Offshore Renewable Development ("SeabORD") model.

9.4.6.4 **Table 13** below provides the cumulative estimated additional mortality during the breeding season from collisions and displacement/barrier effects for kittiwake in relation to the Development in-combination with the Forth and Tay Developments, for both the 2014 and 2017 designs. Collisions during the non-breeding season were assessed for the Forth and Tay Developments in isolation and in-combination with all North Sea Developments (using only the WCS of the 2014 consented and 2017 designs for the Forth and Tay Developments). Displacement and barrier effects were assessed quantitatively for the breeding season only.

9.4.6.5 The 2014 designs give the highest collision estimates and the impacts for displacement and barrier effects are unaffected by the design, therefore, the 2014 impacts remain the WCS. Collisions account for over 75% of the estimated additional mortality for kittiwake.

Table 13 Cumulative estimated additional mortality during the breeding season from collision and displacement/barrier effects for kittiwake

Development	Impact	Design	Additional mortality (individuals)		
			Total	Breeding Adults	Sub Adults
Development	Collision	2017	40 (33-47)	33	3
	Displacement/barrier effects	N/A	23	19	2
NnGOWL Development	Collision	2017	7 (6-8)	6	0
		2014	18 (15-21)	15	1
	Displacement/barrier effects	N/A	13	11	1
Seagreen Alpha	Collision	2017	74 (61-87)	62	5
		2014	78 (64-92)	65	5
	Displacement/barrier Effects	N/A	13	11	1

Development	Impact	Design	Additional mortality (individuals)		
			Total	Breeding Adults	Sub Adults
Seagreen Bravo	Collision	2017	80 (60-95)	68	4
		2014	84 (69-99)	72	4
	Displacement/barrier effects	N/A	16	14	1
Forth and Tay total		2017 – all projects	267	225	17
		2014 with 2017 for the Development	286	241	18

9.4.6.6 Forth Islands SPA – Kittiwake – Development in isolation

9.4.6.6.1 The kittiwake population at the Forth Islands SPA is in an unfavourable and declining condition (SNH, 2017b)[13] having declined from 8,400 pairs at the time of designation in 1990 to 4,333 pairs in 2015.

9.4.6.6.2 The Development area (including 2km buffer) does not overlap with the Forth Islands SPA. Published information on kittiwake foraging ranges (Thaxter et al, 2012)[14] and tracking from the Isle of May (CEH, 2011a)[15] suggests it is very likely that breeding period kittiwakes from the Forth Islands SPA will occur in the Development area (including 2km buffer), as well as the other Forth and Tay Development areas.

9.4.6.6.3 During the non-breeding season, kittiwake are largely pelagic, therefore, it is likely that some SPA kittiwake will pass through North Sea Developments during the autumn and spring passage periods (September-December and January-mid April). Non-breeding season displacement impacts have been considered qualitatively, as per the Scoping Opinion.

[13] SNH (2017b). Sitelinks. Scottish Natural Heritage. https://gateway.snh.gov.uk/sitelink/index.jsp.

[14] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

[15] Daunt, F., Bogdanova, M., Newell, M., Harris, M. and Wanless, S. (2011a). GPS tracking of common guillemot, razorbill and black-legged kittiwake on the Isle of May, summer 2010. Report to FTOWDG. CEH Edinburgh.

9.4.6.6.4 Collision

9.4.6.6.4.1 In the HRA Report, the WCS scenario for kittiwake collisions was based on the 40 WTG design (see further, Appendix 11C of the EIA Report). The outputs of the CRM predicted that seven adults and one sub-adult would be impacted per annum, with the majority of impacts predicted during the breeding period. The figures presented correspond to 0.08% and 0.04% of the current and citation population sizes.

9.4.6.6.5 Displacement

9.4.6.6.5.1 Displacement impacts were calculated following the SNCB matrix approach, as per the Scoping Opinion, using a displacement rate of 30% and a 2% mortality rate. The HRA Report estimated that four adult birds per annum would be impacted by displacement mortality from the Development alone, corresponding to 0.04% and 0.02% of the current and citation population sizes respectively.

9.4.6.6.6 Collision and displacement combined for the Development in isolation

9.4.6.6.6.1 The combined predicted impacts of collision and displacement are assumed in the HRA Report to be additive. The combined impact from the Development in isolation is predicted to be an additional mortality of 11 adult birds and one sub-adult bird per annum.

9.4.6.6.6.2 PVA was undertaken by ICOL for a range of scenarios; for collision only and for collision and displacement combined. The PVA projected continued population decline for the Forth Islands SPA kittiwake for all scenarios, with the projected population size at 50 years always smaller than the predicted population size at 25 years. The PVA results for 25 and 50 years for the Development in isolation are presented below.

Table 14 PVA results for Forth Islands SPA kittiwake for the Development in isolation

Impact	**Ratio of impacted to un-impacted population size**	
	25 years	**50 years**
Collision only	0.982	0.966
Collision and displacement combined	0.973	0.950

9.4.6.6.7 Conclusion

9.4.6.6.7.1 SNH advised that there would be no adverse effect on the site integrity of the Forth Islands SPA in respect of kittiwake as a result of the Development in isolation.

9.4.6.7 Forth Islands SPA – Kittiwake – Development in-combination

9.4.6.7.1 Collision

9.4.6.7.1.1 The 2014 designs for the NnGOWL Development and the Seagreen Developments represented the WCS for the in-combination assessment (in conjunction with the 40 WTG design for the Development). The outputs of the CRM predicted that the majority of impacts would occur during the breeding period, with 29 birds estimated to be impacted by collision mortality, corresponding to 0.33% and 0.18% of the current and citation population sizes respectively. Across the year, 31 adults and three sub-adults were predicted to be impacted by collision mortality when the Development was considered in-combination with the other Forth and Tay Developments.

9.4.6.7.1.2 Collision estimates were provided for the Development in-combination with the WCS for the other Forth and Tay Developments, plus the passage period collision estimates for the North Sea Developments (see Appendix 2 for full list). The inclusion of these collision impacts increased the predicted number of birds to be impacted. These figures are presented in **Table 15** below. The total number of adult kittiwakes predicted to be impacted by collision mortality per annum was 37 birds, corresponding to 0.40% and 0.22% of the current and citation population sizes.

Table 15 Estimated in-combination collision impacts for Forth Islands SPA kittiwake

Developments	Seasonal period	Estimated number of collisions	
		Breeding adults	Sub-adults
Forth and Tay	Breeding	29	2
Forth and Tay	Autumn passage	0.9	0.5
North Sea		2.9	1.3
Total autumn passage		**3.8**	**1.8**
Forth and Tay	Spring passage	0.6	0.2
North Sea		3.4	1.5
Total spring passage		**4.0**	**1.8**
Total	**All seasons**	**37**	**6**

9.4.6.7.2 Displacement

9.4.6.7.2.1 Displacement impacts were calculated for the Development in-combination with the other Forth and Tay Developments and a total estimated mortality of 14 breeding adult birds and one sub-adult bird was

predicted (corresponding to 0.15% and 0.08% of the current and citation population sizes).

9.4.6.7.2.2 A qualitative assessment of displacement during the non-breeding season was undertaken. The HRA Report considered the outputs of tracking and other studies (see further, paragraph 133 of the HRA Report) regarding the behaviour of adult kittiwake during the non-breeding season. The HRA Report concluded that kittiwake from the Forth Islands SPA are not likely to be dependent on any particular area of the North Sea and, therefore, the likely effects of displacement from the North Sea Developments during the non-breeding season will be limited.

9.4.6.7.3 Collision and displacement combined for the Development in-combination

9.4.6.7.3.1 The combined predicted impacts of collision and displacement are assumed in the HRA Report to be additive. The combined impact from the Development in-combination with the other Forth and Tay Developments is predicted to be an additional mortality of 45 adult birds and four sub-adult birds per annum. For the WCS, comprising the Development in-combination with the other Forth and Tay Developments and the North Sea Developments, this figure rises to 51 adult and seven sub-adult birds per annum.

9.4.6.7.3.1 Breeding season effects from other offshore wind farms (in this case Offshore Renewable Energy Catapult ("OREC") Levenmouth Demonstration Turbine and Forthwind Demonstration Array, see further in Appendix 1) within mean maximum foraging range of the Forth Islands SPA were considered qualitatively. The HRA Report concluded that the collision, displacement and barrier effects from these developments (as reported in their EIA reports) would be minor and not affect the conclusions of the assessment presented in the HRA Report.

9.4.6.7.3.2 The cumulative total number of individuals experiencing annual mortality is assessed to be 58 which is less than the cumulative total of 135 estimated in the 2014 AA. The 135 estimate from the 2014 AA was based upon the assessment of adults only. The adults only estimate for this assessment is 51.

9.4.6.7.3.3 PVA results were presented for the Development in-combination with the other Forth and Tay Developments and the WCS (the other North Sea Developments). The WCS gave reductions of up to 22% in end population size after 50 years, and 15% after 25 years of impact. The PVA results are presented below for all scenarios.

Table 16 PVA results for Forth Islands SPA kittiwake for the Development in-combination with other plans and projects

Impacts	Scenario	Ratio of impacted to un-impacted population size	
		25 years	50 years
Collision only	Development in-combination with other Forth and Tay Developments	0.926	0.861
	Development in-combination with the North Sea Developments	0.909	0.828
Collision and displacement combined	Development in-combination with other Forth and Tay Developments	0.896	0.807
	Development in-combination with the North Sea Developments	0.878	0.776

9.4.6.7.4 Conclusion

9.4.6.7.4.1 SNH advised that there would be an adverse effect on the site integrity of the Forth Islands SPA in respect of kittiwake as a result of the Development in-combination with other plans and projects.

9.4.6.8 Fowlsheugh SPA – Kittiwake – Development in isolation

9.4.6.8.1 The kittiwake population at the Fowlsheugh SPA is reported as in a favourable and maintained condition (based on latest assessed condition in 1999) (SNH, 2017b).[16] However, the kittiwake population has declined from 36,350 pairs at the time of site designation in 1992 to 9,655 pairs in 2015.

9.4.6.8.2 The Development area (including 2km buffer) does not overlap with the Fowlsheugh SPA, however, from published data (Thaxter et al, 2012 and CEH, 2011b[17]) it is likely that during the breeding period kittiwake from the Fowlsheugh SPA will occur in the Development area.

9.4.6.8.3 Collision

9.4.6.8.3.1 The WCS for kittiwake collision risk was represented by the 40 WTG design (see further, Appendix 11C of the EIA Report). The HRA Report

[16] SNH (2017b). Sitelinks. Scottish Natural Heritage.

[17] Daunt, F., Bogdanova, M., Redman, P., Russell, S. and Wanless, S. (2011b). GPS tracking of blacklegged kittiwakes and observations of trip durations and flight directions of common guillemot at Fowlsheugh and St Abb's Head, summer 2011. Report to FTOWDG. CEH Edinburgh.

predicted that collision mortality would mainly impact kittiwake during the breeding season, with a predicted 10 birds per annum estimated, corresponding to 0.05% and 0.01% of the current and citation population sizes respectively.

9.4.6.8.4 Displacement

9.4.6.8.4.1 The SNCB matrix approach was used to estimate displacement impacts (as per the Scoping Opinion), using a 30% displacement rate and a 2% mortality rate. The matrix predicted an estimated mortality of six adult birds per annum (corresponding to 0.03% and 0.01% of the current and citation population sizes).

9.4.6.8.5 Collision and displacement

9.4.6.8.5.1 The combined predicted impacts of collision and displacement are assumed in the HRA Report to be additive. The combined impact from the Development in isolation is predicted to be an additional mortality of 15 adult birds and approximately one sub-adult bird per annum.

9.4.6.8.5.2 PVA was undertaken by ICOL for a range of scenarios; for collision only and for collision and displacement combined. The PVA projected continued population decline for the Fowlsheugh SPA kittiwake for all scenarios, with the projected population size at 50 years always smaller than the predicted population size at 25 years. The PVA metrics for 25 and 50 years estimated small reductions in population sizes, whilst the decrease in annual population growth was not deemed to be detectable for collisions-only. The PVA metrics for the Development in isolation are presented in **Table 17** below.

Table 17 PVA metrics for Fowlsheugh SPA kittiwake for the Development in isolation

Impact	**Ratio of impacted to un-impacted population size**	
	25 years	**50 years**
Collision only	0.988	0.977
Collision and displacement combined	0.981	0.964

9.4.6.8.6 Conclusion

9.4.6.8.6.1 SNH advised that there would be no adverse effect on the site integrity of the Fowlsheugh SPA in respect of kittiwake as a result of the Development in isolation.

9.4.6.9 Fowlsheugh SPA – Kittiwake – Development in-combination

9.4.6.9.1 Collision

9.4.6.9.1.1 The 2014 designs for the NnGOWL Development and the Seagreen Developments represented the WCS for the in-combination assessment

(in conjunction with the 40 WTG design for the Development). The HRA Report considered that the NnGOWL Development site was beyond the mean maximum foraging range of kittiwake from Fowlsheugh SPA (Thaxter et al, 2012)[18] and was therefore not deemed to have connectivity to the SPA population during the breeding period (however see paragraph 0 below). Breeding period impacts were attributed to the Fowlsheugh SPA between the Development (28.7%) and Seagreen Alpha and Seagreen Bravo (41.2%). For the Development in-combination with the other Forth and Tay Developments, based on Option 2 and a 98.9% avoidance rate (as advised in the Scoping Opinion), a mortality increase of 71 breeding adults and seven sub-adults per annum was predicted (corresponding to 0.38% and 0.10% of the current and citation population sizes respectively). The majority of collision impacts were predicted to occur during the breeding season (67 adults and five sub-adults).

9.4.6.9.1.2 The Development in-combination with the other Forth and Tay Developments and the North Sea Developments represented the WCS for the CRM, with a substantial increase in collision mortality predicted. A total predicted in-combination mortality of 88 adult kittiwakes per annum was predicted, corresponding to 0.46% and 0.12% of the current and citation population sizes respectively.

9.4.6.9.2 Displacement

9.4.6.9.2.1 Displacement impacts were calculated for the Development in-combination with Seagreen Alpha and Seagreen Bravo, with a total estimated mortality of 16 breeding adults and one sub-adult per annum, corresponding to 0.08% and 0.02% of the citation and current population sizes respectively.

Table 18 Estimated in-combination breeding season displacement mortality for Fowlsheugh SPA kittiwake for the Development in-combination with the Seagreen Developments.

Development	Additional mortality	
	Breeding adults	Sub-adults
Development (2017)	5.6	0.5
Seagreen Alpha (2014)	4.6	0.4
Seagreen Bravo (2014)	5.7	0.3
Total	16	1.2

9.4.6.9.2.2 A qualitative assessment of the displacement effects of the other North Sea Developments was undertaken for the non-breeding season at paragraph 267 of the HRA Report. The HRA Report concluded that the

[18] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

likely effects of displacement from these wind farms would be minimal on the Fowlsheugh SPA population due to the availability of large areas of alternative habitat.

9.4.6.9.3 Collision and displacement

9.4.6.9.3.1 The combined predicted impacts of collision and displacement are assumed in the HRA Report to be additive. The combined impact from the Development in-combination with the other Forth and Tay Developments is predicted to be an additional mortality of 86 adult birds and eight sub-adult birds per annum. For the WCS, which combines the passage period collisions for the North Sea Developments, the HRA Report estimated an overall additional mortality of 103 adult and 17 sub-adult birds per annum.

9.4.6.9.3.2 Breeding season effects from other offshore wind farms (in this case the European Offshore Wind Deployment Centre and Kincardine Floating Offshore Wind Farm, see further in Appendix 1) within mean maximum foraging range of the Fowlsheugh SPA were considered qualitatively. The HRA Report considered the collision mortality estimates presented in the EIA Reports for both projects and concluded that these projects would contribute a further 12 collisions for the Fowlsheugh SPA kittiwake population, corresponding to 0.06% of the current SPA population size and would, therefore, not affect the conclusions of the assessment presented in the HRA Report. Further, due to the scale of the Developments, the HRA Report concluded that the displacement and barrier effects of these wind farms would be minor and not alter the conclusions of the assessment presented.

9.4.6.9.3.3 The cumulative total number of individuals at risk of mortality is assessed to be 120 which is less than the cumulative total of 212 estimated in the 2014 AA. The 212 estimate from the 2014 AA was based upon the assessment of adults only. The adults only estimate for this assessment is 103.

9.4.6.9.3.4 PVA was undertaken for the Development in-combination with the other Forth and Tay Developments and the WCS of the Development in-combination with the North Sea Developments. The WCS gave reductions of up to 22% in end population size after 50 years, and 12% or less after 25 years of impact. The PVA results are presented in **Table 19** below for all scenarios.

Table 19 PVA results for Fowlsheugh SPA kittiwake for the Development in-combination with other plans and projects for collision and collision and displacement impacts

Impacts	**Scenario**	**Ratio of impacted to un-impacted population size**	
		25 years	**50 years**
Collision only	Development in-combination with	0.919	0.847

	other Forth and Tay Developments		
	Development in-combination with the North Sea Developments	0.896	0.808
Collision and displacement combined	Development in-combination with other Forth and Tay Developments	0.902	0.819
	Development in-combination with the North Sea Developments	0.879	0.779

9.4.6.9.4 Conclusion

9.4.6.9.4.1 SNH advised that there would be an adverse effect on the site integrity of the Fowlsheugh SPA with respect to kittiwake from the Development in-combination with the other Forth and Tay Developments (2014).

9.4.6.9.4.2 SNH subsequently provided advice on the draft AA on 24 January 2019, advising that the plus 1 standard deviation shown in Thaxter et al (2012)[19] should be applied to mean maximum foraging ranges. Therefore, the impacts of the NnGOWL Development site have been considered qualitatively in this assessment. The cumulative assessment of annual adult mortality from collision, presented in Table 16.50 of the Seagreen's HRA Report of 2018,[20] concluded that a total of four adult kittiwake (one during the breeding season, two during the post-breeding season and less than one during the pre-breeding season) would be impacted by the NnGOWL Development as proposed in 2014. The cumulative displacement assessment presented in the 2018 Seagreen HRA Report (Table 16.52) calculated that three adult birds would be impacted per annum (one bird during the breeding, post-breeding and pre-breeding seasons).

[19] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

[20] Seagreen Alpha and Seagreen Bravo, Habitats Regulations Appraisal (2018), Available here – http://marine.gov.scot/sites/default/files/chapter_16_habitats_regulations_appraisal_hra.pdf (Last accessed 30/01/2019).

9.4.6.10 St Abb's Head to Fast Castle SPA – Kittiwake – Development in isolation

9.4.6.10.1 The kittiwake population at the St Abb's Head to Fast Castle SPA is reported as in an unfavourable and declining condition (SNH, 2017b).[21] The population has declined from 21,170 pairs at the time of site designation in 1992 to 3,334 pairs in 2016.

9.4.6.10.2 Collision

9.4.6.10.2.1 The predicted impacts of collision from the Development in isolation were predicted to be small, primarily affecting the breeding adult population. A predicted two birds per annum were estimated to collide, equating to 0.03% of the current population size and 0.005% of the citation breeding adult population of the St Abb's Head to Fast Castle SPA.

9.4.6.10.3 Displacement

9.4.6.10.3.1 The SNCB matrix approach was used to estimate additional mortality impacts attributable to the kittiwake population of the St Abb's Head to Fast Castle SPA as a result of displacement and barrier effects during the breeding period. Displacement effects were calculated using a 30% displacement rate and 2% mortality rate, and the HRA Report estimated a mortality rate of adult bird per annum, equating to 0.01% of the current population and 0.002% of the citation population size.

9.4.6.10.4 PVA

9.4.6.10.4.1 PVA outputs were produced for kittiwake for a range of scenarios, for both 25 and 50 year timeframes and for collision impacts only, and collision plus displacement. After 25 years the median of the ratio of impacted to un-impacted population for the Development in isolation, is 0.992 and for 50 years, 0.985. The PVA metrics predicted a continuing rapid decline for the St Abb's Head to Fast Castle SPA kittiwake population, for both the SPA with and without the Development in isolation. The median end population for each modelled impact was lower than the current SPA population and the projected population size at 50 years was smaller than the predicted population size at 25 years. The PVA metrics for the Development in isolation predicted a small reduction in the end population size, after both 25 and 50 years of impact. The decrease in annual population size was not detectable when collision only impacts were considered.

9.4.6.10.5 In isolation - conclusion

9.4.6.10.5.1 SNH advised that there would be no adverse effect on the site integrity of the St Abb's Head to Fast Castle SPA in respect of kittiwake as a result of the Development in isolation.

[21] SNH (2017b). Sitelinks. Scottish Natural Heritage.

9.4.6.11 St Abb's Head to Fast Castle SPA – Kittiwake – Development in-combination

9.4.6.11.1 Collision

9.4.6.11.1.1 The in-combination impacts of the 2014 parameters for the NnGOWL Development and the Seagreen Developments on kittiwake were predicted to be three times higher than the impacts estimated for the Development in isolation. The HRA Report concluded that the estimated in-combination collision impacts on breeding adults remains small when compared to the current and citation SPA population size, equating to 0.09% of the current population size and 0.01% of the citation population size for both the 2014 and 2017 design scenarios. The CRM estimates were calculated using Option 2 and a 98.9% avoidance rate, as per the Scoping Opinion.

Table 20 Annual estimated in-combination collision impacts for the kittiwake qualifying interest of St Abb's Head to Fast Castle SPA

Development	Breeding adults	Sub adults
Development (2017)	2	<0.2
NnGOWL Development (2014)	2	<0.2
Seagreen Alpha (2014)	1	<1
Seagreen Bravo (2014)	1	<1
Total	**6**	**1**

9.4.6.11.1.2 In-combination CRM for the WCS (including the North Sea Developments) substantially increased the impacts during both passage periods and doubled the estimated total impact. The total predicted in-combination collision mortality estimate presented in the HRA Report for the kittiwake population of the St Abb's Head to Fast Castle SPA is 12 birds per annum (equating to 0.18% of the current population size and 0.03% of the citation population size).

Table 21 Estimated in-combination collision impacts for the St Abb's Head to Fast Castle SPA kittiwake population

Development/Scenario	Seasonal period	Estimated number of collisions	
		Breeding adults	Sub-adult birds
Forth and Tay	Breeding	4	0
Forth and Tay	Autumn passage	1	0.6
North Sea		2.5	1.4
Total autumn passage		**3.5**	**2.0**
Forth and Tay	Spring passage	0.6	0.3
North Sea		3.8	1.7

Total spring passage		**4.4**	**1.9**
TOTAL	**All seasons**	**12**	**4**

Source: Table 4.52, page 144 HRA Report

9.4.6.11.2 Displacement

9.4.6.11.2.1 Displacement impacts were estimated for the Development in-combination with the NnGOWL development (as it was deemed that there is no connectivity with Seagreen Alpha and Seagreen Bravo during the breeding season). A total estimated mortality rate of three breeding adults and fewer than one sub-adult bird per annum was presented, with adult mortality equating to 0.04% of the current population size and 0.007% of the citation population size. A qualitative assessment of in-combination displacement impacts during the non-breeding season was undertaken, as per the Scoping Opinion.

9.4.6.11.3 PVA

9.4.6.11.3.1 PVA outputs were produced for the kittiwake population for a range of scenarios, for both 25 and 50 year timeframes, as set out in **Table 22** below. The PVA results predicted a continuing rapid decline for the St Abb's Head to Fast Castle SPA kittiwake population for the SPA without the Development, with the Development in isolation and the Development in-combination. The population level impacts were greatest for the scenario incorporating the other Forth and Tay Developments, plus the passage period collision estimates for the North Sea Developments. This equated to a predicted 11% decline in end population size after 50 years and 6% after 25 years. The reductions in annual predicted growth rate were reported as small. The HRA Report estimated that median predicted population size at 25 years (550 pairs) is still likely to be sufficiently large to allow recovery. At 50 years, the HRA Report estimated that the median predicted population size would be 100 pairs, with the lower fifth quantile encompassing zero (suggesting a reasonable likelihood of extinction), however, these impacts were estimated for all scenarios and irrespective of whether the SPA population was subjected to the predicted wind farm impacts.

Table 22 PVA results for the St Abb's Head to Fast Castle SPA kittiwake population after 25 and 50 years for the Development alone and in-combination (for collision impacts and for collision plus displacement impacts)

Impact(s)	Scenario	Counterfactual of end population size	
		25 years	**50 years**
Collision only	Development in isolation	0.992	0.985
	In-combination with other Forth and Tay Developments	0.978	0.951

	In-combination with the North Sea Developments	0.953	0.904
Collision and displacement combined	Development in isolation	0.988	0.974
	In-combination with other Forth and Tay Developments	0.969	0.938
	In-combination with the North Sea Developments	0.944	0.888

9.4.6.11.4 In-combination conclusion

9.4.6.11.4.1 The combined predicted impacts from collision and displacement were assumed to be additive within the assessment. For the in-combination scenario with the other Forth and Tay Developments, an additional mortality rate of eight adult and two sub-adult birds per annum was predicted, whilst the worst-case in-combination scenario (in-combination with the North Sea Developments), gave an overall additive mortality of 14 adult and five sub-adult birds per annum. The HRA Report calculated that these impacts represent relatively small proportions of the current and citation population sizes (ranging from 0.12-0.21% and 0.02-0.003% respectively).

9.4.6.11.4.2 The cumulative total number of individuals experiencing annual mortality is assessed to be 19 which is less than the cumulative total of 60 estimated in the 2014 AA. The 60 estimate from the 2014 AA was based upon the assessment of adults only. The adults only estimate for this assessment is 14.

9.4.6.11.4.3 On 28 September, 2018 SNH advised that there could be an adverse effect on the site integrity of the St Abb's Head to Fast Castle SPA in-combination with the other Forth and Tay Developments. This was clarified on 24 January 2019, when SNH advised that an adverse effect on the site integrity of the St Abb's Head to Fast Castle SPA could not be ruled out with respect to kittiwake.

9.4.6.12 Buchan Ness to Collieston Coast SPA – Kittiwake – Development in isolation and in-combination

9.4.6.12.1 The kittiwake population at the Buchan Ness to Collieston Coast SPA is reported as in an unfavourable (SNH, 2017b).[22] The population has declined from 30,452 pairs at the time of site designation in 1998 to 11,482 pairs in 2016.

9.4.6.12.2 The HRA Report concluded that there is no connectivity between kittiwake from the Buchan Ness to Collieston Coast SPA with the

[22] SNH (2017b). Sitelinks. Scottish Natural Heritage.

Development and therefore, no adverse effects were predicted from the Development in isolation or in-combination with other plans or projects. PVA modelling was not undertaken.

9.4.6.13 Outer Firth of Forth and St Andrews Bay Complex pSPA – Kittiwake – Development in Isolation and In-combination

9.4.6.13.1 The Scoping Opinion advised that the assessment carried out for kittiwake at the breeding colony SPAs detailed above could also be applied to the pSPA, and a separate assessment for the kittiwake qualifying feature at the pSPA was not required.

9.4.6.13.2 SNH advised that there would be no adverse effect on the site integrity of the Outer Firth of Forth and St Andrews Bay Complex pSPA in respect of kittiwake as a result of the Development in isolation or in-combination with the other Forth and Tay Developments.

9.4.6.14 Kittiwake – Precaution in the Assessment

9.4.6.14.1 There are a number of precautionary assumptions made in this assessment which mean that the estimated cumulative total number of individuals impacted and the population consequences are highly likely to be over-estimates.

9.4.6.14.2 SNH, in its scoping advice, advised that displacement for kittiwake did not require to be included in the assessment due to emerging evidence that kittiwake are not affected by displacement. The inclusion of displacement in this assessment is likely to be precautionary, as is the assumption that collision and displacement effects are additive. The assumption that all birds are displaced from a 2km buffer around each project is also likely to be very precautionary.

9.4.6.14.3 Another example comes from the seabird collision avoidance study undertaken at Thanet offshore wind farm which lends support to the view that the avoidance rates used in this assessment are likely to be highly precautionary (Skov et al, 2018).[23]

9.4.6.14.4 The Scoping Opinion advised that flight speed data for use in CRM be taken from published data (Pennycuick 1997;[24] Alerstam et al. 2007).[25] These flight speeds are based on very small sample sizes (2 kittiwake). The laser rangefinder track data collected at Thanet recorded by Skov et al. (2018) offers species-specific empirical data on flight speeds from large numbers of individuals (287 kittiwake). This information was not

[23] Skov, H., Heinanen, S., Norman, T., Ward, R.M., Mendez-Roldan, S. & Ellis, I. 2018. ORJIP Bird Collision and Avoidance Study. Final report – April 2018. The Carbon Trust. United Kingdom.

[24] Pennycuick, C.J., 1997. Actual and 'Optimum' Flight Speeds: Field Data Research. The Journal of Experimental Biology, 200, pp. 2355-2361.

[25] Alerstam, T., Rosén, M., Bäckman, J., Ericson, P.G. & Jellgren, O. (2007). Flight speeds among bird species: allometric and phylogenetic effects. PLoS Biology, 5(8), e197.

available at the time of the Application, however the Seagreen EIA Report estimates that using the flight speeds recorded at Thanet would reduce kittiwake collisions by 19%. MSS have advised that across the four wind farm sites, using the Skov (2018) flight speeds would reduce kittiwake collisions by between 20-30% depending on the wind farm site (average of 24%).

9.4.6.14.5 The HRA and EIA Reports provided a comparison of the estimates using both Options 1 and 2 of the Band model. When using Option 1, the collision risk estimates for kittiwake were lower, as a lower percentage of kittiwakes were estimated to be at collision risk height using site-specific data (Option 1) when compared to the generic data (Option 2) (with the difference most pronounced during the breeding season). The HRA Report provided justification for the use of site-specific data (stating that the site-specific fight height data used was based upon a large sample size and that there is relatively strong statistical support for the observed differences). SNH supported this view in its consultation response of 28 September 2018, however, RSPB Scotland did not agree that the sample size used for the site-specific data was sufficient to support its usage. The HRA Report stated that the use of Option 2 CRM will over-estimate the collision impacts for the Development in isolation, thereby resulting in a highly precautionary assessment. Table 11C.5 of Appendix 11C[26] provides collision modelling outputs using both Option 1 and Option 2. For breeding kittiwake, Option 2 of the CRM (when run for the 72 WTG scenario) estimated that 36 birds would be impacted, whilst Option 1 estimated no birds would be impacted. During the autumn passage period it was predicted that 23 birds would be impacted using Option 2, and 7 when using Option 1. For the 40 WTG scenario, it was estimated that 40 birds would be impacted during the breeding season when Option 2 was used and 1 bird when Option 1 was utilised.

9.4.6.14.6 The 50 Year Assessment for the Development assumes a 50 year operational life, within the PVA, for the NnGOWL Development and the Seagreen Developments, whereas the s.36 consents granted in 2014 for these projects are only for 25 years. Therefore the in-combination 50 Year Assessment over-estimates the effects.

9.4.6.14.7 Lastly, basing this assessment on the WCS for the NnGOWL Development and the Seagreen Developments (i.e., the s.36 consents for these projects granted in 2014) is very precautionary, as they are unlikely to be constructed due to advances in technology. If their current proposals were used in this assessment it would reduce the effects associated with those projects.

[26] Appendix 11C, Estimation of the Development alone and Cumulative Collision Risk (2018). Available here: http://marine.gov.scot/sites/default/files/appendix_11c_estimation_of_the_development._reva.pdf (Last accessed 08/02/2019).

9.4.6.15 Kittiwake - Conclusion

9.4.6.15.1 Based on the information provided in the HRA Report and EIA Report, SNH advised on 28 September 2018 that the Development will have an adverse effect on site integrity for kittiwake as a qualifying interest of the Forth Islands SPA and Fowlsheugh SPA in-combination with the s.36 consents granted in 2014 for the NnGOWL Development and the Seagreen Developments. Further, on 24 January 2019, SNH advised that an adverse effect on the kittiwake qualifying interest of the St Abb's Head to Fast Castle SPA could not be ruled out when considered in-combination.

9.4.6.15.2 In reaching their conclusion Scottish Ministers have considered the conservation objectives, the populations at the sites, the predicted levels of effect and population consequences, the fact that the effects are less than in 2014, the precaution in the assessment methods and the advice from SNH. Scottish Ministers conclude that, subject to the appliance of conditions, there will be no adverse effect on the site integrity of Forth Islands SPA, Fowlsheugh SPA, St Abb's Head to Fast Castle SPA, Buchan Ness to Collieston Coast SPA or Outer Firth of Forth and St Andrews Bay Complex pSPA in respect of the kittiwake qualifying interest as a result of the Development in isolation or in-combination with the other Forth and Tay Developments or the projects detailed in Appendices 1 and 2.

9.4.7 HERRING GULL - Forth Islands SPA, Fowlsheugh SPA, St Abb's Head to Fast Castle SPA and Outer Firth of Forth and St Andrews Bay Complex pSPA

9.4.7.1 The closest largest breeding colonies of herring gulls to the Development are on the islands in the Firth of Forth and Isle of May, part of the Forth Islands SPA. Results from site-specific monitoring indicate that herring gulls are present in the Development area throughout the year, although during the breeding season (April to August) numbers are generally lower.

9.4.7.2 During the breeding season, herring gulls from other breeding colonies, which may not be SPAs, may also be present within the Development area and, therefore, at risk from collision impacts. The potential impacts on all non-SPA breeding colonies and across all SPA colonies, for which herring gull is a qualifying interest, within the mean maximum foraging range have been apportioned to take account of the presence of these birds.

9.4.7.3 The Development was assessed in-combination with the WCS of the 2014 and 2017 designs for the Forth and Tay Developments and the 2017 design for the Forth and Tay Developments. Qualitative consideration was given to the impacts from other wind farms within mean maximum foraging range of the relevant SPA populations.

9.4.7.4 Forth Islands SPA – Herring gull – Development in isolation

9.4.7.4.1 The herring gull population decreased between the time of designation and counts undertaken in 2014, however the population has increased again since 2014 and is in a favourable and maintained condition. The herring gull breeding population in the Forth Islands SPA is 6,580 pairs and it is likely that breeding herring gull from this SPA will occur within the Development area and 2km buffer.

9.4.7.4.2 The CRM presented in the HRA Report estimated that there would be a loss of fewer than one bird from the breeding adult age class per annum (0.5). This would result in an increase in the mortality of the breeding population by 0.005% as a result of collision impacts.

9.4.7.4.3 SNH advised that there would be no adverse effect on the site integrity of the Forth Islands SPA in respect of herring gull as a result of the Development in isolation.

9.4.7.5 Forth Islands SPA – Herring gull – Development in-combination

9.4.7.5.1 The estimated collision impacts for the Development in-combination with the other Forth and Tay Developments were ten times higher, when the WCS was assessed. Estimated collisions were higher in the non-breeding season due to the precaution in the assessment (see further discussion at section 19.8). The predicted in-combination collision mortality to adult herring gull was five birds per annum, equating to an increase in the baseline annual adult mortality of 0.24%.

9.4.7.5.2 Qualitative assessment of the in-combination impacts with other wind farms within mean maximum foraging range of breeding herring gulls from the Forth Islands SPA was carried out (including OREC Levenmouth Demonstration Turbine and Forthwind Demonstration Array, see further in Appendix 1), the HRA Report concluded that the impacts predicted for these two developments would not alter the conclusions of the assessment.

9.4.7.5.3 SNH advised that there would no adverse effect on site integrity of the Forth Islands SPA in respect of herring gull as a result of the Development in in-combination with other plans or projects.

9.4.7.6 Fowlsheugh SPA – Herring gull – Development in isolation

9.4.7.6.1 The herring gull population has decreased significantly since the time of designation when the population was 3,190 pairs to the latest population estimate of 125 pairs. The population is in an unfavourable and declining condition (SNH, 2017b).[27]

9.4.7.6.2 The HRA Report provided updated CRM results for herring gull for both the breeding and non-breeding seasons, as per the Scoping Opinion.

[27] SNH (2017b). Sitelinks. Scottish Natural Heritage.

The Development area (including 2km buffer) does not overlap with the Fowlsheugh SPA boundary. Published information (Thaxter et al. 2012)[28] suggests that it is likely that breeding herring gull from the Fowlsheugh SPA will be present in the Development area and 2km buffer.

9.4.7.6.3 Collision risk modelling was undertaken using the Band model, using Option 3 of the CRM (as per Scoping Opinion), outputs for Options 1 and 2 were also presented in the report. An avoidance rate of 99% for Option 3 and 99.5% for Options 1 and 2 was used in the CRM undertaken.

9.4.7.6.4 The HRA Report predicted extremely small impacts on herring gulls from the Fowlsheugh SPA, with fewer than 0.01 birds from the breeding age class estimated to collide per annum (Option 3). Collision estimates for the sub-adult age range were equally small. The predicted number of collisions per annum for the Development in isolation on breeding adults equate to 0.003% of the current population size and 0.0001% of the citation population size. Outputs using Options 1 and 2 were of similar size, with Option 1 predicted no collisions during the breeding period.

9.4.7.6.5 SNH advised that there would be no adverse effect on the site integrity of the Fowlsheugh SPA in respect of herring gull as a result of the Development in isolation.

9.4.7.7 Fowlsheugh SPA – Herring gull – Development in-combination

9.4.7.7.1 The in-combination assessment presented in the HRA Report considered the impacts of the 2014 parameters for the Seagreen Developments. The NnGOWL Development was not considered within the CRM, as the site is beyond the mean maximum foraging range of herring gulls from Fowlsheugh SPA (as per Thaxter et al. 2012)[29] and was therefore deemed not to have connectivity to the SPA population during the breeding or non-breeding seasons. Following SNH advice regarding the inclusion of standard deviation in the mean maximum foraging ranges it was concluded that <1 bird would be impacted from the NnGOWL Development, therefore not considered further within this assessment.[30] The breeding season impacts were attributed to the Development and the Seagreen Developments at 0.6% and 1.3% respectively. Apportioning estimates for the breeding season period were applied to the non-breeding season period.

9.4.7.7.2 The estimated in-combination collisions for the Development and the Seagreen Developments did not exceed 0.1 birds per annum. The predicted in-combination collision rates equate to 0.03% of the current

[28] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

[29] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

[30] See further, Seagreen HRA Report (2018), Table 16.50.

population size (and 0.0001% of the citation population size). Based on an annual adult survival rate of 83.4% for adult herring gulls (Horswill and Robinson, 2015)[31] the mortality of adult herring gulls from the Fowlsheugh SPA was predicted to be 41 individuals per annum in the absence of any wind farm impacts. Therefore, the in-combination collision estimates would represent an increase from the baseline mortality of 0.19%.

9.4.7.7.3 Other wind farms within mean maximum foraging range of the Fowlsheugh SPA were considered qualitatively within the in-combination assessment (in this instance, EOWDC and Kincardine Floating Offshore Wind Farm, see further Appendix 1). The estimated collision mortality to adult herring gulls during the breeding season was one bird or less from each of these wind farms and the HRA Report therefore concluded that this did not alter the conclusions of the assessment presented.

9.4.7.7.4 SNH advised that there would no adverse effect on site integrity of the Fowlsheugh SPA in respect of herring gull from the Development in-combination with other plans and projects.

9.4.7.8 St Abb's Head to Fast Castle SPA – Herring gull – Development in isolation

9.4.7.8.1 The herring gull population has decreased significantly since the time of designation when the population was 1,160 pairs to the latest population estimate of 325 pairs. The population is in an unfavourable and declining condition (SNH, 2017b).[32]

9.4.7.8.2 Updated CRM results were presented in the HRA Report for the breeding and non-breeding season, as per the Scoping Opinion. Data from site-specific surveys of the Development area and 2km buffer zone indicate there is a potential for collisions to occur and the apportioning estimates for the breeding season were applied to the non-breeding season.

9.4.7.8.3 The HRA Report presented predicted collision impacts of fewer than 0.1 for the breeding age class (0.0 for sub-adults) per annum using Option 3 of the CRM, corresponding to 0.002% of the current SPA population and 0.0004% of the citation SPA population. CRM using Options 1 and 2 produced similar results, whilst Option 1 predicted no collisions during the breeding period.

9.4.7.8.4 SNH advised that there would be no adverse effect on the site integrity of the St Abb's Head to Fast Castle SPA in respect of herring gull as a result of the Development in isolation.

[31]Horswill, C. and Robinson, R.A. (2015). Review of seabird demographic rates and density dependence. JNCC report no. 552, JNCC, Peterborough.ICOL (2017).

[32] SNH (2017b). Sitelinks. Scottish Natural Heritage.

9.4.7.9 St Abb's Head to Fast Caste SPA – Herring gull – Development in-combination

9.4.7.9.1 The in-combination collision estimates for St Abb's Head to Fast Castle SPA, for both the breeding and non-breeding season, predicted less than 0.1 adult birds per annum would be impacted. The in-combination assessment for herring gull of the St Abb's Head to Fast Castle SPA did not consider impacts from the Seagreen Developments, which are beyond mean maximum foraging range for this species (Thaxter et al).[33] These impacts correspond to 0.008% of the current population and 0.002% of the citation population size. Based on an annual survival rate of 83.4% for herring gulls,[34] the HRA Report predicted that the mortality of adult herring gull from the St Abb's Head to Fast Castle SPA would equate to 108 adults per year in the absence of any wind farm impacts. The HRA Report predicted that the in-combination collision estimates would therefore represent an increase in the baseline adult mortality of 0.05%.

9.4.7.9.2 Impacts from other wind farms (in this instance, OREC Levenmouth Demonstration Turbine and Forthwind Demonstration Array, see further in Appendix 1) were considered qualitatively in the HRA Report, as per the Scoping Opinion. The HRA Report concluded that, due to the scale of these impacts, the conclusions of the in-combination assessment would not be altered.

9.4.7.9.3 SNH advised that there would no adverse effect on site integrity of the St Abb's Head to Fast Castle SPA in respect of herring gull from a result of the Development in-combination with other plans or projects.

9.4.7.10 Outer Firth of Forth and St Andrews Bay Complex pSPA – Herring Gull – Development in Isolation and In-combination

9.4.7.10.1 The Scoping Opinion advised that the assessment carried out for herring gull at the breeding colony SPAs detailed above could also be applied to the pSPA, and a separate assessment for the herring gull qualifying feature at the pSPA was not required.

9.4.7.10.2 SNH advised that there would be no adverse effect on the site integrity of the Outer Firth of Forth and St Andrews Bay Complex pSPA in respect of herring gull as a result of the Development in isolation or in-combination with the other Forth and Tay Developments.

[33] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

[34] Horswill, C. and Robinson, R.A. (2015). Review of seabird demographic rates and density dependence. JNCC report no. 552, JNCC, Peterborough.ICOL (2017).

9.4.7.11 Herring gull – Conclusion

9.4.7.11.1 SNH advised that there would be no adverse effect on the site integrity of the St Abb's Head to Fast Castle SPA, Forth Islands SPA or the Fowlsheugh SPA in respect of the qualifying interest from the Development in isolation or in-combination with other plans or projects.

9.4.7.11.2 In reaching their conclusion, Scottish Ministers have considered the conservation objectives, the populations at the sites, the predicted levels of effect and population consequences and the advice from SNH. Scottish Ministers conclude subject to the appliance of conditions, there will be no adverse effect on the site integrity of the Forth Islands SPA, Fowlsheugh SPA and St Abb's Head to Fast Castle SPA in respect of the herring gull qualifying interest as a result of the Development in isolation or in-combination with the Forth and Tay Developments and other projects detailed in Appendix 1.

9.4.8 RAZORBILL - Forth Islands SPA, Fowlsheugh SPA, St Abb's Head to Fast Castle SPA and Outer Firth of Forth and St Andrews Bay Complex pSPA

9.4.8.1 The Scoping Opinion advised that ICOL was only required to consider displacement effects as razorbill fly lower than the height of the turbine blades and, therefore, are not at risk from collision impacts.

9.4.8.2 As the footprints of the Development site and the sites for the NnGOWL Development and the Seagreen Developments have not changed, the displacement effects from the s.36 consents as granted in 2014 will be no different to those from the 2018 applications for s.36 consent, therefore it was not necessary to assess the revised scenarios as it was for the collision risk assessment. However methods of assessment for displacement have changed since 2014 as detailed in Appendix 3.

9.4.8.3 The closest large razorbill colonies to the Development are at the Isle of May (part of the Forth Islands SPA), St Abb's Head to Fast Castle SPA and Fowlsheugh SPA. These three SPAs were identified as being at possible risk from the impacts of displacement. The population sizes at Forth Islands SPA and Fowlsheugh SPA have increased significantly since the time of designation.

9.4.8.4 This assessment follows the advice on displacement of razorbill provided in the Scoping Opinion and assesses the wind farm areas plus 2km buffers. A 60% displacement rate and 1% mortality rate are assumed during the breeding and non-breeding seasons.

9.4.8.5 Forth Islands SPA – Razorbill – Development in isolation

9.4.8.5.1 The razorbill population at Forth Islands SPA is in a favourable maintained condition with an increase in population from 2,800 birds at the time of site designation in 1990 to 7,792 birds in 2017 (SNH,

2017b).[35] Published information on razorbill foraging ranges (Thaxter et al, 2012)[36] and the outputs of tracking studies on the Isle of May (Daunt et al. 2011a)[37] demonstrate that it is very likely that breeding razorbills from the Forth Islands SPA will occur within the Development area and 2km buffer.

9.4.8.5.2 The HRA Report predicted a displacement mortality of four adult birds per breeding period (equating to around 0.14% of the citation population size). During the non-breeding season, the HRA Report predicted a mortality of four birds, resulting in a total estimated annual mortality of eight adult razorbill from the Forth Islands SPA (representing 0.29% of the citation population size).

9.4.8.5.3 PVA was undertaken by ICOL for razorbill breeding in the Forth Islands SPA over 25 and 50 year periods for a number of scenarios. After 25 years the median of the ratio of impacted to un-impacted population for the Development in isolation, is 0.969 and for 50 years, 0.938. The PVA results predicted a small reduction in end population sizes after both 25 and 50 years of impact, with a minimal decline in the annual population growth rate.

9.4.8.5.4 SNH advised that the Development taken alone would not result in an adverse effect on site integrity to the Forth Islands SPA with respect to razorbill.

9.4.8.6 Forth Islands SPA – Razorbill – Development in-combination

9.4.8.6.1 The apportioning calculations were undertaken for the Development area and 2km buffer and the NnGOWL Development (plus buffer). The sites for the Seagreen Developments are beyond the mean maximum foraging range of razorbill from the Forth Islands SPA and were therefore deemed not to have connectivity.

9.4.8.6.2 The predicted in-combination mortality arising from displacement during the breeding season is approx. 1.5 times greater than the Development in isolation, resulting in a total estimated mortality of seven breeding adults and eight sub-adult birds – equating to 0.25% of the citation population size. Impacts during the non-breeding season were predicted to be greater, however, the contribution of the Development to the non-breeding season impacts was predicted to be lower. During the non-breeding season, the HRA Report estimated an additional mortality of 11 adult birds and 13 sub-adult birds – resulting in a total annual mortality of

[35] SNH (2017b). Sitelinks. Scottish Natural Heritage. https://gateway.snh.gov.uk/sitelink/index.jsp

[36] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

[37] Daunt, F., Bogdanova, M., Newell, M., Harris, M. & Wanless, S. (2011a). GPS tracking of common guillemot, razorbill, black-legged kittiwake on the Isle of May Summer 2010. Report for FTOWDG. Centre for Ecology and Hydrology, Edinburgh.

19 breeding adults and 21 sub-adult birds, representing 0.64% of the citation population size of breeding adults.

Table 23 Estimated in-combination annual displacement effects on Forth Islands SPA - Razorbill

Project	Breeding adults	Sub-adults
Development (2017)	8	10
NnGOWL Development (2017)	10	11
Total	18	21

9.4.8.6.3 The PVA results for in-combination effects indicated small population-level impacts, with a predicted reduction in end population size of 7% after 25 years and 13% after 50 years, with a small reduction in annual population growth rate. After 25 years the predicted median of the ratio of impacted to un-impacted population size for the in-combination assessment is 0.933 and after 50 years, 0.868 (see further: Table 4.24 of HRA Report).

9.4.8.6.4 The 2014 AA estimated a loss of 41 individual adults only, which is larger than the effects predicted by this assessment. The adults only estimate presented by ICOL is 18. SNH subsequently provided advice on the draft AA on 24 January 2019, advising that the plus 1 standard deviation shown in Thaxter et al (2012) should be applied to mean maximum foraging ranges. The impact of the Seagreen Developments have therefore been considered qualitatively.

9.4.8.6.5 The in-combination displacement assessment undertaken for the NnGOWL Development, as presented in Table 17 of the AA, completed by Scottish Ministers in 2018,[38] concluded that an additional five birds per annum would be impacted by the Seagreen Developments. Therefore, a total of 23 birds per annum would be impacted by the Development in-combination with the NnGOWL Development and the Seagreen Developments. These impacts remain lower than those presented in the 2014 AA.

9.4.8.7 Fowlsheugh SPA – Razorbill – Development in isolation

9.4.8.7.1 The razorbill population is in a favourable maintained condition with an increase in population from 5,800 birds at the time of site designation to 9,950 birds in 2017 (SNH, 2017c).[39]

[38] Neart na Gaoithe Offshore Wind Farm (Revised Design) – Appropriate Assessment (December 2018) – Available here: http://marine.gov.scot/data/neart-na-gaoithe-offshore-windfarm-revised-design-appropriate-assessment-2018.

[39] SNH (2017c). SNH advice to Marine Scotland dated 11 May 2018.

9.4.8.7.2 The Development area (including 2km buffer) does not overlap with the Fowlsheugh SPA. Published data (Thaxter et al 2012)[40] suggests it is likely that breeding razorbill from the Fowlsheugh SPA will occur within the Development area and 2km buffer, as well as the Forth and Tay Development areas.

9.4.8.7.3 The HRA Report estimates that four adult birds may be impacted by displacement mortality during the breeding season, corresponding to 0.04% and 0.07% of the current and citation population sizes respectively. During the non-breeding season, based on a mean peak population of 4,905 birds, it was estimated that four adult birds may be impacted by displacement mortality. Therefore, an annual total of eight adult razorbill was predicted, corresponding to 0.08% and 0.15% of the current and citation SPA population sizes.

9.4.8.7.4 PVA was undertaken by ICOL for razorbill at Fowlsheugh SPA over 25 and 50 year periods for a range of scenarios. The PVA projected gradual population growth for the Fowlsheugh SPA razorbill population both with and without the Development in isolation and in-combination with other plans and projects over both 25 and 50 year periods. The projected population size at 50 years was always larger than that projected for 25 years, for all scenarios modelled. The PVA predicted small reductions in the end population size after both 25 and 50 year periods for the Development in isolation, with values of the median of the ratio of the impacted to un-impacted population size being 0.977 (after 25 years) and 0.952 (after 50 years). The HRA Report concluded that the decline in population growth rate was minimal.

9.4.8.7.5 SNH advised that the Development taken alone would not result in an adverse effect on site integrity to the Fowlsheugh SPA with respect to razorbill.

9.4.8.8 Fowlsheugh SPA – Razorbill – Development in-combination

9.4.8.8.1 The NnGOWL Development is beyond the mean maximum foraging range of razorbill from the Fowlsheugh SPA, therefore, was deemed not to have connectivity, therefore the displacement matrix predictions in the HRA Report were only presented for the Development in-combination with the Seagreen Developments.

9.4.8.8.2 **Table 24** below represents the apportioned total effects (breeding and non-breeding seasons) for Fowlsheugh SPA. The predicted in-combination mortality during the breeding season is approximately 2.5 times greater than the impacts predicted for the Development in isolation, corresponding to 0.10% and 0.17% of the current and citation population sizes respectively.

[40] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

9.4.8.8.3 Impacts during the non-breeding season were predicted to be similar to those predicted for the breeding season, however, the contribution of the Development to the in-combination mortality was slightly greater in the non-breeding season (around 45%). The total estimated annual mortality of breeding adults from displacement corresponds to 0.19% and 0.33% of the current and citation SPA population sizes respectively.

Table 24 Estimated annual displacement effects on Fowlsheugh SPA razorbill

Seasonal period	Project	Breeding adults	Sub-adults
Breeding	Development (2017)	4.0	4.5
	Seagreen Alpha (2014)	4.6	5.1
	Seagreen Bravo (2014)	1.6	1.8
	Total	10.2	11.4
Non-breeding	Development (2017)	4.2	4.7
	Seagreen Alpha (2014)	2.1	2.3
	Seagreen Bravo (2014)	2.9	3.2
	Total	9 (9.2)	10 (10.2)
Annual	**Total**	**19 (19.4)**	**22 (21.6)**

9.4.8.8.4 Impacts from other offshore wind farms within mean maximum foraging range were considered qualitatively, as per the Scoping Opinion, including Kincardine Floating Offshore Wind Farm (comprising up to 7 WTGs) and the European Offshore Wind Deployment Centre (comprising 11 WTGs). Full details of these projects can be found in Appendix 1. The HRA Report concluded that impacts from displacement and barrier effects from these offshore wind farms would be minor and would not affect the conclusions of the assessment presented.

9.4.8.8.5 The HRA Report presented PVA results for the Development in-combination with other plans and projects. After 25 years, the median of the ratio of the impacted to un-impacted population size for the in-combination assessment is 0.944, and after 50 years, 0.890, corresponding to a 6% and 11% reduction in end population size respectively. The HRA Report concluded that the predicted impacts from the Development in-combination and the PVA outputs indicate small population-level effects, the achievement of the conservation objectives for Fowlsheugh SPA with respect to razorbill will not be hindered.

9.4.8.8.6 The 2014 AA estimated negligible effects on razorbill at Fowlsheugh SPA as that assessment was based on a different approach using the Searle

et al. (2014)[41] model. Although there were practically no effects on razorbill at Fowlsheugh, the 2014 AA did identify a threshold of acceptable level of impact. This ratio of impacted to un-impacted population size was 0.79. The effects identified above are less than this value i.e., produce a larger population ratio value (0.89 after 50 years).

9.4.8.8.7 SNH subsequently provided advice on the draft AA on 24 January 2019, advising that the plus 1 standard deviation shown in Thaxter et al (2012)[42] should be applied to mean maximum foraging ranges. The impact of the NnGOWL Development site has therefore been considered qualitatively. The in-combination displacement assessment undertaken for the NnGOWL Development, as presented in Table 17 of the 2018 NnGOWL AA,[43] concluded that an additional seven birds per annum (less than one bird during the breeding season and seven during the non-breeding season) would be impacted by the NnGOWL Development.

9.4.8.8.8 SNH advised that the Development in-combination with the other Forth and Tay Developments would result in an adverse effect on site integrity to the Fowlsheugh SPA with respect to razorbill.

9.4.8.9 St Abb's Head to Fast Castle SPA - Razorbill – Development in isolation and in-combination

9.4.8.9.1 The razorbill population is in a favourable maintained condition with an increase in the population since the time of designation from 2,180 birds to 2,770 in 2016 (although a decrease since 2014 when the population was 4,230).

9.4.8.9.2 The HRA Report concluded that there is no connectivity between razorbill from the St Abb's Head to Fast Castle SPA with the Development due to the distance between the Development site and the colony, and therefore no adverse effects were predicted from the Development in isolation or in-combination with other plans or projects. PVA modelling was not undertaken.

9.4.8.9.3 Following SNH advice received on 24 January 2019, regarding the inclusion of 1 standard deviation in the consideration of the mean

[41] Searle, K., Mobbs, D., Butler, A., Bogdanova, M., Freeman, S., Wanless, S. & Daunt, F. (2014) Population consequences of displacement from proposed offshore wind energy developments for seabirds breeding at Scottish SPAs (CR/2012/03). (Final Report to Marine Scotland Science).

[42] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

[43] Neart na Gaoithe Offshore Wind Farm (Revised Design) – Appropriate Assessment (December 2018) – Available here: http://marine.gov.scot/data/neart-na-gaoithe-offshore-windfarm-revised-design-appropriate-assessment-2018.

maximum foraging range, the figures used in the 2018 NnGOWL AA[44] have been included here for completeness.

9.4.8.9.4 **Table 25** below presents the apportioned total effects (breeding and non-breeding seasons) on the St Abb's Head to Fast Castle SPA based on information provided by SNH on 26 and 27 September 2018.

Table 25 Estimated annual displacement effects on St Abb's Head to Fast Castle SPA - razorbill

Project	Individuals
NnGOWL Development (2017)	3
Development (2014)	5
Seagreen Developments (2014)	2
Total	10

9.4.8.9.5 SNH advised that the Development taken alone or in-combination would not result in an adverse effect on site integrity to the St Abb's Head to Fast Castle SPA with respect to razorbill.

9.4.8.10 Outer Firth of Forth and St Andrews Bay Complex pSPA – Razorbill – Development in Isolation and In-combination

9.4.8.10.1 The Scoping Opinion advised that the assessment carried out for razorbill at the breeding colony SPAs detailed above could also be applied to the pSPA, and a separate assessment for the razorbill qualifying feature at the pSPA was not required.

9.4.8.10.2 SNH advised that there would be no adverse effect on the site integrity of the Outer Firth of Forth and St Andrews Bay Complex pSPA in respect of razorbill as a result of the Development in isolation or in-combination with the other Forth and Tay Developments.

9.4.8.11 Razorbill – Precaution in the Assessment

9.4.8.11.1 Scottish Ministers consider that the assessment completed by ICOL with respect to razorbill is precautionary. In particular, the inclusion of a 2km buffer to all the sites of the Forth and Tay Developments, and no habituation to the wind farms. The inclusion of the 2km buffer in the displacement assessment has led to predicted displacement effects which are much greater than if the wind farm areas had been considered without the buffer.

9.4.8.11.2 The 50 Year Assessment for the Development assumes a 50 year operational life, within the PVA, for the Seagreen Developments, whereas the s.36 consents granted in 2014 and the 2018 s.36

[44] See further, paragraph 18.7, Neart na Gaoithe Offshore Wind Farm (Revised Design) – Appropriate Assessment (December 2018) – Available here: http://marine.gov.scot/data/neart-na-gaoithe-offshore-windfarm-revised-design-appropriate-assessment-2018.

applications for these projects are only for 25 years. Therefore the in-combination 50 Year Assessment over-estimates the effects.

9.4.8.11.2 The apportioning of impacts during the non-breeding season was undertaken using the same apportioning method as for breeding season, on the basis that a proportion of breeding razorbill population may remain in the vicinity. This approach to apportioning impacts during the non-breeding season is precautionary, due to the influx of birds from more northern breeding colonies to Forth and Tay Region (as per Furness, 2015)[45] during the non-breeding season.

9.4.8.12 Razorbill – Conclusions

9.4.8.12.1 SNH advised that there would be an adverse effect on the site integrity of the Forth Islands SPA and Fowlsheugh SPA in respect of razorbill as a result of the Development in-combination with the other Forth and Tay Developments due to displacement impacts.

9.4.8.12.2 SNH advised that there would be no adverse effect on the site integrity of any SPA in respect of razorbill as a qualifying interest as a result of the Development in isolation, or on the site integrity of the St Abb's Head to Fast Castle SPA as a result of the Development in-combination with the other Forth and Tay Developments.

9.4.8.12.3 In reaching their conclusion, Scottish Ministers have considered the conservation objectives, the populations at the sites, the predicted levels of effect and population consequences, the fact that the effects are in the case of Forth Islands SPA less than those predicted in 2014, and in the case of Fowlsheugh SPA less than the threshold identified in 2014. Scottish Ministers have also considered the precaution in the assessment methods and the advice from SNH. Scottish Ministers conclude that, subject to the appliance of conditions, the Development will not adversely affect the site integrity of the Forth Islands SPA, Fowlsheugh SPA or St Abb's Head to Fast Castle SPA with respect to razorbill, either alone or in-combination with the other Forth and Tay Developments and projects detailed in Appendix 1.

9.4.9 GUILLEMOT - Forth Islands SPA, Fowlsheugh SPA, St Abb's Head to Fast Castle SPA and Buchan Ness to Collieston Coast SPA

9.4.9.1 The Scoping Opinion advised that ICOL was only required to consider displacement effects on this species, as guillemot fly lower than the height of the turbine blades and are therefore not at risk from collision.

9.4.9.2 As the footprints of the Development area and the sites for the NnGOWL Development and the Seagreen Developments have not changed, the displacement effects from the s.36 consents granted in 2014 will be no

[45] Furness, R.W. (2015) Non-Breeding season populations of seabirds in UK waters: population sizes for Biologically Defined Minimum Population Scales BDMPS. Report Number 164. Natural England Commissioned Reports.

different to those from the 2018 applications, therefore it was not necessary to assess the different scenarios. However methods of assessment for displacement have changed since 2014 (as detailed in Appendix 3).

9.4.9.3 The closest large guillemot colonies to the Development are at Forth Islands SPA, Fowlsheugh SPA, St Abb's Head to Fast Castle SPA and Buchan Ness to Collieston Coast SPA. These four SPAs were identified as being at possible risk from the impacts of displacement.

9.4.9.4 This assessment follows the advice on displacement of guillemot provided in the Scoping Opinion and assesses the wind farm areas plus 2km buffers. A 60% displacement rate and 1% mortality rate are assumed during the breeding and non-breeding seasons.

9.4.9.5 Forth Islands SPA - Guillemot – Development in isolation

9.4.9.5.1 The guillemot population is in a favourable maintained condition with an increase in population from 8,000 birds at the time of site designation to 28,786 birds in 2017(SNH 2017b).[46] Published data on guillemot foraging ranges (Thaxter et al 2012)[47] and tracking from the Isle of May (Daunt et al. 2011a)[48] suggests that it is very likely that breeding guillemots from the Forth Islands SPA will occur within the Development area and 2km buffer.

9.4.9.5.2 The HRA Report estimated a mortality rate of seven adult birds per breeding season resulting from displacement, which represents 0.02% of the current population and 0.09% of the citation population. During the non-breeding season, an estimated three adult birds were predicted to be impacted. This results in an estimated annual mortality of adult guillemots of nine birds from displacement impacts.

9.4.9.5.3 PVA was undertaken by ICOL for Forth Islands SPA for 25 and 50 year periods (see Table 4.19 of HRA Report). The predicted median end population size is greater than the current SPA population size and increased over the projection period (irrespective of whether impacts were incorporated or not). After 25 years the median of the ratio of impacted to un-impacted population size for the assessment of the Development in isolation is 0.992. After 50 years the ratio value is 0.984 (Table 4.20 of HRA Report). A decrease in annual growth rate was not detectable.

[46] SNH (2017b). Sitelinks. Scottish Natural Heritage.

[47] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

[48] Daunt, F., Bogdanova, M., Newell, M., Harris, M. & Wanless, S. (2011a). GPS tracking of common guillemot, razorbill, black-legged kittiwake on the Isle of May Summer 2010. Report for FTOWDG. Centre for Ecology and Hydrology, Edinburgh.

9.4.9.5.4 SNH advised that the Development taken alone would not result in an adverse effect on the site integrity of the Forth Islands SPA with respect to guillemot.

9.4.9.6 Forth Islands SPA – Guillemot – Development in-combination

9.4.9.6.1 The in-combination displacement impacts were apportioned between the Development, the NnGOWL Development and the Seagreen Developments: 35%, 65.7% and 16.5% (Seagreen Alpha and Seagreen Bravo combined). Displacement impacts were broadly similar for both the breeding and non-breeding seasons, however, the contribution of the Development during the non-breeding season was predicted to be smaller than that during the breeding season. The combined annual estimated mortality was 42 adult birds and 58 sub-adults, equating to 0.11% and 0.13% of the current and citation SPA population sizes, as outlined in **Table** below.

Table 26 Estimated mortality of Forth Islands SPA guillemots as a result from displacement from the Development in-combination

Seasonal period	Project plus 2km buffer	Breeding adults	Sub adults
Breeding	Development (2017)	7	10
	NnGOWL Development (2014)	5	7
	Seagreen Alpha (2014)	5	7
	Seagreen Bravo (2014)	4	6
	Total	**21**	**30**
Non Breeding Season	Development (2017)	3	5
	NnGOWL Development (2014)	12	17
	Seagreen Alpha (2014)	2	3
	Seagreen Bravo (2014)	3	4
	Total	**21**	**29**
Annual	**Total**	**42**	**58**

9.4.9.6.2 Cumulative impacts with other wind farms within mean maximum foraging range of the Forth Islands SPA (OREC Levenmouth Demonstration Turbine and Forthwind Demonstration Array, see further in Appendix 1) were assessed qualitatively. The HRA Report concluded that the impacts from these developments are minor and would not alter the conclusions of the assessment presented.

9.4.9.6.3 PVA was undertaken by ICOL for guillemot breeding in the Forth Islands SPA over 25 and 50 year periods for a number of scenarios. The PVA results for in-combination effects indicated small population-level

impacts. After 25 years the median of the ratio of impacted to un-impacted population size for the in-combination assessment is 0.968. After 50 years the ratio value is 0.936 (Table 4.20 of HRA Report).

9.4.9.6.4 SNH advised that the Development in-combination would not result in an adverse effect on the site integrity of the Forth Islands SPA with respect to guillemot.

9.4.9.7 Fowlsheugh SPA – Guillemot – Development in isolation

9.4.9.7.1 The guillemot population is in a favourable maintained condition with a small decrease in population from 56,450 birds at the time of site designation to 55,507 birds in 2017 (SNH, 2017b).[49]

9.4.9.7.2 The Development area (including 2km buffer zone) does not overlap with the Fowlsheugh SPA. Published data (Thaxter et al 2012)[50] and tracking from the Fowlsheugh SPA (Daunt et al 2011a)[51] demonstrate that it is likely that breeding guillemots from the Fowlsheugh SPA will occur within the Development area and 2km buffer.

9.4.9.7.3 Displacement impacts were assessed using a 60% displacement rate and 1% mortality rate, as per the Scoping Opinion and the HRA Report estimated eight birds per annum would be impacted during the breeding period, equating to a displacement mortality of 0.01% of the current and citation population sizes. During the non-breeding season, the estimated annual mortality rate for adult guillemots was 14 birds, representing 0.005% and 0.007% of the current and citation population sizes.

9.4.9.7.4 PVA was undertaken for a range of scenarios, including 25 and 50 year timeframes. The PVA predicted a decline for the Fowlsheugh SPA guillemot population with and without the impacts of the Development (both in isolation and in-combination). After 25 years the median of the ratio of the impacted to un-impacted population size is estimated at 0.995 and after 50 years, 0.991.

9.4.9.7.5 SNH advised that the Development in isolation would not adversely affect the site integrity of the Fowlsheugh SPA with respect to guillemot.

9.4.9.8 Fowlsheugh SPA – Guillemot – Development in-combination

9.4.9.8.1 In-combination impacts from the Development were apportioned between the NnGOWL Development, Seagreen Developments and

[49] SNH (2017b). Sitelinks. Scottish Natural Heritage.

[50] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

[51] Daunt, F., Bogdanova, M., Newell, M., Harris, M. & Wanless, S. (2011a). GPS tracking of common guillemot, razorbill, black-legged kittiwake on the Isle of May Summer 2010. Report for FTOWDG. Centre for Ecology and Hydrology, Edinburgh.

attributed as follows: Development (37.7%), NnGOWL Development (8.5%) and Seagreen Developments (55.2%).

9.4.9.8.2 The displacement matrix predictions for the Development in-combination with the other Forth and Tay Developments predicted a total estimated mortality of 40 adult birds and 53 sub-adult birds during the breeding season (equating to 0.05% and 0.07% of the current and citation population sizes). Impacts during the non-breeding season were lower, but the contribution of the Development to the total in-combination impacts remained similar, with predicted total of 23 breeding adults and 31 sub-adults being impacted by displacement mortality.

Table 27 Estimated annual in-combination displacement impacts on Fowlsheugh SPA guillemot

Seasonal period	Project plus 2km buffer	Breeding adults	Sub adults
Breeding	Development (2017)	8	10
	NnGOWL Development (2014)	1	1
	Seagreen Alpha (2014)	17	22
	Seagreen Bravo (2014)	15	20
	Total	**40**	**53**
Non Breeding Season	Development (2017)	4	5
	NnGOWL Development (2014)	2	2
	Seagreen Alpha (2014)	8	11
	Seagreen Bravo (2014)	9	12
	Total	**23**	**31**
Annual	**Total**	**64**	**83**

9.4.9.8.3 As outlined in **Table** above, the total annual estimated mortality from in-combination impacts was 64 breeding adults and 83 sub-adult birds (equating to 0.09% and 0.11% of the current and citation population sizes).

9.4.9.8.4 PVA was undertaken for a range of scenarios, for 25 and 50 year timeframes. After 25 years the median of the ratio of the impacted to un-impacted population size is estimated at 0.974 and after 50 years, 0.948. The predicted reduction in annual population growth rate was minimal.

9.4.9.8.5 SNH advised that the Development in-combination would not adversely affect the site integrity of the Fowlsheugh SPA with respect to guillemot.

9.4.9.9 St Abb's Head to Fast Castle SPA – Guillemot – Development in isolation

9.4.9.9.1 The guillemot population is in a favourable maintained condition with an increase in the population from 31,750 birds at the time of site designation to 36,206 birds in 2017 (SNH 2017b).[52]

9.4.9.9.2 The HRA Report considered the impacts of displacement during the breeding season using a 60% rate of displacement and 1% mortality rate. The HRA Report predicted that three adult guillemots may suffer mortality due to the effects of displacement during the breeding season and two adult guillemots during the non-breeding season. The potential loss of five adult birds across the year equates to 0.01% of the current breeding population.

9.4.9.9.3 PVA analysis was undertaken for this SPA for a range of scenarios for 25 and 50 year periods. The median end population size for each modelled impact was higher than the current SPA population size. The PVA results for the Development in isolation indicated a small reduction in end population size after 25 and 50 years of impact. After 25 years the median of the ratio of the impacted to un-impacted population size is estimated at 0.997 and after 50 years, 0.995. A decrease in annual population growth rate was not detectable.

9.4.9.9.4 SNH advised that the Development in isolation would not result in an adverse effect on site integrity to the St Abb's Head to Fast Castle SPA with respect to guillemot.

9.4.9.10 St Abb's Head to Fast Castle SPA – Guillemot – Development in-combination

9.4.9.10.1 **Table 28** below presents the apportioned total effects (breeding and non-breeding season) on the St Abb's Head to Fast Castle SPA based on the information contained in the HRA Report (Table 4.62). The estimated in-combination annual mortality rates comprise 21 breeding adults and 29 sub-adult birds, which equates to an estimated annual mortality of 0.04% of the current population for adult guillemots. Impacts from the OREC Levenmouth Demonstration Turbine and Forthwind Demonstration Array (see further in Appendix 1) were considered qualitatively in the HRA Report and these are considered further in Appendix 1 to this AA.

Table 28 Estimated in-combination annual displacement effects on guillemot of St Abb's Head to Fast Castle SPA

Project plus 2km buffer	Individuals
Development (2017)	11
NnGOWL Development (2014)	13

[52] SNH (2017b). Sitelinks. Scottish Natural Heritage.

Seagreen Alpha (2014)	13
Seagreen Bravo (2014)	13
Total	**50**

9.4.9.10.2 PVA analysis was undertaken for the Development in-combination for a range of scenarios. After 25 years the median of the ratio of the impacted to un-impacted population size is estimated at 0.986 and after 50 years, 0.974. PVA results indicated a small population level-impact, with a predicted reduction in end population size of 3% after 50 years. The population projections for all scenarios estimated that the end population size would be greater than the population size at citation and that the population would continue to increase over the projection period.

9.4.9.10.3 SNH advised that the Development in-combination would not result in adverse effect on the site integrity of the St Abb's Head to Fast Castle SPA with respect to guillemot.

9.4.9.11 Buchan Ness to Collieston Coast SPA - Guillemot – Development in isolation

9.4.9.11.1 The guillemot population is in a favourable maintained condition with an increase in the population from 17,280 birds at the time of site designation to 45,060 birds in 2017 (SNH, 2017c).[53]

9.4.9.11.2 Published data (Thaxter et al 2012)[54] suggests that it is possible that breeding guillemots from the Buchan Ness to Collieston Coast SPA will be present within the Development area (including the 2km buffer).

9.4.9.11.3 For the Development in isolation during the breeding period, impacts were calculated using a 60% displacement rate and 1% mortality rate. The HRA Report estimated that one breeding adult per annum would be impacted, equating to 0.002% of current population size and 0.006% of citation population size. During the non-breeding season, the HRA estimated that zero birds would be impacted. The total annual mortality of adult guillemots from the Buchan Ness to Collieston Coast SPA was estimated to be one bird, which represents 0.004% and 0.006% of the current and citation SPA population sizes.

9.4.9.11.4 PVA analysis was undertaken for the Development in-combination for a range of scenarios. After 25 and 50 years the median of the ratio of the impacted to un-impacted population size is estimated at 0.999 for both time periods. A decrease in annual growth rate was not detectable.

[53] SNH (2017c). SNH advice to Marine Scotland dated 11 May 2018.

[54] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

9.4.9.11.5 SNH advised that the Development in isolation would not result in adverse effects on the site integrity of the Buchan Ness to Collieston Coast SPA in respect to guillemot.

9.4.9.12 Buchan Ness to Collieston Coast SPA - Guillemot – Development in-combination

9.4.9.12.1 In-combination impacts were calculated for the Development in-combination with the Seagreen Developments. The NnGOWL Development is beyond the mean maximum foraging range for guillemots from the Buchan Ness to Collieston Coast SPA (Appendix 11B, Thaxter et al 2012) and was therefore deemed not to have connectivity.

9.4.9.12.2 The HRA Report estimated that the in-combination mortality rates from displacement for the Buchan Ness to Collieston Coast SPA guillemots, during the breeding season, is approx. six times greater than the Development in isolation. Levels of predicted mortality during the non-breeding season were predicted to be slightly more than half those estimated for the breeding season. **Table 29** below outlines the predicted in-combination displacement mortality impacts during the breeding and non-breeding seasons for the Buchan Ness to Collieston Coast SPA guillemots.

Table 29 Estimated seasonal displacement mortality of Buchan Ness to Collieston Coast SPA guillemots in-combination with the Seagreen Developments

Seasonal period	Project	Additional Mortality	
		Breeding adults	Sub adults
Breeding	Development (2017)	1	1
	Seagreen Alpha (2014)	2	2
	Seagreen Bravo (2014)	1	2
	Total	**4**	**5**
Non Breeding	Development (2017)	<1	<1
	Seagreen Alpha (2014)	1	1
	Seagreen Bravo (2014)	1	1
	Total	**2**	**3**

9.4.9.12.3 The combined two seasonal estimates gave an estimated annual mortality from in-combination impacts of six breeding adults and eight sub-adult birds. The annual estimated mortality of breeding adult birds from displacement equates to 0.01% and 0.03% of the current and citation SPA population sizes for the Buchan Ness to Collieston Coast SPA guillemot population.

9.4.9.12.4 Impacts from other offshore wind farms with mean maximum foraging range of breeding guillemots from the Buchan Ness to Collieston Coast SPA were considered qualitatively within the assessment. These wind

farms (European Offshore Wind Deployment Centre, Hywind Scotland Pilot Park Project and Kincardine Floating Offshore Wind Farm) are detailed in Appendix 1.

9.4.9.12.5 PVA analysis was undertaken for a range of scenarios, which indicated small population level impacts arising from the Development in-combination with the other Forth and Tay Developments. After 25 years the median of the ratio of the impacted to un-impacted population size is estimated at 0.997 and after 50 years, 0.992. A predicted reduction in end population size of <1% after 50 years. A reduction in annual population growth rate was undetectable. The population projections for all scenarios estimated that the end population size was greater than the population size at citation and that the population increased over the projected period.

9.4.9.12.6 On 24 January 2019, SNH advised that the plus 1 standard deviation in Thaxter et al (2012) should be applied to mean maximum foraging ranges. The impacts of the NnGOWL Development have therefore been considered qualitatively here. The assessment undertaken for the NnGOWL Development and as presented in the 2018 NnGOWL AA[55] concluded that less than one bird per annum would be impacted by the NnGOWL Development. This does not alter the conclusions of the assessment presented above.

9.4.9.12.7 SNH advised that the Development in-combination would not result in adverse effects on the site integrity of the Buchan Ness to Collieston Coast SPA in respect to guillemot.

9.4.9.13 Outer Firth of Forth and St Andrews Bay Complex pSPA – Guillemot – Development in Isolation and In-combination

9.4.9.13.1 The Scoping Opinion advised that the assessment carried out for guillemot at the breeding colony SPAs detailed above could also be applied to the pSPA, and a separate assessment for the guillemot qualifying feature at the pSPA was not required.

9.4.9.13.2 SNH advised that there would be no adverse effect on the site integrity of the Outer Firth of Forth and St Andrews Bay Complex pSPA in respect of guillemot as a result of the Development in isolation or in-combination with the other Forth and Tay Developments.

9.4.9.14 Guillemot – Precaution in the Assessment

9.4.9.14.1 Scottish Ministers consider that the assessment completed by ICOL with respect to guillemot is precautionary. In particular, the inclusion of a 2km buffer to all the sites of the Forth and Tay Developments, and no habituation to the wind farm. The inclusion of the 2km buffer in the

[55] Neart na Gaoithe Offshore Wind Farm (Revised Design) – Appropriate Assessment (December 2018) – Available here: http://marine.gov.scot/data/neart-na-gaoithe-offshore-windfarm-revised-design-appropriate-assessment-2018.

displacement assessment has led to predicted displacement effects which are much greater than if the wind farm areas had been considered without the buffer.

9.4.9.14.2 The 50 Year Assessment for the Development assumes a 50 year operational life, within the PVA, for the Seagreen Developments, whereas the s.36 consents granted in 2014 and the 2018 s.36 applications for these projects are only for 25 years. Therefore the in-combination 50 Year Assessment over-estimates the effects.

9.4.9.15 Guillemot – Conclusions

9.4.9.15.1 In its advice provided on 28 September 2018, SNH stated that for guillemot as a qualifying interest of the Forth Islands SPA, Fowlsheugh SPA, St Abb's Head to Fast Castle SPA, Buchan Ness to Collieston Coast SPA and Outer Firth of Forth and St Andrews Bay Complex pSPA, the Development would not have an adverse effect on the site integrity in-combination with the NnGOWL Development and the Seagreen Developments.

9.4.9.15.2 In reaching their conclusion Scottish Ministers have considered the conservation objectives, the populations at the sites, the predicted levels of effect and population consequences, the precaution in the assessment methods and the advice from SNH. Scottish Ministers conclude that the Development, subject to the appliance of conditions, will not adversely affect the site integrity of the Forth Islands SPA, Fowlsheugh SPA, St Abb's Head to Fast Castle SPA, Buchan Ness to Collieston Coast SPA and the Outer Firth of Forth and St Andrews Bay Complex pSPA with respect to guillemot, either alone or in-combination with the other Forth and Tay Developments and projects detailed in Appendix 1.

9.4.10 PUFFIN – Forth Islands SPA

9.4.10.1 The Scoping Opinion advised that ICOL was only required to consider displacement effects as puffin fly lower than the height of the turbine blades so are not at risk from collision. Displacement impacts during the non-breeding season were not required to be assessed as, following breeding, puffins disperse widely and are not present within the Forth and Tay region in significant numbers.

9.4.10.2 As the footprints of the Development site and the sites for the NnGOWL Development and the Seagreen Developments have not changed, the displacement effects from the s.36 consents granted in 2014 will be no different to those from the 2018 applications, therefore it was not necessary to assess the different scenarios as it was for the collision risk assessment. However methods of assessment for displacement have changed since 2014 (as detailed in Appendix 3).

9.4.10.3 The closest large puffin colony to the Development is located on the Isle of May, which is part of the Forth Islands SPA. The population is in a favourable maintained condition with an increase in population from

14,000 pairs at the time of site designation to 45,005 pairs between 2009 and 2017 (SNH, 2017b).[56]

9.4.10.4 The assessment follows the advice on displacement of puffin provided in the Scoping Opinion and assesses the wind farm areas plus 2km buffers. A 60% displacement rate and 2% mortality rate are assumed during the breeding season.

9.4.10.5 Forth Islands SPA – Puffin – Development in isolation

9.4.10.5.1 Published data (Thaxter et al, 2012)[57] suggests it is very likely that breeding puffins from the Forth Islands SPA will occur in the Development area and 2km buffer, as well as within the sites of the other Forth and Tay Developments.

9.4.10.5.2 Using the 60% displacement and 2% mortality rates, this equated to a mortality of up to 22 adult birds per annum (see Table 4.26, HRA Report). A displacement mortality rate of 22 adult birds during the breeding season corresponds to 0.02% and 0.08% of the current and citation population sizes respectively.

9.4.10.5.3 PVA undertaken by ICOL concluded that there would be no decrease in the current population, with a continuous significant increase in the breeding population over the next 25 and 50 years. Over 25 years, it is predicted that the population will have increased from its current level (45,005 pairs) to 143,475 pairs, with no wind farms present. The additional mortality from displacement effects from the proposed Development may cause a reduced level of population increase, with the future population predicted to be 142,550 pairs with the Development present (after 25 years). After 25 years, the median of the ratio of the impacted to un-impacted population size from the Development in isolation is 0.993 (n.b. ratio values are referred to in the HRA Report as the counterfactuals). After 50 years, the ratio value is 0.986.

9.4.10.5.4 SNH advised that Development taken alone would not result in an adverse effect on site integrity to the Forth Islands SPA with respect to puffin.

9.4.10.6 Forth Islands SPA – Puffin – Development in-combination

9.4.10.6.1 The HRA Report estimated that the predicted in-combination mortality rate from displacement during the breeding season would be three times higher than the impacts of the Development in isolation. The HRA Report estimated that 77 breeding adults and 135 sub-adults could suffer mortality due to in-combination displacement impacts per annum,

[56] SNH (2017b). Sitelinks. Scottish Natural Heritage.

[57] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W., Burton, N.H.K. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation 156: 53–61.

corresponding to an adult mortality rate of 0.08% and 0.28% of the current and citation population size respectively.

Table 30 Estimated adult puffin mortality from displacement impacts from the Forth and Tay Developments during the breeding season

Project	Breeding adults
Development	22
NnGOWL Development	25
Seagreen Alpha	12
Seagreen Bravo	18
Total	**77**

9.4.10.6.2 Impacts from other offshore wind farms within mean maximum foraging range of breeding puffins from the Forth Islands SPA were considered qualitatively (in this instance, OREC Levenmouth Demonstration Turbine and Forthwind Demonstration Array, see further details in Appendix 1). The HRA Report concluded that the any impacts from displacement or barrier effects would be minor due to the scale of the projects and, therefore, would not impact the conclusions presented in the HRA Report.

9.4.10.6.3 PVA undertaken by ICOL for the Forth Islands SPA over 25 and 50 year periods. The additional mortality from displacement effects arising from the Development in-combination with the other Forth and Tay Developments may cause a reduced level of population increase (when compared to the population without any development), with a predicted population size of 139,925 pairs after 25 years. After 25 years, the median of the ratio of the impacted to un-impacted population size from the Development in-combination with the other Forth and Tay Developments is 0.975 (n.b. ratio values are referred to in the HRA Report as the counterfactuals). After 50 years, the ratio value is 0.952.

9.4.10.6.4 SNH advised that the Development in-combination with the NnGOWL Development and the Seagreen Developments would not result in an adverse effect on site integrity to the Forth Islands SPA with respect to puffin.

9.4.10.7 Outer Firth of Forth and St Andrews Bay Complex pSPA – Puffin – Development in Isolation and In-combination

9.4.10.7.1 The Scoping Opinion advised that the assessment carried out for puffin at the Forth Islands breeding colony SPAs detailed above could also be applied to the pSPA, and a separate assessment for the puffin qualifying feature at the pSPA was not required.

9.4.10.7.2 SNH advised that there would be no adverse effect on the site integrity of the Outer Firth of Forth and St Andrews Bay Complex pSPA in respect

of puffin as a result of the Development in isolation or in-combination with the other Forth and Tay Developments.

9.4.10.8 Puffin – Conclusions

9.4.10.8.1 The 2014 AA estimated a much greater effect on puffin from the Forth and Tay Developments, the total estimated mortalities in 2014 was 1251 puffin per year from the Forth Islands SPA. This was due to the different assessment methodologies advised in 2014. The assumptions in the 2014 AA were overly precautionary for example a mortality rate of 50% was assumed for puffin. The mortality rate used in the current assessment is 2%, which was advised by SNH, and detailed in the Scoping Opinion. The 2014 AA concluded that there would be no adverse effect on site integrity, the predicted effects in the current AA are significantly less.

9.4.10.8.2 SNH advised that, based on the information contained within the EIA and HRA Report, there would be no adverse effect on the site integrity of the Forth Islands SPA or Outer Firth of Forth and St Andrews Bay Complex pSPA in respect of the puffin qualifying interest as a result of the Development in isolation and in-combination with the other Forth and Tay Developments.

9.4.10.8.3 In reaching their conclusion Scottish Ministers have considered the conservation objectives, the populations at the sites, the predicted levels of effect and population consequences, the fact that the effects are less than in 2014 and the advice from SNH. Scottish Ministers conclude that, subject to the appliance of conditions, the Development will not adversely affect the site integrity of Forth Islands SPA or Outer Firth of Forth and St Andrews Bay Complex pSPA with respect to puffin in isolation or in-combination with the other Forth and Tay Developments and projects detailed in Appendix 1.

9.4.11 OUTER FIRTH OF FORTH AND ST ANDREWS BAY COMPLEX pSPA

9.4.11.1 The offshore transmission infrastructure associated with the Development overlaps the pSPA boundary, with the OEC corridor passing through the pSPA for approx. 85% of its 83km length. Due to overlap with the pSPA boundary, LSEs on the qualifying interests of the pSPA are predicted arising from direct disturbance or displacement, indirect disturbance of seabed habitats and/or prey species of seabirds and loss of seabed habitats. Impacts during construction and operational phases were considered in the HRA Report.

9.4.11.2 Potential impacts from displacement and barrier effects as a result of the presence of the Development and of collisions with the rotor blades for gannet, kittiwake, herring gull, guillemot, razorbill and puffin are considered earlier in this AA.

9.4.11.3 The OEC corridor will consist of up to two cables from the OSPs to the landfall site at Cockenzie, East Lothian. Each OEC corridor will be

around 250m wide and gives a WCS affected area of approx. 20.75km^2. In total, the HRA Report estimates that around 0.7% of the pSPA area will be affected. The HRA Report estimates that OEC cable laying activities will result in around 30 vessel movements per cable during the installation period (which take place over a 9 months). Cable protection may be required (mattresses and/or sand/grout bag placement, see further detail at para 477 of HRA Report). The total area of original habitat loss from cable protection is estimated to be around 0.2km^2, resulting from protection of areas six metres wide over 20% of each OEC, equating to around <0.01% of the pSPA area.

9.4.11.4 Under the WCS, each OEC will be laid in a separate trench through the sub-tidal areas. The sub-tidal area of the seabed disturbed during the installation of the OEC will be less than the area of the cable corridor, around 2.5km^2, which the HRA Report estimates equates to <0.1% of the pSPA area. It is estimated that cable laying activities in the sub-tidal area will take place over a nine month period.

9.4.11.5 Operational and maintenance activities associated with the OEC were considered in the HRA Report including vessel movements associated with inspections and monitoring and remedial action to repair OEC or cable protection. Temporary habitat disturbance associated with operation and maintenance was estimated to affect a maximum of 0.0025km^2 of seabed per annum, equating to <0.0001% of the pSPA area.

9.4.11.6 Direct disturbance/displacement

9.4.11.6.1 The HRA Report considered impacts arising during the construction (and decommissioning), operational and maintenance phases of the Development on the achievement of the conservation objective of the pSPA to “avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long term.”

9.4.11.6.2 Construction activities are expected to take place over a period of nine months. Disturbance would not take place simultaneously over the entirety of the OEC corridor, but would be limited to the vicinity of the cable laying vessels (which would move slowly and remain static for long periods) and would represent a fractional increase in existing shipping traffic levels (see Chapter 15 of the EIA Report for further detail). Visual disturbance would be limited to vessels and activities on board the vessels and below water areas in close proximity to the cable-laying tools and the cable itself. Further, cable laying activities are predicted to emit low levels of noise above and below water.

9.4.11.6.3 Disturbance and habitat flexibility scores for the pSPA qualifying interests were presented in Table 4.70 of the HRA Report. The following species were predicted to have high overall sensitivity to disturbance/displacement; common scoter, red-throated diver, velvet scoter, goldeneye, Slavonian grebe, eider and long-tailed duck.

Guillemot, razorbill and shag were predicted to have medium overall sensitivity. The remaining species were predicted to have low/very low sensitivity and were therefore not assessed further within the HRA Report.

9.4.11.6.4 For the species considered in the HRA Report, the short-presence of a slow-moving vessel with low levels of associated visual and noise disturbance was considered likely to cause temporary and localised disturbance and displacement impacts. The HRA Report therefore predicted that there would be no adverse effects on the site integrity of the pSPA from the Development in isolation. The HRA Report further considered in-combination impacts from the construction phase of the Development with wider shipping activities and considered that there would be minimal potential for in-combination impacts.

9.4.11.6.5 The HRA Report considered displacement and disturbance impacts arising during the operational phase of the Development (very small-scale repair requirements – around 10% of each OEC during the operational phase of the Development, vessel and other activities associated with cable repair works and/or reburial) and considered that there would be infrequent, temporary and localised sources of disturbance of a smaller scale than construction impacts. In-combination impacts with existing shipping activities were also considered in the HRA Report.

9.4.11.6.6 The HRA Report concluded that the impacts of disturbance and displacement from the Development, both in isolation and in-combination with other plans and projects, and during all phases (construction, operation, maintenance and decommissioning) would not hinder the achievement of the conservation objectives of the pSPA and therefore would not have significant adverse effects on the site integrity of the Outer Firth of Forth and St Andrews Bay Complex pSPA.

9.4.11.7 Habitat disturbance and prey availability

9.4.11.7.1 The HRA Report considered potential impacts during the construction, decommissioning and operational phases of the Development. Habitat disturbance arising from laying of the OEC and placement of cable protection could disturb foraging habitat and affect the availability and abundance of prey for pSPA qualifying species. Disturbance would not affect the whole area simultaneously, during the installation period of nine months disturbance would be limited to the area where works are being undertaken and recovery of habitat is anticipated as soon as cable laying is completed.

9.4.11.7.2 The HRA Report estimated that the area to be impacted would be small in relation to the area of alternative seabed habitat and any losses of benthic prey species would be so small as to be virtually undetectable in relation to the sizes of local populations. Further, construction works were not predicted to displace birds from any offshore foraging areas within the pSPA boundary. Recovery of disturbed seabed areas is

expected in the short to medium term.[58] It is expected that fish species would be able to move away from areas of seabed disturbed during cable-laying activities and the small-scale disturbance of habitat would not be expected to cause any detectable changes in the abundance and distribution of fish in the vicinity of the OEC and therefore, in the prey availability for the qualifying bird interests of the pSPA.

9.4.11.7.3 The HRA Report estimated that the in-combination effects of the construction and decommissioning of the offshore transmission infrastructure for the Development would result in temporary impacts on the habitat for prey species and prey availability for the qualifying interests of the pSPA and that the effects would be of a such small scale that the impacts would be of negligible magnitude. The HRA Report therefore concluded that the conservation objective to "maintain the habitats and food resources of the qualifying features in favourable condition" would not be compromised for the qualifying features of the pSPA as a result of the predicted impacts from the Development in isolation and in-combination from disturbance of habitats and prey species associated with the construction and decommissioning of the OEC.

9.4.11.7.4 During the operational phase, the temporary habitat disturbance is anticipated to affect a maximum of 0.0025km^2 of seabed per year (equating to <0.0001% of the pSPA area). The HRA Report predicted no detectable loss of habitat for prey species or depletion of prey resource arising for the Development and therefore, no effect on the achievement of the pSPA conservation objective to "maintain habitats and food resources of the qualifying features in favourable condition".

9.4.11.8 Habitat loss

9.4.11.8.1 Habitat loss was considered in the HRA Report for the operational phase only, as habitat loss during construction activities was considered as part of disturbance impacts during cable laying activities (see above). The extent of construction (and decommissioning) habitat loss (temporary and permanent) would be greater than operational impacts.

9.4.11.8.2 The total area of original seabed habitat predicted to be lost due to the presence of the OEC is estimated to <0.01% of the pSPA area. The HRA Report concluded that these impacts were virtually undetectable in terms of extent of habitat available to prey species and the prey resource of the qualifying interests of the pSPA.

9.4.11.8.3 The HRA Report concluded that the predicted impacts had negligible potential to contribute to in-combination effects with other plans or projects within the outer Forth and Tay. The HRA Report concluded that the achievement of the conservation objectives for the pSPA would not be hindered or compromised by the Development both in isolation and in-combination with other plans and projects. The in-combination impacts

[58] See further, para. 510 of HRA Report and UK Marine SACs Project 2018.

of other plans and projects on the pSPA are considered in Appendix 1 to this AA.

9.4.11.9 Prey Availability and Habitat Loss – Outer Firth of Forth and St Andrews Bay Complex pSPA - Conclusion

9.4.11.9.1 SNH advised that there would no adverse effect on the site integrity of the Outer Firth of Forth and St Andrews Bay Complex pSPA as a result of the Development in isolation or in-combination with other plans and projects.

9.4.11.9.2 In reaching their conclusion, Scottish Ministers have considered the conservation objectives, the limited impacts on prey species and the large area of habitat available. Scottish Ministers conclude that there will be no adverse effect on the site integrity of the Outer Firth of Forth and St Andrews Bay Complex pSPA as a result of impacts arising from prey availability or habitat loss.

9.4.11.10 Consideration of the Outer Firth of Forth and St Andrews Bay Complex pSPA under Article 4(4) of the Birds Directive

9.4.11.10.1 As detailed in paragraph 0, as the Outer Firth of Forth and St Andrews Bay Complex pSPA has not yet been designated, it also falls within the regime governed by the first sentence of Article 4(4) of the Birds Directive as follows:

> "In respect of the protection areas referred to in paragraphs 1 and 2, Member States shall take appropriate steps to avoid pollution or deterioration of habitats or any disturbances affecting the birds, in so far as these would be significant having regard to the objectives of this Article. Outside these protection areas, Member States shall also strive to avoid pollution or deterioration of habitats."

9.4.11.10.2 The Scottish Ministers have considered the information contained within the HRA Report and the advice provided by SNH and conclude that the works will not cause pollution or deterioration of habitats and any disturbance will be negligible.

9.4.12 Overall conclusion

9.4.12.1 In the ornithology assessments above, Scottish Ministers have considered the conservation objective of "maintaining the population of the species as a viable component of the site" on the individual qualifying features of the SPAs, as well as additional conservation objectives in relation to the pSPA.

9.4.12.2 For the qualifying interests of the sites concerned Scottish Ministers have determined that the Development in isolation and in-combination will not affect the populations as viable components of the SPAs. Scottish Ministers also conclude that the Development will not, taken alone or in-

combination with the projects detailed in Appendices 1 and 2, adversely affect the integrity of the Forth Islands SPA, Fowlsheugh SPA, Buchan Ness to Collieston Coast SPA, St Abb's Head to Fast Castle SPA, or the Outer Firth of Forth and St Andrews Bay Complex pSPA, where each SPA is taken as a whole.

9.4.12.3 In reaching their conclusion Scottish Ministers consider that the most up to date and best scientific evidence available has been used and are satisfied that no reasonable scientific doubt remains. The Scottish Ministers conclude that, subject to the appliance of conditions, the Development with a 50 year operational life will not have an adverse effect on the site integrity of the Isle of May SAC, Berwickshire and North Northumberland Coast SAC, Firth of Tay and Eden Estuary SAC, Moray Firth SAC, Forth Islands SPA, Fowlsheugh SPA, Buchan Ness and Collieston Coast SPA, St Abb's Head to Fast Castle SPA, and the Outer Firth of Forth and St Andrews Bay Complex pSPA in isolation or in-combination with the NnGOWL Development and the Seagreen Developments and other projects detailed in Appendices 1 and 2.

10. Reasons for diverging from SNH advice

10.1 In reaching their conclusions Scottish Ministers have given considerable weight to SNH's advice. The methods advised by SNH through scoping and subsequent clarifications have been fully incorporated into this assessment. As such, divergence from its advice is limited to differing conclusions in relation to site integrity for gannet at Forth Islands SPA, kittiwake at Forth Islands SPA, Fowlsheugh SPA, and St Abb's Head to Fast Castle SPA and razorbill at Forth Islands SPA and Fowlsheugh SPA. In reaching a different conclusion, Scottish Ministers consider that the level of impact being adverse to site integrity is a subjective opinion. In reaching their own conclusions, Scottish Ministers have taken account of the entire context of this assessment, in particular its highly precautionary assumptions, which make it very unlikely the number of impacted individuals will be as large as the values presented in the assessment. For these reasons Scottish Ministers consider the levels of assessed impact to be reasonable and are convinced there will be no adverse impacts on site integrity of any of the SACs, SPAs or the pSPA considered in this AA.

SECTION 4: CONDITIONS

11. Requirement for conditions

11.1 The requirement for the below conditions is as a result of ICOL's commitments in the EIA and HRA Reports, along with SNH's advice regarding mitigation measures to ensure that there will be no adverse effect on the site integrity of the Natura sites listed above.

11.2 The conditions below relate to Natura concerns as well as covering other 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 s.36 consent if granted.

1. Duration of the Consent

The consent is for a period of 50 years from the date of Final Commissioning of the Development.

Written confirmation of the dates of First Commissioning of the Development and Final Commissioning of the Development must be provided by the Company to the Scottish Ministers and to Aberdeenshire Council, Angus Council, Dundee City Council, East Lothian Council, Fife Council, Scottish Borders Council and Scottish Ministers no later than one calendar month after these respective dates.

Reason: *To define the duration of the consent.*

2. Decommissioning

There must be no Commencement of Development unless a Decommissioning Programme ("DP") has been submitted to and approved in writing by the Scottish Ministers. The DP must outline measures for the decommissioning of the Development, restoration of the seabed and will include without limitation, proposals for the removal of the Development, the management and timing of the works and, environmental management provisions.

The Development must be decommissioned in accordance with the approved DP, unless otherwise agreed in writing in advance with the Scottish Ministers.

Reason*: To ensure the decommissioning and removal of the Development in an appropriate and environmentally acceptable manner, and in the interests of safety and environmental protection.*

3. **Construction Method Statement**

The Company must, no later than six months prior to the Commencement of the Development submit a Construction Method Statement ("CMS"), in writing, to the Scottish Ministers for their written approval. Such approval may only be granted following consultation by the Scottish Ministers with SNH, MCA, NLB and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers.

The CMS must include, but not be limited to:

a. Details of the commencement dates, duration and phasing for the key elements of construction, the working areas, the construction procedures and good working practices for installing the Development.

b. 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 Development.

c. Details of how the construction related mitigation steps proposed in the Application are to be delivered.

The CMS must adhere to the construction methods assessed in the Application. The CMS also must, so far as is reasonably practicable, be consistent with the Design Statement ("DS"), the Environmental Management Plan ("EMP"), the Vessel Management Plan ("VMP"), the Navigational Safety Plan ("NSP"), the Piling Strategy ("PS"), the Cable Plan ("CaP") and the Lighting and Marking Plan ("LMP").

The final CMS must be sent to Aberdeenshire Council, Angus Council, East Lothian Council, Fife Council and Dundee City Council for information only.

***Reason**: To ensure the appropriate construction management of the Development, taking into account mitigation measures to protect the environment and other users of the marine area.*

4. **Piling Strategy**

The Company must, no later than six months prior to the Commencement of the Development, submit a Piling Strategy ("PS"), in writing, to the Scottish Ministers for their written approval. Such approval may only be granted following consultation by the Scottish Ministers with SNH, Fisheries Management Scotland ("FMS"), Whale and Dolphin Conservation ("WDC") and any such other advisors as may be required at the discretion of the Scottish Ministers.

The PS must include, but not be limited to:

a. Details of expected noise levels from pile-drilling/driving in order to inform point d below;

b. Full details of the proposed method and anticipated duration of piling to be carried out at all locations;

c. Details of soft-start piling procedures and anticipated maximum piling energy required at each pile location; and

d. Details of any mitigation such as Passive Acoustic Monitoring ("PAM"), Marine Mammal Observers ("MMO"), use of Acoustic Deterrent Devices ("ADD") and monitoring to be employed during pile-driving, as agreed by the Scottish Ministers.

The PS must be in accordance with the Application and must also reflect any monitoring or data collection carried out after submission of the Application. The PS must demonstrate how the exposure to and/or the effects of underwater noise have been mitigated in respect to harbour porpoise, minke whale, bottlenose dolphin, harbour seal, grey seal and Atlantic salmon.

The PS must, so far as is reasonably practicable, be consistent with the EMP, the Project Environmental Monitoring Programme ("PEMP") and the CMS.

Reason*: To mitigate the underwater noise impacts arising from piling activity.*

5. **Environmental Management Plan**

The Company must, no later than six months prior to the Commencement of the Development, submit an Environmental Management Plan ("EMP"), in writing, to the Scottish Ministers for their written approval. Such approval may only be granted following consultation by the Scottish Ministers with SNH, Royal Society for the Protection of Birds Scotland ("RSPB Scotland"), WDC, FMS and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers.

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

a. All construction as required to be undertaken before the Final Commissioning of the Development; and

b. The operational lifespan of the Development from the Final Commissioning of the Development until the cessation of electricity generation (environmental management during decommissioning is addressed by the Decommissioning Programme provided for by condition 2).

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

a. Mitigation measures to prevent significant adverse impacts to environmental interests, as identified in the Application and pre-consent and pre-construction monitoring or data collection, and include reference to relevant parts of the CMS;

b. A pollution prevention and control method statement, including contingency plans;

c. Management measures to prevent the introduction of invasive non-native marine species;

d. A site waste management plan (dealing with all aspects of waste produced during the construction period), including details of contingency planning in the event of accidental release of materials which could cause harm to the environment. Wherever possible the waste hierarchy of reduce, reuse and recycle should be encouraged; and

e. The reporting mechanisms that will be used to provide the Scottish Ministers and relevant stakeholders with regular updates on construction activity, including any environmental issues that have been encountered and how these have been addressed.

The EMP must be regularly reviewed by the Company and the Scottish Ministers or Forth and Tay Regional Advisory Group ("FTRAG"), at intervals agreed by the Scottish Ministers. Reviews must include, but not be limited to, the reviews of updated information on construction methods and operations of the Development and updated working practices.

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

Reason: *To ensure that all construction and operation activities are carried out in a manner that minimises their impact on the environment, and that mitigation measures contained in the Application, or as otherwise agreed are fully implemented.*

6. **Vessel Management Plan**

The Company must, no later than six months prior to the Commencement of the Development, submit a Vessel Management Plan ("VMP"), in writing, to the Scottish Ministers for their written approval. Such approval may only be granted following consultation by the Scottish Ministers with SNH, WDC, FP, MCA, NLB, SFF and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers.

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

a. The number, types and specification of vessels required;

b. How vessel management will be coordinated, particularly during construction but also during operation;

c. Location of working port(s), the routes of passage, how often vessels will be required to transit between port(s) and the site and indicative vessel transit corridors proposed to be used during construction and operation of the Development; and

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

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

Reason: *To mitigate the impact of vessels.*

7. **Cable Plan**

The Company must, no later than six months prior to the Commencement of the Development, submit a Cable Plan ("CaP"), in writing, to the Scottish Ministers for their written approval. Such approval may only be granted following consultation by the Scottish Ministers with SNH, MCA, SFF, East Lothian Council and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers.

The CaP must be in accordance with the Application.

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

a. The vessel types, location, duration and cable laying techniques for the inter array cables, export cables and inter-connector cables;

b. The results of monitoring or data collection work (including geophysical, geotechnical and benthic surveys) which will help inform cable routing;

c. Technical specification of inter array cables, export cables and inter-connector cables, including a desk based assessment of attenuation of electro-magnetic field strengths and shielding;

d. A burial risk assessment to ascertain burial depths and where necessary alternative protection measures;

e. Methodologies for surveys (e.g. over trawl) of the inter array cables, export cables and inter-connector cables through the operational life of the wind farm where mechanical protection of cables laid on the sea bed is deployed; and

f. Methodologies for inter array cable, export cable and inter-connector cable inspection with measures to address and report to the Scottish Ministers any exposure of inter array cables, export cables and inter-connector cables.

Any consented cable protection works must ensure existing and future safe navigation is not compromised. The Scottish Ministers will accept a maximum of 5% reduction in surrounding depth referenced to Chart Datum. Any greater reduction in depth must be agreed in writing by the Scottish Ministers.

Reason: *To ensure all environmental and navigational issues are considered for the location and construction of the inter array cables,* export cables and inter-connector cables.

APPENDIX 1: IN-COMBINATION ASSESSMENT – OTHER PLANS AND PROJECTS

12. In-Combination Assessment (Other Plans & Projects) - Introduction

12.1 The AA above provides a detailed in-combination assessment with the NnGOWL Development and the Seagreen Developments (and where relevant other UK wind farms) for ornithology and also with the Moray East, Moray West and Beatrice offshore wind farms for bottlenose dolphin.

12.2 Scottish Ministers are aware of a number of activities which currently have a marine licence and/or s.36 consent and where LSE was identified on the qualifying interests of the Forth Islands SPA, Fowlsheugh SPA, St Abb's Head to Fast Castle SPA, Buchan Ness to Collieston Coast SPA, Outer Firth of Forth and St Andrews Bay Complex pSPA, Moray Firth SAC, Firth of Tay and Eden Estuary SAC, Berwickshire and North Northumberland Coast SAC and Isle of May SAC. Scottish Ministers have considered these other projects in reaching their conclusions above.

12.3 Table 31 below provides a summary of the projects which have been considered in this assessment. An overall conclusion regarding in-combination effects is included within the main body of the AA.

Table 31 Projects for which there is currently an active marine licence or s.36 consent and where LSE was identified on the qualifying interests of the sites

Project Name	Licence/Consent Type(s)	Relevant site(s)
Aberdeen Harbour Expansion Project	Construction	Moray Firth SAC Berwickshire & North Northumberland Coast SAC Isle of May SAC Forth Islands SPA Fowlsheugh SPA Buchan Ness to Collieston Coast SPA
Beatrice Offshore Wind Farm	Offshore wind farm	Moray Firth SAC
Dounreay Tri – Hexicon	Offshore wind farm	Forth Islands SPA Fowlsheugh SPA Buchan Ness to Collieston Coast SPA

		Outer Firth of Forth and St Andrews Bay Complex pSPA
European Offshore Wind Deployment Centre ("EOWDC")	Offshore wind farm (operational phase only)	Moray Firth SAC Fowlsheugh SPA Buchan Ness to Collieston Coast SPA
Forth Ports – Leith and Rosyth	Maintenance dredge and sea disposal	Outer Firth of Forth and St Andrews Bay Complex pSPA
Forth Road Bridge	Maintenance Works	Forth Islands SPA
Forthwind, Methil	Offshore wind farm	Outer Firth of Forth and St Andrews Bay Complex pSPA
Hywind Scotland Pilot Park	Offshore wind farm (Operational phase only)	Moray Firth SAC Forth Islands SPA Fowlsheugh SPA Buchan Ness to Collieston Coast SPA
Kincardine Floating Offshore Wind Farm	Offshore wind farm	Moray Firth SAC Forth Islands SPA Fowlsheugh SPA Buchan Ness to Collieston Coast SPA Outer Firth of Forth and St Andrews Bay Complex pSPA
Moray East Offshore Transmission Infrastructure	Offshore transmission infrastructure	Moray Firth SAC
Moray Offshore Eastern Development	Offshore wind farm	Moray Firth SAC
ORE Catapult – Levenmouth Demonstration Turbine	Offshore wind farm	Outer Firth of Forth and St Andrews Bay Complex pSPA
Port of Cromarty Firth – Phase 4 (Invergordon)	Construction, dredging, sea disposal and land reclamation	Moray Firth SAC
University of St Andrews, Guardbridge, Fife	Seawall Repair	Firth of Tay and Eden Estuary SAC

12.4 Project Descriptions

12.4.1 Descriptions of the projects considered in the in-combination assessment are detailed below.

12.4.1.1 Offshore Renewables Projects

12.4.1.1.1 The Seagreen Developments

12.4.1.1.1.1 Installation and operation of the Seagreen Developments, located 27km off the Angus coastline, in the outer Firth of Forth and Firth of Tay region. Section 36 consent was granted in respect of both Seagreen Alpha and Seagreen Bravo and the associated transmission infrastructure in October 2014. In total, the Seagreen Developments cover an area of approximately 391km$^{2.}$ The operational lifespan for both projects is expected to be 25 years. The offshore transmission infrastructure will consist of up to 5 offshore substation platforms and 6 offshore export cables, in addition to inter-array cabling and scour protection. The s.36 consents for both projects were subsequently varied in 2018, to remove the maximum generating capacity for each site.

12.4.1.1.1.2 In September 2018, Seagreen submitted applications for s.36 consent for revised designs for Seagreen Alpha and Seagreen Bravo, within the same boundary as the consented projects. Seagreen has submitted new applications for s.36 consent in order to reflect technological advancements in the intervening years since the s.36 consents were originally granted in 2014. The operational lifespan of the revised design is expected to be 25 years. The Seagreen Developments will utilise the existing marine licence granted in respect of the offshore transmission infrastructure. It is anticipated that construction activities would take place over a period of four years.

Table 32 Summary of design parameters for the as-consented Seagreen Alpha and Bravo (2014) and new applications for s.36 consent (2018)

Design Parameter	As-consented (2014)	Application (2018)
Maximum number of WTGs	150	120
Rotor diameter	220m	167m
Blade tip height	209.7m	280m
Minimum blade tip clearance above LAT	29.8m	32.5m
Foundation options	Gravity base structures, pin piled jackets, suction caisson	As per 2014, expanded to include monopile foundation option at up to 70 WTG locations

12.4.1.1.1.3 A full project description of the existing consents can be found here and a description of the new applications can be found here.

12.4.1.1.2 The NnGOWL Development

12.4.1.1.2.1 Construction and operation of the NnGOWL Development and associated offshore transmission infrastructure, located 15.5km east of Fife Ness in the Firth of Forth, for which s.36 consent was granted in October 2014. The operational lifespan of the project is expected to be 25 years. The s.36 consent for the NnGOWL Development was subsequently varied in 2015 to increase the maximum rated turbine capacity and increase the maximum turbine hub heights and platform heights. The project covers a total area of approx. 150km^2.

12.4.1.1.2.2 In March 2018, NnGOWL submitted applications for marine licences and s.36 consent in respect of the revised design for the wind farm and offshore transmission infrastructure to take advantage of technological advancements in the time period since s.36 consent was granted. In December 2018, s.36 consent and marine licences were granted and the NnGOWL Development is expected to have an operational lifespan of 50 years. Construction activities are anticipated to take between the third quarter of 2019 and the fourth quarter of 2022.

Table 33 Summary of design parameters for the NnGOWL Development s.36 consent (as varied in 2015) and the s.36 consent granted in 2018

Design Envelope Parameter	**s.36 consent (2018)**	**As-varied s.36 consent (2015)**
Maximum number of WTGs	54	75
Maximum rotor tip height (above LAT)	208 metres	197 metres
Maximum hub height	126 metres	115 metres
Maximum rotor diameter	167 metres	126-152 metres
Minimum spacing between WTGs	800 metres	450 metres
Blade clearance above LAT	35 metres	30.5 metres
Maximum number of piles per foundation (Offshore Substation Platforms)	8	8
Number of piles per foundation (turbines)	6	4
Foundation Options	Jackets	1. Gravity Base Structures 2. Jackets
Inter-array cables	Up to 10 WTGs per collector unit Up to 14 circuits 14km cable length	Up to 6 WTGs per collector unit Up to 15 circuits 75- 120km cable length
Offshore Substation Platforms – maximum	21 metres	18 metres

level of topside above LAT		
Offshore Export Cable Length (per cable)	43km	33km

12.4.1.1.2.3 A full project description can be found here.

12.4.1.1.3 Beatrice Offshore Wind Farm

12.4.1.1.3.1 Installation and operation of the Beatrice Offshore Wind Farm which is located in the outer Moray Firth 13.5km from the Caithness coast. The total area of the development is 131.5km^2. The operational lifespan of the wind farm is expected to be 25 years.

12.4.1.1.3.2 The original application was for a design envelope of up to 277 wind turbine generators ("WTGs") and a maximum generating capacity of up to 1,000MW. Since s.36 consent was granted in 2014, the design has been revised and the development will comprise 84 turbines. Piling operations and cable laying activities are now complete.

12.4.1.1.3.3 Also included in the infrastructure is:

- Up to a maximum of three Offshore Substation Platforms ("OSPs");
- Up to a maximum of three meteorological masts; and
- Up to 350km of inter-array cabling linking the turbines, OSPs and meteorological masts.

12.4.1.1.3.4 Construction started in April 2017 and will continue until approximately the end of 2019. A full project description can be found here.

12.4.1.1.4 Hywind Scotland Pilot Park

12.4.1.1.4.1 Five 6MW turbines have been installed approximately 25km off the coast at Peterhead, north east Scotland, just outside the 12 nautical mile territorial water limit. The project will be expected to produce up to 135GWh per year of electricity. The turbines are positioned between 800 to 1,600m apart and attached to the seabed by a three-point mooring spread and anchoring system. Three anchors are required per turbine and the radius of the mooring system extends 600 to 1,200m out from each turbine.

12.4.1.1.4.2 The turbines are connected by inter-array cables which may require stabilisation in some locations. The export cable, which transports electricity from the Pilot Park to shore at Peterhead, is buried where seabed conditions allow. Where this is not possible cable protection in the form of concrete mattresses and rock is required. Both the inter-array and export cables have 33 kV transfer voltage. The export cable comes ashore at Peterhead and connects to the local distribution network at SSE Peterhead Grange substation. The onshore project infrastructure comprises an underground cable approximately 1.5km in length and a small switchgear yard facility close to Peterhead Grange substation.

12.4.1.1.4.3 This project has now finished construction and moved into the operational phase. A full project description can be found here.

12.4.1.1.5 Dounreay Trì Floating Wind Demonstration Project

12.4.1.1.4.1 The Development will consist of a demonstration floating offshore wind farm called Dounreay Trì which shall consist of:

- A two turbine offshore wind farm with an installed capacity of between 8 to 12MW, at least 6km off Dounreay, Caithness;
- A single, 33 kV, export cable to bring the power to shore immediately to the west of the Dounreay Restoration Site fence line; and
- Subject to a Connection Offer from Scottish and Southern Energy Power Distribution ("SSEPD"), the associated onshore electrical infrastructure to connect the project at, or near, the existing substation at Dounreay.

12.4.1.1.4.2 The main offshore components will include:

- Two offshore wind turbines;
- A floating foundation;
- Mooring clump weight;
- Mooring chain and/or steel lines;
- Drag embedment anchors;
- One cable to bring the renewable electricity ashore; and
- Scour protection for the anchors and the export cable, where necessary.

12.4.1.1.4.3 A full project description can be found here.

12.4.1.1.4.4 The AA for this project concluded that there would be no adverse effect on the site integrity of any SPAs provided the conditions set out in the AA were complied with.

12.4.1.1.6 ORE Catapult Levenmouth Demonstration Turbine ("LDT")

12.4.1.1.6.1 The project involves the construction, operation and decommissioning of a site for the testing of new designs of offshore wind turbines with a capacity of up to 7MW at the Fife Energy Park, Methil. The development will be operational for 15 years, until 2029. During this timescale there is potential for more than one turbine model to be tested at the site. Once one turbine has been tested it will be removed from the site and replaced with a new turbine which falls within the same design parameters (maximum hub height of 110m, rotor diameter of 172m, and maximum height to turbine tip from MSL of 196m). Only one turbine will ever be installed at any one time. The base will remain in place throughout the development.

12.4.1.1.6.2 The development comprises:

- A single, three bladed demonstration wind turbine with an installed capacity of up to 7MW. The turbine tower is up to 110m tall, from Mean

Sea Level ("MSL") including the base jacket. The turbine has a maximum rotor diameter of 172m, giving a maximum level from the MSL to turbine tip of up to 196m;
- A personnel bridge connection between the Fife Energy Park ("FEP") and turbine tower;
- Construction of an onshore crane pad on the FEP; and
- Construction of an onshore control compound

12.4.1.1.6.3 A full project description can be found here.

12.4.1.1.6.4 The AA for this project concluded that, based on the outputs of surveys during the first three years of operation, the population level impacts arising from the displacement of the wintering sea duck qualifying interests would not result in an adverse effect on the site integrity of the SPA.

12.4.1.1.7 Forthwind Offshore Development – Methil

12.4.1.1.7.1 The current licence and s.36 consent in respect of this project, is for the construction and operation of the Forthwind Offshore Wind Demonstration Project ("Forthwind"), approximately 1km from the coast of Methil, Fife. The Forthwind development consists of 2, two-bladed lattice structure WTGs, associated infrastructure, 2 electricity offshore export cables with an overall project footprint of 37,400m^2. The WTG parameters are as follows;

- Maximum hub height 121 metres (measured from LAT)
- Generating capacity of up to 9MW per turbine
- Maximum rotor diameter of 155m
- 3 pin piled foundations per turbine

12.4.1.1.7.2 Construction has not yet commenced but is anticipated to take place over a 3 to 6 month period, followed by testing and commissioning before becoming operational.

12.4.1.1.7.3 A full project description can be found here. At present, the timescales for commencement of construction activities are unclear and the current marine licence expires on 12 September 2037.

12.4.1.1.7.4 The AA for this project concluded that there would be no adverse effect on the site integrity of any SPA.

12.4.1.1.8 Kincardine Floating Offshore Wind Farm

12.4.1.1.8.1 The works consist of the construction and operation of a demonstrator floating offshore wind farm development, located to the south east of Aberdeen, approximately eight miles from the Scottish coastline. The development is considered a commercial demonstrator site, which will utilise floating semi-submersible technology to install six or eight WTGs, with a combined maximum generating capacity of 50MW, in approximately 60 to 80m of water. The proposal also includes inter-array

cabling to the connection point at the onshore Redmoss substation, Altens, Aberdeen. A full project description can be found here. The construction works are scheduled to take place in three phases between March 2018 and June 2020.

12.4.1.1.9 European Offshore Wind Deployment Centre ("EOWDC")

12.4.1.1.9.1 Installation and operation of a European Offshore Wind Deployment Centre consisting of 11 turbines, inter-array and export cables located 2 to 4.5km east of Blackdog, Aberdeenshire. Construction commenced in November 2017, beginning with foundations and cabling. Construction works are concluded and the project is now in the operational phase. A full project description can be found here.

12.4.1.1.9.2 The AA for this project concluded that there would be no adverse effect on any SPAs or SACs subject to conditions attached to the consent.

12.4.1.1.10 Moray Offshore Eastern Development

12.4.1.1.10.1 The Moray Offshore Eastern Development consists of three proposed wind farm sites: the Telford, Stevenson and MacColl wind farms all situated within the development area. The original design envelope was for up to 339 WTGs with a maximum generating capacity of up to 1,500MW. This has since been reduced to a design with a maximum generating capacity of up to 1,116MW and for a maximum of 186 WTGs. The proposals are located on the Smith Bank in the outer Moray Firth (approximately 2km from the Caithness coastline, in water depths of 38 – 57m). The operational lifespan of the wind farms is expected to be 25 years.

12.4.1.1.10.2 Substructure and foundation design for the WTGs will consist of either a mixture of, or one design option of:

- Concrete gravity base foundation with ballast and a gravel/grout bed; or
- Steel lattice jackets with pin piles.

12.4.1.1.10.3 A full project description for the Moray Offshore Eastern Development can be found here. Construction is anticipated to commence in April 2019, with piling activities due to commence in July 2019.

12.4.1.1.11 Moray East Modified Offshore Transmission Infrastructure

12.4.1.1.11.1 The construction and operation of offshore transmission infrastructure in the Outer Moray Firth, to support the Moray Offshore Eastern Development, consisting of:

- Up to 2 OSPs with associated substructures and foundations;
- Inter-platform cabling within the three consented Telford, Stevenson and MacColl wind farms; and
- Up to 4 triplecore submarine export cables between the OSPs and the shore.

12.4.1.1.11.2 Recent project updates advised construction is likely to commence in March 2019.

12.4.1.2 Large-scale construction projects

12.4.1.2.1 Aberdeen Harbour Expansion Project ("AHEP") – construction works, capital dredging and sea disposal operations

12.4.1.2.1.1 Development of a new harbour facility at Nigg Bay, Aberdeen, approximately 0.8km south of the existing harbour in Aberdeen City centre. The works include the construction of two breakwaters, quaysides and associated infrastructure, as well as a large-scale capital dredge and dredge spoil deposit operation. Works commenced in late 2016 and are scheduled to take place over a 3 year period. Construction works began in May 2017 with the construction of the northern breakwater.

12.4.1.2.1.2 Dredging operations are expected to last until September 2018, which is when their dredging licence expires. Blasting operations are expected to commence in August 2018 for a maximum of 7 consecutive months, however, these timescales may be subject to change. Impact piling will no longer be used and rotary piling used instead, which is thought to produce less noise. All marine elements of the works are scheduled to be complete by February 2020.

12.4.1.2.1.3 Full details of the project can be found in the documentation here.

12.4.1.2.1.4 The AA for this project concluded that there would be no adverse effect on the site integrity of any SPAs or SACs provided that the conditions set out in the AA were complied with.

12.4.1.2.2 Port of Cromarty Firth Phase 4 – Construction of Laydown Area & Capital Dredging

12.4.1.2.2.1 These works involve land reclamation to provide an additional 4.5Ha of laydown space to the west of the previously completed phase 3 development, including the construction of 215m of quay wall to create a new berth adjacent to the existing berth 5, providing a 369m long combined quay face. Fendering will then be installed along berth 5 and the new berth 6.

12.4.1.2.2.2 A rock armour revetment will be constructed along the north and west sides of the new laydown area with a tubular and sheet piled wall forming the new quay. The existing rock armour will be removed from the western edge of the phase 3 development and re-used on phase 4. The area will then be lined with a geotextile membrane and infilled, before appropriate drainage, bollards and services are installed prior to surfacing.

12.4.1.2.2.3 Dredging will be required along the toe of the new revetment structure and a second campaign will be required to create a finished depth of 12 metres along the new berth. The total dredge volume is estimated to be

110,000m^3. It is anticipated that up to 60,000m^3 of dredge material will be suitable for re-use within the land reclamation and that the remainder will be deposited at the Sutors dredge spoil deposit area.

12.4.1.2.2.4 The works are scheduled to take place between 1 November 2018 and 31 March 2020.

12.4.1.3 Dredging operations, maintenance works and small-scale construction projects

12.4.1.3.1 Forth Road Bridge - Maintenance Works

12.4.1.3.1.1 Bridge maintenance works, incorporating various schemes as outlined in the supporting information submitted to Marine Scotland as part of the marine licence application. The programme of works is scheduled for an initial period of 5 years, with the option for 5 additional 1 year extensions and is currently anticipated to conclude by October 2020.

12.4.1.3.1.2 The AA for this project concluded that there would be no adverse effect on the site integrity of any SPA due to the extensive alternative areas of habitat available for wintering birds. SNH advised that population, displacement and disturbance effects would be minor, temporary and very limited in area.

12.4.1.3.2 Rosyth and Leith Docks - Maintenance dredging and sea disposal operations

12.4.1.3.2.1 Maintenance dredge and sea disposal at the Leith and Rosyth docks and approaches. The Leith works comprise maintenance dredging of the docks and approach channel consisting of 100,000m^3 of spoil per year and disposal at Narrow Deep B spoil ground for a period of 3 years. The Rosyth works comprise maintenance dredging of the docks and approach channel consisting of 400,000m^3 of spoil per year and disposal at the Oxcars spoil ground for a period of 3 years.

12.4.1.3.2.2 A combined AA was undertaken for these activities due to the close proximity, complete overlap of active licence period and potentially affected Natura sites. The AA concluded that there would be no adverse effect on the site integrity of the Firth of Forth SPA.

12.4.1.3.3 Old Guardbridge Paper Mill – Seawall Repairs

12.4.1.3.3.1 Repair to the East Seal Wall in Guardbridge, Fife, which forms the boundary between the old Guardbridge Paper Mill and the Eden Estuary. The repairs will be over 385m of sewall and include the removal and replacement of wall cope, removal of rubble behind the seawall, concrete repairs to the seawall and replacement of revetment using concrete and rock armour. Works will be carried out over four phases during 2018-2021. Works cannot be carried out between 1 October and 31 April in any calendar year, thus ensuring works are carried out outside the period

that the qualifying interests of the Firth of Tay and Eden Estuary SAC are present.

12.5 Assessment of in-combination effects

12.5.1 Assessment of in-combination effects on the Fowlsheugh SPA

12.5.1.1 The following projects have the potential to have a LSE on the relevant qualifying interests of the Fowlsheugh SPA in addition to the Forth and Tay Developments considered in detail above:

- Aberdeen Harbour Expansion Project ("AHEP")
- EOWDC
- Hywind Scotland Pilot Park Project
- Kincardine Floating Offshore Wind Farm

12.5.1.2 The AAs for these projects concluded that there would no adverse effect on the site integrity of the Fowlsheugh SPA, either in isolation or in-combination with other plans or projects, provided that the conditions set out in the AAs and marine licences and s.36 consents were implemented and complied with. The proposed timeframes for the Development will overlap with the operational phases of the projects listed above. The AAs for these projects identified LSEs on the relevant qualifying interests of the SPA during the operational phases of the works as a result of collision risk and displacement and barrier effects.

12.5.1.3 Scottish Ministers have considered these projects in the in-combination assessment completed.

12.5.2 Assessment of in-combination effects on the St Abb's Head to Fast Castle SPA

12.5.2.1 The Scottish Ministers identified no additional projects to the Forth and Tay Developments which would have an in-combination effect with the Development on the site integrity of the St Abb's Head to Fast Castle SPA.

12.5.3 Assessment of in-combination effects on the Buchan Ness to Collieston Coast SPA

12.5.3.1 The following projects have the potential to have a LSE on the relevant qualifying interests of the Buchan Ness to Collieston Coast SPA:

- AHEP
- Dounreay Tri – Hexicon
- EOWDC
- Hywind Scotland Pilot Park Project
- Kincardine Floating Offshore Wind Farm

12.5.3.2 The AAs for these projects concluded that there would no adverse effect on the site integrity of the Buchan Ness to Collieston Coast SPA, either in isolation or in-combination with other plans or projects, provided that

the conditions set out in the AAs and marine licences and s.36 consents were implemented and complied with. The proposed timeframes for the Development will overlap with the operational phases of the projects listed above. The AAs for these projects identified LSEs on the relevant qualifying interests of the SPA during the operational phases of the works as a result of collision risks and displacement and barrier effects.

12.5.3.3 Scottish Ministers have considered these projects in the in-combination assessment completed.

12.5.4 Assessment of in-combination effects on the Forth Islands SPA

12.5.4.1 The following projects have the potential to have a LSE on the relevant qualifying interests of the Forth Islands SPA:

- AHEP
- Dounreay Tri – Hexicon
- Forth Road Bridge Maintenance Works
- Hywind Scotland Pilot Park Project
- Kincardine Floating Offshore Wind Farm

12.5.4.2 The AAs for these projects concluded that there would no adverse effect on the site integrity of the Forth Islands SPA, either in isolation or in-combination with other plans or projects, provided that the conditions set out in the AAs and marine licences and s.36 consents were implemented and complied with. The AAs for these projects identified LSEs on the relevant qualifying interests of the SPA. Conditions were attached to the respective AAs, marine licences and s.36 consents to mitigate the impacts on the relevant qualifying interests of the SPA.

12.5.4.3 Scottish Ministers have considered these projects in the in-combination assessment completed.

2.5.5 Assessment of in-combination effects on the Outer Firth of Forth and St Andrews Bay Complex pSPA

2.5.5.1 The following projects have the potential to have a LSE on the relevant qualifying interests of the Outer Firth of Forth and St Andrews Bay Complex pSPA:

- Dounreay Tri – Hexicon
- Forthwind, Methil
- Kincardine Floating Offshore Wind Farm
- ORE Catapult – Levenmouth Demonstration Turbine
- Rosyth and Leith Harbour Maintenance Dredge and Sea Disposal

12.5.5.2 The Rosyth and Leith Harbour Maintenance Dredge and Sea Disposal operations are anticipated to conclude by February 2021, therefore, there may be minimal temporal overlap with the indicative construction schedule for the Development. The AA for these works concluded that there would be no adverse effect on site integrity due to the availability of extensive alternative areas of habitat, the ability of marine birds to

move away from the disposal operations and the long history of dredge spoil disposal at the location to be utilised.

12.5.5.3 The AAs for the offshore wind farm projects listed above (Dounreay Tri, Forthwind, Kincardine and ORE Catapult) concluded that there would no adverse effect on the site integrity of the Outer Firth of Forth and St Andrews Bay Complex pSPA, either in isolation or in-combination with other plans or projects, provided that the conditions set out in the AAs and marine licences and s.36 consents were implemented and complied with. Conditions were attached to the respective AAs, marine licences and s.36 consents to mitigate the impacts on the relevant qualifying interests of the SPA.

12.5.5.3 Scottish Ministers have considered these projects in the in-combination assessment completed.

12.5.6 Assessment of in-combination effects on the Moray Firth SAC

12.5.6.1 In addition to the Forth and Tay Developments, the following projects have the potential to have a LSE on the relevant qualifying interests of the Moray Firth SAC:

- AHEP
- Beatrice Offshore Wind Farm
- EOWDC
- Hywind Scotland Pilot Park Project
- Moray East Offshore Transmission Infrastructure
- Moray Offshore Eastern Development
- Port of Cromarty Firth – Phase 4 (Invergordon)

12.5.6.2 The AAs for these projects concluded that there would no adverse effect on the site integrity of the Moray Firth SAC, either in isolation or in-combination with other plans or projects, provided that the conditions set out in the AAs and marine licences and s.36 consents were implemented and complied with.

12.5.6.3 The construction works for the AHEP works and Port of Cromarty Firth Phase 4 development are scheduled to conclude by the end of February 2020 and March 2020 respectively and, therefore, prior to the commencement of offshore activities for the Development.

12.5.6.3 The AA for the Hywind, Beatrice and Moray East offshore wind farm works concluded that there would be LSE on the bottlenose dolphin qualifying interest of the SAC as a result of construction activities. Scottish Ministers have considered these projects in the in-combination assessment completed.

12.5.7 Assessment of in-combination effects on the Firth of Tay and Eden Estuary SAC

12.5.7.1 Repair works to the seawall, Guardbridge, Fife was the only project identified by Scottish Ministers as having a potential in-combination effect on the site integrity of the Firth of Tay and Eden Estuary SAC. The works will conclude by September 2021, therefore there may be temporal overlap with the timeframes for the Development. The works are of relatively small-scale and are scheduled to be carried out outside the period that the qualifying interests are present (1 October – 31 April each year).

12.5.7.2 Scottish Ministers have considered this project in the in-combination assessment completed.

12.5.8 Assessment of in-combination effects on the Berwickshire and North Northumberland Coast SAC

12.5.8.1 The Scottish Ministers identified no plans or projects apart from the Forth and Tay Developments which would have an in-combination effect with the Development on the site integrity of the Berwickshire and North Northumberland Coast SAC.

12.5.9 Assessment of in-combination effects on the Isle of May SAC

12.5.9.1 The AHEP was the only plan or project in addition to the Forth and Tay Developments identified by the Scottish Ministers as having potential in-combination effects on the Isle of May SAC with the Development. The AHEP AA concluded that there would be no adverse effect on the site integrity of the Isle of May SAC during the construction or operational phase of the works, provided that the conditions set out in the AA, to mitigate the impacts of underwater noise, vessel movements, reduced water quality and prey availability on the grey seal qualifying interest of the SAC.

12.5.9.2 Scottish Ministers have considered this project in the in-combination assessment completed.

APPENDIX 2: IN-COMBINATION ASSESSMENT – NORTH SEA OFFSHORE WIND FARMS

List of the North Sea Developments assessed for non-breeding season effects:

1. East Anglia 3
2. East Anglia 1
3. Hornsea 3
4. Blyth Demonstrator
5. Dogger Creyke Beck A&B
6. Dogger Teeside A&B
7. Dudgeon
8. Hornsea 1
9. Hornsea 2
10. Humber Gateway
11. Lincs
12. Race Bank
13. Sheringham Shoal
14. Teeside
15. Triton Knoll
16. Westermost Rough
17. Aberdeen demonstrator
18. Beatrice
19. Galloper
20. Greater Gabbard
21. Kentish Flats
22. London Array
23. Moray Firth 1
24. Thanet
25. Rampion

APPENDIX 3: DIFFERENCES BETWEEN 2014 AND 2018 SEABIRD ASSESSMENT METHODS

The table below identifies the main differences between the 2014 and 2018 assessment methodologies. These differences mean that a direct comparison of the results of the 2014 and 2018 assessments is not appropriate. Consequently, where results from 2014 and 2018 are presented in this document, the methodological differences identified here provide context.

Table 34 Differences in methodologies between the 2014 and 2018 assessments

Difference	2018 Method(s)	2014 Method(s)
1. Displacement (required for puffin, guillemot, razorbill and kittiwake).		
1. a) Overall method	Matrix approach used for all species, which applies an assumed displacement rate to the number of birds estimated to be present in the wind farm and surrounding buffer, and then a mortality rate is applied to those displaced birds. The Scoping Opinion noted the development of the SeabORD model which is an updated version of the Searle *et al* model used in the 2014 assessment. The model has not been used to inform this assessment as there is not yet agreement on how it should be used (i.e., what assumptions should be made when running the model). However, outputs from the SeabORD and Searle *et al* (2014) models have been presented in the EIA Report (Appendix 11D) to provide further context.	Assessment of kittiwake, razorbill and guillemot used effect estimated in Searle *et al* (2014) individual based simulation model of impacts of changes to time and energy budgets resulting from displacement from the wind farm and buffer on survival. Puffin assessment used the matrix approach.

	Modelling using SeabORD was undertaken for various scenarios, with the percentage of birds within each population assumed to be susceptible to displacement being equivalent to the species-specific displacement rates stated in the Scoping Opinion. All displacement susceptible birds were assumed to be susceptible to barrier effects. Outputs were also produced using the Searle et al (2014) model and when compared, the outputs from the two models demonstrated little evidence of a close correlation between the chick and adult mortalities presented when a heterogeneous prey distribution was used. Direct comparison between the predicted effects from the SeabORD and SNCB matrix models were limited to predicted adult mortality during the breeding period, due to differences in the outputs produced by both models. Comparison suggests that SeabORD estimates of adult mortality during the breeding period may be unrealistically high for some SPA populations (in particular the Forth Islands SPA).	
1. b) seabird data informing method	At sea density estimates	Tracking data from adult birds tagged at breeding colonies

1. c) output	Change to adult survival rate	Changes to adult survival and productivity rates
1. d) buffer area	All birds displaced from 2km buffer around offshore wind farm	All birds avoid a 1km buffer around offshore wind farm
1. e) non-breeding season	Assessed for Forth and Tay Developments	Not assessed
2. Collision Risk Modelling (CRM) differences		
2 a) (CRM) – Band model option	Assessment is based on Band model Option 2. The Option 2 model assumes an even distribution of birds across the rotor swept heights. Option 1 outputs have been provided using site-specific data to provide further context.	Assessment was based on Band model Option 3. The Option 3 model assumes the observed distribution of birds across the rotor swept heights and calculates the appropriate collision risk at each height.
2 b) CRM - avoidance rates	Kittiwake & gannet 98.9% Herring gull 99.5%	All species 95%
2 d) CRM- nocturnal activity	Nocturnal activity scores of 2 (25%) should be used for herring gull and kittiwake and 1 (0%) for gannet).	Nocturnal activity scores of 2 (25%) should be used for herring gull and kittiwake and 2 (25%) for gannet).
2 f) CRM – non breeding season	Scope of quantitative assessment includes all the North Sea Developments for gannet and kittiwake.	Scope of quantitative assessment limited to Forth and Tay Developments, with qualitative consideration given to the North Sea Developments other UK offshore wind farms.
3. Apportioning		
3. a) non-breeding season	BDMPS (Furness, 2015) used for gannet and kittiwake following SNH scoping advice.	None

3. b) non-breeding season months	Gannet – Autumn, October to November; Spring, December to mid-March Kittiwake – Autumn, September to December; Spring, January to mid-April Guillemot and razorbill all non-breeding season impacts should be assigned to SPA as per the breeding season.	N/A
3. c) Age classes	Using proportions derived from at sea survey data or, if not available, PVA stable age structure	
3. d) breeding season	Apportioned to SPA and non-SPA colonies using seabird 2000 data and then between SPA colonies using most recent count data. Used SNH apportioning approach for all species.	Species and colonies included in Searle et al displacement model did not require apportioning of displacement effects. For other species and collision effects, the SNH approach and seabird 2000 data were used.
4. Population Viability Analysis ("PVA")		
4. a) population modelling approach	Stochastic Leslie matrix PVA	Bayesian state-space models for most populations.
4. b) effect period	25 and 50 years	25 years
4. c) effect scenarios	Reductions in survival of all age classes estimated for the wind farm in isolation, with the other existing 2014 consented Forth and Tay Developments, and with the other consented or operational offshore wind farms in the eastern UK.	A range of reductions in adult survival and productivity values that were selected and run prior to the wind farm/s effects being known.