



Document Reference	IC02-INT-EC-OFC-017-INC-STR-001	Revision	4
Date	24/11/2025		
Date of Next Review	As Required		
Classification	Public		

Inch Cape Offshore Wind Farm Project Environmental Monitoring Programme – Generating Station (PEMP - GS)

Ornithology Monitoring Strategy

Inch Cape Acceptance

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Revision History (previous five)

Date	Rev.	Purpose of Issue	Description of revision	Initials
11/03/2025	00	First draft	First draft for FTRAG-O consultation	EMA
27/06/2025	01	PEMP Appendix	First issue for PEMP-GS Rev 0	EMA
16/10/2025	02	Review	Update following PEMP-GS Rev 1 consultation	EMA
20/11/2025	03	Review	Update following PEMP-GS Rev 2 consultation	EMA
24/11/2025	04	Review	Update following consultation	EMA

Template Reference: IC02-INT-QU-TEM-ECO-INC-TEM-002

Template Revision: 1

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Acronyms & Abbreviations

Acronym	Term
AA	Appropriate Assessment
BTO	British Trust for Ornithology
CoP	Construction Programme
DAS	Digital Aerial Survey
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
ES	Environmental Statement
F&T	Forth and Tay
FTRAG	Forth and Tay Regional Advisory Group
GPS	Global Positioning System
GS	Generating Station
HPAI	Highly Pathogenic Avian Influenza
ICOL	Inch Cape Offshore Limited
JNCC	Joint Nature Conservation Committee
MD-LOT	Marine Directorate - Licensing Operations Team
MD-SEDD	Marine Directorate-Science, Evidence, Data and Digital
MMO	Marine Management Organisation



Acronyms & Abbreviations

Acronym	Term
MS-LOT	Marine Scotland - Licensing Operations Team (now MD-LOT)
NnG	Neart na Gaoithe
OfTI	Offshore Transmission Infrastructure
OWF	Offshore Wind Farms
PEMP	Project Environmental Monitoring Programme
PEMP- OfTI	Project Environmental Monitoring Programme – Offshore Transmission
PEMP-GS	Project Environmental Monitoring Programme – Generating Station
RSPB	Royal Society for the Protection of Birds
SCNB	Statutory Nature Conservation Bodies
ScotMER	Scottish Marine Energy Research
SFF	Scottish Fishermen’s Federation
SNH	Scottish Natural Heritage (now NatureScot)
SPA	Special Protection Area
ToR	Terms of Reference
UK	United Kingdom
UKCEH	UK Centre of Ecology and Hydrology
WTG	Wind Turbine Generator



Glossary

Defined Term	Meaning
Development	The Inch Cape Offshore Wind Farm (the Wind Farm) and Offshore Transmission Infrastructure (OfTI) being developed by ICOL.
Development Area	The area for the Wind Farm, within which all WTGs, IACs, interconnector cables, OSP and the initial part of the Offshore Export Cable and any other associated works must be sited. As stipulated in the Crown Estate agreement for lease.
2013 Environmental Statement (ES)	Refers to the document in which the Environmental Impact Assessment (EIA) was detailed for the Inch Cape 2014 Consent.
2018 Environmental Impact Assessment (EIA) Report (EIAR)	Refers to the document produced in 2018 to accompany the application for Consent of the Development (granted in 2019) following a material change in design.
The Forth and Tay Regional Advisory Group Ornithology Sub-Group (FTRAG-O)	A forum established to discuss and agree appropriate bird monitoring for the Firth of Forth and Tay offshore wind farms, and to develop effective post-consent monitoring programmes and share ornithology data.
Inch Cape Offshore Transmission Infrastructure (OfTI)	The offshore export cable and OSP, which are components of the Development, are permitted under the OfTI Marine Licence (MS-00010593), granted on 23 rd August 2023 and amended on 9 th November 2023. The current Marine Licence is a variation of the revised design consent granted on 17th June 2019 (No. 06782/19/0)
Inch Cape Offshore Transmission Works (OfTW)	Offshore Transmission Works (i.e., construction methods) associated with Inch Cape Offshore Wind Farm.



Defined Term	Meaning
Inch Cape Offshore Wind Farm (OWF)/the Wind Farm	A component of the Development, comprising wind turbines and their foundations and substructures, and IACs.
Inch Cape Onshore Transmission Works (OnTW)	Onshore transmission works associated with the Inch Cape Offshore Wind Farm comprising the construction, operation and decommissioning of an onshore substation, electricity cables and associated infrastructure required to export electricity from the Inch Cape Offshore Wind Farm to the National Electricity Transmission System.
Offshore Export Cables	The subsea, buried or protected electricity cables running from the offshore wind farm substation to the landfall and transmitting the electricity generated to the onshore cables for transmission onwards to the onshore substation and the electrical grid connection.
Offshore Export Cable Corridor	The area within which the Offshore Export Cables will be laid from the OSP and up to Mean High Water Springs.
(The) Consents	Collective term used to describe the Section 36 consents and Marine Licences issued to ICOL.



1 Executive Summary

Requirements for ornithology monitoring form part of the conditions attached to the Section 36 consent and the Marine Licences for the Development. The monitoring aims to verify key predictions from the environmental assessments supporting the consent application, while contributing to wider strategy relevance monitoring

A review of the ornithology baseline and assessment of impacts resulting from the Development was undertaken based on the 2018 EIAR and HRA (ICOL, 2018a; ICOL, 2018b). This was considered alongside key drivers for monitoring as discussed at meetings held with the Forth and Tay Regional Advisory Group – subgroup ornithology (FTRAG-O) since 2015.

The key effects arising from developments in the Forth and Tay (F&T) around which the monitoring strategy has been developed are: (1) effects from displacement and barrier effects on kittiwake, puffin, razorbill and guillemot, and (2) collision effects on gannet and kittiwake. In particular during the breeding season, and associated to Special Protected Area (SPA) populations in the F&T.

The following monitoring approach is proposed:

- Site Specific Monitoring, comprising pre- and two years of post-construction Digital Aerial Surveys;
- Regional Monitoring, consisting of contributing to ongoing regional monitoring at the Forth and Tay, including:
 - GPS Tracking and colony monitoring at Isle of May;
 - GPS Tracking and colony monitoring at St Abbs and Fowlsheugh; and
 - Gannet adult survival and tagging at Bass Rock, Scotland, and Grassholm, Wales, used as a control site.

Consideration is also being given to a contribution to the Seabird Interaction Study. The study is being conducted by STRIX, and funded by NnG, Seagreen and Berwick Bank offshore wind farms. The potential for ICOL contribution to this study is being discussed with the funding group.



2 Introduction

2.1 Background

The Inch Cape Offshore Wind Farm (the Wind Farm) and Offshore Transmission Infrastructure (OfTI), hereafter referred to as the Development, is being developed by Inch Cape Offshore Limited (ICOL).

ICOL originally applied for consent for the Development in 2013, and this was updated, and a revised application submitted in 2018. In 2013 an Environmental Statement (ES) was produced to accompany the initial application based on the original design of the Wind Farm. This was also subsequently updated in 2018 with the production of an Environmental Impact Assessment Report (EIAR) to enable the use of progressions in technology following the original consent, through a reduction in turbine numbers (fewer turbines with larger generating capacity), and reduction in associated cabling (inter-array and export cables) in order to maximise efficiencies whilst minimising environmental impacts.

The Section 36 Consent, Generating Station (GS) Marine Licence, and OfTI Marine Licence for the revised design were granted by Scottish Ministers on 17th June 2019. The Section 36 Consent was subsequently varied on 16th July 2020, 22nd July 2021, and 14th June 2023, the GS Marine Licence was varied on 14th June 2023 (Licence No. MS-00010140); and the OfTI Marine Licence varied on 23rd August and amended on 9th November 2023 (Licence No. MS-00010593).

2.2 Purpose of this document

This document outlines the rationale and specification of the proposed ornithology monitoring for the Wind Farm.

This document has been produced to communicate to stakeholders the proposed approach to monitoring and inform the Project Environmental Monitoring Programme (PEMP), as required by the Inch Cape Offshore Wind Farm Section 36 Consent conditions 24 and 25, Offshore Energy Generating Station (GS) Marine Licence (MS-00010140) conditions 3.2.2.21 and 3.2.2.22. These include conditions relating to the Regional Advisory Group (RAG) which will require to be consulted on with respect to monitoring. No requirements for bird monitoring were included in the OfTI Marine Licence.

Due to the Project Timelines, two separate PEMP's are being developed to address the GS and Offshore Transmission Infrastructure (OfTI) permit requirements, the PEMP-GS and PEMP-OfTI, respectively. Ornithological monitoring is relevant only to PEMP-GS.

2.3 Approach to Ornithological Monitoring

The proposed approach to ornithological monitoring takes into consideration the following:

- The baseline conditions of the Development Area (i.e. the results of the 2018 Environmental Impact Assessment (EIA) Report baseline characterisation);



- The predictions of the impact assessment for ornithological receptors, and degree of certainty in these predictions, made in the revised Environmental Impact Assessment Report (EIAR) (ICOL, 2018a);
- The mitigation and monitoring commitments outlined in the 2018 EIAR (ICOL, 2018a);
- The findings of the Ornithology Habitats Regulations Appraisal and Information to Support Appropriate Assessment (ICOL, 2018b);
- The findings of the 2019 Appropriate Assessment (Marine Scotland, 2019);
- The further technical considerations arising from the 2022 Section 36 Variation, for which an updated collision risk estimate report was prepared in support of the application (ICOL, 2022a);
- Collision risk estimates updated for the 2024 final design (Royal HaskoningDHV, 2024);
- The outcomes/recommendations of published reports on monitoring at other offshore wind farm (OWF) sites in the UK (and overseas) and existing data on the sensitivity and recoverability of receptors as relevant; and
- The Forth and Tay Regional Advisory Group Ornithology Sub-Group (FTRAG-O) agreed objectives for bird monitoring for the Firth of Forth and Tay offshore wind farms (FTRAG-O 2016).

In line with S36 consent and Marine Licence conditions, the ornithology monitoring aims to monitor environmental impacts to verify key predictions from the environmental assessments supporting the consent application for the Wind Farm, while contributing to wider strategy relevance monitoring.



3 The Development

3.1 Project Description

The Wind Farm will be located approximately 15 to 22 km (eight to 12 nautical miles) off the Angus coastline, to the east of the Firth of Tay. The Development Area is approximately 150 km² in area and will contain 72 (Wind Turbine Generators) WTGs, one Offshore Substation Platform (OSP), 66 kilovolts (kV) inter-array cabling and the initial section of the Export Cables between the Development Area boundary and OSP.

The Offshore Export Cables will be installed within the Offshore Export Cable Corridor (ECC), and will consist of two 220 kV export cables approximately 85 km long, between the landfall point at Cockenzie in East Lothian and the OSP within the Development Area. The ECC is approximately 1.4 km wide across at the widest point, reducing to approximately 250 m when approaching the landfall. The location and Wind Farm layout are illustrated in Figure 3.1 and Figure 3.2.

Offshore construction is currently expected to commence June 2025 and is anticipated to take over two years, running to August 2027. Details of the full programme for the construction works are provided in the Construction Programme (CoP) (IC02-INT-EC-OFC-004-INC-PRG-001).

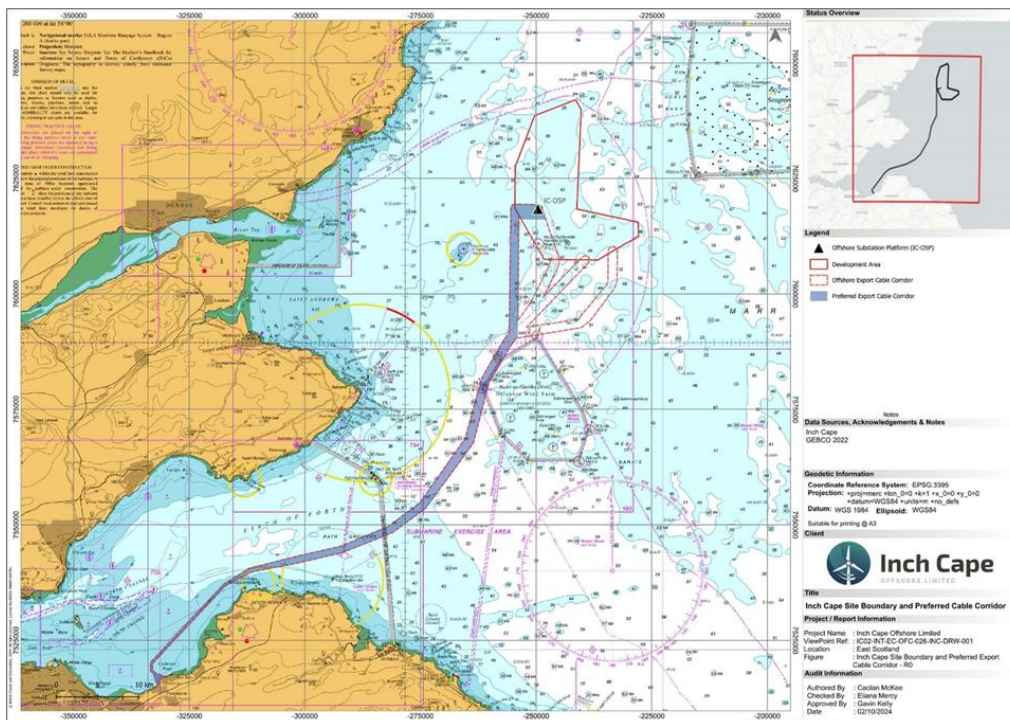


Figure 3.1: Inch Cape project location

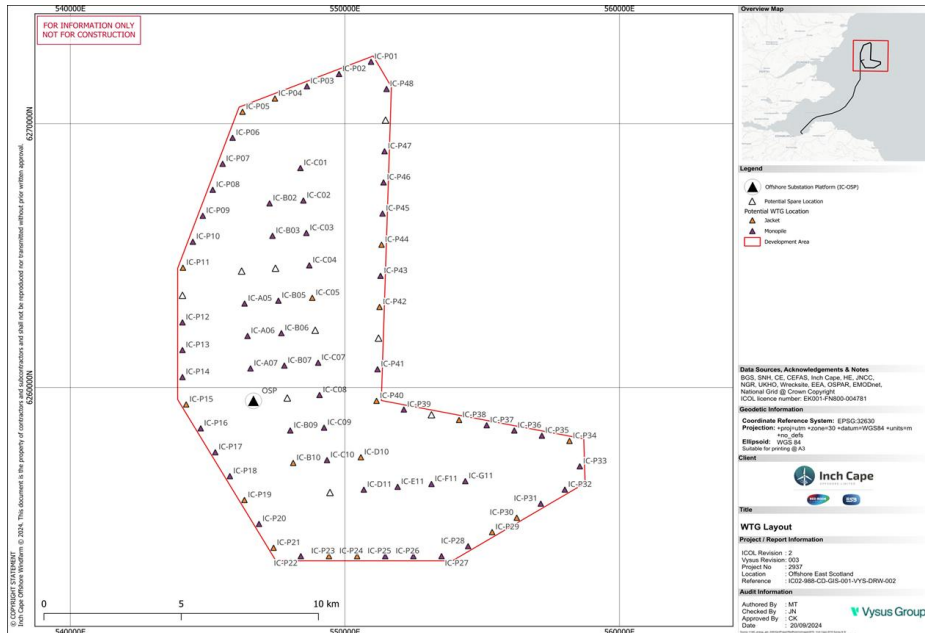


Figure 3.2: Generating station infrastructure layout

4 Baseline Summary

This section provides a brief overview of the ornithology baseline conditions at the Inch Cape Offshore Wind Farm, as outlined in the 2018 EIAR (ICOL,2018a) and the HRA (ICOL, 2018b).

The baseline conditions identified in the development area and informed during the 2018 EIAR indicated that potentially important numbers of protected bird species were regularly using the development area throughout the year, but particularly during the breeding period. During the breeding season, the Development Area lies within the foraging ranges of several seabird species from a number of important breeding colonies, including those designated as Special Protection Areas (SPAs) (as shown in Figure 4.1).

Based on the results of the boat-based baseline surveys, the desk-based assessment and the Scoping Opinion (Marine Scotland, 2017), the species considered for assessment in the Development Area were:

- **Gannet:** recorded in all months of the year and in every survey;
- **Kittiwake:** recorded in all months of the year and in all but one survey;
- **Puffin:** recorded in all months of the year and in all but one survey;
- **Guillemot:** recorded in all months of the year and in all but one survey;
- **Razorbill:** recorded in all months of the year and in all but one survey; and



- **Herring gull:** recorded in all months of the year and in 18 (of 24) boat-based surveys, with abundance being highest in winter and overall considerably lower than for the other species listed above.

The breeding populations of the above species were scoped into the assessment, although the assessment also considered the potential impacts to these breeding populations during the non-breeding season where relevant. The sites for which the breeding populations of the key species identified are qualifying features (or named components of the breeding seabird assemblage qualifying feature) and which were screened in for assessment in the HRA are:

- **Forth Islands SPA:** south-west of the Development Area, this site covers islands of the Isle of May, Inchmickery, Fidra, The Lamb, Craigleith and Bass Rock;
- **Fowlsheugh SPA:** north-west of the Development Area, designated as an assemblage of more than 20,000 seabirds;
- **St Abb's Head to Fast Castle SPA:** south-west of the Development Area. A mainland seabird SPA of multiple colonies along the coast of Berwickshire;
- **Buchan Ness to Collieston Coast SPA:** north-west of the Development Area, consists of multiple mainland colonies along the coast of Aberdeenshire;
- **Outer Firth of Forth and St Andrews Bay Complex SPA¹:** a large estuarine/marine site encompassing the outer Firths of Forth and Tay and adjacent marine areas. This site was a proposed SPA (pSPA) during the 2018 assessments, and was fully classified in December 2020.

¹ The Outer Firth of Forth and St Andrew's Bay Complex SPA differs from the other SPAs that were considered in the assessment because it is concerned with the protection of supporting intertidal and marine habitats for seabird, and other waterbird, species during both breeding and non-breeding periods, whilst the other SPAs are concerned with the protection of the breeding colony populations of seabird species.

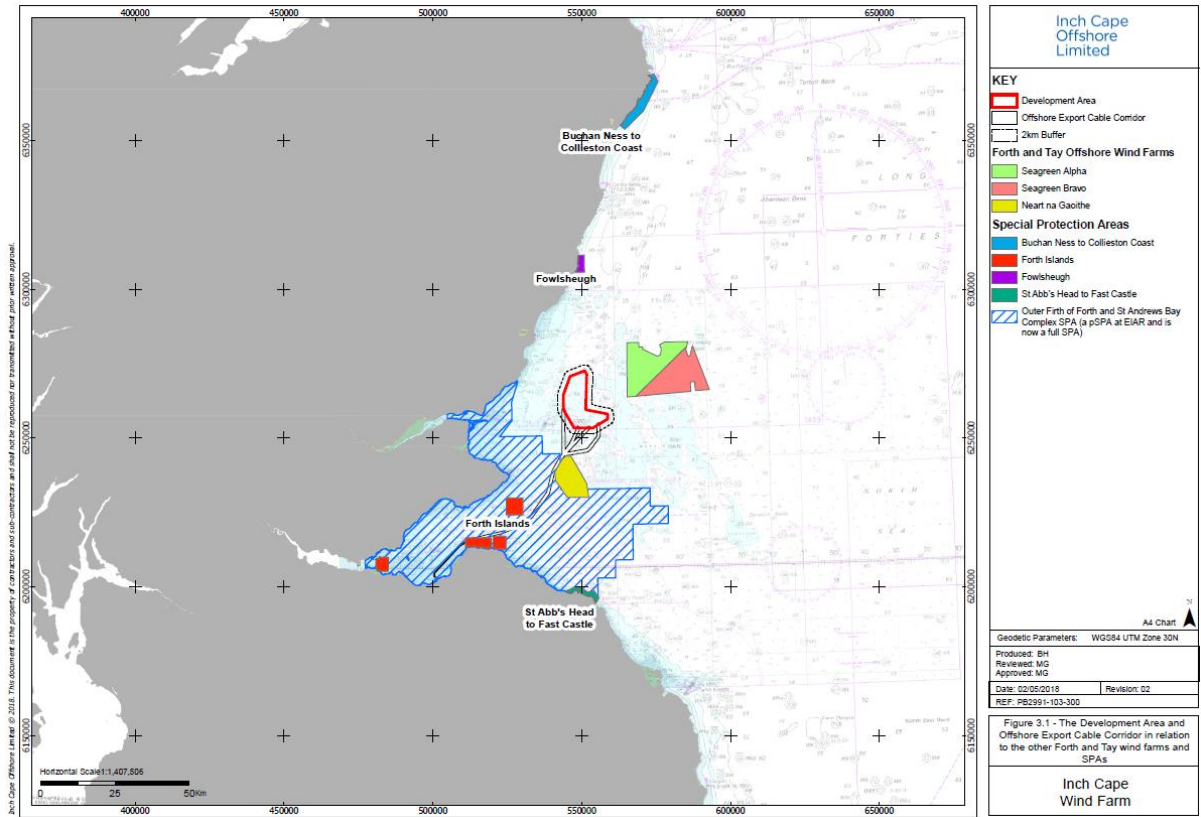


Figure 4.1 The Development Area and Offshore Export Cable Corridor in relation to the other Forth and Tay wind farms and SPAs and pSPAs with connectivity



5 Impact Assessment Summary

This section provides a brief summary of the ornithology impact assessments at the Inch Cape Offshore Wind Farm, as outlined in the 2018 EIAR (ICOL, 2018a), HRA (ICOL, 2018b), the 2022 variation supporting information (ICOL, 2022a), the updated collision risk estimates for the 2022 variation (ICOL, 2022b) and collision risk estimates updated for the 2024 final design (Royal HaskoningDHV, 2024).

The ornithology impact assessment for the revised design of the Wind Farm focussed on the potential effects resulting from displacement, barrier effects and the risk of collisions due to the presence of the Wind Farm during operation (ICOL, 2018a), with the assessment undertaken in relation to regional and SPA breeding populations, of each of the species listed in Section 4, and including the impacts arising on these breeding populations during the non-breeding season where relevant.

Effects relating to the construction of the GS infrastructure were scoped out of assessment, as these were considered to be unlikely to lead to significant effects and sufficient information was considered to be available to enable this conclusion (as agreed during the scoping process in 2017).

The assessment also considered the bird species and qualifying features of the Outer Firth of Forth and St Andrews Bay Complex SPA. However, in relation to this latter SPA the assessment was concerned with the potential effects associated with the construction and maintenance of the Offshore Export Cables, as opposed to those associated with the Wind Farm, and therefore is not relevant to the GS.

Displacement and barrier effects were not considered for gannet or herring gull. This is because of the particularly large foraging range of gannet during the breeding season, and the fact that there is little evidence for the occurrence of displacement and barrier effects for herring gulls. It should be noted that subsequent to this, NatureScot (2023) advice has changed, such that the potential impacts from displacement and barrier effects have been considered in more recent offshore wind farm assessments (e.g. for the Berwick Bank Wind Farm) but the monitoring proposed here has the potential to estimate such effects and potential impacts (e.g. via the DAS programme and support to the gannet survival study). Collision impacts are not considered for the three auk species (puffins, guillemots and razorbills) because of their low flight heights, meaning that almost all flights are well below the rotor swept area (See Table A.1 provided in Appendix A Impact Assessment Summary Tables).

No significant effects on regional populations or adverse effects on the integrity of the SPAs were identified in the 2018 EIAR (ICOL, 2018a) and HRA (ICOL, 2018b). For the project alone, effects were assessed to be up to minor significance. Of the impact pathways and populations considered



(including those relevant to the pSPA²), the largest potential effects were identified in the cumulative assessment, where moderate but non-significant effects were associated with gannet, kittiwake, guillemots and razorbill. Negligible and minor cumulative effects were associated with puffin and herring gull.

In the Appropriate Assessment (Marine Scotland, 2019), ministers concluded 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 pSPA² in respect to the qualifying interest as a result of the Development in isolation or in-combination with the other Forth and Tay Developments or the projects.

In 2022, a Preferred Design Scenario was proposed, with changes in the design and turbine spacing. A Variation Report (ICOL, 2022a) was produced, and it was confirmed that changes pertinent to the Preferred Design Scenario did not affect ornithology collision risk modelling (CRM). A Finalized Design was later confirmed in 2024, with the submission of the Inch Cape Development Specification and Layout Plan (DSLPL).

The collision estimates for the two designs assessed in the 2018 assessment (ICOL, 2022a and b), the 2022 Preferred Design Scenario, and the 2024 Finalised Design (Royal HaskoningDHV, 2024) as calculated using the deterministic Band (2012) model (as used for the 2018 EIA assessment) are provided in Table A.1 provided in Appendix A Impact Assessment Summary Tables.

The 2024 and 2022 review identified no new materially different impacts, and so no changes which would affect the cumulative or in-combination effects or the conclusions of the Habitats Regulations Assessment (HRA) (ICOL, 2018b).

² This site was a proposed SPA during the 2018 assessments, and was fully classified in December 2020.



6 Monitoring Commitments and Relevant Conditions

6.1 Monitoring Commitments in the EIAR 2018

The EIAR 2018 anticipated that pre-, during and post-construction would provide valuable data on the predicted and actual effects of the Development on the key bird species.

The EIAR 2018 proposed working with Marine Directorate - Licensing Operations Team (MD-LOT) and other stakeholders, including through forums such as the Forth and Tay Regional Advisory Group – ornithology sub-group (FTRAG-O), to develop effective post-consent monitoring programmes and share ornithology data, with a view to informing and further developing best practice measures.

6.2 Section 36 Consent and Marine Licence Conditions

The Section 36 Consent, Generating Station (GS) Marine Licence, and OfTI Marine Licence for the revised design were granted by Scottish Ministers on 17th June 2019. The Section 36 Consent was subsequently varied on 16th July 2020, 22nd July 2021, and 14th June 2023, the GS Marine Licence was varied on 14th June 2023 (Licence No. MS-00010140); and the OfTI Marine Licence varied on 23rd August and amended on 9th November 2023 (Licence No. MS-00010593).

The S36 Condition 24, GS Marine Licence condition 3.2.2.21, and OfTI Marine Licence Condition 3.2.2.18 provide the requirement for the PEMP, as described below:

- The Company/ Licensee must, no later than six months prior to the Commencement of the Development/ Works, submit a Project Environmental Monitoring Programme (“PEMP”), in writing, to the Scottish Ministers/ Licensing Authority for their written approval. Such approval may only be granted following consultation by the Scottish Ministers/ Licensing Authority with SNH (now NatureScot), RSPB Scotland, WDC, SFF, FMS and any other environmental advisors or organisations as required at the discretion of the Scottish Ministers/ Licensing Authority. The PEMP must be in accordance with the Application as it relates to environmental monitoring.
- The PEMP must set out measures by which the Company/Licensee must monitor the environmental impacts of the Development. Monitoring is required throughout the lifespan of the Development where this is deemed necessary by the Scottish Ministers/ Licensing Authority. Lifespan in this context includes pre-construction, construction, operational and decommissioning phases.
- The Scottish Ministers/ Licensing Authority must approve all initial methodologies for the above monitoring, in writing and, where appropriate, in consultation with the FTRAG.
- Monitoring must be done in such a way so as to ensure that the data which is collected allows useful and valid comparisons between different phases of the Development. Monitoring may also serve the purpose of verifying key predictions in the Application. In the event that further potential



adverse environmental effects are identified, for which no predictions were made in the Application, the Scottish Ministers/ Licensing Authority may require the Company/Licensee to undertake additional monitoring.

- The PEMP must cover, but not be limited to, the following matters:
 - a. Pre-construction, construction (if considered appropriate by the Scottish Ministers/ Licensing Authority) and post-construction monitoring or data collection as relevant in terms of the Application, and any subsequent monitoring or data collection for:
 1. Birds; [Generating Station Marine Licence and S36 only]
 2. Marine Mammals;
 3. Commercial Fisheries;
 4. Marine fish;
 5. Diadromous fish;
 6. Benthic communities; and
 7. Seabed scour and local sediment deposition.
 - b. The participation by the Company/Licensee to contribute to data collection or monitoring of wider strategic relevance, identified and agreed by the Scottish Ministers/ Licensing Authority.
- Due consideration must be given to the Scottish Marine Energy Research (“ScotMER”) programme, or any successor programme formed to facilitate these research interests.
- Any pre-consent monitoring or data collection carried out by the Company/Licensee to address any of the above issues may be used in part to discharge this condition subject to the written approval of the Scottish Ministers/ Licensing Authority.
- The PEMP is a live document which will be regularly reviewed by the Scottish Ministers/ Licensing Authority, at timescales to be determined by them to identify the appropriateness of on-going monitoring. Following such reviews, the Scottish Ministers/ Licensing Authority may, in consultation with the FTRAG require the Company to amend the PEMP and submit such an amended PEMP, in writing, to the Scottish Ministers/ Licensing Authority, for their written approval. Such approval may only be granted following consultation with the FTRAG and any other environmental, or such other advisors as may be required at the discretion of the Scottish Ministers/ Licensing Authority.



- The Company/Licensee must submit written reports and associated raw and processed data of such monitoring or data collection to the Scottish Ministers/ Licensing Authority at timescales to be determined by them. Consideration should be given to data storage, analysis and reporting and be to Marine Environmental Data and Information Network standards.
- Subject to any legal restrictions regarding the treatment of the information, the results are to be made publicly available by the Scottish Ministers/ Licensing Authority, or by such other party appointed at their discretion.
- The Scottish Ministers/ Licensing Authority may agree, in writing, that monitoring may be reduced or ceased before the end of the lifespan of the Development.

The S36 Condition 25, GS Marine Licence condition 3.2.2.22, and OfTI Marine Licence Condition 3.2.2.19, also set up the requirements for ICOL participation at the Forth and Tay Regional Advisory Group, the FTRAG, as described below:

- The Company/Licensee must participate in the Forth and Tay Regional Advisory Group (“FTRAG”) or any successor group, established by the Scottish Ministers/ Licensing Authority for the purpose of advising the Scottish Ministers/ Licensing Authority on research, monitoring and mitigation programmes for, but not limited to, ornithology, marine mammals, diadromous and commercial fish. The extent and nature of the Company’s/Licensee’s participation in the Regional Advisory Group is to be agreed by the Scottish Ministers/ Licensing Authority.



7 Consultation

Discussions regarding the requirements for ornithology monitoring in the Forth and Tay began in 2015, with the formation of the Ornithology group within the Forth and Tay Regional Advisory Group (FTRAG-O). The FTRAG was set up to meet the requirements of the section 36 and associated marine licence conditions attached to consents granted for offshore wind farms in the Forth and Tay region.

As part of FTRAG, an ornithology subgroup (FTRAG-O) was established in 2015 to discuss and agree appropriate seabird monitoring for the Firth of Forth and Tay OWFs, which includes Inch Cape Offshore Wind Farm, Neart na Gaoithe Offshore Wind Farm (NnGOWL) and Seagreen (formerly referred as Seagreen Alpha and Bravo). In 2021, the subgroup later expanded to include Berwick Bank, formerly Seagreen Phases 2 & 3, with limited membership. In addition to the F&T Developers, the group included representatives from a number of organizations, including: Marine Directorate-Science, Evidence, Data and Digital (MD-SEDD) (formerly Marine Scotland Science (MSS)), MD-LOT (formerly Marine Scotland - Licensing Operations Team (MS-LOT)), NatureScot (formerly SNH), the Royal Society for the Protection of Birds (RSPB). Summaries of meetings relevant to the development of ornithological monitoring are provided in Table 7.1.

Table 7.1: FTRAG-O discussions on ornithological monitoring

Date	Details of Consultation	Relevant Consultation
29 th June 2015	FTRAG-O meeting	<p>The Terms of Reference (ToR) were circulated. Discussion was held on MSS document 'Key Post Consent Monitoring Questions in the Forth & Tay' (MSS, 2015). It was acknowledged that while there may be differences in concerns and priorities between the developers, there would also be similarities to be found, in particular for cumulative impacts, and where these exist, cooperation in developing monitoring strategies and approaches between the developers should be encouraged.</p> <p>Key species, priority protected sites and impact mechanism questions and metrics of interest for receptors were presented to the group for their consideration.</p>
3 rd September 2015	FTRAG-O meeting	<p>The key species for monitoring and their priority were determined to be gannet, kittiwake, guillemot, razorbill and puffin. The main Special Protection Areas (SPAs) of concern were agreed to be the Forth Islands SPA and to a lesser extent Fowlsheugh SPA. Strategies to monitor collision risk and displacement effects were identified as key areas of focus.</p>
17 th November 2015	FTRAG-O meeting	<p>Further discussion was held on revisions on the MSS document 'Key Post Consent Monitoring Questions in the Forth & Tay' (MSS, 2015), in particular regarding the key questions that might be answered through</p>



Date	Details of Consultation	Relevant Consultation
		<p>monitoring and areas for improved clarity in the document were discussed.</p> <p>NnGOWL shared information on discussions held with the UK Centre of Ecology and Hydrology (UKCEH) to explore potential methods to identify the potential effects of displacement and barrier effects on key seabird species. MSS provided progress on gannet tagging and colour ringing studies being undertaken at Bass Rock by Leeds University.</p>
26th January 2016	FTRAG-O meeting	<p>Guest Presenters spoke on the current and future seabird tagging studies being undertaken in the Forth & Tay area. The UKCEH presented on how by tagging a variety of key seabird species breeding on the Isle of May it may be possible to assess the potential impacts from displacement and barrier effects. Presentations were also given outlining the potential for assessing possible impacts on breeding gannets at the Bass Rock by undertaking a colour ringing study to monitor breeding success and adult survival at the colony, and methods for measuring the flight heights of gannets using pressure based altitude loggers.</p> <p>The MSS 2015 document was updated to 'Seabird Monitoring for Forth and Tay Offshore Wind Farms – Discussion Document, January 2016' (MSS, 2016). Further updates were discussed.</p>
23rd March 2016	FTRAG-O meeting	<p>NnGOWL Pre-Construction Ornithology Monitoring Proposal was shared for discussion. This included Digital Aerial Surveys (DAS) and tagging and tracking programme at the Isle of May for a selection of key seabird species including: puffin, razorbill and kittiwake. The group generally agreed to the proposed approaches. Considerations to a potential collision study using turbine mounted camera and radar systems was introduced.</p> <p>The appropriateness for using seabird tagging and ringing to monitor potential wind farm impacts was discussed, in particular in relation to adult gannet survival works and detection of population level effects.</p>
4th October 2018	FTRAG-O meeting	<p>Summary of monitoring undertaken at NnG was shared, including preliminary results from seabird Global Positioning System (GPS) tracking surveys from the 2018 breeding season on the Isle of May.</p>
2nd July 2019	FTRAG-O meeting	<p>FTRAG were informed of the collaborative digital aerial survey (DAS) programme being undertaken across all F&T wind farms (Inch Cape, NnG, and Seagreen) (plus appropriate buffer area) in the Forth and Tay area that started in April 2019, and was programmed to undertake monthly surveys up until April 2020.</p> <p>There were discussions on the collection of data during construction period, in relation to a potential 5 years gap between pre- and post-construction.</p>

Date	Details of Consultation	Relevant Consultation
		<p>Discussion on DAS bird monitoring buffer distances highlighted that Inch Cape proposed to use a 4km buffer around the wind farm. There was agreement that 4km buffer was sufficient, and that the minimum buffer should be 4km.</p> <p>It was flagged that the Bass Rock colour ringing study funding was coming to an end in 2019, and the potential for the F&T developers to pick up on this funding has been discussed in the past. It was understood that any breaks in the data collection could affect the future value of the data when looking at potential population level impacts. It was noted that this was a long-term study and would analyse adult survival rather than just wind farm impacts, and could potentially be taken forward as a strategic study e.g. by government, in the future.</p>
<p>30th January 2020</p>	<p>FTRAG-O meeting</p>	<p>HiDef's method report was circulated, detailing current survey area, methods and approach to coverage and survey progress to date. FTRAG were briefed on the combined surveys which commenced April 2019 across all wind farms plus buffers.</p> <p>Details of a draft proposal prepared by UKCEH and RSPB for GPS tracking and colony monitoring at Isle of May (within Forth Islands SPA), Fowlsheugh and St.Abb's Head were shared.</p> <p>The main aim of the proposal was individual-based approach, whereby the behaviour and distribution at sea (obtained from GPS loggers), energetics/condition and demography is estimated at the individual not population level. A second aim was to expand monitoring at St Abb's Head and Fowlsheugh (kittiwake) and Isle of May (kittiwake, razorbill, puffin and guillemot).</p> <p>Discussion held on support that could be provided to the gannet colour ringing to monitor survival rates at the Bass Rock and potential 'control' colonies, including Grassholm or a third colony.</p> <p>A proposed joint collision/avoidance study was discussed, which would be a joint study between NnG, Inch Cape and Seagreen</p>
<p>12th November 2020</p>	<p>FTRAG-O meeting</p>	<p>FTRAG were updated on the DAS progress on the NnG, Seagreen and Inch Cape survey areas being undertaken by HiDef.</p> <p>An update was provided by RSPB on GPS tracking and colony monitoring programmes. Restrictions during the COVID pandemic affected work at Fowlsheugh and St. Abb's, but the 3rd consecutive year of tracking of the 4 target species had been possible at Isle of May (kittiwake, guillemot, razorbill and puffin).</p> <p>An overview of the gannet adult survival study at the Bass Rock and Grassholm colonies was provided. Seagreen and NnG committed to</p>



Date	Details of Consultation	Relevant Consultation
		<p>funding this work between 2020 – 2024.</p> <p>An update on progress towards awarding a contractor to undertake a collaborative Seabird Interactions Study at NnG was shared, and programme of the ScotMer symposium discussed.</p>
<p>16th November 2021</p>		<p>Updates were given on the tracking and colony monitoring at the Isle of May in the 2021 breeding season. The two key questions are: (1) Do changes in demographic rates occur between the pre-construction, construction and operation period?; (2) Can we attribute these effects to offshore renewable developments vs other drivers?</p> <p>A power analysis was conducted to examine what sample size would be needed to detect particular levels of percentage change in both survival and breeding success, presented in April 2021, with a recommendation to increase the sample size of tagged birds in future years.</p> <p>Updates were given on the kittiwake tracking and colony monitoring at the Isle of May, Fowlsheugh and St Abb's Head, and gannet adult survival study on the Bass Rock and Grassholm colonies, including results from a power analysis for the gannet study</p> <p>A summary presentation on the Seabird Interaction Study was provided, with windfarm structures being built to accommodate the monitoring equipment, and progress towards the commercial agreement. A commercial agreement is being finalized to allow sharing costs between NnG, Seagreen and Berwick Bank.</p>
<p>31st May 2022</p>	<p>FTRAG-O meeting</p>	<p>Strix (the contractors appointed to undertake the Seabird Interactions Study) gave a presentation on the planned Seabird Interactions Study at the NnG site. Key research questions are: (1) Do collisions occur and are there empirical methods to record seabird collisions at offshore wind farms?; and (2) What are the collision rates?</p>
<p>10th November 2022</p>	<p>FTRAG-O meeting</p>	<p>RSPB provided an update on the gannet survival study, and the impacts of highly pathogenic avian influenza (HPAI) on the gannet population at the Bass Rock and Grassholm in 2022, including consideration of how this might affect the gannet survival study. The ability and approach to determine WF impacts in light of potentially confounding impacts of HPAI remains uncertain.</p> <p>HPAI effects were further discussed in relation to the tracking and colony monitoring update from NnG, and the implications of this for the 2022 studies undertaken at Isle of May, St Abb's Head and Fowlsheugh. Limited GPS tracking had been possible as a result of the HPAI outbreak, and surviving birds may be more susceptible to effects from wind farms.</p> <p>Plans for winter data analysis and processing in 2022/2023 were shared,</p>



Date	Details of Consultation	Relevant Consultation
		led by NatureScot. This included quantifying interannual variation and site fidelity, and behavioural classification work.
7th March 2023	FTRAG-O meeting	<p data-bbox="552 535 1390 712">UKCEH and RSPB shared updates on tracking and colony monitoring at Isle of May, St Abb's Head and Fowlsheugh. For the 2024 season four species were to be tagged and tracked at the Isle of May (kittiwake, guillemot, razorbill and puffin), with tagging and tracking limited to kittiwake at the other two sites. Monitoring for signs of HPAI would also occur at these sites.</p> <p data-bbox="552 734 1390 824">Updates were shared on the gannet survival study at Bass Rock and Grassholm, progress towards initiating the Seabird Interactions Study and the ongoing monthly DAS.</p>
7th November 2023	FTRAG-O meeting	<p data-bbox="552 864 1390 981">It was informed that a DAS was planned at Inch Cape, in combination with other F&T Developers, for the 2024 breeding season starting in March 2024, with monthly surveys up to Feb 2025. It was noted that DAS were also undertaken during the 2017 and 2019 breeding seasons.</p> <p data-bbox="552 1003 1390 1093">Updates were provided on the adult gannet survival surveys, which indicated negligible signs of HPAI at the Bass Rock colony, tracking and colony monitoring.</p>
19th March 2024	FTRAG-O meeting	<p data-bbox="552 1133 1390 1283">Updates provided on the tracking and colony monitoring, including a review of the questions to be answered: (1) is there evidence for collisions, displacement or barrier effects caused by the F&T wind farms; (2) If so, do the impacted birds come from the SPAs local to the wind farms?; (3) Are there population level consequences for these effects?</p> <p data-bbox="552 1305 1390 1361">The integration of the tracking results into the interactions study is still being assessed by UKCEH and RSPB.</p> <p data-bbox="552 1384 1390 1440">DAS to be undertaken covering all 4 F&T developments (NnG, Seagreen, Inch Cape and Berwick Bank).</p> <p data-bbox="552 1462 1390 1579">Updates were given on the Gannet Adult Survival study, and discussions on the extent of HPAI effects, and how this may compromise the capacity of the study to compare sites and understand the effects from wind farms on gannet survival, which remains unknown.</p>
19th November 2024	FTRAG-O meeting	<p>Inch Cape presented the preliminary approach to ornithology monitoring to FTRAG-O for comment ahead of submission through the PEMP-GS. Monitoring objectives, key species, sites and effects were shared for comment. Monitoring questions and proposed project specific and regional monitoring outlines were shared.</p>

Date	Details of Consultation	Relevant Consultation
22 Jan 2025	Consultation with NatureScot through email	<p>Based on the extent of survey and construction work planned to take place within the ECC and array area from March 2025, NatureScot was content for the Digital Aerial Surveys (DAS) to end in February 2025, as it was agreed that any further monitoring would unlikely yield representative pre-construction breeding season data.</p> <p>NatureScot also noted that, once the 2024/2025 DAS campaign has finished and the data has been analysed, it would be useful to compare this to the data from previous campaigns (2017, 2019) and provide a summary of any key differences in densities/abundance observed, especially in light of HPAI.</p>
18 March 2025	FTRAG-O meeting	<p>Inch Cape presented an overview of ICOL's approach to monitoring, in line with the Ornithology Monitoring Strategy REV 00 that was circulated to the FTRAG-O on 13 March 2025.</p> <p>No changes were proposed to the priority sites, species and effects, and monitoring questions presented and discussed at the November 2024 FTRAG-O meeting (except by a minimal rewording) (these are provided in Section 8 of this document). Additional text has been added to set out the rationale for why the original monitoring objectives and questions as established in 2016 remain the key priorities and, hence, valid for the ICOL monitoring strategy.</p> <p>The proposed project specific monitoring consists of DAS surveys during breeding season, and contribution to ongoing regional monitoring with focus on comparing pre- and post-construction data. The exception in this regard is the Adult Gannet Survival study, where contributions cover both pre-, during and post-construction.</p> <p>A summary of the key concerns received during the call are presented in Section 7.1.</p>

7.1 Consultation to Ornithology Monitoring Strategy REV 0

A previous version of this document, the Inch Cape's Ornithology Monitoring Strategy REV 00, was circulated to the FTRAG-O members on 13th March 2025, in advance to the discussions to take place during the FTRAG-O meeting on the 18th of March.

The following key points were raised by members of the FTRAG-O during the meeting and through subsequent emails received from MD-SEDD on 2nd April 2025 and NatureScot on 7th April 2025.

7.1.1 Monitoring questions being outdated / consideration of new evidence

There was a concern that while the monitoring questions outlined in the 2016 framework are broadly



relevant and have provided a strong foundation for seabird monitoring in the F&T region, they now risk being outdated. Members of the group expressed views that the evidence base has increased since 2016, with a significant amount of work having taken place in the Forth and Tay.

The importance of maintaining the original 2016 questions for context and historical value was acknowledged, however, it was emphasized that these questions should be revised to reflect current knowledge and updated monitoring drivers.

It was suggested that the FTRAG-O group should undertake a focused workshop (or similar approach) to review and, where appropriate, reframe the monitoring questions collaboratively, ensuring alignment with existing datasets and emerging evidence. NatureScot and MD-SEDD are liaising to discuss next steps for this review. In addition, it was pointed out that consideration of relevant datasets and results from other studies to inform the approach taken by ICOL is welcome.

ICOL acknowledges the comments raised regarding the potential need to update the monitoring questions set out in the 2016 framework, and will consider any revised priorities identified through this process and how these apply to the proposed monitoring. Consideration was also given to the findings of regional monitoring undertaken to date in the F&T, including a rationale to why the original monitoring objectives and questions as established in 2016 remain valid (see Section 8.1.2).

7.1.2 Clear narrative between questions and monitoring

It was suggested that a clear narrative between the relevant questions and the methods and approaches being proposed would be beneficial. This would link together the proposed efforts for data collection, the planned analytical methods, and how these will address the specific questions being targeted. This has now been included in the considerations set out in Section 8.1.3.

7.1.3 Monitoring during construction

A key concern raised was the absence of dedicated construction-phase monitoring in ICOL's proposed strategy. It was noted that the original monitoring questions agreed in 2016 had no emphasis on understanding construction-related effects. However, a concern was expressed that construction activities, particularly when occurring alongside other operational developments, can contribute to ecological impacts that need to be better understood³. The effects during this transition period cannot be captured if monitoring is paused during construction.

ICOL considers that this position is not justified because:

1. The construction period will be substantially shorter (extending over two to three years only)

³ This concern was not supported by the presentation of any new evidence to explain why the perception of the importance of the construction period in terms of effects on seabirds should have changed since the completion of the assessments for the Forth and Tay projects, at which time the clear focus was on the predicted effects during operation. Such a perception also runs contrary to the predictions made in virtually all (if not all) current and recent assessments for offshore wind farms.



compared to 35 to 50 years for operation), so that the potential for any additional annual mortality associated with wind farm effects to act cumulatively over a period of years and lead to population-level impacts is negligible during construction when compared with operation.

2. The construction period will be less impactful, noting that collision effects are limited to the operational phase and that current Statutory Nature Conservation Bodies (SNCB) guidance (e.g. SNCB 2022, NatureScot 2023) places greater focus on displacement and barrier effects during operation than during construction (with the consequence being that any predicted additional annual mortality from displacement and barrier effects is greater for operation).
3. In terms of specific concerns over any phasing of the construction and operational periods, it is unclear how monitoring during such a period would aid understanding of the key predicted effects (i.e. displacement and barrier effects and collision effects during operation) because the predicted magnitude of such effects would be smaller than during operation (due to fewer installed and operational turbines), whilst the short duration of any such period means there is little, or no, potential for resultant population-level impacts.

It is further highlighted that impacts from construction are not associated with the key impacts identified in the 2018 EIAR, HRA and 2019 AA, as agreed in the Scoping Opinion for the revised design (Marine Scotland, 2017). For this reason, priority is given to surveys being undertaken during the pre-construction and operational periods. This is in line with one of the key purposes of monitoring, which is to verify key predictions in the Application (and noting that it also aligns with ICOL's understanding of the approaches adopted in most other ornithology monitoring programmes for UK offshore wind farms which focus on effects during operation).

7.1.4 Concerns About a Gap in Tracking Data

There was a concern about having a gap in survey effort, in particular the GPS tracking and colony monitoring at Isle of May, St Abb's Head and Fowlsheugh (detailed in section 8.3.1).

It was noted that seabird behaviour and foraging distributions exhibit inter-annual variability, and a lack of continuous data could lead to misinterpretation or missed signals when assessing wind farm impacts and connectivity with SPAs⁴.

Moreover, maintaining data continuity would enhance the value of integrating these results with forthcoming studies such as the Seabird Interactions Study, planned for 2026 and 2027.

⁴ No detail has been provided to explain why (and how) a continuous data series would act to reduce the risk of misinterpretation or missed signals when assessing wind farm effects. The key risk is presumably that the effects of wind farm phase are confounded by temporal variation in other environmental effects which also influence seabird foraging behaviour.



The proposed post-construction contributions from Seagreen and NnG wind farms are expected to continue through 2025 and 2026, respectively, while further support from Berwick Bank is uncertain due to the pending final permitting decisions.

It is recognised that inter-annual variation can be driven by a range of environmental and ecological factors, and that additional data can improve understanding of these dynamics. However, it is unclear exactly how a continuous data series, *per se*, reduces such a risk and, if it does, then to what extent is this risk reduced.

The proposed monitoring has been updated, following further consultations, as detailed in Section 7.3.1.

7.1.5 Considerations on 2025 being a 'pre-construction' year, rather than a construction year

A question was raised on whether the year 2025 should be considered a pre-construction year, given that the start of construction for the Generating Station assets is due to begin in December 2025.

ICOL considers 2025 as part of the construction phase. The commencement of the construction works for the OfTI is June 2025, with the commencement of construction activities ahead of the OSP and cable installation at the wind farm site, which commenced in July. In addition, significant preparatory works are taking place in anticipation of the GS works starting in December, such as boulder and UXO clearance. Therefore, ICOL believes that conducting additional DAS during the 2025 breeding season will not yield representative pre-construction breeding season data. This position aligned with NatureScot, in correspondence exchanged in January 2025 (see Table 7.1).

7.1.6 Reporting

NatureScot requested further consideration to be given to reporting the monitoring findings, as interim DAS reports could be useful to allow for any changes to survey design or effort to be addressed. For instance, once the data analysis for the 2024/2025 DAS campaign has finished, it would be useful to compare this to the data from previous campaigns (2017, 2019) and provide a summary of any key differences in densities/abundance observed, especially in light of HPAI.

ICOL welcome the NatureScot position and propose to prepare a DAS baseline review following the completion of the 2024/2025 DAS data analysis (currently ongoing). This would include between year comparisons of densities of the key seabird species (as identified in Table 8.1) on a month-by-month basis, as well as for the overall breeding season. These comparisons would also be undertaken according to different behaviours (i.e. all birds, birds in flight, birds on the water), and at a range of resolutions (e.g. array, array plus 2km buffer and full survey area). Distribution maps would be included to enable visualisation of any between year differences that are identified in densities.



7.2 Consultation to Ornithology Monitoring Strategy REV 1

NatureScot and RSPB provided further comments to the Ornithology Monitoring Strategy (Rev 1) during the consultation of the PEMP REV 0, through letter dated 11 September 2025 and 18 September 2025, respectively. Most of the concerns raised had already been identified during earlier consultations, and are addressed in Section 7.1, where ICOL's response remain valid. The approach to monitoring has been updated to address a key concern detailed below.

7.2.1 Post Construction DAS

The scope initially proposed included the first breeding season immediately after completion of construction, anticipated to take place in 2028, and a breeding season two years later, anticipated in 2030.

NatureScot informed they usually advise two years of consecutive monitoring post-construction, as a '*gap in monitoring may result in difficulties with disentangling impacts due to interannual variation in bird movements*'. They also advised that any changes in behaviour over a longer time frame could be identified through additional monitoring after the two years campaign.

RSPB also raised a concern in relation to a mismatch between the collected DAS and proposed contribution to regional monitoring (GPS tracking), which could weaken the analytical power of the monitoring.

ICOL proposal for post construction DAS has been updated to include two years of consecutive monitoring, as informed in Section 8.2.1.2.

7.3 Consultation to Ornithology Monitoring Strategy REV 2

NatureScot provided further comments to the Ornithology Monitoring Strategy (Rev 2) during the consultation of the PEMP REV 1. These were provided to ICOL through email from MD-LOT on 19 November 2025.

7.3.1 Regional monitoring – GPS tracking and colony monitoring

NatureScot acknowledged ICOL's consideration of an alternative GPS tracking and colony monitoring proposal covering 2027–2029, as a potential substitute for the original pre-construction (2023, 2024), and post-construction (2028 and 2029) contribution plan.

NatureScot advised that 2027 should be added to the original proposal rather than replace earlier years, emphasising that without continuous monitoring, there is a risk that the key questions will not be answered due to the inherent uncertainty and volatility in the system (e.g. marine heatwaves, HPAI, etc), as well as difficulties with disentangling cumulative impacts with other wind farms and the potential for habituation effects to arise.

MD-LOT requested the PEMP to be updated accordingly to reflect this advice. The proposed



monitoring has been updated, as detailed in Section 8.3.1.

As previously discussed in Section 7.1.4, ICOL recognises that inter-annual variation can be driven by a range of environmental and ecological factors, and that additional data can improve understanding of these dynamics. However, it is unclear exactly how a continuous data series, *per se*, reduces such a risk and, if it does, then to what extent is this risk reduced.

8 Proposed Ornithology Monitoring

This section outlines the proposed methods to monitor the impacts of the Development, in the context of previously identified key bird species, SPAs and considering the questions identified during the FTRAG meetings (Section 7).

8.1 Approach to Monitoring

The seabird monitoring program aims to enhance understanding of seabird interactions with OWFs in the Forth and Tay and to validate the key assumptions made in the EIAR 2018 (ICOL, 2018a).

The initial discussion document circulated by Marine Scotland prior to the first FTRAG-O meeting in June 2015 (MSS, 2015) highlighted priority species, priority protected sites, and several detailed questions regarding collision/avoidance, flight height, displacement, barrier effects and population impacts. These were subject to discussions and review through FTRAG-O meetings. A revised discussion note was circulated in March 2016 (MSS, 2016), which provided a summary of key questions which monitoring and future research could seek to address, either through post construction monitoring or strategic research projects. Given that the key predicted impacts are primarily concerned with SPA breeding populations, it was considered that this should be reflected by the monitoring programme, such that understanding the consequences on breeding populations of the key SPAs and seabird species is the priority of the proposed monitoring approach. As the construction period will extend over two to three years only and is not associated with any of the key impacts identified in the 2018 EIAR, as agreed in the Scoping Opinion for the revised design (Marine Scotland, 2017), priority will be given to surveys being undertaken during the pre-construction and operational periods. Similarly, the survey programme will encompass the seabird breeding season but will not extend into the non-breeding periods, on the basis that it is the potential impacts to the breeding populations (via effects occurring during the breeding season) that are of key interest.

The above approach is consistent with other recent survey designs for ornithology monitoring programmes for consented OWFs, in that it focusses on the phase of the development associated with the impacts considered potentially important in affecting seabird populations and on the seasonal period during which the populations of key interest (and of highest potential vulnerability) are present in greatest numbers at the site (e.g. developments in the Moray Firth, East Anglia one). This focus will ensure that outputs are aligned with the key issues identified in the assessment.



8.1.1 Priority species, protected sites and effects

Through consideration of the 2018 EIAR and HRA, 2019 AA, 2016 FTRAG Discussion Document (MSS, 2016), and subsequent discussions held with FTRAG-O, a priority species list, SPA and key effects were identified, as detailed in Table 8.1.

Table 8.1: Priority species, protected sites, and effects

Species	Effects	SPA populations
Gannet	Collisions	Forth Islands
Kittiwake	Collisions, displacement/ barrier effects	Forth Islands, Fowlsheugh, St Abb's Head to Fast Castle
Puffin	Displacement/ barrier effects	Forth Islands
Guillemot	Displacement/ barrier effects	Forth Islands, Fowlsheugh, St Abb's Head to Fast Castle, Buchan Ness to Collieston Coast
Razorbill	Displacement/ barrier effects	Forth Islands, Fowlsheugh

It was agreed that herring gull was of lower priority than the other five key species but where future studies (e.g. surveys of seabird distributions at sea), that were focused on the higher priority species, were undertaken there should be recognition that data obtained on herring gull (as well as other large gull species, such as lesser black-backed gull) may also be useful.

8.1.2 Key monitoring questions

The key effects and monitoring questions underpinning the Forth and Tay monitoring strategy were initially developed in 2016 (MSS, 2016). These formed the basis for collaborative monitoring efforts across the region and have been discussed further through FTRAG-O as monitoring programmes progressed. While the implementation of survey methods has evolved, particularly in response to practical and methodological challenges, the core ecological questions that underpin the monitoring remain broadly unchanged (noting that this is unsurprising given that none of the wind farms became operational until recently, and it will require more time for findings to emerge on the key operational effects). For instance, recent adjustments to the survey works have focused more on improving the robustness and reliability of methods, rather than altering the understanding of what needs to be monitored.



Findings from GPS tracking surveys conducted at the Isle of May, St Abb's Head, and Fowlsheugh indicate that seabird foraging behaviour exhibits interannual variability. While individual birds show site fidelity, the overall population-level use of space can vary from year to year. These outcomes reinforce the value of collecting data for extended periods, but do not alter the fundamental questions around exposure, displacement, and connectivity that were originally set out.

The refinement of survey methods has been critical in ensuring that the data collected is sufficient and suitable for answering the original monitoring questions. For instance, concerns over potential behavioural effects resulting from tag deployment techniques have led to improved capture protocols and tag designs. Target sample sizes were also revised following a power analysis which indicated a need to increase these to ensure the representativity and statistical reliability of the tracking data (pre and post construction) (Daunt, F., Bogdanova, M., McCluskie, A. and Wischniewski, S., 2021).

ICOL considers that the published findings which have emerged from the FTRAG-O monitoring to date provide no basis for amending the key monitoring objectives and questions from 2016. This is also reflected by the situation more widely in the offshore wind industry in terms of understanding key effects on seabird populations. For example, displacement and barrier effects (objective 1 below) and collision effects (objective 2 below) remain of greatest importance in terms of the predicted impacts on seabird populations in virtually all (if not all) recent and current assessments for UK offshore wind farm projects.

Some recent research and monitoring studies have made important advances in improving understanding of these effects, perhaps most notably at the Thanet and Aberdeen wind farms in relation to collision effects and at the Beatrice wind farm in relation to displacement effects⁵ (Skov *et al.* 2018, Tjørnløv *et al.* 2023, Trinder *et al.* 2024). However, it is widely recognised that further research and monitoring on these effects is critical for determining the wider applicability of the findings from these early studies and the factors that lead to variation in such findings. For instance, the paucity of studies which provide estimates of displacement and barrier effects in the vicinity of breeding colonies has been very clearly highlighted by the recent ScotMER and NatureScot workshop on displacement (held in October 2024).

Thus, as in 2016 when the FTRAG-O monitoring questions were set out, further research and monitoring to address key questions on displacement and barrier effects and collision effects remains the absolute priority for the FTRAG-O monitoring programme in relation to understanding wind farm effects on seabirds, as it does across the UK offshore wind industry more widely. Furthermore, the location of the Forth and Tay wind farms in relation to key seabird breeding colonies means that it is of particular importance for these questions to be addressed by the FTRAG-O monitoring (as was the case in 2016). For each of objectives 1 and 2 (i.e. displacement and barrier effects and collision effects,

⁵ This is particularly in relation to displacement effects within the vicinity of breeding colonies, with few previous studies obtaining such data from locations likely to be used by actively breeding birds.



respectively), the series of questions as identified in 2016 and presented below, are considered to remain relevant to current FTRAG-O monitoring priorities and to align with the monitoring approaches being deployed by the programme.

Considering the impacts of wind farm effects at a population level is ultimately the key objective in understanding the consequences of wind farms for seabird populations. Objective 3 below encapsulates this objective, as it did when the key objectives and questions were originally developed in 2016. Despite the importance of determining population-level impacts, there have been few such initiatives undertaken within the industry to date, as previously highlighted (Cook *et al.* 2019). To inform the potential population-level impacts, colony monitoring is required to encompass a number of years during both the pre-construction and operational periods, so clearly this objective remains highly relevant to the FTRAG-O programme.

In relation to colony monitoring, long-term projects such as the Gannet Survival Study (section 8.3.2) have provided important baseline data on adult survival and demonstrated the feasibility of using colour-marking and re-sighting as a monitoring approach. These findings enhance understanding of population dynamics and support future demographic monitoring, and reinforce, rather than alter, the original rationale and scope of the existing monitoring questions.

1. In this context, the core monitoring questions that continue to guide the Forth and Tay strategy remain broadly consistent with those agreed in 2016. These were discussed during FTRAG-O meetings in November 2024 and March 2025 and remain a key reference point for ICOL's monitoring strategy. These are detailed below. Displacement and barrier effects (kittiwake, puffin, razorbill and guillemot):
 - 1.1 Can a significant change in foraging activity or densities of kittiwake, puffin, razorbill and guillemot in the wind farm be identified? Can these be attributed to the wind farm?
 - 1.2 Do densities of kittiwake, puffin, razorbill and guillemot inside the wind farm change with time from construction (i.e. after construction, for example due to habituation)?
 - 1.3 Is there evidence of connectivity between breeding birds from specific colonies and the Wind Farm footprint, in particular kittiwakes from the Forth Islands SPA, Fowlsheugh SPA and St Abb's to Fast Castle SPA, as well as puffin, guillemot and razorbill from the Forth Islands SPA.
 - 1.4 To what extent do birds avoid the Wind Farm boundary, in particular kittiwakes from the Forth Islands SPA, Fowlsheugh SPA and St Abb's to Fast Castle SPA, as well as puffin, guillemot and razorbill from the Forth Islands SPA.
2. Collision effects (focus on gannet and kittiwake):
 - 2.1 Does collision occur and are there empirical methods to record seabird collisions at



offshore wind farms?

2.2 What are the collision rates? OR

2.3 What are the micro, meso and macro avoidance rates?

3. Population effects

ICOL will collaborate with ongoing regional monitoring to address population effects at relevant SPAs, and the contribution of wind farms to any such effects. The specific relevant questions relating to population effects are not yet defined, and these will continue to be developed and refined through the FTRAG. The PEMP will be updated to reflect these changes.

8.1.3 **Proposed monitoring**

A summary of ICOL's approach to address the questions outlined in Section 8.1.2 is presented below, and further details in Section 8.2 and 8.3.

- Displacement and barrier effects on kittiwake, puffin, razorbill and guillemot:
 - Site-specific DAS pre and post construction to monitor changes in densities at the wind farm footprint, and potential for displacement (Questions 1.1 and 1.2); and
 - Collaboration with regional monitoring for the tracking of breeding kittiwake, puffin, guillemot and razorbill on the Isle of May and kittiwake at St Abb's Head and Fowlsheugh, to identify potential for both displacement and barrier effects resulting from the wind farm operation (Question 1.1, 1.2, 1.3 and 1.4)
- Collision effects (relevant to gannet and kittiwake):
 - Site-specific DAS pre and post construction will monitor changes in density and distribution within the wind farm footprint and associated buffers, which in turn inform collision risk via estimation of macro-avoidance (Question 2.3);
 - Collaboration with regional monitoring for the tracking of breeding kittiwake on the Isle of May and kittiwake at St Abb's Head and Fowlsheugh, to monitor changes in density and behaviour at the wind farm footprint, which in turn refine collision risk assessment, again via estimation of macro-avoidance and potentially meso-avoidance (Question 2.3); and
 - Potential collaboration with F&T developers on the Seabird Interactions Study (this is under discussion). (Question 2.1, 2.2 and 2.3)
- Population effects:
 - Collaboration with regional monitoring for the tracking and colony monitoring of breeding kittiwake, puffin, guillemot and razorbill on the Isle of May and kittiwake at St Abb's Head



and Fowlsheugh, where the effects on individuals can be combined with colony counts to give insights on a potential population-level effect; and

- Collaboration with regional monitoring of adult gannet survival rates at Bass Rock, Scotland, and Grassholm in Wales (control site) to assess whether any changes in survival rates are associated with the timing and occurrence of wind farm operation.

8.2 Site Specific Monitoring

8.2.1 Pre-Construction

8.2.1.1 Boat-based surveys (completed)

Boat-based surveys of the Development Area and an associated 4 km buffer were undertaken approximately once per month between September 2010 and September 2012 (inclusive) to characterise the baseline ornithology conditions for the purposes of the EIA. The abundance estimates derived from these surveys suggest that high numbers of five of the six key seabird species assessed in the 2018 EIAR can occur on the Development Area and 4 km buffer during the breeding season, as based upon the peak counts. Herring gull is the exception, with the peak numbers of this species on the Development Area and 4 km buffer estimated to be fewer than 100 and, as such, at least an order of magnitude lower than for any of the other key species. The estimated numbers (of all species) were almost invariably higher within the 4 km buffer than within the Development Area, which is to be expected based on the difference in their areas (i.e. approximately 280 km² and 150 km², respectively). The results of these surveys were presented in the EIAR 2018 (ICOL, 2018a).

8.2.1.2 Digital Aerial Surveys (DAS)

DAS encompassing the Development site and a 4 km buffer have been undertaken during the breeding seasons of 2017, 2019 and 2024, providing recent baseline data on bird abundance and distribution. These surveys were undertaken in three separate campaigns covering one year of monthly surveys (i.e. beyond the breeding season, assumed to be from March to September). The duration of each campaign is detailed below:

- The 2017 campaign, comprising monthly surveys from October 2016 to September 2017, as reported in the 'Digital video aerial surveys of seabirds and marine mammals at Inch Cape: Annual Report October 2016 to September 2017' Report (HiDef, 2020a).
- The 2019 campaign, comprising monthly surveys from April 2019 to March 2020, as reported in the 'Digital video aerial surveys of seabirds and marine mammals at Inch Cape: Annual Report April 2019 to March 2020' Report (HiDef, 2020b).
- The 2024 campaign, comprising monthly surveys from March 2024 to February 2025, for which a report is expected in 2025.

The 2019 and 2024 survey campaigns were undertaken as part of a wider survey of all Forth and Tay



wind farms plus associated buffers (including Inch Cape, NnG and Seagreen, in addition to Berwick Bank during the 2024 survey).

All surveys were undertaken by HiDef using high definition video cameras which record data continuously along strip transects with the survey area sampled by a series of parallel strip transects orientated on a north-west to south-east axis so that they are approximately perpendicular to the coast (Figure 8.1). Images were recorded and processed from the two central cameras, which give a transect strip width of 250 m and a sampling intensity of approximately 10% and 12% in the 2017 and 2019 survey campaigns, respectively (for both the Development Area alone and the Development Area plus 4 km buffer).

As stated above, the 2019 and 2024 survey campaigns were part of a wider survey programme encompassing all of the Forth and Tay wind farms, and consequently there are small differences in transect coverage of the Survey Area when compared to the 2017 campaign. Thus, for both the Development Area alone and the Development Area plus 4 km buffer, the number of transects and the total transect length were slightly greater for the 2019 and 2024 surveys than for the 2017 surveys.

For each of the surveys undertaken in 2017, 2019 and 2024, the following data will be extracted:

- Bird locations for all species recorded;
- Basic behaviour for each record (e.g. whether flying or sitting on the water);
- Where possible, age and sex of the recorded birds; and
- Potentially, flight directions for key species (where this is considered to inform connectivity with SPAs).

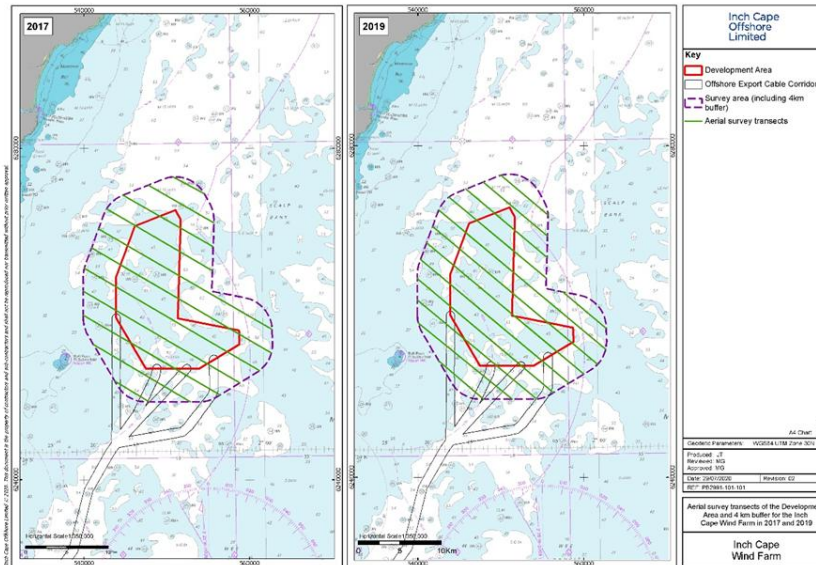


Figure 8.1 Locations of aerial survey transects used in the 2017 and 2019 survey campaigns, including the Development Area and 4 km buffer. The 2024 survey campaign follow similar design as the 2019.

8.2.2 Post-Construction

8.2.2.1 Digital Aerial Surveys

ICOL will undertake DAS post-construction site specific monitoring covering two breeding seasons during the operation and maintenance phase of the Development. This initially included the first breeding season immediately after completion of construction, anticipated to take place in 2028⁶, and a breeding season two years later, anticipated in 2030. Following further consultation (see Section 7.2.1), the two years monitoring are now proposed to cover two consecutive years, anticipated to be 2028 and 2029.

It is proposed that the survey design will cover the Inch Cape Wind Farm plus 4 km buffer, in line with the DAS transects design from 2019 and 2024 campaigns, for breeding seasons from March to September (NatureScot, 2020).

The finalised details on the methodology for post-construction DAS are to be agreed with MD-LOT and consulted with the FTRAG-O in due course. Consideration will be given to the DAS findings from other F&T Developers, which have been based on similar a sampling effort to that undertaken during the pre-construction DAS programmes within the Wind Farm plus 4 km.

Reporting would follow two years of campaign, and a review of the results would indicate if further

⁶ Assumes WTG installation and commissioning to be completed in August 2027, per current programme



DAS are required.

8.3 Regional Monitoring

8.3.1 GPS tracking and colony monitoring at the F&T

Since 2018, GPS tracking studies have been conducted to monitor seabird movements and spatial distribution during their breeding seasons, and assess their interactions with the offshore wind farms in the F&T region. These studies aim to inform conservation efforts and evaluate potential risks associated with offshore wind farm developments.

The following studies are currently ongoing in the scope of the F&T Developments:

- GPS Tracking and colony monitoring of breeding kittiwake, puffin, guillemot and razorbill at Isle of May, which is being delivered by UK Centre for Ecology & Hydrology (UKCEH) since 2018 under contracting agreement with NnGOWL. (Daunt, F., 2019; Bogdanova, M. et al., 2020a; Bogdanova, M. et al., 2020b, 2022).
- GPS Tracking and colony monitoring of breeding kittiwake at St Abb's Head and Fowlsheugh, which is being delivered by the RSPB since 2021 under contracting agreement with Seagreen Offshore Wind Farm (Bogdanova, M. et al., 2022).

The study consists of attaching GPS loggers on adult breeding seabirds, to obtain high-resolution spatial data, capturing seabird movements, foraging trips, flight paths and interactions with offshore wind farm footprints. The resultant data is then analysed to assess potential displacement, collision risk, and barrier effects. Alongside the bird tracking, the studies also conduct colony monitoring, particularly in relation to seabird breeding success, chick condition, and potential effects of GPS tracking on behaviour.

The methods for these surveys, progress and results are periodically discussed during the FTRAG-O meetings. The scope and methods are revised and refined before each year's campaign, based on previous outcomes, technology available and other identified factors (e.g. consideration to HPAI).

At the time of writing, the costs for these studies are equally shared among NnG, Seagreen and Berwick Bank OWFs.

ICOL will collaborate with the F&T developers to share the GPS tracking and colony monitoring costs associated with 2023 and 2024 (pre-construction period), and future costs associated with two consecutive years after Inch Cape wind farm construction (post-construction period, anticipated to be 2028 and 2029). The comparison of both pre and post construction datasets would allow understanding the effects resulting from Inch Cape Wind Farm development in combination with the other F&T Developments. Contributions during the construction phase were not initially considered (i.e. from 2025 to 2027), as construction is anticipated to extend over a short period (2-3 years), and the impacts from construction are not associated with the key impacts assessed for the Development.



Therefore, initial efforts were focused on periods most relevant to predicted impacts—pre-construction and operational phases. However, following further advice (see Section 7.3.1), ICOL now commits to also contribute to monitoring in 2027 to minimise the risk of a gap in the monitoring continuity.

It is noted that the long-term continuation of these studies depends on post-construction funding commitments from developers and agreements reached through FTRAG-O. There is a recognized level of uncertainty regarding the extent of future contributions from other F&T Developments. For instance, it is understood that contributions from Seagreen may cease in 2025 and contributions from NnG OWFs may cease in 2026 following the completion of a two-year post-construction monitoring period, as outlined in their respective PEMPs. In addition, contributions from Berwick Bank OWF are currently voluntary, as the development is still at an early stage and was only recently awarded a licence in July 2025. The level of contribution, therefore, may be reduced or cease depending on the future licence conditions or date for commencement of construction.

ICOL's proposed contribution is based on the assumption that monitoring costs will be shared with at least one other developer. If no co-funding agreement is reached, the scope of the monitoring surveys may need to be revised or reduced, to reflect a lower available budget.

8.3.2 Gannet adult survival and tagging

The colour ringing and re-sighting of adult Northern Gannets has taken place since 2010 at the Bass Rock, Scotland, allowing apparent annual adult survival to be estimated. Since 2020, this work has been funded by the F&T Developers (NnG, Seagreen and Berwick Bank OWFs), alongside funding for gannet adult survival at Grassholm, Wales, as a before-after control-impact (BACI) study to determine the possible offshore wind farm impacts. By maintaining long-term tracking and survival data from both locations, this study is anticipated to provide valuable insights into the potential effects of offshore wind farms on gannet populations.

The primary objective of the study is to monitor adult survival via mark and recapture of adults. In addition, pre- and post-construction movements, flight behaviour, and foraging trips of gannets to understand the potential impacts of offshore wind farms have also been monitored. The research focuses on Bass Rock, Scotland, as the primary site, while Grassholm in Wales was selected to serve as a control site (although the validity of this approach is dependent on a continued absence of operational wind farms within the key foraging range of the Grassholm population).

Work on the Bass Rock was previously undertaken by researchers at the University of Leeds (2010-2021) and is now being led by the RSPB (2022-present), work at Grassholm is led by researchers at Herriot Watt University.

The surveys are carried out during the breeding season, and consist of capturing and fitting colour rings, and releasing the bird to the nest site for future re-sighting. Since 2022, additional tracking with GPS logger (iGotU) was included in the study. All birds equipped with loggers are then recaptured



after 7 - 14 days to retrieve loggers and download tracking data. Birds are sexed based on observed sex-specific behaviour, or in some cases from DNA.

Grassholm was chosen as the control colony for several reasons; the ongoing long-term colour-ringing and re-sighting project already taking place at the time this study was commissioned, the project being comparable in both the time period and scale to that at Bass Rock, its location with no operational or planned wind farms (until after the end of the NnG and Seagreen PEMPs) within gannet foraging range and its relatively straightforward access.

An outbreak of High Pathogenicity Avian Influenza virus (HPAIV) occurred in UK Gannet colonies in 2022 including Bass Rock and Grassholm. As a result, work plans were significantly disrupted.

ICOL will collaborate with the F&T developers to share the gannet adult survival monitoring costs associated with the period starting in 2023 (i.e. two years prior Inch Cape Wind farm construction) up to two consecutive years after construction (expected to be achieved in 2029). The total duration of this contribution (i.e. if this will extend up to two years post construction) will be subject to ongoing evaluation to ensure it remains suitable for addressing the relevant monitoring questions for the F&T wind farm developments. It was noted that this was a long-term study to analyse adult survival rather than just wind farm impacts, therefore management and funding of these surveys may be incorporated to other strategic initiatives in the future.

As noted in Section 8.3.1 above, ICOL's contribution is based on the assumption that post-construction monitoring costs will be shared with at least one other developer. If no co-funding agreement is reached, the scope of the monitoring surveys may need to be revised or reduced, to reflect a lower available budget.

8.3.3 Seabird Interactions Study

A seabird interaction study is being developed in the F&T to improve understanding of seabird behaviour and interactions around operational offshore wind turbines with a focus on acquiring empirical measures of collision risk and three-dimensional flight behaviour around wind turbines, with a focus on gannets and kittiwake.

Bird monitoring equipment composed of radar and camera equipment will be installed in nine wind turbines within the NnG wind farm and will first detect, track and classify birds at long to medium range (Birdtrack system or BT), and second to detect and classify birds that collide with the wind turbine structure or blades (Collision Detection System or CDS).

The key questions to be addressed are related to collision risk, reactive behaviour, and monitoring methods. It seeks to determine whether seabird collisions occur and explore empirical methods for recording such events, while also quantifying collision rates. The research will assess seabird behaviours near turbines, identifying avoidance and reactive responses, their distances from turbines, and species-specific variations. Additionally, it aims to refine methods for accurately recording these



behaviours and examine how factors such as weather conditions, time of day, and seasonal variations influence seabird responses. Ultimately, the findings will contribute to a better understanding of collision risk assessment and mitigation strategies for offshore wind farms.

The study is being conducted by STRIX, and funded by NnG, Seagreen and Berwick Bank offshore wind farms. The potential for ICOL contribution to this study is currently being discussed with NnG, Seagreen and Berwick Bank offshore wind farms.



9 Reporting

Reporting on DAS will be provided following the completion of the 2024/2025 DAS data analysis (currently ongoing), and the two years of post-construction campaign, alongside a comparison with pre-construction baseline data and considerations for whether further surveys are recommended. The baseline report will include between year comparisons of densities of the key seabird species (as identified in Table 8.1) on a month-by-month basis, as well as for the overall breeding season. These comparisons would also be undertaken according to different behaviours (i.e. all birds, birds in flight, birds on the water), and at a range of resolutions (e.g. array, array plus 2km buffer and full survey area). Distribution maps would be included to enable visualisation of any between year differences that are identified in densities. The specific timeline for submission of written reports and associated raw and processed data will be agreed with MD-LOT and FTRAG in due course.

The timeline for reporting on regional and strategic monitoring will be agreed with the FTRAG-O.

Where applicable, Marine Environmental Data and Information Network ("MEDIN") standards will be adhered to. ICOL acknowledges that, subject to any legal restrictions regarding the treatment of the information, all data will be made publicly available by MD-LOT. The survey results will be used to inform future monitoring and will be used to discharge relevant Consent conditions.



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Appendix A Impact Assessment Summary Tables

Table A.1 The seabird species and populations assessed in the 2018 EIAR, and conclusion of the assessment (ICOL, 2018a)

Species	Impacts assessed	Regional population	SPA populations	Development alone effect	Cumulative
Gannet	Collisions	Yes	Forth Islands	Minor and non-significant	Moderate and non-significant
Kittiwake	Collisions, displacement/barrier effects	Yes	Forth Islands, Fowlsheugh, St Abb's Head to Fast Castle	Minor and non-significant	Moderate and non-significant
Herring gull	Collisions	Yes	Forth Islands, Fowlsheugh, St Abb's Head to Fast Castle	Negligible and non-significant	Negligible and non-significant
Puffin	Displacement/barrier effects	Yes	Forth Islands	Minor and non-significant	Minor and non-significant
Guillemot	Displacement/barrier effects	Yes	Forth Islands, Fowlsheugh, St Abb's Head to Fast Castle, Buchan Ness to Collieston Coast	Minor and non-significant	Moderate/minor and non-significant
Razorbill	Displacement/barrier effects	Yes	Forth Islands, Fowlsheugh	Minor and non-significant	Moderate/minor and non-significant



Table A.2 Comparison of annual and breeding season deterministic model collision estimates for the Finalised Design, Preferred Design from the 2022 variation and for the two designs assessed in the 2018 EIAR (with the worst case on which consent base shown in red). Comparisons are undertaken for the three species for which collision mortality was considered a relevant effect pathway in the assessment for the Project

Species	Finalised Design (additive method)		Finalised Design (averaging method method)		2018 Scenario A		2018 Scenario B		2022 Variation Preferred Design Scenario	
	Annual	Breeding Season	Annual	Breeding Season	Annual	Breeding Season	Annual	Breeding Season	Annual	Breeding Season
Gannet	101	94	100	93	105	96	117	108	105	98
Kittiwake	59	35	59	35	64	36	72	40	61	36
Herring gull (option 2)	4	2	4	2	4	1	3	1	4	2
Herring gul (option 3)	N/A	N/A	N/A	N/A	3	1	2	1	2	1

