

## **Appendix 7.3: Shadow Habitat Regulations Appraisal**





MacArthur  
Green

# Dunside Wind Farm Shadow Habitats Regulations Appraisal (Ornithology) Appendix 7.3

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## 1 INTRODUCTION

EDF Energy Renewables Ltd ('the Applicant') proposes to construct and operate Dunside Wind Farm, near Longformacus in the Scottish Borders Council area (hereafter referred to as 'the Proposed Development'). MacArthur Green was commissioned to complete ornithological field surveys and desk-based studies to provide information on the ornithological features present, and potential impacts associated with the Proposed Development. From these exercises it was determined that there is potential connectivity between the Proposed Development and the qualifying features of European sites. In Scotland, under the terms of the Habitats Regulations, a Habitats Regulations Appraisal (HRA) is therefore required to establish whether the Proposed Development would have a likely significant effect on any European site.

This report presents information to enable the competent authority to conclude whether any likely significant effects on a European site may occur, and if so, whether the proposals would have an adverse effect on the site's integrity.

This report should be read in conjunction with the following Environmental Impact Assessment (EIA) Report documents:

- **Chapter 7: Ornithology;** and
- **Appendix 7.1** (and associated Annexes A – F).

Refer to **Chapter 6: Ecology** and **Appendix 6.7** for consideration of the River Tweed Special Area of Conservation (SAC) and Dogden Moss SAC.

## 2 HABITATS REGULATIONS APPRAISAL PROCESS

Under the Conservation (Natural Habitats &c.) Regulations 1994 (as amended by the Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2012) (The Habitats Regulations), all competent authorities must consider whether any plan or project will have a 'likely significant effect' on a European site. In Scotland Special Protection Areas (SPAs) are European sites given legal protection by the Habitats Regulations.

The Habitats Regulations ensure that any plan or project that may damage a European site is assessed and can only go ahead if certain strict conditions are met, via an HRA.

If required, the competent authority must carry out an 'appropriate assessment' to decide whether there is enough evidence to conclude that the proposals will not have adverse effects on a European site's integrity.

Regulation 48 of the Habitats Regulations indicates a number of steps to be taken by the competent authority before granting consent to a project. In order of application, the first four steps of the HRA process are:

- Step 1: consider whether the proposal is directly connected to or necessary for the management of the SPA (Regulation 48(1)(b)).
- If not, Step 2: consider whether the proposal (alone or in combination) is likely to have a significant effect on the SPA (Regulation 48(1)(a)).

- If so, Step 3: make an Appropriate Assessment of the implications for the SPA in view of that SPA's conservation objectives (Regulation 48(1)(a)).
- Step 4: consider whether it can be ascertained that the proposal will not adversely affect the integrity of the SPA ("Integrity Test") having regard to the manner in which it is proposed to be carried out or to any conditions or restrictions subject to which they propose that the consent, permission or other authorisation should be given (Regulation 48(5) and 48(6)).

It has already been established that the Proposed Development does not meet the criteria for Step 1. The Step 2 assessment of the likely significant effects on European sites in relation to the Proposed Development is presented in this report. Where likely significant effects are predicted, information to inform an appropriate assessment (Step 3) is then provided, along with consideration of whether the integrity of designated sites would be adversely affected (Step 4).

### 3 THE PROPOSED DEVELOPMENT

As described in EIA Report **Chapter 3: Development Description**, the Proposed Development comprises:

- Up to 15 wind turbines, each with a maximum blade tip height of 220 m (with an external transformer kiosk);
- Crane hardstandings adjacent to each turbine position;
- Four new watercourse crossings and associated infrastructure;
- Approximately 15 km of proposed wind farm tracks and approximately 1.1 km of proposed light vehicle track;
- Approximately 17.5 km of existing access tracks (including areas of widening/upgrading);
- Onsite underground electrical cables and cable trenches (including a short section of underground cable for wind farm cabling to cross a watercourse);
- Control building and extension to Fallago Rig existing substation; and
- A 20 MW battery storage area.

In addition to the above components associated with the operation of the Proposed Development, construction will also require the following:

- Four temporary construction compounds (two existing compounds which will remain in situ following completion of the Proposed Development, and two proposed), including laydown area(s) and car parking; and
- Up to three borrow pits which will be closed and reinstated following completion of construction.

As detailed in EIA Report **Chapter 7: Ornithology**, the following committed design considerations will be implemented:

- All electrical cabling between the proposed turbines and the associated infrastructure will be underground in shallow trenches which would be reinstated post-construction and, in most cases, follow the proposed access tracks.
- Any ground disturbance areas around permanent infrastructure during construction will be temporary and land will be reinstated or restored before the construction period ends.
- To ensure all reasonable precautions are taken to avoid negative effects on ornithological interests during construction and decommissioning, the Applicant will appoint a suitably qualified Ecological Clerk of Works (EcCoW) prior to the commencement of construction and decommissioning, and they will advise the Applicant and the Principal Contractor on all ornithological matters (with the assistance of a suitably qualified/licenced ornithologist if required). The EcCoW will be required to be present on Site during the construction and decommissioning periods and will carry out monitoring of works and briefings with regards to any ornithological sensitivities on the Site to the relevant staff within the Principal Contractor and subcontractors' organisations.
- A Bird Disturbance Management Plan (BDMP) will be implemented during construction of the Proposed Development. The BDMP will detail measures to ensure legal compliance and safeguard breeding birds known to be in the area and will include species-specific guidance. The BDMP will include pre-construction surveys and good practice measures during construction. Pre-construction surveys will be undertaken to check for any new breeding bird activity in the vicinity of the construction works. The EcCoW will oversee the implementation of the above measures.
- Work on the Proposed Development, including vegetation clearance and construction of the site access tracks, turbine hardstandings and site compound and erection of the turbines, is predicted to last for approximately 19 months. The number of bird breeding seasons potentially disrupted would depend on the month in which construction commences and the breeding season of the potentially affected species. The main breeding season of most birds at the Site extends from March to August. For the purposes of this assessment, it is assumed that, for any given species of bird, construction activities would commence during the breeding season and would therefore potentially affect a maximum of up to two breeding seasons. This, therefore, represents a worst-case scenario.

#### 4 DATA SOURCES

A desk-based study was undertaken to inform subsequent field surveys and ornithological constraints, including the presence of statutory designated sites and qualifying features within the appropriate study area relevant to each species. Data sources obtained that are relevant to this HRA are:

- NatureScot SiteLink (<https://sitelink.nature.scot>) for designated site information;
- Wetland Bird Survey (WeBS) counts (Austin *et al.* 2023<sup>i</sup>) for non-breeding bird abundance and distribution; and
- Mitchell (2012<sup>ii</sup>) for pink-footed goose foraging distribution.



The following field surveys were undertaken at the Site from September 2020 to August 2021 and November 2021 to November 2022 (as detailed in **Appendix 7.1**):

- Flight activity surveys (two breeding seasons and two non-breeding seasons, **Figure 7.2** and **Figure 7.3**);
- Breeding bird surveys (two breeding seasons);
- Winter walkover surveys (one non-breeding season);
- Scarce breeding bird surveys (two breeding seasons); and
- Black grouse surveys (one breeding season).

## 5 DETERMINATION OF LIKELY SIGNIFICANT EFFECTS

NatureScot (2016a<sup>iii</sup>) guidance helps identify connectivity between development proposals and SPAs, and therefore determination of likely significant effects (following Step 2 of the HRA process outlined in **section 2**). It provides a method for removing from the HRA those European sites which clearly have no connectivity to the Proposed Development, or those where it is obvious that the conservation objectives for the site's qualifying interests will not be undermined despite a theoretical connection.

As the Proposed Development Site does not overlap with any SPA, the process is based on consideration of the distances that some species may travel beyond the boundary of their SPAs for dispersal and foraging. Information is provided on key species' core and maximum foraging ranges, with the former value recommended by NatureScot for use in determining connectivity (unless there is an apparent reason to use the maximum range). Of the species listed, the largest core foraging range presented is for goose species during the non-breeding season, which ranges from 15 to 20 km. As such, it was determined that screening for European sites can be limited to within 20 km of the Proposed Development.

**Table 7-3-1 Determination of likely significant effects based on core foraging range connectivity**

SPA	Distance to nearest proposed turbine	Qualifying interests	Core foraging range (SNH 2016a <sup>iii</sup> )	Likely significant effect
Greenlaw Moor	11.1 km	Pink-footed goose (non-breeding)	15-20	Yes
Fala Flow	15.1 km	Pink-footed goose (non-breeding)	15-20	Yes
Firth of Forth	18.3 km	Bar-tailed godwit (non-breeding)	Not provided	No
		Common scoter (non-breeding)	Not provided	No
		Cormorant (non-breeding)	Not provided	No
		Curlew (non-breeding)	1 km <sup>1</sup>	No
		Dunlin (non-breeding)	500 m <sup>1</sup>	No
		Eider (non-breeding)	Not provided	No
		Golden plover (non-breeding)	3 km <sup>1</sup>	No
		Goldeneye (non-breeding)	Not provided	No
		Great crested grebe (non-breeding)	Not provided	No
		Grey plover (non-breeding)	Not provided	No
		Knot (non-breeding)	Not provided	No
Lapwing (non-breeding)	Not provided	No		

<sup>1</sup> Non-breeding range not provided in SNH 2016a, breeding range provided.

SPA	Distance to nearest proposed turbine	Qualifying interests	Core foraging range (SNH 2016a <sup>iii</sup> )	Likely significant effect
		Long-tailed duck (non-breeding)	Not provided	No
		Mallard (non-breeding)	Not provided	No
		Oystercatcher (non-breeding)	Not provided	No
		Pink-footed goose (non-breeding)	15-20 km	Yes
		Red-breasted merganser (non-breeding)	Not provided	No
		Red-throated diver (non-breeding)	8 km <sup>1</sup>	No
		Redshank (non-breeding)	Not provided	No
		Ringed plover (non-breeding)	Not provided	No
		Sandwich tern (passage)	Not provided	No
		Scaup (non-breeding)	Not provided	No
		Shelduck (non-breeding)	Not provided	No
		Slavonian grebe (non-breeding)	Not provided	No
		Turnstone (non-breeding)	Not provided	No
		Velvet scoter (non-breeding)	Not provided	No
		Wigeon (non-breeding)	Not provided	No

From the screening assessment presented in **Table 7-3-1** (SPAs are shown on **Figure 7.4**), the following SPAs are considered to be subject to likely significant effects due to the Proposed Development, and an appropriate assessment is required:

- Greenlaw Moor SPA;
- Fala Flow SPA; and
- Firth of Forth SPA (pink-footed goose only).

As detailed in the Proposed Development's Scoping Report, there is considered to be no connectivity between the Site and the Firth of Forth SPA for non-breeding bar-tailed godwit, common scoter, cormorant, curlew, dunlin, eider, golden plover, goldeneye, great crested grebe, grey plover, knot, lapwing, long-tailed duck, mallard, oystercatcher, red-breasted merganser, red-throated diver, redshank, ringed plover, sandwich tern (passage), scaup, shelduck, Slavonian grebe, turnstone, velvet scoter and wigeon as these species are either considered to be true seabirds or are migratory species characteristically associated with estuary habitats. The Site is located well inland from the Firth of Forth SPA and would not be located within any flyways for these species between the SPA and their feeding areas, nor is there considered to be suitable habitat for these species within the Site.

## 6 INFORMATION TO INFORM AN APPROPRIATE ASSESSMENT

### 6.1 Scope of the Appropriate Assessment

Based on the screening assessment in **Table 7-3-1**, the following SPAs and their associated pink-footed goose populations (**Table 7-3-2**) require further consideration in an appropriate assessment to determine whether there may be an adverse effect on the integrity of the SPAs.

**Table 7-3-2 SPAs requiring appropriate assessment for pink-footed goose.**

SPA	Feature	Identified pressures	Condition	Cited Description
Greenlaw Moor <sup>iv</sup>	Pink-footed goose (non-breeding)	No negative pressures	Favourable maintained: September 2007	Average peak of 14,200 birds (1987/88 to 1991/92).
Fala Flow <sup>v</sup>		Water management	Favourable maintained: December 2009	Average of 2,400 birds.
Firth of Forth <sup>vi</sup>		No negative pressures	Favourable maintained: March 2015	Average peak of 10,852 birds (1993/94 to 1997/98).

### 6.2 Potential Impacts on Qualifying Features

Based on the information on the Proposed Development presented in **section 3**, the identified potential impacts on pink-footed goose are:

- displacement: where birds are excluded from suitable areas of habitat, caused by a number of factors, including direct loss of habitat to accommodate the infrastructure, or indirect loss of habitat if birds avoid the turbines and the surrounding area due to its presence, and/or disturbance through construction and operational maintenance activities. Displacement can also include barrier effects in which birds are deterred from using their normal routes to feeding or roosting grounds;
- collision risk: death or injury through collision with turbines;
- lighting impacts associated with turbine lighting requirements and any other permanent infrastructure; and
- in-combination effects of the Proposed Development with other projects.

### 6.3 Conservation Objectives

In order to conduct the appropriate assessment under Step 3 of the HRA process, it is necessary to ascertain whether the Proposed Development would not adversely affect the integrity of a European site ('Integrity Test'). NatureScot advises that "There are no concrete rules about what constitutes 'no adverse effect on site integrity'. Each case should be judged on its own merits".

To establish the effect of the Proposed Development on the integrity of a European site, it is necessary to consider the relevant Conservation Objectives which may be affected.

The Conservation Objectives of all SPAs considered here are:

1. To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
2. To ensure for the qualifying species that the following are maintained in the long term:

- a. Population of the species as a viable component of the site;
- b. Distribution of the species within site;
- c. Distribution and extent of habitats supporting the species;
- d. Structure, function and supporting processes of habitats supporting the species;  
and
- e. No significant disturbance of the species.

For all the SPAs, as there is no overlap between the Site and each SPA, Conservation Objectives 2 (b), 2(c) and 2(d) are not considered relevant and have been scoped out of the appropriate assessment. In light of the Proposed Development's proximity to the SPAs, and the movements of qualifying features outside of the SPAs, Conservation Objectives 1, 2(a) and 2(e) are considered relevant and are considered below.

#### 6.4 Baseline Conditions

Pink-footed geese were recorded in flight over the Site during walkover surveys on ten occasions between September 2020 and March 2021, and four occasions between November 2021 and April 2022 (**Figure 7.23** details records where birds were in flight over the Site/were able to be observed). No evidence of birds using the Site for roosting or foraging was recorded during baseline surveys.

Flight activity surveys recorded 35 flights (**Figure 7.26**) totalling 2,388 individuals, of which 11 flights were identified to be 'at-risk' (i.e., occurring at least in part at turbine rotor height, within 500m of a turbine and within a surveyor's 2km viewshed), predicting a worst-case collision risk of one bird every 7.6 years (based on a mean non-breeding season predicted collision rate of 0.1310).

#### 6.5 Assessment of Impacts to Pink-Footed Goose

##### 6.5.1 Potential Construction/Decommissioning Effects

Pink-footed geese were not recorded foraging or roosting within the Site during the baseline survey period (**Figure 7.23**). A review of national pink-footed goose feeding distributions provided by Mitchell (2012<sup>ii</sup>) indicates that the nearest known feeding area is over 4 km to the south of the turbine area with the next nearest over 13 km to the southeast (**Figure 7.4**). It is therefore unlikely that the Site provides suitable foraging or roosting habitat for pink-footed goose, and it can be reasonably concluded that there would be no impacts from construction or decommissioning activities or habitat loss. As such there is considered to be **no adverse effects on the integrity of the Greenlaw Moor SPA, Fala Flow SPA or Firth of Forth SPA** due to construction or decommissioning.

##### 6.5.2 Potential Operational Effects – Displacement

As detailed above, pink-footed geese are not likely to forage or roost within or directly adjacent to the Site, with the nearest known foraging areas over 4 km to the south of the turbine area (Mitchell 2012<sup>ii</sup>). Furthermore, when reviewing the known foraging areas provided by Mitchell (2012<sup>ii</sup>) in the wider context of the location of the Proposed Development in relation to the Greenlaw Moor SPA, Fala Flow SPA or Firth of Forth SPA, foraging activity is clearly concentrated nearer the SPAs (**Figure 7.4**) so the likelihood of the Proposed Development displacing regular flightpaths between foraging areas and the Greenlaw Moor SPA, Fala Flow SPA or Firth of Forth SPA is very low.

As such there is considered to be **no adverse effects on the integrity of the Greenlaw Moor SPA, Fala Flow SPA or Firth of Forth SPA** due to operational displacement.

### 6.5.3 Potential Operational Effects – Collision Risk

Collision risk modelling predicted a mean annual pink-footed goose collision rate of 0.1310, or one bird every 7.6 years.

The cited Greenlaw Moor SPA, Fala Flow SPA and Firth of Forth SPA wintering populations were estimated to be 14,200, 2,400 and 10,852 birds respectively (**Table 7-3-2**). The additional mortality due to collision would be an increase over the baseline mortality rate (0.171, BTO BirdFacts<sup>vii</sup>) of 0.005 %, 0.032 % and 0.007 % for each SPA respectively.

Scientific studies have found that geese are adept at avoiding wind turbines in all conditions, reflected in the high avoidance rate used (99.8 %) in collision modelling calculations (SNH, 2014<sup>viii</sup>). Large scale migratory flight movements tend to be at an altitude well above turbine heights and geese are able to easily adjust their flight paths (with limited additional effort/reduction in overall fitness) to avoid wind turbines. Furthermore, migratory geese tend to follow topographical features such as river valleys to avoid unnecessary altitude gains over higher ground. Considering the distance between the Proposed Development and the SPAs (5.8 km, 13.1 km and 18.1 km) and the nearest known foraging area to the Proposed Development over 4 km (**Figure 7.4**, Mitchell 2012<sup>ii</sup>), any geese crossing the Proposed Development are considered to have had sufficient distance to gain the altitude required to fly above turbine height. Furthermore, the distribution of foraging areas in the wider area in relation to the SPAs and the Proposed Development suggests that birds would not be making journeys in darkness from roosts on the SPAs to foraging areas that would cross the Site.

It should also be noted that migratory wildfowl in the region will be habituated to the presence of the operational Fallago Rig Wind Farm directly to the north west of the Proposed Development and the adjustment required to flight paths as a result of the Proposed Development is considered to be negligible.

With such low collision risk and resultant small increases in mortality rates for each SPA population, there is considered to be **no adverse effects on the integrity of the Greenlaw Moor SPA, Fala Flow SPA or Firth of Forth SPA** due to collision risk.

### 6.5.4 Potential Operational Effects – Lighting

Impacts on pink-footed goose could arise as a consequence of deployment of obstruction lighting on turbines over 150 m to blade tip. Lighting can have various impacts on birds: they may be attracted to lights and thereby placed at higher risk of collisions, have migration patterns disrupted, show avoidance of lights with a consequent displacement effect, or be subject to increased predation threat. NatureScot (2020b<sup>x</sup>) has identified attraction (phototaxis) as posing the principal threat to birds, in relation to wind turbines.

It is widely recognised that nocturnal migrant birds can be attracted to artificial light while migrating, and historical reports of collisions associated with structures such as lighthouses or oil rigs suggest that risks are highest during periods of poor visibility and high winds. Watson *et al.* (2016<sup>x</sup>) conclude that artificial lighting changes behaviour of nocturnal migrant birds, either by

changing their flight paths to pass over lit areas, by flying at lower altitudes over lit areas, by increasing their call rates over lit areas, or by remaining longer over lit areas.

As reflected in the empirically derived high avoidance rate (99.8 %) recommended by NatureScot for use in collision modelling calculations (see above), it is evident that pink-footed geese are adept at avoiding wind turbines in all conditions. Large scale migratory flight movements tend to be at an altitude well above turbine heights and geese are able to easily adjust their flight paths (with limited additional effort/reduction in overall fitness) to avoid wind turbines. Furthermore, migratory geese tend to follow topographical features such as river valleys to avoid unnecessary altitude gains over higher ground. Considering the distance between the Site and the SPAs (5.8 km, 13.1 km and 18.1 km) and the nearest known foraging area to the Proposed Development over 4 km (**Figure 7.4**, Mitchell 2012<sup>ii</sup>), any geese crossing the Proposed Development are considered to have had sufficient distance to gain the altitude required to fly above turbine height and be unaffected by lighting. Furthermore, the distribution of foraging areas in the wider area in relation to the SPAs and the Proposed Development suggests that birds would not be making journeys in darkness from roosts on the SPAs to foraging areas that would cross the Site, and therefore near any lit turbines.

As such, it is considered that there is little evidence to suggest that pink-footed geese from the three SPAs would be affected by lighting requirements of the Proposed Development. Consequently, there is considered to be **no adverse effects on the integrity of the Greenlaw Moor SPA, Fala Flow SPA or Firth of Forth SPA** due to lighting.

## 7 MITIGATION

No significant unmitigated effects were predicted in the ornithological assessment (see **Chapter 7** of the EIAR) and therefore no additional mitigation above the embedded mitigation outlined above (BDMP, EcCoW and pre-construction surveys) is required. These measures will aim to ensure that any disruption to birds as a result of construction activities is minimised.

## 8 IN-COMBINATION EFFECTS

Based on the conclusions of the assessment presented in the section above, in-combination effects for pink-footed goose can be reasonably scoped out considering that no impacts, or at worst, negligible levels of impacts are predicted from the Proposed Development alone.

## 9 CONCLUSION

Based on the information presented above, and an assessment of potential impacts on qualifying features of European sites, it can be reasonably concluded that there would be **no adverse effects on the integrity of any European site**, either alone or in-combination with other projects and activities, due to the construction, operation and decommissioning of the Proposed Development.

<sup>i</sup> Austin, G.E., Calbrade, N.A., Birtles, G.A., Peck, K., Shaw, J.M. Wotton, S.R., Balmer, D.E. and Frost, T.M. 2023. Waterbirds in the UK 2021/22: The Wetland Bird Survey and Goose & Swan Monitoring Programme. BTO/RSPB/JNCC/NatureScot. Thetford

<sup>ii</sup> Mitchell, C. (2012). Mapping the distribution of feeding Pink-footed and Iceland Greylag Geese in Scotland. Wildfowl & Wetlands Trust / Scottish Natural Heritage Report, Slimbridge.

<sup>iii</sup> Scottish Natural Heritage (2016a). Assessing Connectivity with Special Protection Areas (SPAs).



<sup>iv</sup> <https://sitelink.nature.scot/site/8509> (accessed May 2023)

<sup>v</sup> <https://sitelink.nature.scot/site/8497> (accessed May 2023)

<sup>vi</sup> <https://sitelink.nature.scot/site/8499> (accessed May 2023)

<sup>vii</sup> <https://www.bto.org/understanding-birds/birdfacts/pink-footed-geese> (accessed May 2023)

<sup>viii</sup> Scottish Natural Heritage (2014). Assessing impacts to pink-footed and greylag geese from small-scale wind farms in Scotland. Guidance Note.

<sup>ix</sup> NatureScot (2020b). The Effect of Aviation Obstruction Lighting on Birds at Wind Turbines, Communication Towers and Other Structures. NatureScot Information Note.

<sup>x</sup> Watson, M.J., Wilson, D.R. and Mennill, D.J. 2016. Anthropogenic light is associated with increased vocal activity by nocturnally migrating birds. *Condor*, 118, 338-344.