

Chapter 9 Ornithology

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9 Ornithology

9.1 Introduction

9.1.1 This chapter considers the likely significant effects on ornithology associated with the construction and operation of the Torfichen Wind Farm (the Proposed Development). The specific objectives of the chapter are to:

- describe the current ornithological baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address the likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation measures.

9.1.2 The assessment has been carried out by Dr Steve Percival of Ecology Consulting.

9.1.3 The chapter is supported by a set of figures and the following Technical Appendices:

- **Technical Appendix 9.1:** Breeding Bird Survey 2021;
- **Technical Appendix 9.2:** Breeding Bird Survey 2022;
- **Technical Appendix 9.3:** Wintering Bird Survey 2021-22;
- **Technical Appendix 9.4:** Wintering Bird Survey 2022-23;
- **Technical Appendix 9.5:** Collision Risk Modelling Calculations;
- **Technical Appendix 9.6:** Draft Breeding Bird Protection Plan; and
- **Technical Appendix 9.7:** Shadow Habitats Regulations Assessment (HRA).

9.2 Legislation, Policy and Guidance

9.2.1 The ornithological assessment followed the guidance produced by Scottish Natural Heritage (SNH) (now NatureScot) (SNH 2017). Additionally, the following documents were taken into account:

- The Wildlife and Countryside Act 1981, as amended;
- EU Council Directive 79/409/EEC and 2009/147/EC on the Conservation of wild birds (the ‘Birds Directive’);

- EU Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the ‘Habitats Directive’);
- The Conservation of Habitats and Species Regulations 2017.
- Environmental Impact Assessment Directive 85/337/EEC (the EIA Directive);
- The Nature Conservation (Scotland) Act 2004;
- The Wildlife and Natural Environment (Scotland) Act 2011;
- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended).
- National Planning Framework 4 (NPF4) - sets out the spatial principles, regional priorities, national developments and national planning policy;
- Planning Advice Note (PAN) 1/2013 - Environmental Impact Assessment (Scottish Government 2013);
- PAN 51: Planning, Environmental Protection and Regulation (Scottish Government, revised 2006);
- PAN 60: Planning for Natural Heritage (Scottish Government 2000);
- Scottish Executive Circular 6/1995 EIR release (as amended June 2000). Information request and response under the Environmental Information (Scotland) Regulations 2004;
- Planning Circular 1/2017; Environmental Impact Assessment Regulations. Guidance on The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 (Scottish Government, 2017);
- ‘Managing Natura 2000 Sites’ (European Communities 2000), which gives guidance on the implementation of the Birds and Habitats Directives;
- Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater and Coastal (CIEEM 2018);
- Recommended bird survey methods to inform impact assessment of onshore wind farms (SNH 2017a);
- Developing field and analytical methods to assess avian collision risk at wind farms (Band et al. 2007);
- Avoidance rates for the onshore SNH collision risk model (SNH 2017b);
- Assessing significance of impacts from onshore windfarms on birds outwith designated areas: version 2 (SNH 2018a);

- Assessing the cumulative impact of onshore wind energy developments (SNH 2018b);
- Assessing connectivity with Special Protection Areas (SPAs) (SNH 2016a);
- Environmental Statements and Annexes of Environmentally Sensitive Bird Information Guidance for Developers, Consultants and Consultees. Version 2 (SNH 2016b);
- Good Practice during Wind Farm Construction (Scottish Renewables et al. 2019);
- Birds of Conservation Concern (BoCC) 5: the Population Status of Birds in the United Kingdom, Channel Islands and the Isle of Man (Stanbury et al. 2021);
- Midlothian Local Biodiversity Action Plan (LBAP);
- The UK Post-2010 Biodiversity Framework; and
- The Scottish Biodiversity List (SBL) (NatureScot 2020: <https://www.nature.scot/doc/scottish-biodiversity-list>)

9.3 Consultation

9.3.1 Consultation was undertaken primarily through the EIA Scoping process. The issues raised and key outcomes of this consultation relating to ornithology are summarised in **Table 9.1**.

Table 9.1 Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
Royal Society for the Protection of Birds (RSPB) 29/1/23	Scoping Opinion	The ornithological chapter of the EIA should consider all the components of the proposal including access roads (including the route on public roads to get the turbines on site), on-site tracks, borrow pits, drainage, grid connection, substation, and temporary construction buildings/storage compounds. Disturbance, displacement (including barrier effects), loss of suitable habitat (breeding, wintering and foraging) and collision risk should be assessed for all species.	All addressed in this chapter.
		With NPF4 now approved by the Scottish Parliament and soon to be adopted we would	oBEMP includes such measures (see Chapter 8: Ecology)

		<p>expect the outline Biodiversity and Enhancement Management Plan (oBEMP) to include proposals for mitigation and enhancement of habitats and species on site and discuss opportunities for development and enhancement of wider Nature Networks.</p>	
		<p>Confirm that surveys have been scoped to ensure that a robust and complete set of baseline ecological data is collected for the Proposed Development.</p>	<p>Noted.</p>
<p>Midlothian Council 13/2/23</p>	<p>Scoping Opinion</p>	<p>The site is close to the internationally important nature conservation sites at Gladhouse Reservoir, Fala Flow and Peeswit Moss.</p>	<p>Specific assessment included in the chapter and further details provided in Technical Appendix 9.7.</p>
		<p>The EIA should assess the impact on migratory species passing through/ in close proximity to the site between Midlothian and Scottish Borders.</p>	<p>Addressed in this chapter.</p>
		<p>The impact on the wider environment and species not found in these designated sites should also be included in the assessment, including in other statutory and non-statutory nature conservation designations.</p>	<p>These have been included in the assessment presented in this chapter.</p>
<p>NatureScot 10/5/22</p>	<p>Scoping Opinion</p>	<p>Advise that the proposal is likely to have a significant effect on the qualifying interests of the sites Gladhouse Reservoir, Fala Flow, Firth of Forth and Westwater Special Protection Areas (SPAs), as it lies within the 20 km foraging range for their designated populations of pink-footed goose, so a Habitats Regulations assessment will be required.</p>	<p>Potential effects on pink-footed geese and these SPAs have been assessed and an HRA report is included in Technical Appendix 9.7.</p>
		<p>Assessment of the impacts of this proposal on the avian features of the Moorfoot Hills Site of Special Scientific Interest (SSSI) should be included in the EIA (including breeding golden plover).</p>	<p>Included in this chapter (see 9.5.1 and 9.6.7).</p>

		The surveys carried out appear comprehensive, and the proposed approach to the assessment of impacts appears appropriate and in line with NatureScot guidance.	Noted.
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9.4 Methodology

Scope of Assessment

9.4.1 The key issues for the assessment of potential ornithological effects relating to onshore wind farms include the following, based on NatureScot (NS; formerly Scottish National Heritage (SNH)) guidance (SNH, 2018a):

- direct loss of bird habitat through construction of wind farm infrastructure;
- disturbance of birds during construction and operation (including displacement of flight activity through barrier effects);
- mortality of birds through collision with wind turbine blades or towers during operation; and
- cumulative effects of wind farm operational disturbance and collision mortality, on the national and Natural Heritage Zone (NHZ) populations of key target species.

9.4.2 Key target species for the assessment have been identified following SNH 2018a guidance using the following criteria:

- species listed on Annex 1 of the EU Birds Directive;
- species listed on Schedule 1 of the 1981 Wildlife & Countryside Act;
- species identified by NatureScot (SNH 2018a) as ‘Priority bird species for assessment when considering the development of onshore wind farms in Scotland’. These include (a) species that are widespread across Scotland which utilise habitats or have flight behaviours that may be adversely affected by a wind farm, and (b) as ‘restricted range’ species; and
- red-listed species on the Birds of Conservation Concern list (Stanbury et al. 2021).

9.4.3 The ornithological assessment has, therefore, given particular consideration to all species recorded during the baseline surveys at the site that meet any of these criteria.

9.4.4 No ornithological issues have been scoped out from this assessment, though, following NS (SNH 2018a) guidance, the assessment has focussed on the key species likely to be affected by the Proposed Development.

Baseline Characterisation

Study Area

9.4.5 The ornithology study areas were chosen to include all areas within the potential zone of ornithological influence of the Proposed Development, with reference to SNH (2017) guidance. The specific study areas were as follows:

- Ornithological designated sites: sites designated for ornithological interests within 5 km of the site (all statutory protected sites) and within 20 km (internationally important sites), see **Figure 9.1.** for internationally important sites within 20 km and **Figure 8.1** for nationally important sites within 5 km.
- Core breeding and wintering bird surveys: included the site boundary (the site), plus a 500 m buffer for the main breeding bird surveys (the core breeding bird survey area) covering a total area of 18.1 square kilometres (km²), shown in **Figure 9.2.**
- Key species surveys (the wider breeding bird survey area): a 2 km buffer, where access was possible, covering an additional 32 km².
- Flight Activity (Vantage Point) surveys as shown in **Figure 9.2;** and
- Cumulative Effects: other proposed developments within the ‘Border Hills’ NatureScot Natural Heritage Zone (NHZ20) included in assessment of potential cumulative ornithological effects. The site lies mainly within the ‘Border Hills’ NHZ, though the northern edge of the survey area is within the ‘Eastern Lowlands’ (NHZ16).

Desk Study

9.4.6 The ornithological desk study provided information on the ornithological interest of the study area out to 20 km from the site, including the locations of any relevant statutory protected sites and collation of data on key species such as raptors and breeding waders. Data from following sources of information were sought for the desk study:

- NatureScot website (<https://sitelink.nature.scot/home>) - statutory designated site boundaries, including SSSIs and SSSI citation details;
- Joint Nature Conservation Committee (JNCC) website (<https://jncc.gov.uk/our-work/special-protection-areas-overview/>) - European protected site boundaries and designations (SPA/Ramsar);

- Wetland Bird Survey annual reports (Frost et al. 2021);
- The Birds of Scotland (Forrester et al. 2007);
- Bird Atlas 2007-11: The Breeding and Wintering Birds of Britain and Ireland (Balmer et al. 2013);
- The Wildlife Information Centre for Lothian and the Borders;
- Information published in Environmental Statements (ES) and EIA Reports for other developments in the NHZ20 and the adjacent 'Eastern Lowlands' (NHZ16); and
- Lothian and Borders Raptor Study Group.

Field Survey

9.4.7 A comprehensive range of bird surveys have been undertaken at the site between April 2021 and March 2023. This has included surveys over two full breeding seasons (2021 and 2022) and two winter periods (2021-22 and 2022-23). These surveys comprised:

- year-round vantage point surveys to quantify bird flight activity;
- breeding bird walkover mapping survey;
- species-specific breeding bird surveys; and
- autumn/winter walkover surveys.

9.4.8 Full details of the surveys, dates and weather conditions are given in **Technical Appendices 9.1-9.4**.

Vantage Point (VP) Surveys (year-round)

9.4.9 VP surveys were carried out to determine flight activity within the site and its surrounds. The VP surveys quantified the bird numbers that could potentially be at risk of collision (including roost flight observations at dawn/dusk). All flight lines of target species were mapped, and the flight height and duration of each flock/individual recorded. The following species were recorded:

- all birds of prey and owls;
- all waders (including lapwing and golden plover) and gulls;
- all ducks, geese, swans, cormorants, herons, coot and grebes;
- large flocks (>100 birds) of other species (except woodpigeon and rook); and
- any other notable species, including SNH 2018a priority species.

9.4.10 Three VPs were used, to give sufficient coverage of the site and its surrounds. Computer GIS (Global Mapper v21)-generated viewsheds are shown in **Figure 9.2**. The same locations were used for all of the surveys, with the following surveys being undertaken at each VP:

- breeding season:
 - April-August 2021 - 36 hours/VP.
 - April-August 2022 - 36 hours/VP.
- autumn/winter:
 - September-March 2021-22 - 72 hours (36 hours plus an additional 36 hours to cover goose migration).
 - September-March 2022-24 - 72 hours (36 hours plus an additional 36 hours to cover goose migration).

Core Breeding Bird Walkover Surveys

9.4.11 The breeding bird walkover survey of the core survey area followed the standard Brown and Shepherd (1993) moorland survey method with two additional visits as recommended in SNH 2017 guidance. These surveys covered the site plus a 500 m buffer. The extent of the core breeding bird survey area is shown in **Figure 9.2**.

- 2021 - four visits during April-July; and
- 2022 - four visits during April-July.

9.4.12 All bird locations and behaviour were mapped at 1:10,000 scale, using the standard British Trust for Ornithology (BTO) Common Birds Census notation, and all species were recorded. In addition, the survey effort per unit area was standardised to make the surveys as repeatable as possible, recording systematically for approximately two hours per km². A route was chosen to ensure that all parts of the ornithology study area were covered to within approximately 100 m of the observer, where access was possible. The survey route was plotted onto the survey map as it was undertaken.

9.4.13 The surveys avoided strong winds, heavy rain, fog and low cloud. Birds were located by walking, listening and scanning by eye and with binoculars. Standard BTO notation was used to record the birds' activities; singing, calling, carrying nest material, nests or young found, repetitively alarmed adults, disturbance displaying, carrying food or in territorial dispute.

9.4.14 The survey data were analysed to determine spatially distinct clusters of records, equivalent to breeding territories, with the number of such territories used to calculate the breeding population for each species (Gilbert et al. 1998). A record in potentially suitable breeding habitat on a single visit was considered sufficient to indicate a potential breeding attempt.

Species-specific Breeding Bird Surveys (Wider Area Surveys)

9.4.15 As the site and its surrounds supported potentially suitable habitat for a range of scarce raptor, and black grouse, additional species-specific surveys were undertaken during April-August 2021 and 2022, as set out in the scoping document. Surveys were undertaken within the site and a 2 km buffer zone (the ‘wider breeding bird survey area’) where potentially suitable breeding habitat for these species are present. Walkovers were carried out where access was allowed, supplemented by a series of mini-VPs (short watches from additional VPs) chosen to observe over all of the site plus a 2 km buffer. This comprised surveys for black grouse, goshawk, hen harrier, red kite, short-eared owl, barn owl, peregrine and merlin, following the standard methodologies detailed in Gilbert *et al.* (1998) and Hardey *et al.* (2013):

- black grouse surveys - dawn surveys during April-May 2021 and 2022 over 2-3 visits for each of the two baseline survey years; and
- raptor/owl surveys - walkover and mini-VP surveys, each month for each of the two baseline survey years during March-August 2021 and 2022.

9.4.16 In addition, any other key target species observed during these surveys were recorded, including curlew, golden plover and dunlin.

Autumn/Winter Walkover Surveys

9.4.17 Walkover mapping surveys of the wintering birds within the site and a 500 m buffer took place in accordance with NS guidance (**Figure 9.2**). The survey focused on key target species, as set out above for the VP surveys. As well as counting and mapping each species, the behaviour of each flock was also recorded, e.g. feeding/roosting. The surveys included work at dawn and dusk to check the area specifically for roosting hen harriers and other important raptors, and were carried out as follows:

- 2021-22 - monthly surveys, September-March; and
- 2022-23 - monthly surveys, September-March.

Winter Waterfowl Feeding Distribution Surveys

9.4.18 Additional surveys were undertaken twice-monthly of all possible habitats that could be used by wintering waterfowl as feeding/roosting sites within 2 km of the site (to give contextual information about where goose feeding flocks were located, and provide further information on possible linkage to Gladhouse Reservoir and Fala Flow SPAs, see **Figure 9.2**). The counts were carried out as instantaneous ‘look-see’ counts, recording a

snapshot of the birds present in each field/count sector when surveyed (Gilbert *et al.* 1998).

Collision Risk Modelling

- 9.4.19 To further inform the determination of the likelihood of potentially significant adverse effects occurring, collision risk modelling was carried out for all the key target species (as per SNH guidance 2018a) recorded flying through the collision risk zone at rotor height. Rotor height would be 30-180 m. Further details are provided in **Technical Appendix 9.5**.
- 9.4.20 The modelling included six target raptor species (osprey, goshawk, red kite, hen harrier, peregrine and merlin) and two breeding waders (curlew and lapwing). The collision risk for each of these species was modelled using the non-direct flight model. In addition, wintering/migrating whooper swans, greylag geese, barnacle geese, pink-footed geese, golden plover and herring gulls were observed flying through the collision risk zone and were also modelled to determine their collision risk. As their flights were largely direct ones through the site, the direct flight model was applied. No other key species was recorded flying through the collision risk zone at rotor height.
- 9.4.21 The collision risk model used in this assessment was developed by NS and BWEA (Band *et al.* 2005). The model runs as a two-stage process. Firstly, the risk is calculated making the assumption that flight patterns are unaffected by the presence of the wind turbines, i.e. that no avoidance action is taken. This is essentially a mechanistic calculation, with the collision risk calculated as the product of (i) the probability of a bird flying through the rotor swept area, and (ii) the probability of a bird colliding if it does so. This probability is then multiplied by the estimated numbers of bird movements through the wind farm rotors at the risk height (i.e. the height of the rotating rotor blades) in order to estimate the theoretical numbers at risk of collision if they take no avoiding action.
- 9.4.22 The second stage then incorporates the probability that the birds, rather than flying blindly into the wind turbines, will actually take a degree of avoiding action, as has been shown to occur in all studies of birds at existing wind farms. NS has recommended a precautionary approach, using a value of 98% as a general default avoidance rate, 99% for some larger raptors (including red kite and hen harrier) and 99.8% for geese (SNH 2017b). This precautionary approach is useful as an initial filter to identify sites where collision risk is clearly not an issue, but does not necessarily provide a realistic estimate of actual likely collision rates when

compared with data from existing wind farms. The magnitude of the impact was determined as a percentage increase in the existing baseline mortality (to put the potential wind farm mortality into the ecological context of the birds' population dynamics), though professional judgement was also applied in the assessment of any non-negligible magnitude collision risks predicted.

- 9.4.23 Details of the input data and the collision risk calculations are given in **Technical Appendix 9.5**. Body sizes and baseline mortality rates were taken from Robinson (2005) and flight speeds from Alerstam *et al.* (2007).

Assessment Methodology

- 9.4.24 The significance of the potential effects of the Proposed Development has been classified by professional consideration of the value of the receptor and the magnitude of the potential effect.
- 9.4.25 The assessment includes a full evaluation of the ornithological importance of the bird populations at the site and identification of any particularly sensitive areas. The assessment has been carried out with reference to the assessment methodologies produced by NatureScot (SNH 2018a) for the wider countryside, and the CIEEM (2018) Guidelines.
- 9.4.26 An assessment of the effects of the Proposed Development on European Protected Sites under the Habitats Regulations is presented separately in **Technical Appendix 9.7**.

Criteria for Assessing Value (Conservation Importance)

- 9.4.27 Value (conservation importance) was assigned using the criteria set out in **Table 9.2**, drawing upon those adopted by NS in Guidelines for Selection of Biological SSSI, using 1% of the resource to define international and national importance (very high and high values) (Frost *et al.* 2021). An additional category of regional importance (medium value) was assigned for species approaching the threshold for national importance and those for which the survey area held a notable concentration in a county context. A further category of 'local importance' (low value) was used for species that did not reach regional importance but were still of some conservation interest. This included all species on the red or amber lists of the 'Birds of Conservation Concern' (Stanbury *et al.* 2021) that did not reach national or regional importance at the site. National reference populations have been taken from Woodward *et al.* 2020 and regional NHZ populations from Wilson *et al.* 2015. In addition, listing on Annex 1 of the EU Birds Directive, Schedule 1 of the Wildlife and Countryside and Scottish

Biodiversity List (SBL) species were all considered in the evaluation process.

9.4.28 The sensitivity (conservation importance, as defined in **Table 9.2**) of the receptors present in the 20 km study area were identified, then the magnitude of the possible impact on those receptors determined (as described in **Table 9.3**).

Table 9.2 Value (conservation importance) of bird species

Value	Definitions
Very High	Cited interest of SPAs, Special Areas of Conservation (SACs) and SSSIs. Cited means mentioned in the citation text for those protected sites as a species for which the site is designated (SPAs/SACs) or notified (SSSIs).
High	Other species that contribute to the integrity of an SPA or SSSI. A local population of more than 1% of the national population of a species. Any ecologically sensitive species, e.g. large birds of prey or rare birds (<300 breeding pairs in the UK). EU Birds Directive Annex 1, EU Habitats Directive priority habitat/species and/or Wildlife and Countryside Act Schedule 1 species (if not covered above). Other specially protected species.
Medium	Regionally important population of a species, either because of population size or distributional context. UK Biodiversity Action Plan (BAP) priority species (if not covered above).
Low	Any other species of conservation interest, e.g. species listed on the Birds of Conservation Concern not covered above, present in only locally important numbers
Nil	Green-listed species (Stanbury et al. 2021) of favourable conservation status.

Magnitude of Impact

9.4.29 An impact is defined as a change of particular magnitude to the abundance and/or distribution of a population as a result of the Proposed Development. The magnitude of impact is assessed in terms of the extent of the impact (spatial) and the temporal aspects of the impact, in terms of timing, frequency, duration and reversibility. **Table 9.3** shows the definitions of the impact magnitude classification used for the assessment.

Table 9.3 Definition of terms relating to the magnitude of ornithological impacts

Magnitude	Definition
Very High	Total loss or very major alteration to key elements/ features of the baseline conditions such that post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether. Guide: >80% of population/habitat lost
High	Major alteration to key elements/ features of the baseline conditions such that post development character/composition/attributes will be

Magnitude	Definition
	fundamentally changed. Guide: 20-80% of population/habitat lost
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/ composition/ attributes of baseline will be partially changed. Guide: 5-20% of population/habitat lost
Low	Minor shift away from baseline conditions. Change arising from the loss/ alteration will be discernible but underlying character/composition/ attributes of baseline condition will be similar to pre-development circumstances/patterns. Guide: 1-5% of population/habitat lost
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the “no change” situation. Guide: <1% of population/habitat lost

Significance Criteria

9.4.30 The combined assessment of the magnitude of an impact and the value of the receptor was used to determine the significance of potential effects. These two criteria were cross-tabulated to assess the overall effect and significance of that effect (Table 9.4). This gives a guide as to the determination of significance, though the final assessment was still subject to professional judgment. The significance category of each combination is shown in each cell. Shaded cells indicate potentially significant effects in terms of the EIA Regulations.

Table 9.4 Matrix of magnitude of impact and sensitivity used to test the significance of effects

		SENSITIVITY				
		Very high	High	Medium	Low	Nil
MAGNITUDE	Very high	Major	Major	Major-moderate	Moderate	Negligible
	High	Major	Major	Moderate	Minor	Negligible
	Medium	Major	Major-moderate	Minor	Negligible	Negligible
	Low	Moderate	Minor	Minor	Negligible	Negligible
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible

9.4.31 The interpretation of these significance categories was as follows:

- Negligible and minor are not normally of concern, though normal design care should be exercised to minimise any adverse effects;
- Moderate represents a potentially significant adverse effect on which professional judgment has to be made, though for which it is likely that mitigation will reduce it below the significance threshold; and
- Major and major/moderate represent significant adverse effects on bird populations which are regarded as significant for the purposes of EIA.

9.4.32 The SNH (2018a) wider countryside assessment guidance defines the key significance test as follows: “An impact should be judged as of concern where it would adversely affect the favourable conservation status of a species or stop a recovering species from reaching favourable conservation status, at international or national level or regionally.” It notes that the key baseline population against which the assessment should be made for breeding birds is the SNH Natural Heritage Zone (NHZ) population (NHZ 20, ‘Border Hills’, in this case).

9.4.33 A cumulative ornithological assessment (using the same criteria as the main assessment) has been undertaken following the SNH 2018b guidance on ‘Assessing the cumulative impacts of onshore wind farms on birds’, considering impacts on the favourable conservation status of key species within the relevant NHZ, in this case NHZ 20 ‘Border Hills’.

9.4.34 As the 20 km study area held species specially protected under Schedule 1 of the 1981 Wildlife and Countryside Act, information on the breeding sites and associated flight activity of the species listed on that Schedule is provided in a Confidential Annex to **Technical Appendix 9.2**. It is important that their breeding locations are kept confidential to minimise the risk of persecution and disturbance. Following SNH (2016b) guidance, the amount of information contained in that Technical Appendix has been kept to a minimum but includes all data that indicate breeding locations.

Limitations and Assumptions

9.4.35 No significant information gaps have been identified. Inevitably with any ornithological survey it cannot be guaranteed to detect all target species/individuals and surveys cannot be fully representative of all conditions (e.g. severely reduced visibility). However, in this case it was concluded that the baseline surveys provide a robust data set on which to carry out the assessment.

9.5 Baseline

Statutory Protected Sites

9.5.1 There are eight statutory designated nature conservation sites in the search area around the Proposed Development (5 km for nationally important SSSIs and 20 km for internationally important European Protected SPAs and Ramsar Sites):

- Gladhouse Reservoir SPA/Ramsar/SSSI - 700 m west from the site boundary, and 940 m from the closest proposed turbine - designated for its wintering population of pink-footed geese (which roost on the reservoir at night and forage on the surrounding farmland, up to 15-20 km from the roost).
- Moorfoot Hills SSSI - 410 m south from the southern boundary of the site, 970 m from the closest proposed turbine - notified for its breeding golden plover population, its breeding bird assemblage (including 9 species of wader, and ring ouzel), and its blanket bog, upland birch woodland and upland habitat assemblage). It is also designated as an SAC.
- Dundreich Plateau SSSI - 4.0 km south-west from the site - notified for its blanket bog and subalpine flush habitats. The citation also notes that the site supports a number of breeding birds including golden plover, curlew, ring ouzel and redshank.
- Fala Flow SPA/Ramsar/SSSI - 6.4 km north-east - designated for its wintering population of pink-footed geese. Blanket bog habitat is also a key feature of the SSSI.
- Firth of Forth SPA/Ramsar/SSSI - 16.5 km north - designated for range of internationally important wintering waterfowl populations, and passage Sandwich terns. The only species for which the SPA could have any connectivity given the distance is pink-footed goose.
- Westwater SPA/Ramsar/SSSI - 19.5 km west - designated for its wintering population of pink-footed geese and its wintering waterbird assemblage.

9.5.2 The following statutory designated nature conservation sites are located within the search area but have no ornithological interest features:

- Peeswit Moss SAC/SSSI - 2.7 km north-west - notified for its raised bog habitats.
- Crichton Glen SSSI - 4.2 km north-east - notified for its lowland neutral grassland, upland oak woodland and valley fen habitats.

9.5.3 The potential connectivity of each of the SPA/Ramsar sites to the Proposed Development is summarised in **Table 9.5**. This lists the qualifying features for each SPA, the distance from the site at its closest point and an initial assessment of whether the site falls within the core range of each (as set out in SNH 2016a). As set out in this guidance, *“In most cases the core range should be used when determining whether there is connectivity between the proposal and the qualifying interests”*, so this has been used for this assessment (though with consideration of the maximum ranges too).

Table 9.5 Special Protection Areas/Ramsar Sites within 20 km of the Proposed Development, their qualifying features and likely connectivity to the site.

SPA	Distance from site	Qualifying features	Qualifying features for which site lies within core range (SNH 2016a)
Gladhouse Reservoir	0.7 km	Wintering pink-footed goose	Pink-footed goose (15-20 km)
Fala Flow	6.4 km	Wintering pink-footed goose	Pink-footed goose (15-20 km)
Firth of Forth	16.5 km	Internationally important wintering waterfowl populations, including pink-footed geese, and passage Sandwich terns.	Pink-footed goose (15-20 km)
Westwater	19.5 km	Wintering pink-footed goose	Pink-footed goose (15-20 km)

Current Baseline

Field Survey Results: Breeding Birds

9.5.4 The breeding bird populations found within the core survey area during each of the breeding bird surveys are summarised in **Table 9.6**. This Table shows the estimated number of breeding pairs recorded during each of the two survey years (2021 and 2022). Details of all the breeding bird populations are set out in **Technical Appendices 9.1 and 9.2**.

Table 9.6 Breeding Bird Populations in the Core Study Area (April-August 2021 and 2022)

Species	Number of pairs in 2021	Number of pairs in 2022
Mute Swan	1	1
Greylag Goose	25	8
Canada Goose	0	2
Shelduck	0	2

Species	Number of pairs in 2021	Number of pairs in 2022
Teal	2	1
Mallard	6	4
Tufted Duck	4	4
Red Grouse	18	8
Black Grouse	1 (8)	1 (6)
Red-legged Partridge	1	6
Quail	1	0
Pheasant	20	27
Little Grebe	1	1
Osprey	0	(1)
Buzzard	13	17
Kestrel	4	3
Moorhen	1	3
Coot	0	1
Oystercatcher	7	13
Golden Plover	2	2
Lapwing	33	45
Snipe	27	28
Curlew	87	57
Common Sandpiper	0	2
Redshank	3	2
Black-headed Gull	313	380
Feral Pigeon	0	4
Stock Dove	0	1
Woodpigeon	99	594
Collared Dove	0	1
Cuckoo	2	2
Long-eared Owl	1	0
Short-eared Owl	(1)	0
Barn Owl	0	(1)
Great Spotted Woodpecker	1	8
Skylark	327	520
Sand Martin	3	24
Swallow	9	13
House Martin	0	2
Tree Pipit	2	0

Species	Number of pairs in 2021	Number of pairs in 2022
Meadow Pipit	450	1040
Grey Wagtail	0	5
Pied Wagtail	3	21
Wren	16	90
Duncock	5	18
Robin	21	56
Redstart	1	3
Whinchat	3	3
Stonechat	5	16
Wheatear	22	26
Blackbird	14	35
Song Thrush	16	24
Mistle Thrush	12	14
Grasshopper Warbler	0	1
Sedge Warbler	0	4
Blackcap	0	2
Whitethroat	0	1
Chiffchaff	4	13
Willow Warbler	35	101
Goldcrest	7	38
Spotted Flycatcher	1	1
Long-tailed Tit	0	1
Blue Tit	5	11
Great Tit	5	8
Coal Tit	9	51
Treecreeper	0	1
Jay	0	4
Magpie	2	6
Jackdaw	12	22
Rook	65	55
Carrion Crow	38	37
Raven	5	1
Starling	1	12
House Sparrow	0	8
Tree Sparrow	0	2
Chaffinch	50	132

Species	Number of pairs in 2021	Number of pairs in 2022
Goldfinch	2	13
Siskin	5	33
Linnet	3	10
Lesser Redpoll	3	41
Common Crossbill	2	7
Bullfinch	0	2
Yellowhammer	0	4
Reed Bunting	8	45

Note: The brackets in the Table indicate numbers breeding in the wider study area (500 m-2 km from the Proposed Development).

Species-Specific Breeding Bird Survey Results

Black Grouse

9.5.5 Two black grouse lekking areas were located during the surveys, the main one on the south-eastern edge of the core survey area (peak count 7 males in 2021 and 5 in 2022), and a second smaller lek (with only 1-2 lekking males) within the site at its western end (plus an alternative lekking location 900 m south from that during the 2022 April survey).

Osprey

9.5.6 One pair was recorded breeding in the wider survey area in 2022. Further details are given in the Confidential Appendix. Flight activity over the site itself was very infrequent, with only a single flight recorded during the VP surveys.

Goshawk

9.5.7 There were occasional records of this species during the surveys, but no evidence of breeding was found within the core survey area. It is, though, likely that it was breeding in woodland in the 2 km buffer to the north.

Short-eared Owl

9.5.8 One pair of short-eared owls was found breeding in 2021, nesting in the 2 km buffer zone. Though the nest site was located outside the core survey area (and the Proposed Development site), there was still some foraging/flight activity observed within the site. There was no evidence of breeding in 2022 (with only a single record during the VP surveys).

Barn Owl

9.5.9 One pair was recorded in 2022 breeding in a nestbox in the 2 km buffer south-east of the site, but there were no records within the core survey area during the breeding bird or VP surveys.

Other Target Raptors

9.5.10 The following key target species were recorded within the survey area (core and wider areas), but no evidence was found for any of them of breeding within the core or wider 2 km buffer survey area.

- Red kite
- Hen harrier
- Marsh harrier
- Merlin
- Peregrine.

Vantage Point Survey Results: Breeding Season

9.5.11 The rates of bird flight movement observed across the site during the breeding season VP surveys are summarised in **Table 9.7**. This gives the flight rate per hour of observation in each year and the overall mean flight rate per hour. Overall flight rates of key species over the site were low, with no major differences apparent between years.

9.5.12 **Table 9.7** also gives the percentage of flights of each species that were recorded at rotor height (30-180 m above ground level) over both years' baseline data.

Table 9.7 Key Species Flight Rates recorded over the VP survey area during the 2021 and 2022 breeding season vantage point surveys

Species	Flight rate in 2021 (birds/hour)	Flight rate in 2022 (birds/hour)	Total number observed	% flights at rotor height (30-180m)
Pink-footed Goose	0.00	0.01	1	100%
Greylag Goose	0.98	0.75	218	28%
Shelduck	0.02	0.03	6	0%
Teal	0.01	0.04	6	0%
Mallard	0.06	0.06	14	11%
Red Grouse	0.02	0.00	2	0%
Black Grouse	0.02	0.01	3	0%
Grey Heron	0.01	0.00	1	100%
Red Kite	0.01	0.02	3	67%
Marsh Harrier	0.00	0.01	1	0%
Hen Harrier	0.00	0.01	1	0%

Species	Flight rate in 2021 (birds/hour)	Flight rate in 2022 (birds/hour)	Total number observed	% flights at rotor height (30-180m)
Goshawk	0.00	0.03	4	0%
Sparrowhawk	0.04	0.09	16	19%
Buzzard	1.25	1.32	324	55%
Osprey	0.00	0.01	1	100%
Kestrel	0.75	0.49	157	25%
Merlin	0.00	0.02	3	0%
Peregrine	0.04	0.02	8	75%
Oystercatcher	0.12	0.32	55	19%
Golden Plover	0.06	0.00	7	100%
Lapwing	2.26	3.44	718	7%
Snipe	0.34	0.25	74	37%
Curlew	1.91	3.17	640	13%
Redshank	0.02	0.01	3	33%
Common Gull	0.00	0.75	95	58%
Lesser Black-backed Gull	0.26	2.95	405	55%
Herring Gull	0.00	0.63	79	51%
Great Black-backed Gull	0.00	0.02	3	33%
Little Gull	0.00	0.01	1	0%
Black-headed Gull	-	19.91	2509	84%
Long-eared Owl	0.01	0.00	1	0%

Note: black-headed gulls not recorded as target species in 2021.

Field Survey Results: Wintering Birds Site Walkover

9.5.13 The results of the autumn/winter walkover surveys are summarised in Table 9.8. The Table shows the mean and peak counts recorded in each of the two survey years (2021-22 and 2022-23).

Table 9.8 Autumn/Winter Bird Populations (wintering bird walkover survey area during 2021-22 and 2022-23)

Species	Mean count 2021-22	Mean count 2022-23	Peak count 2021-22	Peak count 2022-23
Pink-footed Goose	446.0	379.1	1270	2555
Greylag Goose	22.3	19.4	120	54
Canada Goose	2.3	4.7	8	15
Barnacle Goose	253.3	0.0	1773	0

Species	Mean count 2021-22	Mean count 2022-23	Peak count 2021-22	Peak count 2022-23
Teal	5.4	0.0	38	0
Mallard	0.1	2.0	1	8
Red Grouse	39.1	74.3	84	278
Black Grouse	3.9	0.1	9	1
Little Grebe	0.1	0.0	1	0
Hen Harrier	0.7	0.0	3	0
Goshawk	0.6	0.4	3	2
Sparrowhawk	0.3	0.0	1	0
Buzzard	9.0	6.6	19	14
Kestrel	1.0	3.7	4	7
Merlin	0.3	0.0	1	0
Golden Plover	13.1	9.6	45	37
Lapwing	89.4	38.3	262	130
Jack Snipe	0.4	0.1	2	1
Snipe	8.9	13.7	22	41
Woodcock	1.1	1.9	3	6
Curlew	31.9	3.7	223	25
Common Gull	23.6	0.0	61	0
Lesser Black-backed Gull	0.1	0.0	1	0
Herring Gull	6.7	6.9	27	46
Black-headed Gull	0.7	0.7	4	5
Tawny Owl	0.1	0.0	1	0
Short-eared Owl	0	0.4	0	1

Field Survey Results: Wintering Birds Wider Waterfowl Survey

9.5.14 The results of the autumn/winter waterfowl surveys are summarised in Table 9.8. The Table shows the mean and peak counts recorded in each of the two survey years (2021-22 and 2022-23). Pink-footed geese were the most abundant target species and were seen frequently during the surveys, with higher numbers in the second half of the survey period during both winters (peak count 3,279 in 2021-22 and 2,368 in 2022-23).

Table 9.8 Autumn/Winter Bird Populations (wintering waterfowl survey area during 2021-22 and 2022-23)

Species	Mean count 2021-22	Mean count 2022-23	Peak count 2021-22	Peak count 2022-23
Mute Swan	20.5	11.1	57	35
Whooper Swan	0.2	0.5	3	6
Pink-footed Goose	805.1	614.1	3279	2368
White-fronted Goose	0	0.1	0	1
Greylag Goose	111.8	106.4	349	337
Canada Goose	52.7	61.4	132	138
Barnacle Goose	0.4	7.6	3	105
Shelduck	0.9	0.4	6	3
Wigeon	63.4	44.4	154	87
Teal	79.6	53.1	190	185
Mallard	105.4	131.6	239	290
Pintail	0	0.1	0	1
Pochard	0.1	0.1	1	2
Tufted Duck	31	48.0	78	119
Goldeneye	9.2	21.4	31	46
Goosander	0.4	0.7	4	4
Little Grebe	2.6	5.8	12	29
Cormorant	6.6	13.6	23	39
Grey Heron	0.6	0.6	2	6
Goshawk	0.1	0.0	1	0
Sparrowhawk	0.4	0.2	2	2
Buzzard	3.1	1.8	6	4
Kestrel	0.7	0.6	3	2
Peregrine	0.1	0.2	1	3
Moorhen	0	0.1	0	1
Coot	0.1	0.6	2	4
Oystercatcher	14.6	9.9	111	64
Ringed Plover	0	0.2	0	2
Golden Plover	2.9	0.0	40	0
Lapwing	97.4	64.7	276	165
Ruff	0	0.1	0	1
Snipe	0.1	0.1	1	1
Black-tailed Godwit	3.2	0.0	45	0
Whimbrel	0	0.1	0	1

Species	Mean count 2021-22	Mean count 2022-23	Peak count 2021-22	Peak count 2022-23
Curlew	23.3	20.6	264	163
Common Sandpiper	0.1	0.0	1	0
Green Sandpiper	0.1	0.0	1	0
Redshank	0.3	0.1	4	2
Mediterranean Gull	0	0.1	0	1
Common Gull	310.9	369.0	689	1080
Lesser Black-backed Gull	8.1	6.6	50	30
Herring Gull	65.3	68.5	297	443
Great Black-backed Gull	2.1	0.2	21	2
Black-headed Gull	140.1	142.6	1121	310

Vantage Point Survey Results: Winter

9.5.15 The rates of bird flight movement observed across the site during the autumn/winter VP surveys are summarised in **Table 9.9**. This shows a comparison of the flight rates recorded in each of the two autumn/winters (2021-22 and 2022-23).

9.5.16 **Table 9.9** also gives the overall percentage of flights of each species that were recorded at rotor height (between 30 m and 180 m above ground level).

Table 9.9 Key Species Flight Rates recorded over the VP survey area during the 2021-22 and 2023-23 autumn/winter vantage point surveys

Species	Flight rate in 2021-22 (birds/hour)	Flight rate in 2022-23 (birds/hour)	Total number observed over-flying	% flights at rotor height (30-180m)
Mute Swan	0.01	0.02	7	75%
Whooper Swan	0.23	0.07	65	80%
Pink-footed Goose	128.8	138.8	57787	81%
Greylag Goose	8.46	3.89	2669	65%
Canada Goose	1.14	0.15	280	29%
Barnacle Goose	2.58	0.00	558	63%
Teal	0.19	0.00	42	100%
Mallard	0.05	0.09	29	36%
Goldeneye	0.00	0.00	1	100%
Goosander	0.00	0.07	17	50%

Species	Flight rate in 2021-22 (birds/hour)	Flight rate in 2022-23 (birds/hour)	Total number observed over-flying	% flights at rotor height (30-180m)
Red Grouse	0.05	0.00	10	0%
Cormorant	0.00	0.00	2	100%
Grey Heron	0.02	0.01	6	83%
Red Kite	0.02	0.01	7	43%
Marsh Harrier	0.00	0.02	4	0%
Hen Harrier	0.17	0.10	57	4%
Goshawk	0.19	0.03	47	49%
Sparrowhawk	0.07	0.08	33	15%
Buzzard	1.15	1.37	544	36%
Osprey	0.00	0.00	1	100%
Kestrel	0.21	0.83	224	8%
Merlin	0.04	0.00	9	22%
Peregrine	0.03	0.02	12	33%
Golden Plover	2.04	4.54	1422	75%
Lapwing	10.47	5.36	3419	24%
Snipe	0.18	0.30	103	25%
Woodcock	0.03	0.00	7	0%
Curlew	2.23	0.57	605	36%
Common Gull	5.03	3.67	1878	34%
Lesser Black-backed Gull	0.25	0.06	67	43%
Herring Gull	3.30	2.16	1179	47%
Great Black-backed Gull	0.07	0.06	29	64%
Black-headed Gull	4.26	2.19	1393	83%
Short-eared Owl	0.01	0.00	3	0%

Future Baseline

9.5.17 In the “do nothing” scenario without the construction of the Proposed Development, it is anticipated that the current management of the site will continue as part of wider estate management activities and that the bird populations currently present will continue at the site, though subject to changes occurring at the national and regional levels, such as the national decline in curlew population (Franks et al. 2017). Local future trends in numbers will be dependent primarily on habitat change. Further afforestation could reduce open ground species, such as the breeding waders, but temporarily improve conditions for black grouse and hen harrier. The main current land use within the site (sheep and deer grazing), would likely continue into the future. Changes are also likely to occur as a result of climate change, though would be anticipated to be minor over the lifetime of the Proposed Development.

Ornithological Conservation Evaluation

Conservation Evaluation of Breeding Bird Populations

9.5.18 The conservation value of the breeding bird populations was determined using the criteria specified in **Table 9.2**. The results are summarised in **Table 9.10**. All of the species with very high - low value have been taken forward in the ornithological assessment (i.e. only those with nil value have been scoped out at this stage).

Table 9.10 Conservation Evaluation of the Breeding Bird Populations at the Site (2021 and 2022)

Species	Peak breeding pairs 2021/22	>1% NHZ	EU Birds Dir Ann ¹	Wildlife and Countryside Act Sch 1	Red [R]/ Amber [A] List	UK priority sp	Scottish BAP sp	Conservation Value
Breeding Species:								
Mute Swan	1							Nil
Greylag Goose ²	25				A			Low
Canada Goose	2							Nil
Shelduck	2				A			Low
Teal ³	2				A			Low
Mallard	6				A			Low
Tufted Duck	4							Nil

Species	Peak breeding pairs 2021/22	>1% NHZ	EU Birds Dir Ann ¹	Wildlife and Countryside Act Sch 1	Red [R]/ Amber [A] List	UK priority sp	Scottish BAP sp	Conservation Value
Red Grouse ¹	18					✓		Medium
Black Grouse ³	1 (8)	✓			R	✓	✓	Medium
Red-legged Partridge	1							Nil
Quail	1			✓	A			High
Pheasant	27							Nil
Little Grebe ³	1							Nil
Osprey ⁴	(1)	✓	✓	✓	A			High
Goshawk	(1)	✓		✓				High
Buzzard ²	17							Nil
Kestrel	4				A		✓	Low
Moorhen	3				A			Low
Coot	1							Nil
Oystercatcher ²	7				A			Low
Golden Plover ²	2		✓				✓	High
Lapwing	45				R	✓	✓	Medium
Snipe ²	28	✓			A			Medium
Curlew ²	87	✓			R	✓	✓	Medium
Common Sandpiper ²	2				A			Low
Redshank ²	3				A			Low
Black-headed Gull	380	✓			A			Medium
Feral Pigeon	4							Nil
Stock Dove	1				A			Low
Woodpigeon	594				A			Low
Collared Dove	1							Nil
Cuckoo ^{2,5}	2				R	✓	✓	Medium
Long-eared Owl	1	✓						Medium
Short-eared Owl ^{3,5}	(1)	✓	✓		A		✓	High
Barn Owl	(1)			✓				High
Great Spotted Woodpecker	8							Nil

Species	Peak breeding pairs 2021/22	>1% NHZ	EU Birds Dir Ann ¹	Wildlife and Countryside Act Sch 1	Red [R]/ Amber [A] List	UK priority sp	Scottish BAP sp	Conservation Value
Skylark	520				R	✓	✓	Medium
Sand Martin	24							Nil
Swallow	13							Nil
House Martin	2				R			Low
Tree Pipit	2				R	✓	✓	Medium
Meadow Pipit	1040				A			Low
Grey Wagtail ²	5				A			Low
Pied Wagtail	3							Nil
Wren	90				A			Low
Dunnock	18				A	✓		Medium
Robin	56							Nil
Redstart	3							Nil
Whinchat ²	3				R			Low
Stonechat ²	16							Nil
Wheatear ¹	26				A			Low
Blackbird	35							Nil
Song Thrush	24				A	✓	✓	Medium
Mistle Thrush	14				R			Low
Grasshopper Warbler	1				R	✓	✓	Medium
Sedge Warbler	4				A			Low
Blackcap	2							Nil
Whitethroat	1							Nil
Chiffchaff	13							Nil
Willow Warbler	101				A			Low
Goldcrest	38							Nil
Spotted Flycatcher	1				R	✓	✓	Medium
Long-tailed Tit	1							Nil
Blue Tit	11							Nil
Great Tit	8							Nil
Coal Tit	51							Nil
Treecreeper	1							Nil

Species	Peak breeding pairs 2021/22	>1% NHZ	EU Birds Dir Ann ¹	Wildlife and Countryside Act Sch 1	Red [R]/ Amber [A] List	UK priority sp	Scottish BAP sp	Conservation Value
Jay	4							Nil
Magpie	6							Nil
Jackdaw	22							Nil
Rook	65				A			Low
Carrion Crow	38							Nil
Raven ³	5							Nil
Starling	12				R	✓		Medium
House Sparrow	8				R	✓	✓	Medium
Tree Sparrow	2				R	✓	✓	Medium
Chaffinch	132							Nil
Goldfinch	13							Nil
Siskin	33						✓	Low
Linnet	10				R	✓	✓	Medium
Lesser Redpoll	41					✓	✓	Medium
Common Crossbill	7			✓				High
Bullfinch	2				A	✓	✓	Medium
Yellowhammer	4				R	✓	✓	Medium
Reed Bunting	45				A	✓	✓	Medium
<i>Additional non-breeding species:</i>	<i>Peak count</i>							
Pink-footed Goose	75				A			Very high
Cormorant	8							Nil
Grey Heron	1							Nil
Red Kite	1	✓	✓	✓			✓	High
Marsh Harrier	1	✓	✓	✓	A		✓	High
Hen Harrier	1	✓	✓	✓	R		✓	High
Merlin	1		✓	✓	R		✓	High
Peregrine	1		✓	✓			✓	High
Whimbrel	1			✓	R			High
Common Gull	23				A			Low

Species	Peak breeding pairs 2021/22	>1% NHZ	EU Birds Dir Ann ¹	Wildlife and Countryside Act Sch 1	Red [R]/ Amber [A] List	UK priority sp	Scottish BAP sp	Conservation Value
Lesser Black-backed Gull	126				A			Low
Herring Gull	106				R	✓	✓	Medium
Great Black-backed Gull	2				A			Low
Little Gull	1		✓	✓				High
Swift	11				R		✓	Low
Fieldfare	8				R			Low

Note: The brackets in the Table indicate numbers breeding in the wider study area (500 m-2 km from the development). Superscript numbers give the score for each species' contribution to the breeding bird community score (Drewitt et al. 2020).

- 9.5.19 Three high value species were recorded breeding within the core breeding bird survey area: quail (one pair on the eastern edge in 2021), golden plover (two pairs in both years on the moorland in the southern part of the survey area) and common crossbill (with two pairs in coniferous plantations in 2021 and seven in 2022).
- 9.5.20 Four additional high value species were recorded breeding in the wider 2 km, osprey (single pair in 2022), goshawk (single pair in 2022), short-eared owl (single pair in 2021) and barn owl single pair in 2022).
- 9.5.21 Twenty-two breeding species were classed as medium conservation value over the two years: red grouse, black grouse, lapwing, snipe, curlew, black-headed gull, long-eared owl, cuckoo, skylark, tree pipit, dunnock, song thrush, grasshopper warbler, spotted flycatcher, starling, house sparrow, tree sparrow, linnet, lesser redpoll, bullfinch, yellowhammer and reed bunting. All were classed as medium value because they occurred at the site in regionally important numbers (>1% NHZ population: snipe, curlew, black-headed gull and long-eared owl) and/or for their listing on the UK BAP list of priority species. They are mostly farmland species that have declined widely across Britain but are still common and widespread.
- 9.5.22 A further 21 breeding species were classed as low sensitivity, through their listing on RSPB et al.'s (Stanbury *et al.* 2021) amber lists of birds of conservation concern and/or the Scottish Biodiversity List.
- 9.5.23 The overall conservation value of the breeding bird community, measured from the core survey data as the breeding bird assemblage score, was 46.

This is above the threshold for national importance (40) for the main habitat within the survey area, ‘Upland moorland and grassland with water bodies’ (Drewitt et al. 2020). The core survey area therefore supports a nationally important breeding bird community.

9.5.24 Other non-breeding species recorded during the surveys included one very high-value species (pink-footed goose), seven high sensitivity species (red kite, marsh harrier, hen harrier, merlin, peregrine, whimbrel and little gull). These species were classed as high-value receptors through their listing as EU Birds Directive Annex 1 and/or Wildlife and Countryside Act Schedule 1 species.

9.5.25 **Conservation Evaluation of Wintering Bird Populations**

9.5.26 The conservation value of the wintering bird populations was determined using the criteria specified in **Table 9.2**. The results are summarised in **Table 9.11**. All of the species with very high - low value have been taken forward in the ornithological assessment (i.e. only those with nil value have been scoped out at this stage).

9.5.27 One species (pink-footed goose) was classed as very high sensitivity as the site lies within the connectivity range of the Gladhouse Reservoir, Fala Flow, Firth of Forth and Westwater SPAs, for which they are qualifying species. Sixteen species were classed as high sensitivity (whooper swan, barnacle goose, goldeneye, red kite, marsh harrier, hen harrier, goshawk, osprey, merlin, peregrine, golden plover, black-tailed godwit, whimbrel, green sandpiper, Mediterranean gull and short-eared owl) that are EU Birds Directive Annex 1/Wildlife and Countryside Act Schedule 1 species, four medium sensitivity species (UK BAP priority/red listed species of conservation concern; red grouse, lapwing, curlew and herring gull), and 12 low sensitivity species

Table 9.11 Conservation Evaluation of the Wintering Bird Populations at the Site (2021-22 and 2022-23)

Species	Peak ground count	>1% region	EU Birds Dir Ann 1	Wildlife and Countryside Act Sch 1	Red [R]/ Amber [A] List	UK priority sp	Scottish BAP sp	Conservation Value
Mute Swan	57							Medium

Whooper Swan	7	✓	✓	✓	A		✓	High
Pink-footed Goose	3279	✓			A			Very high
White-fronted Goose	1				R	✓	✓	Medium
Greylag Goose	349				A			Low
Canada Goose	138							Nil
Barnacle Goose	1	✓	✓		A		✓	High
Shelduck	6				A			Low
Wigeon	154	✓			A			Medium
Teal	190	✓			A			Medium
Mallard	290	✓			A			Medium
Pintail	1				A			Low
Pochard	2				R		✓	Low
Tufted Duck	119	✓						Medium
Goldeneye	46			✓	R			High
Goosander	16							Nil
Red Grouse	278					✓		Medium
Black Grouse	9				R	✓	✓	Medium
Little Grebe	29							Medium
Cormorant	39							Medium
Grey Heron	6							Nil
Red Kite	1	✓	✓	✓			✓	High
Marsh Harrier	1	✓	✓	✓	A		✓	High
Hen Harrier	3	✓	✓	✓	R		✓	High
Goshawk	3	✓		✓				High
Sparrowhawk	2				A			Low
Buzzard	19							Nil
Osprey	1	✓	✓	✓	A		✓	High
Kestrel	7				A		✓	Low
Merlin	1	✓	✓	✓	R		✓	High
Peregrine	3	✓	✓	✓			✓	High
Moorhen	1				A			Low
Coot	4							Nil
Oystercatcher	111				A			Medium
Ringed Plover	2				R			Low
Golden Plover	60		✓				✓	High
Lapwing	276				R	✓	✓	Medium

Species	Peak ground count	>1% region	EU Birds Dir Ann 1	Wildlife and Countryside Act Sch 1	Red [R]/ Amber [A] List	UK priority sp	Scottish BAP sp	Conservation Value
<i>Ruff</i>	1		✓	✓	R		✓	High
<i>Jack Snipe</i>	2							Nil
<i>Snipe</i>	41				A			Low
<i>Woodcock</i>	6				R		✓	Low
<i>Black-tailed Godwit</i>	45	✓		✓	R	✓	✓	High
<i>Curlew</i>	264	✓			R	✓	✓	Medium
<i>Whimbrel</i>	1			✓	R			High
<i>Common Sandpiper</i>	1				A			Low
<i>Green Sandpiper</i>	1			✓	A		✓	High
<i>Redshank</i>	4				A			Low
<i>Mediterranean Gull</i>	1		✓	✓	A			High
<i>Common Gull</i>	1080				A			Medium
<i>Lesser Black-backed Gull</i>	50				A			Low
<i>Herring Gull</i>	443				R	✓	✓	Medium
<i>Great Black-backed Gull</i>	21				A			Medium
<i>Black-headed Gull</i>	1121				A			Medium
<i>Tawny Owl</i>	1				A			Low
<i>Short-eared Owl</i>	1	✓	✓		A		✓	High

9.5.28 Key wintering bird populations recorded included:

- Pink-footed goose - the main pink-footed goose feeding area was to the north-east of the Proposed Development in both winters, though there were feeding flocks seen across most of the wider survey area to the north of the Proposed Development site. There were regular flights over the site, including birds moving between feeding areas and to/from night roosts. Those roost flights included movements to/from Gladhouse Reservoir, though also to the east (in the direction of Fala Flow).

- Whooper Swan - the only record of birds on the ground were single birds on Gladhouse Reservoir on 20/10/22 and 22/11/22, and a group of five on the quarry pool on 22/11/22. In 2021-22 the only ground record was a family of two adults and one young during the waterfowl survey on 20/21/21. Only three flocks were seen over-flying during the 2022-23 VP surveys, one of 5 and one of 7 on 22/11/22 and one of 3 on 2/12/22. In 2021-22 only two flocks were observed over-flying during the VP surveys (one of 16 on 13/10/21 and one of 34 on 8/3/22).
- Barnacle Goose - during the 2021-22 surveys, 16 migrant flocks were observed during the 12/10/21 walkover survey (on a broad front across the whole survey area), and a further six migrant flocks during the VP surveys between the 11 and 13 October 2021. Flock sizes varied between 10 and 260 birds (with an average of 125). Fewer were seen in the 2022-23 winter, with occasional records of single barnacle geese mixed in with the pink-footed goose flocks and a flock of 105 recorded on 2/12/22.
- Goldeneye - this species was seen in regionally important numbers on Gladhouse Reservoir (peak 31 in 2021-22 and 46 in 2022-23), but there were no records elsewhere.
- Other wintering wildfowl - Gladhouse Reservoir supported a range of regionally important wintering waterfowl populations, including mute swan, wigeon, teal, mallard, tufted duck, little grebe and cormorant. These species were, though, largely restricted to the reservoir.
- Red and Black Grouse - red grouse were widely distributed over the higher ground, whilst black grouse were mainly found around the same areas that they had been seen in the breeding season (around lek sites on the south-eastern edge of the survey area and in the western part).
- Hen harrier - this species was regularly seen hunting over the site through the winter. No evidence was found, though, of any night roosts in the survey area, most flights seen were below rotor height (so collision risk would be expected to be low), and there were no notable concentrations of flight activity.
- Other scarce raptors and owls - goshawk, red kite, marsh harrier, peregrine, merlin and short-eared owl were all recorded during the winter surveys, but only infrequently in low numbers. There was no indication that the survey area was important to any of these species at this time of year.
- Golden Plover - small numbers of golden plover were seen regularly through both winters, with peak counts of 190 in 2021-22 and 60 in

2022-23. Most birds were seen in the wider area rather than within the site itself and only low numbers observed over-flying.

- Lapwing - regularly present in the survey area in regionally important numbers, with most records from the wider area to the north-east of the site and to the west in the fields adjacent to Gladhouse Reservoir. Lapwing were also regularly observed over-flying during the VP surveys.
- Curlew - this species was recorded in regionally important numbers during the winter survey but only in March, so it is likely that these would have been spring migrants/early returning breeders. They were seen mostly in the fields in the wider area to the north of the site and to the west in the fields adjacent to Gladhouse Reservoir.
- Gulls - common, herring and black-headed gulls were all recorded within the survey area in regionally important numbers. All had broadly similar distributions, mainly using the fields to the north of the Proposed Development site in the wider survey area and Gladhouse Reservoir. All regularly over-flew the site.

9.6 Assessment of Potential Effects

9.6.1 The key issues for the assessment of potential ornithological effects relating to the Proposed Development are identified below (SNH 2018a):

- Direct loss of bird habitat through construction of the Proposed Development;
- Disturbance of birds during construction and operation; and
- Collision risk to birds during operation.

9.6.2 No ornithological issues were scoped out from this assessment, though, following NS (SNH 2018a) guidance, the assessment has focussed on the key species likely to be affected by the Proposed Development. Key species were defined using the following criteria:

- species listed on Annex 1 of the EU Birds Directive;
- species listed on Schedule 1 of the 1981 Wildlife & Countryside Act;
- species with potential ecological connectivity with statutory protected sites;
- species identified by SNH 2018a as ‘Priority bird species for assessment when considering the development of onshore wind farms in Scotland’. These include (a) species that are widespread across Scotland which utilise habitats or have flight behaviours that may be adversely affected by a wind farm, and (b) as ‘restricted range’ species; and

- red-listed species on the Birds of Conservation Concern list.

9.6.3 The assessment also takes into account and applies the tests given in NS guidance on the assessment of effects of wind farms in the wider countryside (SNH 2018a). This guidance lists a range of priority ‘species potentially at risk of impact’, of which the following were recorded during the baseline surveys: whooper swan, barnacle goose, pink-footed goose, greylag goose, hen harrier, goshawk, red kite, osprey, merlin, peregrine, golden plover, lapwing, dunlin, curlew, herring gull and short-eared owl. The potential effects of the Proposed Development on each of these have been specifically considered and assessed below.

NatureScot Key Species Potentially at Risk

9.6.4 NatureScot (SNH 2018a) has identified a range of key species as being at potential risk of impact from wind farms. These species form the key focus of the ornithological impact assessment in the following section. In total four such species potentially at risk of impact were found breeding within the potential disturbance zone around the site (see **Figure 9.2**), these include:

- greylag goose (up to 9 pairs);
- golden plover (1 pair);
- lapwing (up to 24 pairs); and
- curlew (up to 62 pairs).

9.6.5 Additional key species recorded breeding outside this zone but within 2 km of the site included osprey, goshawk, black grouse and short-eared owl.

9.6.6 Other key species recorded during the breeding season but without any evidence of breeding within 2 km of the site included osprey, red kite, marsh harrier, hen harrier, merlin, peregrine and herring gull.

9.6.7 Key species recorded using the potential disturbance zone outside the breeding season included pink-footed goose, black grouse, red kite, hen harrier, goshawk, golden plover, lapwing, curlew, herring gull, peregrine, merlin and short-eared owl.

9.6.8 Key species recorded at risk of collision (i.e. flying through the wind farm at rotor height) included whooper swan, pink-footed goose, greylag goose, barnacle goose, red kite, osprey, hen harrier, goshawk, curlew, golden plover, lapwing, herring gull, peregrine and merlin.

Construction Effects

Direct Effects: Loss of Habitat (Direct loss or degradation of habitat through construction of the Proposed Development)

Nature of Impact

- 9.6.9 There will be a direct loss of habitat resulting from the construction of the Proposed Development. As set out further in **Chapter 8**, the main habitats within the study area are unimproved acid grassland, marsh/marshy grassland and dry modified bog. **Tables 8.9** and **8.11** set out the losses of each habitat that would occur as a result of the Proposed Development.
- 9.6.10 The direct loss of habitat for all bird species associated with the construction of the Proposed Development would be an effect of low/negligible magnitude. The permanent land take would be limited to the wind turbine and associated foundations, access tracks, permanent crane hardstands and substation/battery storage hardstands which account collectively for about 1.7% of the total area within the site. Additional temporary land take during construction would add further temporary habitat loss of about another 0.3% of the site area.
- 9.6.11 The use of existing tracks and the careful selection of routes for the access tracks and wind turbine locations, alongside the use of proven construction techniques, would ensure that such effects on birds would be of low/negligible magnitude (even in a local context). In addition, the applicant has committed to the production and implementation of a Construction Environmental Management Plan (CEMP) to the satisfaction of NatureScot and other relevant stakeholders before construction commences and would follow Windfarm Good Construction Guidance by Scottish Renewables et al. (2019).

Ornithological Receptor Value

- 9.6.12 Direct habitat loss will reduce habitat availability to the species breeding and foraging on the site, including one high value breeding key species (golden plover), two medium value (lapwing and curlew), one low value species (greylag goose), and six high value species recorded foraging (red kite, hen harrier, goshawk, peregrine, merlin and short-eared owl).

Magnitude of Impact

- 9.6.13 This very small loss of breeding and foraging habitat will be of negligible magnitude for all of the bird species affected.

Significance of Effects

- 9.6.14 Ornithological effects of the direct habitat loss resulting from the construction of the Proposed Development would be of negligible magnitude and not significant.

Indirect Effects: Construction Disturbance (Noise and Visual)

- 9.6.15 Experience from existing UK wind farms has shown that many species are tolerant of the presence of operational wind turbines and not unduly disturbed by them. Some short-term displacement during wind farm operation of species such as curlew may occur following construction, but populations have subsequently re-established themselves (Bullen Consultants 2002). Most species that have been studied have not been significantly affected (Phillips 1994, Thomas 1999, Gill 2004, Devereux et al. 2008, Percival and Percival 2011, Douglas et al. 2011). An RSPB study (Pearce-Higgins *et al.* 2009) reported partial displacement of breeding upland birds around wind turbines for a distance up to 800 m; reported significant reductions in golden plover density up to 400 m from wind turbines. The scale and pattern of displacement is similar to that reported for breeding waders in general (Hotker *et al.* 2006), with most studies reporting only small scale (0-200 m) displacement distances and a smaller number over a greater distance.
- 9.6.16 The indirect effect of disturbance is likely to be highest during construction owing to the increased activity on site. Pearce-Higgins et al. (2012) found that red grouse, snipe and curlew densities all declined at wind farm sites during construction, whilst densities of skylark and stonechat increased. Construction also involves the presence of work personnel on site which itself can be an important source of potential disturbance. Pearce-Higgins et al. reported decreases in curlew density during construction of 40% and snipe by 53%. Other species, such as golden plover, though have been shown to be unaffected by construction disturbance (Sansom *et al.* 2016).
- 9.6.17 The assessment of construction disturbance has assumed that all breeding birds within 500 m of the Proposed Development (the wind turbines plus their associated infrastructure and site tracks) could potentially be at risk of displacement, and a slightly wider zone (600 m) for wintering birds (Percival 2005, Drewitt and Langston 2006). It should be noted that only partial displacement within these zones might be expected (Pearce-Higgins et al. 2009), but it is assumed for the purposes of this assessment that all birds occurring within the zone are at risk of disturbance. For NS

priority species (SNH 2018a) consideration has also been given to the disturbance distances given in Ruddock and Whitfield (2007).

Nature of Impact

9.6.18 The estimated on-site construction period for the Proposed Development is expected to last approximately 24 months. The construction works will take place through the year, including the summer months when the weather is more favourable and ground conditions are drier.

9.6.19 Noise and visual disturbance associated with construction activities could potentially affect breeding and foraging birds in the locality of the wind turbine positions, access tracks and other infrastructure components. Birds that are disturbed at breeding sites are vulnerable to a variety of potential effects that could lead to a reduction in the productivity or survival of their populations; these include the chilling or predation of exposed eggs and chicks and damage of eggs and chicks due to panicked adults. Birds subject to disturbance outside the breeding season may also feed less efficiently or resort to less favoured roosting areas, either of which may reduce their survival prospects. The potential impact will vary between species according to each species' tolerance of disturbance from human activity and the availability of suitable alternative breeding and foraging habitat.

Ornithological Receptor Value

9.6.20 **Table 9.12** shows the peak breeding bird populations of conservation importance that were found within 500 m of the proposed wind turbine locations and with the other associated infrastructure (including access tracks) during the baseline surveys, where this distance has been used to identify the potential disturbance zone (though also giving consideration to particularly sensitive species in a wider area around that).

Table 9.12. Conservation Importance of Breeding Birds in the Wind Farm Potential Disturbance Zone

Species	Peak breeding pairs <500m from wind turbines	Peak breeding pairs <500m from all infrastructure	Scale of Importance of Breeding Population Within Potential Disturbance Zone	Conservation Value Within Potential Disturbance Zone
Greylag Goose	9	9	Local	Low
Mallard	1	2	Local	Low
Red Grouse	7	7	Local	Medium

Kestrel	3	4	Local	Low
Moorhen	1	1	Local	Low
Oystercatcher	4	4	Local	Low
Golden Plover	1	1	Local	High
Lapwing	18	24	Local	Medium
Snipe	19	23	Regional	Medium
Curlew	60	62	Regional	Medium
Redshank	2	2	Local	Low
Woodpigeon	42	192	Local	Low
Cuckoo	1	1	Local	Medium
Skylark	298	344	Local	Medium
Tree Pipit	2	2	Local	Medium
Meadow Pipit	656	737	Local	Low
Grey Wagtail	1	1	Local	Low
Wren	19	30	Local	Low
Dunnock	5	5	Local	Medium
Whinchat	3	3	Local	Low
Wheatear	16	18	Local	Low
Song Thrush	6	8	Local	Medium
Mistle Thrush	5	7	Local	Low
Sedge Warbler	1	1	Local	Low
Willow Warbler	20	32	Local	Low
Spotted Flycatcher	1	1	Local	Medium
Rook	0	65	Local	Low
Starling	1	1	Local	Medium
Siskin	8	12	Local	Low
Linnet	2	4	Local	Medium
Lesser Redpoll	9	13	Local	Medium
Common Crossbill	1	2	Local	High
Reed Bunting	28	31	Local	Medium

Note: species in bold are NatureScot priority species at risk from wind farm development (SNH 2018a).

9.6.21 **Table 9.13** shows the peak wintering bird populations of conservation importance that were found within 600 m of the proposed wind turbine locations and with the other associated infrastructure (including access tracks) during the baseline surveys, where this distance has been used to identify the potential disturbance zone (though also giving consideration to particularly sensitive species in a wider area around that).

Table 9.13 Conservation Importance of Wintering Birds in the Wind Farm Potential Disturbance Zone

Species	Peak count <600m from wind turbines	Peak count <600m from all infrastructure	Scale of Importance of Breeding Population Within Potential Disturbance Zone	Conservation Value Within Potential Disturbance Zone
Pink-footed Goose	1125	2635	Regional	Very high
White-fronted Goose	0	1	Local	Medium
Greylag Goose	58	66	Local	Low
Barnacle Goose	1	1	Local	High
Teal	38	38	Regional	Medium
Mallard	6	6	Local	Medium
Red Grouse	93	148	Local	Medium
Black Grouse	6	6	Regional	Medium
Little Grebe	1	1	Local	Medium
Goshawk	1	1	Regional	High
Kestrel	7	7	Local	Low
Merlin	1	1	Regional	High
Golden Plover	26	40	Local	High
Lapwing	170	246	Local	Medium
Snipe	37	37	Local	Low
Woodcock	5	5	Local	Low
Curlew	39	39	Regional	Medium
Common Gull	50	320	Local	Medium
Lesser Black-backed Gull	1	47	Local	Low
Herring Gull	93	184	Local	Medium
Great Black-backed Gull	1	1	Local	Medium
Black-headed Gull	10	100	Local	Medium
Short-eared Owl	1	1	Regional	High

Effects of Construction Disturbance on NS Key Species

9.6.22 The following section assesses the construction disturbance effects on each of the NS (SNH 2018) key species that were found within the

potential disturbance zone within the breeding season (**Table 9.12**) and at other times of year (**Table 9.13**).

Curlew

- 9.6.23 Up to 62 pairs of curlew were found within 500 m of the site infrastructure, and hence would be at risk of disturbance during construction (**Figure 9.3**). Numbers in the potential disturbance zone during winter were low (peak 39). This species is a red-listed Scottish BAP species, so has been classed as medium value. The NHZ population is 1,400 pairs (Wilson *et al.* 2015), so the numbers within the potential disturbance zone would be considered to be of regional importance.
- 9.6.24 This species has been shown to be affected by disturbance, particularly during construction (Pearce-Higgins *et al.* 2012), so some displacement of breeding birds during the construction phase would be expected. The numbers breeding in the potential disturbance zone represent 4.4% of the NHZ population. The worst-case disturbance effect would be a temporary low-magnitude effect on a medium-value receptor, which would be of minor significance and not significant.

Lapwing

- 9.6.25 Up to 24 pairs of lapwing were found within 500 m of the site infrastructure (**Figure 9.3**), and hence would be at risk of disturbance during construction. Numbers in the potential disturbance zone during winter were low (peak 246). This species is a red-listed Scottish BAP species, so has been classed as medium value. No NHZ population estimate is available (Wilson *et al.* 2015) but the numbers within the potential disturbance zone would be considered to be of local importance. Some disturbance of these birds is likely during construction, though probably not the complete displacement assumed in this worst-case assessment. Even in that worst case, a temporary displacement of 24 pairs would be only of low magnitude on a medium value receptor resulting in an effect of minor significance, which would not be significant.

Greylag Goose

- 9.6.26 Nine pairs of greylag goose were found within 500 m of the site infrastructure and hence would be at risk of disturbance during construction (**Figure 9.3**). Numbers in the potential disturbance zone during winter were low (peak 66). This species is an amber-listed species of conservation concern, so has been classed as low value. No NHZ population estimate is available (Wilson *et al.* 2015), but the numbers

within the potential disturbance zone would be considered to be of local importance. Some disturbance of these birds is likely during operation, though probably not the complete displacement assumed in this worst-case assessment. Even in that worst case, this would be only of low magnitude on a low-value receptor resulting in an effect of negligible significance, which would not be significant.

Pink-footed Goose

9.6.27 There were some winter pink-footed goose flocks feeding on fields within the potential disturbance zone, with a peak count of 2,635 recorded within 600 m of the site. These birds, however, ranged over a very wide area, and these fields formed only a very small part of their feeding range. Any disturbance during construction would therefore be an effect of negligible magnitude and not significant.

Black Grouse

9.6.28 A black grouse lek of up to 7 males was found 1.1 km from the nearest wind turbine and associated infrastructure. A second smaller lek (with only 1-2 lekking males) was located within the site at its western end. There would be potential for construction disturbance to this smaller lek - design mitigation has ensured that no wind turbines are located within 500 m, but there is a small amount of access track within that zone (330-500 m from the lek). Mitigation measures during construction would be required to ensure no significant effect on this species.

Scarce raptor species

9.6.29 Several high value raptor species were observed flying over the site during the baseline surveys, including osprey, goshawk, red kite, peregrine, merlin and short-eared owl. All were, however, only seen infrequently, with no evidence of breeding within the potential impact zone of the Proposed Development or that it was important for foraging for any of them. Four additional high value species were recorded breeding in the wider 2 km area (but outside the potential impact zone of the Proposed Development): osprey (single pair in 2022), goshawk (single pair in 2022), short-eared owl (single pair in 2021) and barn owl (single pair in 2022). Whilst some displacement may occur during construction, this effect would be of negligible magnitude on all these species and not significant.

Potential Operational Effects

Operational Displacement

Nature of Impact

- 9.6.30 The presence and operation of wind turbines could potentially displace birds from breeding and foraging areas. Birds may avoid the operational wind turbines and the surrounding area due to the visual appearance of large vertical structures in the landscape, the mechanical noises and wind noises of the blades, or the presence of periodic maintenance vehicles and personnel. Displacement due to operational wind turbines could force birds into less suitable habitat and this might reduce their ability to survive and reproduce. If not displaced, birds may experience reduced foraging success or reduced productivity. Displacement effects can vary over time as birds habituate to the presence of operating wind turbines or site-faithful birds are lost from the population.
- 9.6.31 **Table 9.12** shows the peak breeding bird populations that were found within 500 m of the proposed wind turbine locations during the baseline surveys, where this distance has been used to identify the potential distance zone (though also giving consideration to particularly sensitive species in a wider area around that).
- 9.6.32 **Table 9.13** shows the peak wintering bird populations that were found within 600 m of the proposed wind turbine locations during the baseline surveys, where this distance has been used to identify the potential distance zone (though also giving consideration to particularly sensitive species in a wider area around that).

Effects of Operational Disturbance on NatureScot Key Species

- 9.6.33 The following section assesses the operational disturbance effects on each of the NS key species that were found within the potential disturbance zone within the breeding season (**Table 9.12**) and at other times of year (**Table 9.13**).

Curlew

- 9.6.34 Up to 60 pairs of curlew were found within 500 m of the wind turbines (**Figure 9.3**), and hence would be at risk of disturbance during operation. This species is a red-listed Scottish BAP species, so has been classed as medium value. The NHZ population is 1,400 pairs (Wilson et al. 2015), so the numbers within the potential operational disturbance zone would be considered to be of regional importance. The numbers breeding in the potential operational disturbance zone represent 4.3% of the NHZ population. The worst-case disturbance effect would be of low magnitude on a medium value receptor. Whilst applying the matrix set out in **Table 9.4**, this effect would be of minor significance and not significant, as this population forms a key part of a nationally important breeding bird

community and this effect would last for the lifetime of the Proposed Development, it was concluded that this effect would be significant in the absence of mitigation.

Lapwing

9.6.35 Up to 18 pairs of lapwing were found within 500 m of the wind turbines (**Figure 8.2**), and hence would be at risk of disturbance during operation. This species is a red-listed Scottish BAP species, so has been classed as medium value. No NHZ population estimate is available (Wilson et al. 2015) but the numbers within the potential disturbance zone would be considered to be of local importance. Some disturbance of these birds is likely during operation, though probably not the complete displacement assumed in this worst-case assessment. In a worst case, with complete displacement of 18 pairs, this would be an effect of low magnitude on a medium value receptor resulting in an effect of minor significance, which would not be significant, applying the matrix in **Table 9.4**. However, for the same reasoning as set out above for curlew, it was concluded that in the absence of mitigation this would be significant given that these birds are a key component of a nationally important breeding bird community.

Pink-footed Goose

9.6.36 There were some pink-footed goose flocks in winter feeding on fields within the potential disturbance zone, with a peak count of 1,125 recorded within 600 m of the wind turbines. These birds, however, ranged over a very wide area, and these fields formed only a very small part of their feeding range. Any disturbance during operation would therefore be an effect of negligible magnitude and not significant.

Greylag Goose

9.6.37 Nine pairs of greylag goose were found within 500 m of the wind turbines, and hence would be at risk of disturbance during construction (**Figure 9.3**). Numbers in the potential disturbance zone during winter were low (peak 58). This species is an amber-listed species of conservation concern, so has been classed as low value. No NHZ population estimate is available (Wilson et al. 2015) but the numbers within the potential disturbance zone would be considered to be of local importance. Some disturbance of these birds is likely during operation, though probably not the complete displacement assumed in this worst-case assessment. Even in that worst case, this would be only of low magnitude on a low value receptor resulting in an effect of negligible significance, which would not be significant.

Black Grouse

9.6.38 A black grouse lek of up to 7 males was found 1.1 km from the nearest wind turbine and associated infrastructure. A second smaller lek (with only 1-2 lekking males) was located within the site at its western end. There would be potential for operational disturbance to this smaller lek as it lies within the site, but design mitigation has ensured that no wind turbines are located within 500 m of any lek. As a result, any effect would be negligible magnitude and not significant.

Scarce Raptor Species

9.6.39 Several high value raptor species were observed flying over the site during the baseline surveys, including osprey, goshawk, red kite, peregrine, merlin and short-eared owl. All were, however, only seen infrequently, with no evidence of breeding within the potential impact zone of the Proposed Development or that it was important for foraging for any of them. Four additional high value species were recorded breeding in the wider 2 km area (but outside the potential impact zone of the Proposed Development): osprey (single pair in 2022), goshawk (single pair in 2022), short-eared owl (single pair in 2021) and barn owl (single pair in 2022). Whilst some displacement may occur during operation, this would be an effect of negligible magnitude on all these species and not significant.

Direct Effects: Collision Mortality

9.6.40 There have been a number of wind farms that have caused significant bird mortalities through collision, but their characteristics are very different to those at the Proposed Development. Most notably, at Altamont Pass in California and Tarifa in southern Spain, large numbers of raptors have been killed through collision with wind turbines (Orloff and Flannery 1992, Janss 1998, Thelander *et al.* (2003). Such problems have occurred where large numbers of sensitive species occur in close proximity to very large numbers (hundreds/thousands) of wind turbines, and usually also where the wind farm area provides a particularly attractive feeding resource. At onshore wind farm sites in the UK, with similar bird densities to the site, collision rates have generally been very low and not considered to be significant (Meek *et al.* 1993, Tyler 1995, Bioscan 2001, Percival *et al.* 2009, Percival *et al.* 2013).

9.6.41 The collision risk zone for the Proposed Development was taken as the wind turbines plus a 500 m buffer (following NS guidance). Reference NHZ population sizes were derived from Wilson *et al.* (2015).

Nature of Impact

- 9.6.42 Birds that collide with a wind turbine blade are likely to be killed or fatally injured. Increased mortality rates from collision with wind turbines could potentially affect the maintenance of bird populations, particularly for species that are otherwise experiencing poor reproductive or survival levels due to other factors e.g. food availability. The frequency of collision with wind turbines is assumed to be dependent on the amount of flight activity across the site and the ability of birds to detect the rotating blades and take avoidance action.
- 9.6.43 Operational displacement and collision with wind turbines are spatially mutually exclusive (if a bird is displaced from the wind farm areas it is not at risk of collision). However, displacement effects may change temporarily as birds that were at first displaced from an area may habituate to the presence of the operating wind turbines after a period of time and become exposed to the risk of collision.
- 9.6.44 **Table 9.14** summarises the collision risk analysis for each species. Data is presented separately for each of the two baseline survey years (2020-21 and 2021-22). For further details, see **Technical Appendix 9.5**.
- 9.6.45 **Table 9.14** gives the number of collisions predicted per year based on the precautionary NS avoidance rate of 99% for red kite and hen harrier, 99.5% for swans and gulls, 99.8% for the three goose species and 98% for all of the other species, the percentage increase that this would represent over the baseline mortality and an assessment of the magnitude of these effects. The magnitude was predicted as moderate for goshawk in 2020-21, and negligible for all the other species modelled.

Table 9.14 Collision Risk Modelling Predictions

Species	Precautionary Predicted Number of Collisions per Year (NS avoidance rate)		Percentage Increase in Baseline Mortality		Magnitude
	2021-22	2022-23	2021-22	2022-23	
Whooper Swan	0.20	0.04	0.07%	0.01%	Negligible
Pink-footed Goose	8.67	19.3	0.13%	0.28%	Negligible
Greylag Goose	0.89	0.39	0.05%	0.02%	Negligible
Barnacle Goose	0.43	0	0.01%	0%	Negligible
Osprey	0.04	0	0.58%	0.06%	Negligible
Goshawk	0.49	0.04	6.28%	0.57%	Moderate/ Negligible

Red Kite	0.01	0.20	0.02%	0.27%	Negligible
Hen Harrier	0.04	0	0.36%	0%	Negligible
Golden Plover	0.70	5.62	0.05%	0.39%	Negligible
Lapwing	7.92	2.03	0.57%	0.15%	Negligible
Curlew	0.63	1.52	0.05%	0.13%	Negligible
Herring Gull	0.94	2.00	0.29%	0.63%	Negligible
Peregrine	0.02	0.12	0.11%	0.61%	Negligible
Merlin	0.02	0	0.11%	0%	Negligible

9.6.46 The following section assesses the operational collision risk to each of the NS key species that were found within the collision risk zone (Table 9.14).

Whooper Swan

9.6.47 Only four whooper swan flocks in total were recorded flying through the collision risk zone at rotor height; one (16 birds) in October 2021, one (34) in March 2022, one (7) in November 2022 and one (3) in December 2022 (Figure 9.4). Whooper swan is listed on Schedule 1 of the Wildlife and Countryside Act and Annex 1 of the EU Birds Directive, so is of high value. Collision risk was estimated at 0.12 collisions per year based on the two winters' data (equivalent to a 0.04% increase over the baseline mortality), an effect of negligible magnitude that would not be significant.

9.6.48 There would be no threat to the regional or national population of this species, so no significant adverse effect, following the SNH 2018a guidance, would occur.

Pink-footed Goose

9.6.49 Pink-footed goose was classed as very high value as a qualifying feature of the Gladhouse Reservoir, Fala Flow, Firth of Forth and Westwater SPAs. Pink-footed geese were regularly recorded flying through the collision risk zone throughout the winter period (Figure 9.5). The collision risk was predicted at 14 per year using the two baseline winters' data. This is equivalent to a 0.2% increase over the baseline mortality, an effect of negligible magnitude that would not be significant in both the context of the NHZ population and the SPA populations. Further analysis in relation to the effects on the SPA populations is included in Technical Appendix 9.7.

Greylag Goose

9.6.50 Greylag goose flight activity over the site was lower than for the previous species but occurred year-round, as there were nine breeding pairs

recorded in both 2021 and 2022. Flights through the collision risk zone occurred regularly (**Figure 9.6**), with a predicted collision risk of 0.6 over the two years (a 0.04% increase over the baseline mortality), an effect of negligible magnitude, which would not be significant.

Barnacle Goose

- 9.6.51 Four flocks in total were recorded flying through the collision risk zone at rotor height, three (of 45, 57 and 160 birds) in October 2021 (part of a migratory movement of birds across the area en route to their wintering grounds on the Solway Firth), and one (a single bird) in December 2021. Barnacle Goose is listed on Annex 1 of the EU Birds Directive, so is of high value. Collision risk was estimated at 0.21 collisions per year based on the two winters' data (equivalent to a 0.01% increase over the baseline mortality), an effect of negligible magnitude that would not be significant.
- 9.6.52 There would be no threat to the regional or national population of this species, so no significant adverse effect, following the SNH 2018a guidance, would occur.

Osprey

- 9.6.53 Osprey is listed on Schedule 1 of the Wildlife and Countryside Act and Annex 1 of the EU Birds Directive, so is of high value. Though it bred in the wider survey area, it was rarely seen within the collision risk zone, with only two flights recorded at rotor height through the collision risk zone (**Figure 9.7**). The collision risk was predicted at 0.02 per year, equivalent to a 0.3% increase over the baseline mortality). Collision risk to this species would be of negligible magnitude and not significant.

Hen Harrier

- 9.6.54 Hen harrier was classed as high value as a species listed on Schedule 1 of the Wildlife and Countryside Act and Annex 1 of the EU Birds Directive. The information available on collision risk to hen harriers at existing wind farms is not yet comprehensive. That which has been published suggests that they are not particularly vulnerable to collision and that they will forage and even nest in proximity to wind turbines in some circumstances (Steele 2006, Madders and Whitfield 2006). Very few harrier collisions have been reported, and harrier collision rates are considerably lower than that recorded for raptors in general (Illner 2011), though there have been two hen harrier collisions documented at the Griffin Wind Farm in Perthshire.

9.6.55 Hen harriers were regularly seen flying over the site during the winter, with one bird seen during the breeding season on one occasion (**Figure 9.7**). Only a very low number of flights were recorded at rotor height through the collision risk zone, with resulting collision risks predicted at 0.02 per year using the two years' data, equivalent to a 0.18% increase over the baseline mortality). Collision risk to this species would be of negligible magnitude and not significant.

Goshawk

9.6.56 Goshawk is listed on Schedule 1 of the Wildlife and Countryside Act, so is of high value. A total of 23 flights were recorded at rotor height through the collision risk zone (**Figure 9.7**), most of which were recorded during autumn 2021 (when a family were regularly seen in the area). The resulting collision risk was predicted at 0.27 per year, equivalent to a 3.4% increase over the baseline mortality). Collision risk to this species would be of low magnitude (in the context of the small NHZ population of only 13 pairs) but would not be significant.

Red Kite

9.6.57 Red kite is listed on Schedule 1 of the Wildlife and Countryside Act and Annex 1 of the EU Birds Directive, so is of high value. Only five red kite flights were recorded at rotor height through the collision risk zone (**Figure 9.7**), with resulting collision risks predicted at 0.11 per year, equivalent to only a 0.15% increase over the baseline mortality). Collision risk to this species would be of negligible magnitude and not significant.

Peregrine

9.6.58 Peregrine is listed on Schedule 1 of the Wildlife and Countryside Act and Annex 1 of the EU Birds Directive, so is of high value. A total of 16 flights were recorded through the collision zone at rotor height during the two years' baseline surveys (**Figure 9.7**). The collision risk was very low (0.07 per year, equivalent to a 0.36% increase over the baseline mortality). Collision risk to this species would therefore be of negligible magnitude and not significant.

Merlin

9.6.59 Merlin is listed on Schedule 1 of the Wildlife and Countryside Act and Annex 1 of the EU Birds Directive, so is of high value. Only four merlin flights were recorded at rotor height through the collision risk zone (**Figure 9.7**), so the collision risk was very low (0.01 collisions per year,

equivalent to only a 0.05% increase over the baseline mortality). Collision risk to this species would be of negligible magnitude and not significant.

Curlew

9.6.60 Curlew were frequently observed flying through the collision risk zone (**Figure 9.8**). Collision risk to curlew (a medium value receptor) was predicted to be 1.07 per year using the two year's baseline data. This would represent a 0.09% increase over the baseline mortality for this NHZ population, so would be an effect of negligible magnitude and not significant.

Lapwing

9.6.61 Lapwing were seen regularly flying through the collision risk zone (**Figure 9.9**). Collision risk to lapwing (a medium value receptor) was predicted to be 5.0 per year using the two year's baseline data. This would represent a 0.36% increase over the baseline mortality for this NHZ population, so would be an effect of negligible magnitude and not significant. Most of this risk occurred during the winter period.

Golden Plover

9.6.62 Golden plover flocks were regularly recorded flying through the collision risk zone at rotor height during the winter VP surveys, and a single flight was observed during the breeding season (**Figure 9.10**). Collision risk to golden plover (a high value receptor) was predicted to be 3.2 per year using the two years' baseline data. This would represent a 0.22% increase over the baseline mortality for this NHZ population, so would be an effect of negligible magnitude and not significant.

Herring Gull

9.6.63 Herring gulls were frequently observed flying through the collision risk zone at rotor height during the winter, with smaller numbers of flights observed during the breeding season (**Figure 9.11**). Collision risk to herring gull (a medium value receptor) was predicted to be 1.5 per year over the two baseline years. This would represent a 0.46% increase over the baseline mortality for this NHZ population, so would be an effect of negligible magnitude and not significant.

Indirect Effects: Barrier Effect

9.6.64 A further potential operational disturbance effect could be disruption to important flight lines (barrier effect). Birds may see the Proposed Development and change their route to fly around (rather than through) it.

This would reduce the risk of collision but could possibly have other effects, for example potentially making important feeding areas less attractive (by acting as a barrier to the birds reaching them) and (if diversions were of a sufficient scale) resulting in increased energy consumption. The distance needed to divert around the Proposed Development would be relatively small and would not be expected to act as a major barrier to movements and no important regularly used flight routes across the site have been identified. Accordingly, the ecological consequences of any such changes in flight lines would be of negligible magnitude and not significant.

Assessment of Effects on Other High-Value Species

9.6.65 Common crossbill was breeding in the coniferous plantation (with two pairs in coniferous plantations in the northern and central parts of the survey area) around the site and was also present there outside the breeding season. Though these numbers are only locally important, this species is classed as high value because it is specially protected from disturbance during the breeding season under Schedule 1 of the 1981 Wildlife and Countryside Act. In the absence of any forest felling associated with the construction of the Proposed Development in the areas where common crossbill was present, this high-value species would be unaffected, with no significant impacts.

Assessment of Effects on Other Medium-Value Species

9.6.66 A regionally important black-headed gull breeding colony was located on the southern edge of the site. It held up to 380 breeding pairs. It was avoided during the site design process such that no wind turbines are located within 500 m of the colony to reduce the possibility of any adverse effects on the colony. As a result, any effect would be of low/negligible magnitude and not significant.

9.6.67 Twelve other medium-value species were recorded breeding in the potential impact zone of the development: red grouse, snipe, cuckoo, skylark, tree pipit, dunnock, song thrush, spotted flycatcher, starling, linnet, lesser redpoll and reed bunting. All are SBL species. None would be likely to be significantly affected by the Proposed Development, given experience from other wind farms (Meek *et al.* 1993, Phillips 1994, Thomas 1999, Percival 2005, Devereux *et al.* 2008) and their large regional and national population sizes. Effects would be of low/negligible magnitude and not significant.

9.6.68 Gladhouse Reservoir supported a range of regionally important wintering waterfowl populations, including mute swan, wigeon, teal, mallard, tufted duck, little grebe and cormorant. These species were, though, largely restricted to the reservoir and would be unaffected by the Proposed Development.

Assessment of Effects on Other Low Value Species

9.6.69 The low value species are of lesser concern, as a higher magnitude impact would be necessary in order for a significant effect to occur. As these species are generally at low density within the core survey area, such a magnitude of effect would be very unlikely and it can be safely concluded that there would not be any significant effect on any of these species.

Effects on Protected Sites

European Protected Sites

9.6.70 The potential ornithological effects of the Proposed Development on European Protected Sites are assessed in **Technical Appendix 9.7**. Possible effects on the Gladhouse Reservoir SPA, Fala Flow SPA, Westwater SPA and the Firth of Forth SPA pink-footed goose populations constituted the only possible Likely Significant Effect (LSE) of the Proposed Development (either alone or in-combination) in the context of the Habitats Regulations.

9.6.71 The Proposed Development is (at the closest point) 0.7 km from Gladhouse Reservoir SPA/Ramsar, 6.4 km from Fala Flow SPA/Ramsar, 16.5 km from the Firth of Forth SPA and 19.5 km from Westwater SPA/Ramsar.

9.6.72 There would be a collision risk to pink-footed goose populations from these SPAs, and a risk of displacement from feeding fields during construction and operation of the Proposed Development. Neither of these impacts would, however, threaten the integrity of any SPA population (see **Technical Appendix 9.7**). The conservation objective 'to maintain the population of the species as a viable component of the SPA would not be undermined. This level of additional mortality would not represent an adverse effect on the integrity of any SPA.

9.6.73 Neither cumulative disturbance nor cumulative collision risk would represent an adverse effect on the integrity of any SPA.

Other Protected Sites

9.6.74 The Moorfoot Hills SSSI (0.4 km from the site) has several ornithological interest features, including breeding golden plover population and its

breeding bird assemblage (including 9 species of wader and ring ouzel). Whilst species such as golden plover and curlew may visit the Proposed Development site to feed whilst breeding on this SSSI, any effects on these species would be of negligible magnitude and not significant.

- 9.6.75 Dundreich Plateau SSSI lies 4 km from the site, and its citation includes several breeding bird species such as golden plover, curlew, ring ouzel and redshank. At this distance from the site, any effect on the SSSI populations would be of negligible magnitude and not significant.
- 9.6.76 No significant effects would be likely to occur on the ornithological interest features of any other statutory protected sites, with no other SSSIs with any ornithological interest features within 5 km.

9.7 Mitigation

- 9.7.1 The Proposed Development is not likely to result in any significant ornithological effects in EIA terms, but nonetheless, the best practice measures described below would be followed throughout all of the Proposed Development, and to ensure compliance with the nature conservation legislation. Mitigation is also required to ensure that the development is compliant with the biodiversity objectives of NPF4.

Mitigation of the Construction Phase

- 9.7.2 The Applicant has committed to the production of a CEMP to the satisfaction of NatureScot and other relevant stakeholders, before construction commences, and would follow Windfarm Good Construction Guidance (Scottish Renewables et al., 2019). An outline CEMP is included as **Technical Appendix 3.1**. An Ecological Clerk of Works (ECoW) will be appointed to monitor the implementation of the CEMP, the Breeding Bird Protection Plan (BBPP) and the outline Biodiversity and Enhancement Management Plan (oBEMP).
- 9.7.3 An oBEMP will be delivered to offset habitat loss, including for the breeding waders on site (given the potential for displacement from the Proposed Development). This will deliver the biodiversity gain required under NPF4.
- 9.7.4 A BBPP will be required to ensure compliance with the Wildlife and Countryside Act (a) to avoid any disturbance to species specially protected under Schedule 1 of that Act and (b) to avoid any damage to active nests. A draft BBPP is included within Technical Appendix 9.6.

- 9.7.5 Several species specially protected from disturbance during breeding under Schedule 1 of the Wildlife and Countryside Act were recorded during the surveys, including hen harrier, merlin and common crossbill. It will be essential to ensure that no Schedule 1 species are disturbed during the breeding season, particularly during the construction phase. Therefore, a BBPP will be developed and implemented. Further surveys for hen harrier, merlin and common crossbill and any other Schedule 1 species will be undertaken to inform the BBPP at fortnightly intervals through the breeding season (March-August) during the construction period. If any nesting Schedule 1 birds were found, then potentially disturbing activities would be suspended for the breeding season within an appropriate zone (dependent on the location of the birds and the species involved, to be agreed with NS and the local authority, and following Ruddock and Whitfield 2007). The BBPP will also include measures to ensure the protection of all other nesting birds.
- 9.7.6 Where works affecting habitats that could be used by nesting birds take place between March and August (inclusive), they will only be carried out following an on-site check for nesting birds by an experienced ecologist. If this indicates that no nesting birds are likely to be harmed by the works, then the works will proceed. If nesting birds are found to be present, work will not take place in that area until the adult birds and young have left the nest. A protection zone will be clearly marked around the nest site to prevent accidental disturbance or damage.

Mitigation of the Operational Phase

- 9.7.7 The operational ornithological impacts of the Proposed Development will be mitigated (in order to deliver a net gain in line with NPF4) through a combination of the enhancements that will be delivered through the oBEMP, and further measures that RES provide that will be developed and implemented in consultation with RSPB, NatureScot and the Southern Uplands Partnership (SUP). These will include the development and implementation of a regional plan for breeding waders, and contribution to the SUP Black Grouse project.

9.8 Assessment of Residual Effects

- 9.8.1 The residual ornithological effects of the Proposed Development will be a non-significant loss of a small amount of upland moorland habitat to the elements of the proposed, and a non-significant risk of disturbance and collision.

- 9.8.2 Using evidence from existing wind farms it is considered unlikely that there will be any long-term impact on the integrity of the study area's ornithological features, or the conservation status of the species found here.

9.9 Assessment of Cumulative Effects

- 9.9.1 The potential for cumulative ornithological effects was considered following the SNH 2018b guidance on 'Assessing the Cumulative Impacts of Onshore Wind Farms on Birds', considering impacts on the favourable conservation status of key species within the relevant NHZ (in this case NHZ 20 The Border Hills, within which most of the development falls, though consideration has also been given to NHZ 16 Eastern Lowlands, which overlaps the northern edge of the site). Given this overlap of NHZ areas, the cumulative assessment has focussed on developments within 35 km of the site boundary. This includes operational and consented developments, as well as those in the planning process (though not those in scoping as insufficient information was available to assess those). Details of the developments within this range are given in **Chapter 6: Landscape and Visual Impact Assessment** and illustrated in **Figure 6.27**. However, only sites within 20 km are likely to have any ornithological connectivity with the site.
- 9.9.2 All of the potential effects of wind farms (direct habitat loss and disturbance during construction; and collision risk and disturbance during operation) have the potential to contribute to the cumulative ornithological impacts, therefore have been considered in the cumulative assessment. Consideration of the cumulative collision risk was carried out to determine whether the Proposed Development could materially contribute to a potentially significant cumulative collision risk.
- 9.9.3 This cumulative assessment has scoped in all species with potential ecological linkage to SPAs, and all other key NS target species with non-negligible residual impacts predicted. This included:
- Cumulative collision risk to pink-footed goose;
 - Cumulative disturbance to breeding curlew; and
 - Cumulative collision risk to goshawk.
- 9.9.4 Each of these is considered in turn below, using the information available from other developments that could contribute to the cumulative impacts, but given that full information from all developments is not available, a precautionary approach has been adopted to this cumulative assessment.

9.9.5 For all other species, the predicted residual effects of the Proposed Development, with regard to habitat loss and disturbance are so low (negligible magnitude) it was considered that these would not make any material contribution to any potentially significant cumulative impact at the NHZ level.

Pink-footed Goose Cumulative Collision Risk

9.9.6 Pink-footed goose collision risk at the Proposed Development is predicted at 14 per year using the two baseline winters' data, equivalent to a 0.2% increase over the baseline mortality. Collision risk at other sites has been reported at such low levels that it has not been considered in any other cumulative assessments. Taking into account both the reported cumulative risks from other sites and the likely risks from schemes where collision risk has not been reported, it is concluded that the cumulative collision risk would be of negligible magnitude and would not be significant in both the context of the NHZ population and the SPA populations.

Curlew Cumulative Disturbance Risk

9.9.7 Curlew is widespread breeding species across the upland habitats within the region, and present at the majority of wind farm sites in the NHZ.

9.9.8 There are a minimum of 27 pairs at risk of cumulative impact from operational and consented schemes (1.9% of the NHZ population of 1,400 pairs). Schemes currently in planning add at least a further 23 pairs to this number, and the Proposed Development site another 60 pairs, giving a total potential cumulative disturbance impact to at least 110 pairs. This would be a loss, in a worst case, of about 8% of the NHZ population. However, this worst case does not take into account the fact that there are habitat management measures in place or planned for most of the developments that would at least partially offset the loss through disturbance, and that the disturbance itself would be unlikely to be total for the whole 500 m buffer used in the assessment (for example, results from the Fallago Rig wind farm monitoring reported in the Dunside EIA Report showed that curlew were not completely displaced from the operational turbines at that site). The residual cumulative operational effect is therefore considered to be of low magnitude on a medium value receptor. Applying the matrix set out in **Table 9.4**, this effect would be of minor significance and not significant.

Goshawk Cumulative Collision Risk

9.9.9 Goshawk collision risk is predicted at 0.27 per year at the Proposed Development, equivalent to a 3.4% increase over the baseline mortality. This species was also at risk of collision at several other sites, including Scawd Law (0.17 per year) and Cloich (0.005 collisions per year). There would also be benefits to this species from the habitat management plans that are being implemented at most sites. The cumulative residual risk is considered to be of low magnitude (in the context of the low numeric risk to the small NHZ population of only 13 pairs) and would not be significant.

9.10 Summary

9.10.1 **Table 9.17** provides a summary of the effects of the Proposed Development on features of ornithological interest detailed within this chapter.

9.10.2 Overall, there are not likely to be any significant impacts on ornithology as a result of the Proposed Development. In relation to the key NS wider countryside test, the Proposed Development would not affect the favourable conservation status of any bird species of conservation importance within the NHZ, either alone or in-combination with other schemes. It would also not result in any adverse effect on the integrity of any SPA qualifying interests, nor would it result in any breach of the Habitats Regulations.

Table 9.17 Summary of the effects of the Proposed Development on features of ornithological interest

Project Phase	Summary of Effect	Value	Magnitude	Nature of Effect			Mitigation Measure	Residual Significance
				Positive/negative	Permanent/temporary	Reversible/irreversible		
Construction	Habitat loss: construction of infrastructure including wind turbine foundations and access tracks	Low/ negligible	Negligible	Negative	Temporary	Reversible	Avoidance of more sensitive habitats in design process	Not significant
	Disturbance to Schedule 1 and Annex 1 breeding species	Up to high	Negligible	Negative	Temporary	Reversible	Development and implementation of BBPP, to include pre-construction survey checks; if present avoid disturbing activity in proximity with species-specific buffer zone implemented.	Not significant
	Disturbance to other breeding species	Up to medium	Negligible	Negative	Temporary	Reversible	Pre-construction survey and active nests avoided.	Not significant
	Disturbance to wintering birds	Up to very high	Negligible	Negative	Temporary	Reversible	None required	Not significant
Operation	Displacement of birds from zone around wind turbines	Up to high	Negligible	Negative	Temporary	Reversible	BEMP and additional measures to offset potential losses	Not significant
	Disturbance to Schedule 1 and Annex 1 breeding species	Up to very high	Negligible	Negative	Temporary	Reversible	None required.	Not significant
	Disturbance to other breeding species	Up to medium	Negligible	Negative	Temporary	Reversible	None required	Not significant
	Disturbance to wintering birds	Up to high	Negligible	Negative	Temporary	Reversible	None required	Not significant
	Mortality through bird collision with wind turbines	Up to very high	Low/negligible	Negative	Temporary	Reversible	None required	Not significant

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