

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 Longcroft 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. Details of professional qualifications and any relevant code of practice have been followed and can be found in **Chapter 1: Introduction**.

9.1.3 The chapter is supported by:

- Technical Appendix 9.1: Breeding Bird Survey 2022;
- Technical Appendix 9.2: Breeding Bird Survey 2023;
- 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;
- Technical Appendix 9.7: Shadow Habitats Regulations Assessment; and
- Technical Appendix 9.8: Confidential Information on Schedule 1 Breeding Birds.

9.2 Legislation, Policy and Guidance

9.2.1 The ornithological assessment followed the guidance produced by Scottish Natural Heritage (SNH) (now NatureScot (NS)) (SNH 2017¹). Additionally, the following documents were taken into account:

- The Wildlife and Countryside Act 1981, as amended;

- European Union (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 (Natural Habitats, &c.) Amendment (Scotland) Regulations 2004 (as amended), which translates the Birds and Habitats Directives into Scottish Law;
- 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);
- Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater and Coastal (CIEEM 2018²);
- Recommended bird survey methods to inform impact assessment of onshore wind farms (SNH 2017);
- Developing field and analytical methods to assess avian collision risk at wind farms (Band et al. 2007);

¹ Scottish Natural Heritage 2017. Recommended bird survey methods to inform impact assessment of onshore wind farms. SNH Guidance.

² CIEEM. 2018. Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Winchester: Chartered Institute of Ecology and Environmental Management.

- 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 2018a³);
- Assessing the cumulative impact of onshore wind energy developments (SNH 2018b⁴);
- Assessing connectivity with Special Protection Areas (SPAs) (SNH 2016a⁵);
- Environmental Statements and Annexes of Environmentally Sensitive Bird Information Guidance for Developers, Consultants and Consultees. Version 2 (SNH 2016b⁶);
- Good Practice during Wind Farm Construction (Scottish Renewables *et al.* 2019⁷);
- 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.* 2021⁸);
- 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 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
RSPB 28/4/23	Scoping Opinion	Note access restrictions have reduced survey coverage. Recommend that these must be appropriately factored into the final assessment of bird status in relation to potential impacts.	Access restrictions have been explicitly addressed in the assessment (see 'Limitations').
		Note inclement weather conditions have restricted surveys for health and safety reasons. Recommend the advice at paragraph 3.8.5 in NatureScot guidance on bird surveys is adhered to in this situation.	NS guidance has been followed.
		Note that mitigation should include design measures to reduce impacts and that draft HMP should be included with application	Design mitigation described in the chapter and included in Technical Appendix 9.6 .

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
		NPF4 policy 3(b) states development proposals (for major, national or those that require EIA) will only be supported where it can be demonstrated that it will conserve, restore and enhance biodiversity to ensure it is left in a demonstrably better state than without intervention.	Measures to deliver biodiversity benefit are included within Technical Appendix 9.6 .
		Recommend tracking data from the reintroduction project is used to inform the EIA for this project in the context of the ability of this species to re-establish itself in its former range and relating to the proposed development site and regionally.	Tracking data have been used to inform the assessment. At request of project, presented in a Confidential Annex 9.8.
		Confirm that RSPB considers the range of surveys scoped into EIA assessment for breeding and wintering birds as generally described in the Scoping Report is appropriate (as long as survey coverage limitations are taken into account).	Noted.
NatureScot 7/4/23	Scoping Opinion	Proposal has the potential to impact on pink-footed goose, a qualifying feature of the Fala Flow and Greenlaw Moor SPAs, so a Habitats Regulations Appraisal (HRA) will be needed.	Potential effects on pink-footed geese and these SPAs have been assessed and an HRA report is included in Technical Appendix 9.7 .
		Note that contact has been made with the South of Scotland Golden Eagle Project	The project has supplied eagle tagging data. At request of project, presented in a Confidential Annex 9.8.
		The bird surveys proposed and the approach to the assessment of impacts appear appropriate.	Noted
		Contact with the Southern Uplands Partnership regarding black grouse would also be useful.	No black grouse recorded on site and site lies outside any SUP black grouse conservation areas.
		NS support the use of a Habitat Management Plan (HMP) to provide for positive management and enhancement of habitats across the development site to benefit biodiversity and not just mitigate	Noted, included in Technical Appendix 9.6.

³ Scottish Natural Heritage. 2018a. Assessing Significance of Impacts from Onshore Wind Farms Outwith Designated Areas. SNH.

⁴ Scottish Natural Heritage. 2018b. Assessing the cumulative impacts of onshore wind farms on birds. Guidance. SNH

⁵ Scottish Natural Heritage. 2016a. Assessing Connectivity with Special Protection Areas (SPAs) - Version 3. Vol. Version 3. SNH Guidance

⁶ Scottish Natural Heritage. 2016b. Environmental Statements and Annexes of Environmentally Sensitive Bird Information Guidance for Developers, Consultants and Consultees. Version 2. SNH Guidance

⁷ Scottish Renewables. 2019. Good Practice during Wind Farm Construction. v.4.

⁸ Stanbury, A., M. Eaton, N. Aebischer, D. Balmer, A. Brown, A. Douse, P. Lindley, N. McCulloch, D. Noble, and I. Win. 2021. The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. *British Birds* 114:723-747.

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
		impacts. The EIA Report should offer an outline HMP that sets out broad measures to achieve this.	
Scottish Bords Council 29/5/23	Scoping Opinion	Ecology Officer generally satisfied with the proposed approach.	Noted.
		Collision modelling for golden eagles should be carried out using the latest guidance from NatureScot.	Golden eagle included in collision modelling and presented in Technical Appendix 9.5 .
		An Outline Habitat Enhancement and Management Plan should be submitted with a full application to show how the proposal meets the requirements of NPF4 policy 3 (Biodiversity).	Included in Technical Appendix 9.6.

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 NS (formerly Scottish National Heritage (SNH)) guidance published in 2018a:
- direct loss of bird habitat through the construction of the wind farm infrastructure;
 - disturbance of birds during construction and operation (including displacement of flight activity through barrier effects);
 - mortality of birds through collision with 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 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 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 2010⁹ and 2017 guidance. The specific study areas were as follows:

- Ornithological designated sites: sites designated for ornithological interests within 5km of the site (all statutory protected sites) and within 20km (internationally important sites), see **Figure 9.1**;
- Core breeding and wintering bird surveys: included the site boundary (the site), plus a 500m buffer for the main breeding bird surveys (the core breeding bird survey area), shown in **Figure 9.2**. Access to a wider area around this was not possible because of landownership restrictions. The site (to which full access was allowed) covered a total area of 12.7km², and the area including 500m buffer 22.0km². Access into the 500m buffer, except to the south-west of the site, was not possible and was surveyed by viewing into it from within the site;
- Key species surveys (the wider breeding bird survey area): a 2km buffer, where access was possible, covering an additional 34km². Surveys comprised walkovers where access was allowed (restricted to the site and public access), supplemented by a series of mini-vantage points (shorter watches from additional vantage points (VP)) to cover other areas (looking out from the site itself);
- Flight Activity (VP) surveys, as shown in **Figure 9.2**; and

⁹ Scottish Natural Heritage. 2010. Recommended bird survey methods to inform impact assessment of onshore wind farms. SNH Guidance.

- Cumulative Effects: other wind farms within the 'Border Hills' NatureScot Natural Heritage Zone (NHZ20) included in the assessment of potential cumulative ornithological effects.

Desk Study

9.4.6 The ornithological desk study provided information on the ornithological interest of the study area out to 20km 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 the following sources of information were sought for the desk study:

- NatureScot website (<https://sitelink.nature.scot/home>) - statutory designated site boundaries, including Sites of Special Scientific Interest (SSSI) 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 (Austin *et al.* 2023¹⁰);
- The Birds of Scotland (Forrester *et al.* 2007¹¹);
- Bird Atlas 2007-11: The Breeding and Wintering Birds of Britain and Ireland (Balmer *et al.* 2013¹²);
- Information published in Environmental Statements (ES) and Environmental Impact Assessment (EIA) Reports for other developments in the NHZ 20 'Border Hills';
- Southern Uplands Partnership Black Grouse Restoration Project (<https://sup.org.uk/projects/black-grouse-recovery-project/>);
- South of Scotland Golden Eagle Project (see Confidential Appendix); and
- Lothian and Borders Raptor Study Group (see Confidential Appendix).

Field Survey

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

- year-round VP 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 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 2022 - 36 hours (6 hours per month);
 - April-August 2023 - 36 hours (6 hours per month).
- autumn/winter:
 - September-March 2021-22 - 42 hours (6 hours per month);
 - September-March 2022-23 - 42 hours (6 hours per month).

Core Breeding Bird Walkover Surveys

9.4.11 The breeding bird walkover survey followed the standard Brown and Shepherd 1993¹³ moorland survey method with two additional visits as recommended in SNH 2017 guidance. These surveys covered the site plus a 500m buffer (where access/viewing was possible). The extent of the breeding bird survey area is shown in **Figure 9.2.**

- 2022 - four visits during April-July; and
- 2023 - four visits during April-July.

¹⁰ Austin, G.E., Calbrade, N.A., Birtles, G.A., Peck, K., Shaw, J.M., Wotton, S.R., Balmer, D.E. and Frost, T.M. 2023. Waterbirds in the UK 2021/22: The Wetland Bird Survey and Goose & Swan Monitoring Programme. BTO/RSPB/JNCC/NatureScot. Thetford.

¹¹ Forrester, R. W., Andrews, I., McInerney, C. J., and Scott, H. I. (2007). The Birds of Scotland. Scottish Ornithologists' Club.

¹² Balmer, D., Gillings, S., Caffrey, B. J., Swann, R. L., Downie, I. S. and Fuller, R. J. (2013). Bird Atlas 2007-11: the breeding and wintering atlas of Britain and Ireland, Thetford: BTO Book

¹³ Brown, A. F., and K. B. Shepherd, (1993). *A method for censusing upland breeding waders.* Bird Study 40:189-195.

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 100m 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)¹⁴. 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 raptors and black grouse, additional species-specific surveys were undertaken during April-August 2022 and 2023, as set out in the scoping document. Surveys were undertaken within the site and a 2km 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 2km buffer. This comprised surveys for black grouse, hen harrier, red kite, short-eared owl, peregrine and merlin, following the standard methodologies detailed in Gilbert *et al.* (1998) and Hardey *et al.* (2013)¹⁵:

- black grouse surveys - dawn surveys during April-May 2022 and 2023 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 2022 and 2023.

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

Autumn/Winter Walkover Surveys

9.4.17 Walkover mapping surveys of the wintering birds within the survey area 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, within 500m of the site. 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.

Collision Risk Modelling

9.4.18 In order to further inform the determination of the likelihood of potential 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. The rotor height envelope would be 50-220m. Further details are provided in Technical Appendix 9.5: Collision Risk Modelling Calculations. The modelling included six target raptor species (goshawk, red kite, golden eagle, marsh harrier, peregrine and merlin) and three breeding waders (curlew, lapwing and golden plover). The collision risk for each of these species was modelled using the non-direct flight model. In addition, wintering/migrating whooper swans, greylag geese, pink-footed geese 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.

¹⁴ Gilbert, G., Gibbons, D. W. & Evans, J., (1998). *Bird Monitoring Methods: a manual of techniques for key UK species*. RSPB /BTO/WWT/JNCC/ITE/The Seabird Group.

¹⁵ Hardey, J., H. Q. P. Crick, C. V. Wernham, H. T. Riley, B. Etheridge, and D. B. A. Thompson., (2013). *Raptors: a field guide to survey and monitoring*. The Stationary Office Ltd, Edinburgh. Third Edition.

- 9.4.19 The NS-recommended collision risk model¹⁶ was used in this assessment. 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.
- 9.4.20 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 geese¹⁷. 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.
- 9.4.21 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 2005¹⁸ and flight speeds from Alerstam *et al.* 2007¹⁹.

Assessment Methodology

- 9.4.22 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.

- 9.4.23 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 NS (SNH 2018a) for the wider countryside, and the CIEEM Guidelines (2018).
- 9.4.24 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)

- 9.4.25 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) (Austin *et al.* 2023). 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.* 2020²⁰ and regional NHZ populations from Wilson *et al.* 2015²¹. 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.
- 9.4.26 The sensitivity (conservation importance, as defined in **Table 9.2**) of the receptors present in the 20km study area were identified, then the magnitude of the possible impact on those receptors determined (as described in **Table 9.3**).

¹⁶ Band, W., Madders, M. & Whitfield, D. P., (2007). *Developing field and analytical methods to assess avian collision risk at wind farms*. In *Birds and Wind Farms*. (eds. M. Lucas, de, G. F. E. Janss & M. Ferrer), pp. 15pp. Madrid: Quercus.

¹⁷ Scottish Natural Heritage, (2017b). Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model. SNH.

¹⁸ Robinson, R.A. (2005) BirdFacts: profiles of birds occurring in Britain & Ireland (BTO Research Report 407). BTO, Thetford (<http://www.bto.org/birdfacts>).

¹⁹ Alerstam, T., Rosén, M., Bäckman, J., Ericson, P. & Hellgren, O. 2007. Flight speeds among bird species: allometric and phylogenetic effects. *PLoS biology*, 5.

²⁰ Woodward, I., N. Aebischer, D. Burnell, M. Eaton, T. Frost, C. Hall, D. Stroud, and D. Noble. 2020. Population estimates of birds in Great Britain and the United Kingdom. *British Birds* 113:69-104.

²¹ Wilson, M. W., G. E. Austin, G. S., and C. V. Wernham. 2015. Natural Heritage Zone Bird Population Estimates. SWBSG Commissioned report number 1504.

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 (Eaton <i>et al.</i> 2015) of favourable conservation status.

Magnitude of Impact

9.4.27 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 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

9.4.28 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.

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

9.4.29 The significance category of each combination is shown in each cell. Shaded cells indicate potentially significant effects in terms of the EIA Regulations.

9.4.30 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.

9.4.31 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 is the NS Natural Heritage Zone (NHZ) population (NHZ 20, ‘Border Hills’, in this case).

9.4.32 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'.

9.4.33 As the 20km 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 Appendix 9.8. 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 Confidential Appendix has been kept to a minimum, but includes all data that indicate breeding locations.

Limitations and Assumptions

9.4.34 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.

9.4.35 Though full access was available for the whole of the site, access to a wider area around this was not possible because of landownership restrictions and confidentiality issues. Access into the buffer around the site was restricted to the south-west of the site. Other buffer areas were surveyed by viewing into them from within the site (and for the wider 2km buffer from public access locations).

9.4.36 As a result of these access restrictions, the breeding bird populations within the potential impact zone of the proposed development are likely to have been slightly underestimated, with the size of that underestimate dependent on the detectability of the species involved. For example, curlew and golden plover, both high visible species, are less likely to have been affected in comparison with more cryptic species such as snipe. For the purposes of the assessment, it was assumed that all of the population estimates that could be affected were minimum values and consideration given that slightly higher numbers could be affected.

9.5 Baseline

Statutory Protected Sites

9.5.1 There are two statutory designated nature conservation sites in the search area around the proposed development (5km for nationally important Sites of Special Scientific Interests (SSSI) and 20km for internationally important European Protected Special Protection Areas (SPA) and Ramsar Sites) - see **Figure 9.1**:

- Fala Flow SPA/Ramsar/SSSI - 7.9km north-west - designated for its internationally important wintering population of pink-footed geese. Blanket bog habitat is also a key feature of the SSSI.
- Greenlaw Moor SPA/Ramsar/SSSI - 16km south-east - designated for its internationally important wintering population of pink-footed geese. The SSSI is also notified for its breeding bird assemblage (including golden plover, red grouse, short eared owl and black grouse), and active raised bog habitat.

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

- River Tweed SAC - within the site - designated for its fish and otter populations, and for its wet woodland and riverine habitats.
- Lammer Law SSSI - 1.5km north - notified for its blanket bog, sub-alpine dry heath and juniper woodland habitat, and for its mosaic of upland habitats present.
- Airhouse Wood SSSI - 4.1km south-west - notified for its upland oak woodland habitat (and also adjoins the River Tweed SAC).

9.5.3 The potential connectivity of each of the SPAs to the site 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 within 20km 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)
Fala Flow	7.9km	Wintering pink-footed goose	Pink-footed goose (15-20km)
Greenlaw Moor	16km	Wintering pink-footed goose	Pink-footed goose (15-20km)

Current Baseline

Field Survey Results: Breeding Birds

9.5.4 The breeding bird populations found within the 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 (2022 and 2023). 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 2022 and 2023)

Species	Number of pairs in 2022	Number of pairs in 2023
Greylag Goose	33	35
Canada Goose	2	1
Teal	0	2
Mallard	12	8
Tufted Duck	2	2
Red Grouse	134	163
Red-legged Partridge	-	19
Pheasant	-	28
Buzzard	9	12
Kestrel	1	2
Merlin	1	1
Oystercatcher	12	14
Golden Plover	11	15
Lapwing	27	22
Snipe	15	9
Curlew	52	33
Common Sandpiper	9	10
Redshank	1	0
Black-headed Gull	8	0
Feral Pigeon	0	1
Stock Dove	0	1
Woodpigeon	-	144
Cuckoo	1	4
Short-eared Owl	1	0
Skylark	191	386
Sand Martin	6	24
Swallow	5	15
Meadow Pipit	302	1039
Grey Wagtail	6	8
Pied Wagtail	15	10
Dipper	7	6

Species	Number of pairs in 2022	Number of pairs in 2023
Wren	55	137
Dunnock	6	31
Robin	6	26
Whinchat	4	19
Stonechat	37	67
Wheatear	22	21
Ring Ouzel	4	16
Blackbird	9	14
Song Thrush	8	15
Mistle Thrush	11	18
Blackcap	1	0
Whitethroat	0	3
Chiffchaff	2	7
Willow Warbler	30	68
Goldcrest	4	10
Spotted Flycatcher	0	1
Blue Tit	0	1
Great Tit	1	0
Coal Tit	1	8
Magpie	4	8
Jackdaw	5	8
Carrion Crow	3	13
Starling	1	0
Chaffinch	21	52
Goldfinch	2	10
Siskin	2	9
Linnet	7	31
Lesser Redpoll	19	56
Common Crossbill	0	2
Bullfinch	0	3
Reed Bunting	11	29

Note: access was restricted to the site because of landowner restrictions, so these values should be treated as minimum values.

Species-Specific Breeding Bird Survey Results

9.5.5 A single pair of merlin were breeding in the survey area in 2022 and in 2023. Further details are given in Confidential Appendix 9.8.

9.5.6 A single pair of short-eared owl was breeding in the survey area in 2022, though none were seen in 2023. Further details are given in the Confidential Appendix.

9.5.7 The following key target species were recorded within the survey area, but no evidence was found for any of them breeding:

- Hen harrier;
- Marsh harrier;
- Red kite;
- Golden eagle;
- Osprey; and
- Peregrine.

9.5.8 There were no records of black grouse during the specific surveys for this species or during any of the other baseline surveys.

Vantage Point Survey Results: Breeding Season

9.5.9 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.

9.5.10 **Table 9.7** also gives the percentage of flights of each species that were recorded at rotor height over both years' baseline data (rotor height would be 50-220m).

Table 9.7: Key Species Flight Rates recorded over the VP survey area during the 2022 and 2023 breeding season vantage point surveys

Species	Flight rate in 2022 (birds/hour)	Flight rate in 2023 (birds/hour)	Total number observed	% flights at rotor height (50-220m)
Greylag Goose	0.32	2.90	348	44%
Mallard	0.01	0.07	9	43%
Goosander	0	0.01	1	100%
Grey Heron	0.01	0.02	3	67%
Red Kite	0.06	0.30	38	26%
Marsh Harrier	0	0.04	4	25%
Hen Harrier	0	0.03	3	0%
Sparrowhawk	0.01	0.01	2	50%
Buzzard	0.08	1.32	152	43%
Golden Eagle	0.01	0.07	9	67%
Kestrel	0.04	0.55	63	5%
Merlin	0.01	0.06	8	0%
Peregrine	0.02	0.08	11	40%
Oystercatcher	0.09	0.06	17	22%
Golden Plover	0.15	2.22	256	29%
Lapwing	0.11	1.59	184	9%
Snipe	0.04	0.06	11	50%

Species	Flight rate in 2022 (birds/hour)	Flight rate in 2023 (birds/hour)	Total number observed	% flights at rotor height (50-220m)
Curlew	0.39	1.50	204	14%
Common Gull	0	0.01	1	0%
Lesser Black-backed Gull	0.08	4.72	519	69%
Herring Gull	0.30	4.34	501	70%
Great Black-backed Gull	0	0.06	7	83%
Black-headed Gull	0	3.39	366	65%
Short-eared Owl	0.07	0	8	0%

Field Survey Results: Wintering Birds

9.5.11 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
Greylag Goose	60.4	8.4	226	24
Mallard	3.9	5.0	17	20
Goosander	0.4	0.3	2	2
Red Grouse	154.3	2.1	218	15
Grey Heron	0.0	0.6	0	3
Red Kite	0.7	0.3	4	1
Hen Harrier	0.0	0.1	0	1
Sparrowhawk	0.0	0.6	0	1
Buzzard	22.1	12.6	32	26
Kestrel	0.9	0.4	3	1
Merlin	0.0	0.1	0	1
Peregrine	0.4	0.1	1	1
Oystercatcher	0.6	0.6	4	4
Golden Plover	10.0	0.1	37	1
Lapwing	6.3	5.3	36	36
Jack Snipe	0.0	0.3	0	1
Snipe	0.6	4.4	4	11
Woodcock	0.1	1.6	1	6
Herring Gull	43.0	0.7	101	4

Vantage Point Survey Results: Winter

9.5.12 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). Overall flight rates of key species over the site were low, with no major differences apparent between years.

9.5.13 **Table 9.9** also gives the overall percentage of flights of each species that were recorded at rotor height (50-220m).

Table 9.9: Key Species Flight Rates recorded over the VP survey area during the 2021-22 and 2022-23 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 (50-220m)
Whooper Swan	0	0.06	8	100%
Pink-footed Goose	4.63	7.10	1478	22%
Greylag Goose	2.07	3.74	732	58%
Goosander	0.01	0	1	0%
Red Grouse	0.24	0	30	0%
Grey Heron	0	0.02	2	100%
Red Kite	0.05	0.46	64	41%
Hen Harrier	0.01	0.02	3	0%
Goshawk	0	0.02	3	67%
Sparrowhawk	0	0.02	2	0%
Buzzard	0.56	0.73	163	63%
Golden Eagle	0	0.01	1	100%
Kestrel	0.02	0.03	7	0%
Merlin	0.02	0.02	5	0%
Peregrine	0.03	0.06	12	75%
Golden Plover	2.98	1.79	602	39%
Lapwing	0.48	1.19	211	64%
Snipe	0.02	0.02	5	50%
Curlew	0.01	0	1	0%
Common Gull	0	0.13	17	67%
Lesser Black-backed Gull	0.01	0	1	100%
Herring Gull	3.06	0.71	475	91%
Great Black-backed Gull	0.01	0.02	3	67%

Future Baseline

9.5.14 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.* 2017²²). 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 (game shooting and sheep 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

9.5.15 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 (2022 and 2023)

Species	Peak breeding pairs 2022 & 2023	>1% NHZ	EU Birds Dir Ann 1	Wildlife and Country side Act Sch 1	Red [R]/ Amber [A] List	UK priority sp	Scottish BAP sp	Conservation Value
<i>Breeding Species:</i>								
Greylag Goose	35	✓			A			Low
Canada Goose	2							Nil
Teal ³	2				A			Low
Mallard	12				A			Low
Tufted Duck	2							Nil
Red Grouse ¹	163					✓		Medium

²² Franks, S. E., Douglas, D. J. T., Gillings, S. and Pearce-Higgins, J. W. 2017. Environmental correlates of breeding abundance and population change of Eurasian Curlew *Numenius arquata* in Britain. *Bird Study*, 64: 393-409

Species	Peak breeding pairs 2022 & 2023	>1% NHZ	EU Birds Dir Ann 1	Wildlife and Country side Act Sch 1	Red [R]/ Amber [A] List	UK priority sp	Scottish BAP sp	Conservation Value
Red-legged Partridge	19							Nil
Pheasant	28							Nil
Buzzard ²	12							Nil
Kestrel	1				A		✓	Low
Merlin ^{3.5}	1	✓	✓	✓	R		✓	High
Oystercatcher	14				A			Low
Golden Plover ²	15	✓	✓				✓	High
Lapwing	27				R	✓	✓	Medium
Snipe ²	15	✓			A			Medium
Curlew ²	52	✓			R	✓	✓	Medium
Common Sandpiper	10				A			Low
Redshank ²	1				A			Low
Black-headed Gull	8				A			Low
Feral Pigeon	1							Nil
Stock Dove	1				A			Low
Woodpigeon	144				A			Low
Cuckoo ^{2.5}	4				R	✓	✓	Medium
Short-eared Owl ^{3.5}	1	✓	✓		A		✓	High
Skylark	386				R	✓	✓	Medium
Sand Martin	24							Nil
Swallow	15							Nil
Meadow Pipit	1039				A			Low
Grey Wagtail ²	8				A			Low
Pied Wagtail	15							Nil
Dipper ^{2.5}	7				A			Low
Wren	137				A			Low
Duncock	31				A	✓		Medium
Robin	26							Nil
Whinchat ²	19				R			Low
Stonechat ²	67							Nil
Wheatear ¹	22				A			Low
Ring Ouzel ³	16				R	✓	✓	Medium
Blackbird	14							Nil

Species	Peak breeding pairs 2022 & 2023	>1% NHZ	EU Birds Dir Ann 1	Wildlife and Country side Act Sch 1	Red [R]/ Amber [A] List	UK priority sp	Scottish BAP sp	Conservation Value
Song Thrush	15				A	✓	✓	Medium
Mistle Thrush	18				R			Low
Blackcap	1							Nil
Chiffchaff	7							Nil
Willow Warbler	68				A			Low
Goldcrest	10							Nil
Spotted Flycatcher	1				R	✓	✓	Medium
Blue Tit	1							Nil
Great Tit	1							Nil
Coal Tit	8							Nil
Magpie	8							Nil
Jackdaw	8							Nil
Carrion Crow	13							Nil
Starling	1				R	✓		Medium
Chaffinch	52							Nil
Goldfinch	10							Nil
Siskin	9						✓	Low
Linnet	31				R	✓	✓	Medium
Lesser Redpoll	56					✓	✓	Medium
Common Crossbill	2			✓				High
Bullfinch	3				A	✓	✓	Medium
Reed Bunting	29				A	✓	✓	Medium
<i>Additional non-breeding species:</i>	<i>Peak count</i>							
Pink-footed Goose	35				A			Low
Grey Heron	1							Nil
Red Kite	3		✓	✓			✓	High
Hen Harrier	1		✓	✓	R		✓	High
Golden Eagle	2		✓	✓			✓	High
Osprey	1		✓	✓	A		✓	High
Peregrine	2		✓	✓			✓	High
Common Gull	1				A			Low
Lesser Black-backed Gull	25				A			Low

Species	Peak breeding pairs 2022 & 2023	>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
Herring Gull	101				R	✓	✓	Medium
Great Black-backed Gull	4				A			Low
Swift	4				R		✓	Low
House Martin	20				R			Low
Fieldfare	103				R			Low
Rook	180				A			Low

9.5.16 Four high-value species were recorded breeding within the breeding bird survey area during 2022 and 2023, merlin, golden plover, short-eared owl and common crossbill. Merlin, golden plover and short-eared owl are EU Birds Directive Annex 1 species. Merlin and common crossbill are protected under Schedule 1 of the Wildlife and Countryside Act.

9.5.17 Fifteen breeding species were classed as medium conservation value: red grouse, lapwing, snipe, curlew, cuckoo, skylark, dunnock, ring ouzel, song thrush, spotted flycatcher, starling, linnet, lesser redpoll, bullfinch and reed bunting. All were classed as medium value because of their listing on the UK Biodiversity Action Plan list of priority species and/or were present in regionally important numbers (>1% NHZ). They are mostly species that have declined widely across Britain but are still common and widespread.

9.5.18 A further 18 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.

9.5.19 The overall conservation value of the breeding bird community in 2022 and 2023, measured from the core survey data as the breeding bird assemblage score, was 36. This is above the threshold for national importance (27) for the main habitat within the survey area, 'Upland moorland and grassland without water bodies' (Drewitt *et al.* 2020²³). The survey area therefore supports a nationally important breeding bird community.

9.5.20 Other non-breeding species recorded during the surveys (Table 9.10) included five high-value species (red kite, hen harrier, golden eagle, osprey and peregrine, all EU Annex 1/Wildlife and Countryside Act Schedule 1 species), one medium value (herring gull, a UK BAP priority species), and eight additional low-value species (through their red/amber listing). All these species were seen only infrequently in generally low numbers during the breeding bird surveys.

Conservation Evaluation of Wintering Bird Populations

9.5.21 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).

9.5.22 One species (pink-footed goose) was classed as very high sensitivity as the site lies within the connectivity range of the Fala Flow and Greenlaw Moor SPA, for which it is a qualifying species.

9.5.23 Eight species were classed as high sensitivity (whooper swan, red kite, hen harrier, goshawk, golden eagle, peregrine, merlin and golden plover) 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 9 low sensitivity species.

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

Species	Peak count 2021-22	Peak count 2022-23	EU Birds Dir Ann 1	Wildlife and Countryside Act Sch 1	Red [R]/Amber [A] List	UK priority sp	Scottish BAP sp	Conservation Value
Whooper Swan	0	8	□	□	A		□	High
Pink-footed Goose	80	49			A			Very high (SPA species)
Greylag Goose	226	24			A			Low
Mallard	17	20			A			Low
Goosander	2	2						Nil
Red Grouse	218	15				□		Medium
Red Kite	4	4	□	□			□	High
Hen Harrier	0	1	□	□	R		□	High
Goshawk	1	1		□				High
Sparrowhawk	0	1			A			Low

²³ Drewitt, A. L., S. Whitehead, and S. Cohen. 2020. Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 17: Birds (Version 1.1). Joint Nature Conservation Committee, Peterborough.

Species	Peak count 2021-22	Peak count 2022-23	EU Birds Dir Ann 1	Wildlife and Countryside Act Sch 1	Red [R]/ Amber [A] List	UK priority sp	Scottish BAP sp	Conservation Value
Buzzard	32	26						Nil
Golden Eagle	0	1	□	□			□	High
Kestrel	3	1			A		□	Low
Merlin	1	1	□	□	R		□	High
Peregrine	1	1	□	□			□	High
Oystercatcher	4	4			A			Low
Golden Plover	37	75	□				□	High
Lapwing	36	36			R	□	□	Medium
Jack Snipe	0	1						Nil
Snipe	4	11			A			Low
Woodcock	1	6			R		□	Low
Curlew	19	0			R	□	□	Medium
Lesser Black-backed Gull	1	0			A			Low
Herring Gull	101	4			R	□	□	Medium
Great Black-backed Gull	4	1			A			Low

Note: species in italics seen over-flying only

9.5.24 Key wintering bird populations recorded included:

- **Over-flying Pink-footed Geese** - pink-footed geese were occasionally seen over-flying through the winter (9 flocks in total in 2021-22 and 18 in 2021-22). None were seen on the ground during any of the surveys. There was no evidence of any clear ecological link to the Fala Flow or Greenlaw Moor SPAs, but the site does lie within the connectivity range for this species of both SPAs.
- **Red Kite** - there were regular flights of this species seen during the VP surveys, but no evidence that the site was of particular importance, and no notable concentrations of activity.
- **Red Grouse** - the site supports a high resident population of red grouse for commercial shooting. These birds were distributed widely across all of the higher heather-dominated habitats within the survey area.
- **Golden Plover** - this species occasionally used the site during the winter (but only in small numbers (peak 75), both numerically and in the context of the regional population.
- **Golden Eagle** - there was a single autumn/winter record of an immature bird on 13/10/22.
- Other scarce raptors - **hen harrier**, **goshawk**, **merlin** and **peregrine** were all recorded during the winter surveys, but only infrequently in low numbers. No

evidence was found of any raptor night roosts in the survey area. There was no evidence that the survey area was important to any of these species.

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 new access track;
- 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 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 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
 - c) 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's 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, pink-footed goose, greylag goose, hen harrier, goshawk, red kite, osprey, golden eagle, merlin, peregrine, golden plover, lapwing, 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 NS (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 six 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 (30 pairs);

- golden plover (15 pairs)
- lapwing (21 pairs);
- curlew (34 pairs);
- merlin (1 pair); and
- short-eared owl (1 pair, 2022 only)

9.6.5 Key species recorded using the potential disturbance zone outside the breeding season included red kite, hen harrier, goshawk, golden eagle, golden plover, lapwing, curlew, peregrine and merlin.

9.6.6 Key species recorded at risk of collision (i.e. flying through the site at rotor height) included whooper swan, pink-footed goose, greylag goose, red kite, marsh harrier, goshawk, golden eagle, curlew, golden plover, lapwing, 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

9.6.7 There will be a direct loss of habitat resulting from the construction of the proposed development. **Table 8.8 of Chapter 8: Terrestrial Ecology** sets out the losses of each habitat that would occur as a result of the proposed development.

9.6.8 The permanent land take would be limited to the wind turbine foundations, access tracks, permanent crane hardstands and substation & BESS compounds which account collectively for about 1.2% of the total area within the site. Additional temporary land take during construction would add further temporary habitat loss of about another 1.6% of the site area.

9.6.9 The use of existing tracks and the careful selection of routes for the access tracks and wind turbine locations, alongside 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 NS and other relevant stakeholders, before construction commences, and would follow Windfarm Good Construction Guidance by Scottish Renewables *et al.* (2019).

Ornithological Receptor Value

9.6.10 Direct habitat loss will reduce habitat availability to the species breeding and foraging on the site, including golden plover, merlin and short-eared owl (high value), lapwing and curlew (both medium value) and greylag goose (low value).

9.6.11 Direct habitat loss will also reduce habitat availability to the other species foraging on the site, including six high value species (red kite, golden eagle, hen harrier, marsh harrier, goshawk and peregrine).

Magnitude of Impact

9.6.12 Direct habitat loss to breeding and non-breeding birds will be negligible in the context of the availability of the habitats that will be affected (predominantly open moorland), and in the context of the sizes of these birds' home ranges.

Significance of Effects

9.6.13 The very small loss of breeding and foraging habitat of negligible magnitude on high/medium value receptors results in an effect of negligible significance (as per **Table 9.4**) for all of the bird species affected and would not be significant.

Indirect Effects: Construction Disturbance (Noise and Visual)

9.6.14 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 themselves²⁴. Most species that have been studied have not been significantly affected^{25, 26, 27, 28, 29 and 30}. An RSPB study reported partial displacement of breeding upland birds around wind turbines for a distance up to 800m and reported significant reductions in golden plover density up to 400m from wind turbines, though another study on the same species found no significant operational disturbance to this species. The scale and pattern of displacement is similar to that reported for breeding waders in general³¹, with most studies reporting only small scale (0-200m) displacement distances and a smaller number over a greater distance. For the purposes of this assessment it has been assumed that all breeding birds within 300m of wind turbines could be at risk of disturbance during operation, with consideration also given to the breeding populations within a 500m buffer as well, and a 600m buffer outside the breeding season. It was assumed for the purposes of the assessment that all birds occurring within these zones were at risk of disturbance.

9.6.15 The indirect effect of disturbance is likely to be highest during construction owing to the increased activity on site. Pearce-Higgins *et al.*³² 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.* for example reported decreases in curlew density during construction of 40% and snipe by 53%. Other species, such as golden plover³³, though have been shown to be unaffected by construction disturbance. The assessment of construction disturbance has assumed that all breeding birds within 500m of the proposed development could potentially be at risk of displacement, and a slightly wider zone (600m) for wintering birds^{34, 35}. It should be noted that only partial displacement within these zones might be expected³⁶, but it is assumed for the purposes of this assessment that all birds occurring within the zone are at risk of disturbance. For SNH 2018a priority species consideration has also been given to the disturbance distances given in Ruddock and Whitfield (2007³⁷).

Nature of the Impact

9.6.16 The estimated on-site construction period for the proposed development is expected to last approximately 16 months. The construction works will take place throughout the year, including the summer months when the weather is more favourable and ground conditions are drier.

²⁴ Bullen Consultants, (2002). Ovenden Moor Ornithological Monitoring - breeding bird survey 2002. Report to Powergen Renewables Ltd.

²⁵ Phillips, J. F., (1994). The effects of a windfarm on the Upland breeding bird communities of Bryn Titli, Mid-Wales: 1993-94. RSPB Report to National Windpower.

²⁶ Thomas, R., (1999). *Renewable Energy and Environmental Impacts in the UK; Birds and Wind Turbines*. In Thesis submitted for Master of Research degree in Environmental Science, University College London., MSc: University College London.

²⁷ Gill, J.P., (2004). *Changes in Populations of Wading Birds Breeding at Dun Law Wind Farm 1999-2003*. Report to Scottish Power plc, Renewable Energy Systems Ltd. & CRE Energy Ltd.

²⁸ Devereux, C. L., Denny, M. J. H. & Whittingham, M. J., (2008). *Minimal effects of wind turbines on the distribution of wintering farmland birds*. *Journal of Applied Ecology*, 45: 1689-1694pp.

²⁹ Percival, S. M. & Percival, T., (2011). *Knab's Ridge Wind Farm: Post-construction breeding bird surveys 2010*. Report to RWE Npower Renewables Ltd.

³⁰ Douglas, D. J. T., Bellamy, P. E. & Pearce Higgins, J. W. (2011). Changes in the abundance and distribution of upland breeding birds at an operational wind farm. *Bird Study*, 58: 37-43pp.

³¹ Hotker, H., Thomsen, K. M. & Jeromin, H., (2006). Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation. Michael-Otto-Institut im NABU, Bergenhusen: 65pp.

³² Pearce-Higgins, J. W., Stephen, L., Douse, A. & Langston, R. H. W., (2012). Greater impacts of wind farms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis. *Journal of Applied Ecology*, 49: 386-394.

³³ Sansom, A., Pearce-Higgins, J. W. & Douglas, D. J. T., (2016). Negative impact of wind energy development on a breeding shorebird assessed with a BACI study design. *Ibis*, 158: 541-555.

³⁴ Percival, S. M., (2005). *Birds and wind farms: what are the real issues?* *British Birds*, 98: 194-204

³⁵ Drewitt, A. L. & Langston, R. H. W., (2006). *Assessing the impacts of wind farms on birds*. *Ibis*, 148: 29-42.

³⁶ Pearce-Higgins, J. W., Stephen, L., Langston, R. H. W., Bainbridge, I. P. & Bullman, R., (2009). *The distribution of breeding birds around upland wind farms*. *Journal of Applied Ecology*.

³⁷ Ruddock, M. and Whitfield, D.P.A., (2007). A Review of Disturbance Distances in Selected Bird Species. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage. Available at: <http://www.snh.gov.uk/docs/B313999.pdf>.

9.6.17 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

9.6.18 Table 9.12 shows the peak breeding bird populations of conservation importance that were found within 500m 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	26	30	Regional	Low
Teal	1	1	Local	Low
Mallard	11	11	Local	Low
Red Grouse	120	141	Local	Medium
Kestrel	2	2	Local	Low
Merlin	1	1	Regional	High
Oystercatcher	9	11	Local	Low
Golden Plover	12	15	Regional	High
Lapwing	10	21	Local	Medium
Snipe	8	11	Regional	Medium
Curlew	30	34	Regional	Medium
Common Sandpiper	7	7	Local	Low
Redshank	1	1	Local	Low
Black-headed Gull	1	7	Local	Low

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
Stock Dove	1	1	Local	Low
Woodpigeon	70	75	Local	Low
Cuckoo	1	2	Local	Medium
Short-eared Owl	1	1	Regional	High
Skylark	238	282	Local	Medium
Meadow Pipit	725	836	Local	Low
Grey Wagtail	6	8	Local	Low
Dipper	4	5	Local	Low
Wren	83	97	Local	Low
Duncock	14	20	Local	Medium
Whinchat	13	13	Local	Low
Wheatear	12	14	Local	Low
Ring Ouzel	12	13	Local	Medium
Song Thrush	7	9	Local	Medium
Mistle Thrush	13	14	Local	Low
Willow Warbler	40	48	Local	Low
Spotted Flycatcher	1	1	Local	Medium
Siskin	8	8	Local	Low
Linnet	11	14	Local	Medium
Lesser Redpoll	38	42	Local	Medium
Common Crossbill	2	2	Local	High
Bullfinch	2	3	Local	Medium
Reed Bunting	17	22	Local	Medium

Note: Bold indicates species identified as 'Priority bird species for assessment when considering the development of onshore wind farms in Scotland' in SNH (2018a) guidance.

9.6.19 Table 9.13 shows the peak wintering bird populations of conservation importance that were found within 600m 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 walkover count <600m from wind turbines	Peak walkover count <600m from all infrastructure	Scale of Importance of Breeding Population Within Potential Disturbance Zone	Conservation Value Within Potential Disturbance Zone
Pink-footed Goose	80	80	Local	Very high
Greylag Goose	57	84	Local	Low
Mallard	14	15	Local	Low
Goosander	2	2	Local	Nil
Red Grouse	206	218	Local	Medium
Red-legged Partridge	5	5	Local	Nil
Grey Heron	2	3	Local	Nil
Red Kite	3	3	Local	High
Hen Harrier	1	1	Local	High
Goshawk	1	1	Local	High
Sparrowhawk	1	1	Local	Low
Buzzard	22	30	Local	Nil
Kestrel	3	3	Local	Low
Merlin	1	1	Local	High
Peregrine	1	1	Local	High
Oystercatcher	4	4	Local	Low
Golden Plover	37	37	Local	High
Lapwing	30	34	Local	Medium
Jack Snipe	1	1	Local	Nil
Snipe	9	11	Local	Low
Woodcock	6	6	Local	Low
Curlew	15	18	Local	Medium
Lesser Black-backed Gull	1	1	Local	Low
Herring Gull	25	101	Local	Medium

Note: Bold indicates species identified as 'Priority bird species for assessment when considering the development of onshore wind farms in Scotland' in SNH (2018a) guidance.

9.6.20

Effects of Construction Disturbance on NS Key Species

9.6.21 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

9.6.22 34 pairs of curlew were found within 500m of the site, and hence would be at risk of disturbance during construction (Figure 9.6). 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.

9.6.23 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 effect in a worst case, assuming complete displacement from this zone, would be of low magnitude on a medium value receptor, which would be of minor significance and not significant.

Golden Plover

9.6.24 15 pairs of golden plover were found within 500m of the site (Figure 9.4), and hence would be at risk of disturbance during construction. This species is an EU Birds Directive Annex 1 species, so it has been classed as high value. The NHZ population is 1,058 pairs (Wilson *et al.* 2015), so the numbers within the potential disturbance zone would be considered to be of regional 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 complete displacement of 15 pairs would be of low magnitude on a high value receptor resulting in an effect of minor significance, which would not be significant.

Lapwing

9.6.25 21 pairs of lapwing were found within 500m of the site (Figure 9.5), and hence would be at risk of disturbance during construction. This species is a red-listed Scottish BAP species, so it 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 complete displacement of 21 pairs would be of negligible magnitude on a medium value receptor resulting in an effect of negligible significance, which would not be significant.

Greylag Goose

9.6.26 30 pairs of greylag geese were found within 500m of the site, and hence would be at risk of disturbance during construction (**Figure 9.3**). This species is an amber-listed species of conservation concern, so it 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 construction, though probably not the complete displacement assumed in this worst-case assessment. Even in that worst case, a complete displacement of 30 pairs would be only of negligible magnitude on a low value receptor resulting in an effect of negligible significance, which would not be significant.

Merlin

9.6.27 A pair of merlin bred successfully within the potential construction disturbance zone in both 2022 and 2023 but at different locations (see Confidential Appendix 9.8 for further details). This species is specially protected from disturbance under Schedule 1 of the Wildlife and Countryside Act, so mitigation measures will need to be put in place to avoid a significant impact during construction.

Short-eared Owl

9.6.28 A pair of short-eared owls bred within the potential construction disturbance zone in 2022, but there were no records in 2023. Intermittent breeding at a site is usual for this species. This species is an EU Birds Directive Annex 1 species, so it has been classed as high value. The NHZ population is 35 pairs (Wilson *et al.* 2015), so the numbers within the potential disturbance zone would be considered to be of regional importance. Displacement of one pair during construction would be an effect of low magnitude on a high value receptor, an effect of minor significance, which would not be significant.

Other scarce raptor species

9.6.29 Several other high value raptor species were observed flying over the site during the baseline surveys, including golden eagle, osprey, goshawk, red kite, hen harrier, marsh harrier and peregrine. All were, however, only seen infrequently, with no evidence of breeding within the survey area or that it was important for foraging for any of them. Further analysis of golden eagle in the context of the South of Scotland release scheme is given in Confidential Appendix 9.8. Whilst some displacement may occur during construction, this would be an effect of negligible magnitude and significance 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.

Ornithological Receptor Value

9.6.31 **Table 9.12** shows the peak breeding bird populations that were found within 500m 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). The table also gives the distance between the breeding locations of each key species and the nearest proposed wind turbine.

9.6.32 **Table 9.13** shows the peak wintering bird populations that were found within 600m 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). The table also gives the distance between the breeding locations of each key species and the nearest proposed wind turbine.

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 30 pairs of curlew were found within 500m of the wind turbines and hence would be at risk of disturbance during operation (**Figure 9.6**). 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.
- 9.6.35 This species has been shown to be affected by disturbance, particularly during construction (Pearce-Higgins *et al.* 2012). Some displacement of breeding birds during the operational phase would be expected. The effect in a worst case, assuming complete displacement from this zone, would be of low magnitude on a medium value receptor, which would be of minor significance and not significant.

Golden Plover

- 9.6.36 12 pairs of golden plover were found within 500m of the wind turbines (**Figure 9.4**), and hence would be at risk of disturbance during operation. This species is an EU Birds Directive Annex 1 species, so it has been classed as high value. The NHZ population is 1,058 pairs (Wilson *et al.* 2015), so the numbers within the potential disturbance zone would be considered to be of regional 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, a complete displacement of 12 pairs would be of low magnitude on a high value receptor resulting in an effect of minor significance, which would not be significant.

Lapwing

- 9.6.37 10 pairs of lapwing were found within 500m of the wind turbines (**Figure 9.5**), 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. Even in that worst case, this would be only of negligible magnitude on a medium sensitivity receptor resulting in an effect of negligible significance, which would not be significant.

Greylag Goose

- 9.6.38 30 pairs of greylag geese were found within 500m of the wind turbines (**Figure 9.3**), and hence would be at risk of disturbance during operation. 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 only be a negligible magnitude on a low sensitivity receptor resulting in an effect of negligible significance, which would not be significant.

Merlin

- 9.6.39 A pair of merlin bred successfully within the potential operational disturbance zone in both 2022 and 2023 but at different locations (see Confidential Appendix 9.8 for further details). This species is specially protected from disturbance under Schedule 1 of the Wildlife and Countryside Act. The NHZ population is 22 pairs (Wilson *et al.* 2015), so the numbers within the potential disturbance zone would be considered to be of regional importance. Some small-scale displacement is possible, but this would be an effect of low magnitude on a high value species, which would be of minor significance and not significant.

Short-eared Owl

- 9.6.40 A pair of short-eared owls bred within the potential operational disturbance zone in 2022, but there were no records in 2023. Intermittent breeding at a site is usual for this species. This species is an EU Birds Directive Annex 1 species, so it has been classed as high value. The NHZ population is 35 pairs (Wilson *et al.* 2015), so the numbers within the potential disturbance zone would be considered to be of regional importance. Some small-scale displacement is possible, but this would be an effect of low magnitude on a high value species, which would be of minor significance and not significant.

Other scarce raptor species

- 9.6.41 Several other high value raptor species were observed flying over the site during the baseline surveys, including golden eagle, osprey, goshawk, red kite, hen harrier, marsh harrier and peregrine. All were, however, only seen infrequently, with no evidence of breeding within the survey area or that it was important for foraging for any of them. Further analysis of golden eagle in the context of the South of Scotland release scheme is given in Confidential Appendix 9.8. Whilst some displacement may occur during operation, this would be an effect of negligible magnitude and significance on all these species, and not significant.

Direct Effects: Collision Mortality

- 9.6.42 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^{38, 39, 40}, through collision with wind turbines. 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. For 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^{41, 42, 43, 44, 45}.
- 9.6.43 The collision risk zone for the proposed development was taken as the wind turbines plus a 500 m buffer (following NS guidance).
- 9.6.44 Reference NHZ population sizes were derived from Wilson *et al.* (2015).
- Nature of Impact**
- 9.6.45 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.
- 9.6.46 Operational displacement and collision with wind turbines are spatially mutually exclusive (if a bird is displaced from the wind farm, it is not at risk of collision). However, displacement effects may change through time, 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

- 9.6.47 **Table 9.14** summarises the collision risk analysis for each of species. Data are presented separately for each of the two baseline survey years (2020-21 and 2021-22). For further details, see Technical Appendix 9.5: Collision Risk Modelling Calculations.
- 9.6.48 **Table 9.14** gives the number of collisions predicted per year based on the precautionary NS avoidance rate of 99% for red kite and marsh 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.

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	0.13	0%	<0.1%	Negligible
Pink-footed Goose	0.31	1.78	<0.1%	<0.1%	Negligible
Greylag Goose	0.14	0.44	<0.1%	<0.1%	Negligible
Marsh Harrier	0	0.07	-	-	Negligible
Goshawk	0	0.15	0%	1.9%	Low/negligible
Red Kite	0.14	6.33 (1.0)*	-	-	Low/negligible
Golden Eagle	0	0.10	0%	1.3%	Low/negligible
Peregrine	0.04	0.49	0.2%	2.5%	Low/negligible
Golden Plover	5.32	40.3	0.4%	3.0%	Low/negligible
Lapwing	0.82	10.2	<0.1%	0.6%	Negligible
Curlew	0	1.56	<0.1%	0.1%	Negligible
Herring Gull	1.07	1.71	0.5%	0.7%	Negligible

* Note: red kite collision risk in 2022-23 heavily skewed by 4 birds present for 1.2 hours in November 2022; value in brackets excludes those data and better reflects the overall risk.

- 9.6.49 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**).

³⁸ Orloff, S. & Flannery, A., (1992). Wind turbine effects on Avian activity, habitat use, and mortality in Altamont Pass and Solano County Wind Resource Areas 1989-1991. Biosystems Analysis Inc. California Energy Commission: 160pp.

³⁹ Janss, G., (1998). *Bird behavior in and near a wind farm at Tarifa, Spain: management considerations*. NWCC National Avian - Wind Power Planning Meeting III: 110-114pp.

⁴⁰ Thelander, C. G., Smallwood, K. S. & Rugge, L., (2003). Bird risk behaviours and fatalities at the Altamont Pass Wind Resource Area: Period of performance: March 1998-December 2000. National Renewable Energy Laboratory Report: 92pp.

⁴¹ Meek, E. R., Ribbands, J. B., Christer, W. B., Davy, P. R. & Higginson, I. (1993). The effects of aero-generators on moorland bird populations in the Orkney Islands, Scotland. *Bird Study*, 40: 140-143pp.

⁴² Tyler, S. J. (1995). *Bird strike study at Bryn Tytli windfarm, Rhayader*. RSPB Report to National Wind Power: 2pp.

⁴³ Bioscan (UK) Ltd., (2001). Novar Windfarm Ltd Ornithological Monitoring Studies - Breeding bird and birdstrike monitoring 2001 results and 5-year review. Report to National Wind Power Ltd.

⁴⁴ Percival, S. M., Percival, T., Hoit, M. & Langdon, K., (2009). Red House Farm Wind Cluster, Lincolnshire: Post-construction breeding bird, marsh harrier surveys and collision monitoring 2008. Report to Fenland Wind Farms Ltd.

⁴⁵ Percival, S. M., Percival, T. & Piner, S., (2013). *Kelburn Wind Farm: Post-construction Phase Breeding Bird Surveys 2013*. Report to RES UK & Ireland Ltd.

Whooper Swan

- 9.6.50 A single flock of eight whooper swans was flying through the collision risk zone in September 2022 (**Figure 9.12**). 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 0.13 collisions per year based on the 2022-23 data, an effect of negligible magnitude that would not be significant.
- 9.6.51 There would clearly 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

- 9.6.52 Pink-footed goose was classed as very high value as a qualifying feature of the Fala Flow SPA and the Greenlaw Moor SPA. Pink-footed geese were regularly recorded overflying the site, mainly during their autumn migration (**Figure 9.7**). Collision risk was predicted as 0.3 in the first two baseline years and 1.8 in the second. This is equivalent to less than a 0.1% 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, which would not be significant.

Greylag Goose

- 9.6.53 Greylag goose flight activity occurred year-round. Flights through the collision risk zone occurred are shown in **Figure 9.8**. The predicted collision risk of 0.14 in 2021-22 and 0.44 in 2022-23 (less than a 0.1% increase over the baseline mortality), would be an effect of negligible magnitude and significance, which would not be significant.

Golden Eagle

- 9.6.54 Golden Eagle is listed on Schedule 1 of the Wildlife and Countryside Act, so is of high value. A low number of golden eagle flights were recorded at rotor height through the collision risk zone (details are given in the Confidential Appendix), with resulting collision risks predicted at 0.05 per year, equivalent to a 0.7% increase over the baseline mortality). No flights were observed through the collision risk zone in 2021-22. Collision risk to this species would be of negligible magnitude and would not be significant.

Marsh Harrier

- 9.6.55 Marsh harrier 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 two marsh harrier flights were recorded at rotor height through the collision risk zone (**Figure 9.12**), with resulting collision risks predicted at 0.07 per year using the 2022-23 data (none were recorded in 2021-22). 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 low number of goshawk flights were recorded at rotor height through the collision risk zone in 2022-23 (**Figure 9.11**), with resulting collision risks predicted at 0.15 per year, equivalent to a 1.9% increase over the baseline mortality). No flights were observed through the collision risk zone in 2021-22. Collision risk to this species would be of low magnitude (in the context of the small NHZ population of only 13 pairs) based on the 2022-23 data and 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. Generally, there were only occasional red kite flights recorded at rotor height through the collision risk zone but on a small number of occasions in November 2022, several birds were present for an extended period of time during VP watches (**Figure 9.9**). The resulting collision risk was predicted at 0.14 per year using the 2021-22 data but a much higher 6.33 per year using the 2022-23 data (heavily skewed by the November 2022 data). It is not possible to express this quantitatively as a percentage of the NHZ baseline mortality as the published NHZ red kite population is zero (Wilson et al. 2015), reflecting this species' recent colonisation of this area. If the November 2022 data are excluded, then the collision risk for 2022-23 drops to 1.0). Overall, collision risk to this species would be of low 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. Only a low number of peregrine flights were recorded at rotor height through the collision risk zone (**Figure 9.10**), with resulting collision risks are predicted at 0.04 per year using the 2021-22 data and 0.49 per year using the 2022-23 data, equivalent to a 0.2% and 2.5% increase over the baseline mortality respectively). Collision risk to this species would be of low/negligible magnitude and not significant.

Curlew

9.6.59 Curlew were frequently observed flying through the collision risk zone (Figure 9.12). Collision risk to curlew (a medium value receptor) was predicted to be 0 per year using the 2021-22 baseline data and 1.56 from the 2022-23 data. This would represent a zero increase over the baseline mortality for this NHZ population in 2021-22 and 0.1% in 2022-23, so it would be an effect of negligible magnitude and not significant.

Lapwing

9.6.60 Lapwing were seen regularly flying through the collision risk zone, during both the breeding and winter periods (Figure 9.13). Collision risk to lapwing (a medium value receptor) was predicted to be 0.82 per year using the 2020-21 baseline data and 10.2 from the 2021-22 data (when higher numbers were present, particularly during spring passage). This would represent less than a 0.1% increase over the baseline mortality for this NHZ population for 2021-22, and a 0.6% increase for 2022-23, so it would be an effect of negligible magnitude and not significant.

Golden Plover

9.6.61 Golden plover were seen regularly flying through the collision risk zone, during both the breeding and winter periods (Figure 9.14). Collision risk to golden plover (a high value receptor) was predicted to be 5.3 per year using the 2021-22 baseline data and 40.3 from the 2022-23 data (when higher numbers were present, particularly during spring passage). This would represent a 0.4% increase over the baseline mortality for this NHZ population for 2021-22, and a 3.0% increase for 2022-23, so it would be an effect of low/negligible magnitude and not significant.

Herring Gull

9.6.62 Herring gulls were frequently observed flying through the collision risk zone (Figure 9.15). Collision risk to herring gull (a medium value receptor) was predicted to be 1.1 per year using the 2021-22 baseline data and 1.7 from the 2022-23 data. This would represent a 0.5% increase over the baseline mortality for this NHZ population in 2021-22 and 0.7% in 2022-23, so would be an effect of negligible magnitude and not significant.

Indirect Effects: Barrier Effect

9.6.63 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 it, 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

9.6.64 One additional high value species was recorded in the study area during the baseline surveys, common crossbill. It is specially protected from disturbance during breeding under Schedule 1 of the Wildlife and Countryside Act, so it has been classed as high value.

Common Crossbill

9.6.65 This species 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, this high value species would be unaffected, with no significant impacts.

Assessment of Effects on Other Medium Value Species

9.6.66 13 other medium value species were recorded breeding in the survey area: red grouse, snipe, grey partridge, cuckoo, skylark, dunnoek, ring ouzel, song thrush, spotted flycatcher, linnet, lesser redpoll, bullfinch and reed bunting. All are SBL species. None would be likely to be 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, *op. cit.*) and their large UK and Scottish population sizes. Effects would be of low/negligible magnitude and not significant.

Assessment of Effects on Other Low Value Species

- 9.6.67 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 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

- 9.6.68 The potential ornithological effects of the proposed development on European Protected Sites are assessed in Technical Appendix 9.7. Possible effects on the Fala Flow SPA and the Greenlaw Moor 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.
- 9.6.69 The proposed development is (at its closest point) 7.9km from Fala Flow SPA/Ramsar, and 16km from Greenlaw Moor SPA/Ramsar. Both are designated for their internationally important wintering population of pink-footed geese and both lie within the 15-20km foraging range of this species (SNH 2016).
- 9.6.70 There would be a collision risk to Fala Flow and Greenlaw Moor SPA/Ramsar pink-footed goose populations, but this would be only a negligible magnitude effect on the SPA population for both species. 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 the SPA.
- 9.6.71 Neither cumulative disturbance nor cumulative collision risk would represent an adverse effect on the integrity of the SPA.

Other Protected Sites

- 9.6.72 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 5km.

9.7 Mitigation

- 9.7.1 The proposed development is not likely to result in any significant ornithological effects, 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. Furthermore, measures to benefit biodiversity will need to be delivered as part of the project in order to satisfy NPF4.

Mitigation of the Construction Phase

- 9.7.2 The applicant has committed to the production of a CEMP to the satisfaction of NS 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 Environmental Clerk of Works (ECoW) will be appointed to monitor the implementation of the CEMP, the Breeding Bird Protection Plan (BBPP) and the Biodiversity Enhancement and Restoration Plan (BERP).
- 9.7.3 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**.
- 9.7.4 Several species specially protected from disturbance during breeding under Schedule 1 of the Wildlife and Countryside Act were recorded during the surveys, including 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 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 are 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 Scottish Borders Council, following Ruddock and Whitfield 2007). The BBPP will also include measures to ensure the protection of all other nesting birds.

9.7.5 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

9.7.6 No mitigation for the operational phase of the proposed development will be required.

9.7.7 Notwithstanding this, a BERP will be delivered to ensure that the development delivers a net gain overall to the local bird communities, including in areas more than 500m from the proposed wind turbines (i.e. outside the potential worst case disturbance zone). An outline BERP is included in **Technical Appendix 8.6**.

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 proposed development, 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). 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 5: Approach to EIA**. However, only sites within 20km 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

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 Longcroft was predicted at 1.1 per year using the two baseline winters' data, equivalent to less than a 0.1% 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 was concluded that the cumulative collision risk would be of negligible magnitude and would not contribute to any significant effects 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 Longcroft site another 30 pairs, giving a total potential cumulative disturbance impact to at least 80 pairs. This would be a loss, in a worst case, of about 6% 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 500m buffer used in the assessment (for example, results from the Fallago Rig wind farm monitoring reported in the Dunside EIAR 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.

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 contribute to any Likely Significant Effect on any SPA qualifying interests. No effects would 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 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	BERP will 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