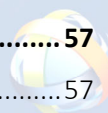


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### TECHNICAL APPENDICES

Technical Appendix 8.1	Ornithological Technical Report
Technical Appendix 8.2	Collision Risk Model Calcs
Technical Appendix 8.3	HRA Report
Technical Appendix 8.4	Outline Bird Protection Plan



## INTRODUCTION

- 8.1 This Chapter provides a description of the avifauna of the proposed Clashindarroch II Wind Farm (the proposed development) study area, based upon data derived from desk study and extensive fieldwork, and a systematic assessment of the potential effects of the proposed development on bird populations of conservation concern and their supporting habitats.
- 8.2 The specific objectives of the assessment as detailed in this Chapter are to:
- set out the methodology used in completing the impact assessment;
  - describe and evaluate the ornithological receptors with a particular focus on species of conservation concern which are considered to be relatively susceptible to the effects of wind farm development;
  - identify the potential effects, including direct, indirect and cumulative effects;
  - assess potentially significant effects associated with the construction, operation/ maintenance and decommissioning of the proposed development;
  - define mitigation measures, where appropriate, to avoid, reduce and offset adverse effects; and
  - determine the level of residual effect taking into consideration the proposed mitigation measures.
- 8.3 A summary of the baseline data is provided in this Chapter, with further detail and background information presented in the Ornithological Technical Appendices as follows:
- Technical Appendix 8.1: Ornithology Technical Report;
  - Technical Appendix 8.2: Collision Risk Model Results;
  - Technical Appendix 8.3: Tips of Corsemaul and Tom Mor SPA Assessment;
  - Technical Appendix 8.4: Outline Bird Protection Plan; and
  - Confidential Annex: Confidential Breeding Bird Records.
- 8.4 A separate Confidential Ornithological Annex (issued to the Scottish Ministers and Scottish Natural Heritage [SNH]) includes details of nesting locations of species at risk from persecution (i.e. raptor species listed on Schedule 1 to the Wildlife & Countryside Act 1981, as amended) in accordance with the guidance on the publication of environmentally sensitive information (SNH 2016, Ref. 8.1).
- 8.5 The ornithological baseline studies, evaluations and assessments presented in this Chapter were carried out by consultants of MBEC ecological consultants during 2015-2019, on behalf of the Applicant. All surveys and assessments have been completed by suitably experienced ornithologists and EIA practitioners.

## LEGISLATION, PLANNING POLICY AND GUIDANCE

### Summary of Relevant Legislation

8.6 This assessment is completed in compliance with the provisions of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. Other key pieces of legislation, conventions, directives and nature conservation-related policy documents that are of relevance to this assessment include:

- European Council Directive 2009/147/EC on the conservation of wild birds (codified version of the EC 'Birds Directive');
- The Conservation (Natural Habitats etc.) Regulations 1994 (as amended) (called "The Habitats Regulations") transposed from the EC Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora;
- Wildlife and Countryside Act 1981 (as amended);
- Nature Conservation (Scotland) Act 2004 (as amended);
- Wildlife and Natural Environment (Scotland) Act 2011;
- The UK Biodiversity Action Plan (UK BAP);
- The North East Scotland Local Biodiversity Action Plan (LBAP); and
- The Scottish Biodiversity List.

### Summary of Relevant Policy

8.7 Scottish guidelines for development include the National Planning Framework and the Planning Advice Note 60 entitled 'Planning for Natural Heritage'.

8.8 Scotland's third National Planning Framework (Scottish Government 2014) provides a strategic level framework for the spatial development of Scotland as a whole, whereas the Planning for Natural Heritage: Planning Advice Note 60 outlines development control processes and provides case studies for good management of the natural heritage, including vegetation restoration following development.

#### *UK Biodiversity Action Plan*

8.9 Relevant biodiversity policies were originally based on the UK Biodiversity Action Plan (UKBAP) which listed 65 Priority Habitats and 1150 Priority Species and created action plans for these priority habitats and species. The UKBAP formally ended in 2010 and was replaced by the UK Post-2010 Biodiversity Framework published in 2012. The UK Post-2010 Biodiversity Framework sets out the priorities for UK-level work to support the Convention on Biological Diversity's (CBD's) Strategic Plan for Biodiversity 2011-2020, as well as its five strategic goals and 20 'Aichi Targets' agreed at the CBD meeting in Nagoya, Japan, in October 2010. In addition, it also considers the EU Biodiversity Strategy (EUBS) launched in May 2011 (JNCC and Defra 2012, Ref. 8.2).

## 2020 Challenge for Scotland's Biodiversity

- 8.10 The '2020 Challenge for Scotland's Biodiversity: A Strategy for the Conservation and Enhancement of Biodiversity in Scotland' launched in 2013 provides the overview of Scottish biodiversity policies set within the UK framework (Scottish Government 2012). The 2020 Challenge publication is a supplement to the Scottish Biodiversity Strategy (SBS) published in 2004. Together, these form the complete SBS (Scottish Government 2013, Ref. 8.3).
- 8.11 The SBS outlines desirable outcomes for 2020 and lists the principles and approaches that should be undertaken to achieve these outcomes. The SBS emphasises the need to take account of how ecosystems work, particularly across landscapes. It states that both the broad and local scales need to be considered, that the capacity of ecosystems to respond to impacts is not infinite and that resilience is to be built into ecosystems using an adaptive, integrated approach at the scale of river catchments.
- 8.12 The UK BAP list of priority habitats and species remain integral to the SBS and the Scottish Biodiversity List.

## The Scottish Biodiversity List

- 8.13 Since the original publication of the SBL in 2005, there are now four categories of habitats and species (Scottish Government 2013 (Ref. 8.3)):
- conservation action needed - this includes habitats and species that have undergone a significant decline in Scotland and / or are rare or have a restricted distribution and are under threat (e.g. species protected Under the Wildlife and Countryside Act 1981, as amended);
  - avoid negative impacts - this includes habitats and species that are protected through international obligations (e.g. European protected species or habitats), those that are rare or have a restricted distribution and/or have undergone a significant decline in Scotland (e.g. species protected Under the Wildlife and Countryside Act);
  - watching brief only - this includes species on the UK BAP list, but not considered to be at particular risk in Scotland, as well as species with international obligations not identified in the other two categories for action (e.g. 'near threatened' category of the IUCN red-data criteria); and
  - communicating with the public - these are non-domestic species and habitats voted as being of importance to the Scottish public in 2005 and are designed to be used to inspire and engage the public on biodiversity conservation.
- 8.14 As a result, the habitats and species are listed on eight SBL schedules:
- Schedule 1 - on the UK BAP list;
  - Schedule 2 - are protected under an international obligation;
  - Schedule 3 - rare in the UK (less than sixteen 10km squares);
  - Schedule 4 - less than six Scottish 10km squares;
  - Schedule 5 - greater than 25% Scottish decline (over 25 years or other appropriate time period);

- Schedule 6a - endemic to Scotland;
- Schedule 6b - endemic subspecies/race (and must meet at least one other criterion); and
- The Social Criteria List.

## Summary of Relevant Guidance

8.15 The approach taken to this assessment draws on a range of guidance from several sources, including guidance produced by statutory nature conservation organisations and available published scientific literature. Listed below are the key guidance documents and scientific literature that were considered, in tandem with professional judgement and MBEC's wind farm Environmental Impact Assessment (EIA) experience, in determining the detailed and site-specific approach to the baseline surveys:

- Survey Methods:
  - SNH (2005). Survey Methods for Use in Assessing the Impacts of Onshore Windfarms on Bird Communities, revised May 2014 (applicable version to the baseline survey period) (Ref. 8.4);
  - Bibby *et al.* (2000). Bird Census Techniques (Ref. 8.5);
  - Gilbert *et al.* (1998). Bird Monitoring Methods; (Ref. 8.6) and
  - Hardey *et al.* (2013). Raptors: A Field Guide to Survey and Monitoring (Ref. 8.7).
- Impact Assessment & Mitigation
  - Environmental Impact Assessment Handbook. Guidance for competent authorities, consulting bodies, and others involved in the Environmental Impact Assessment process in Scotland (SNH 2018) (Ref. 8.8);
  - Chartered Institute of Ecology and Environmental Management Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM 2018) (Ref. 8.9);
  - Assessing the cumulative impacts of onshore wind farms on birds (SNH, August 2018) (Ref. 8.10);
  - Assessing Significance of Impacts from Onshore Wind Farms Outwith Designated Areas (SNH, February 2018) (Ref. 8.11);
  - Significance of impacts on birds within or affecting designated areas (SNH 2013) (Ref. 8.12);
  - A Review of Disturbance Distances in Selected Bird Species (SNH 2007) (Ref. 8.13);
  - Environmental Statements and Annexes of Environmentally Sensitive Bird Information (SNH, September 2016) (Ref. 8.14);
  - Guidance on Assessing Connectivity with Special Protection Areas (SNH, June 2016) (Ref. 8.15);
  - Calculating a theoretical collision risk assuming no avoiding action (SNH 2000, Band *et al.* 2007) (Ref. 8.16);
  - Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model (SNH 2018) (Ref. 8.17);



- Avoidance Rates for Wintering Species of Geese in Scotland at Onshore Wind Farms (SNH, May 2013) (Ref. 8.18);
- Natural Heritage Zones Bird Population Estimates. SWBSG Commissioned Report Number: 1504 (BTO 2015) (Ref. 8.19);
- Dealing with construction and birds (SNH, March 2016) (Ref. 8.20); and
- Wind farm proposals on afforested sites - advice on reducing suitability for hen harrier (*Circus cyaneus*), merlin (*Falco columbarius*) and short-eared owl (*Asio flammeus*) (see SNH, January 2016) (Ref. 8.21).

## SCOPE AND CONSULTATION

- 8.16 This Chapter considers the potential for likely significant effects on sensitive ornithological receptors as a result of the proposed development. The proposed development, including the construction, operation and decommissioning details, is described in Chapter 3: Description of the Development.

### Consultation

- 8.17 Initial consultation with SNH was undertaken prior to Scoping, in April 2016, with respect to confirming the key ornithological receptors for the proposed development area (i.e. the Site, with a particular focus on the area within 2km of the proposed wind turbines) and to request any information that SNH may hold for the study area on important habitats and species. Further consultation was undertaken, during March 2017 and in April 2018, to discuss the potential implications of the proposals for the Tips of Corsemaul and Tom Mor Special Protection Area (SPA) and to confirm that SNH were satisfied that there was sufficient baseline ornithological data to inform the required assessments.

### Scoping

- 8.18 A scoping report, outlining the proposals and which included details of the proposed scope of, and methodological approach to, the assessment of effects on ornithological receptors, was issued for consultation in April 2017. A formal Scoping Opinion was provided by the Scottish Ministers in July 2017. Following a re-design process, to allow the use of taller wind turbines, an updated EIA scoping process was undertaken during 2018, under the 2017 EIA Regulations, with a new scoping report issued to consultees in October 2018. Responses to the scoping report were received from consultees in October and November 2018. The full list of consultees along with a summary of the consultation responses received is provided in Chapter 6: Scoping and Consultation, and highlights the appropriate EIA Report Chapter which addresses each of the issues raised.
- 8.19 The key issues, regarding ornithological receptors, received in the scoping responses and how they have been addressed in this assessment are shown in Table 8-1.

**Table 8-1**  
**Key Issues Raised During Scoping**

Consultee	Summary of Key Issues	Where Addressed in Chapter
SNH	<p>Common gull/SPA - The proposed development site is within the foraging range of common gull from the Tips of Corsemaul and Tom Mor SPA. It is emphasised that the developer will provide a study of the impacts of the proposed development on the SPA, to inform the appropriate assessment. It is also advised that there is connectivity with the SPA and the legislative requirements for European sites.</p> <p>Consideration of the increased turbine blade length will need to be made in relation to bird collision risk.</p> <p>Aviation lighting will also need to be considered in relation to potential increased risk to birds from collision with the wind turbines.</p>	<p>Agreement was reached with SNH on the scope and intensity of baseline ornithology surveys (as set out in the Scoping Report) required to inform the assessment of potential impacts on the key receptors through pre-scoping meetings.</p> <p>A summary assessment of the potential implications of the proposals (in combination with other plans or projects) on the Tips of Corsemaul and Tom Mor SPA conservation objectives (i.e. to inform an appropriate assessment) is provided in the EIA Report with further detail in an appendix (TA 8.3).</p> <p>The issues of increased turbine blade length and aviation warning lights are considered in the assessment.</p>
RSPB Scotland	The ornithological survey areas seem to have been based on the indicative turbine 2015 layout, which has apparently now changed. At least one of the proposed turbines is outside the 500m buffer area.	The issues raised in relation to breeding bird survey effort and coverage, have been addressed through data obtained during summer 2017.
	The 2015 breeding raptor observations started late (May). Given Goshawk are the most numerous raptor, surveys should have been started earlier (March). The earlier start in 2016 indicates there was lots of spring Goshawk activity, which may have been missed in 2015.	This limitation with the 2015 survey was fully recognised in the scoping report. Surveys have now been completed in 2017, providing 2 full years of data.
	There is a possibility of attracting species such as hen harrier and other birds of prey, to within the site by creating open landscape habitat by felling trees. Specific reference to the SNH 2016 guidance "Wind farm proposals on afforested sites – advice on reducing suitability for hen harrier, merlin and short-eared owl" should be considered in the EIA.	This issue is addressed within the assessment and mitigation proposals set out in this chapter.

## Effects Scoped Out

8.20 Table 8-2 summarises the issues scoped out of this assessment and the justification for doing so.

**Table 8-2**  
**Issues Scoped out of the EIA**

Potential Effect	Basis for Scoping Out
Effects on other designated sites in the wider area (i.e. excluding the Tips of Corsemaul and Tom Tor SPA)	There are considered to be no sites with qualifying species that could be at risk of any appreciable adverse impacts from the proposed development.
Effects on wild geese	The nearest relevant SPAs are 28 km north (Moray and Nairn coast SPA) and 38 km north-west (Loch Spynie SPA). Both of these sites exceed the SPA connectivity range for commuting pink-footed goose and greylag goose, as defined in current SNH guidance (SNH 2016).
Effects on non-target species	This assessment does not formally consider potential effects on bird populations that are not listed as focal species for the assessment (i.e. key ornithological receptors) that are common and widespread or species that are not considered to be particularly sensitive to the effects of wind farm development (e.g. common woodland birds).

### Key Ornithological Receptors

8.21 This assessment focuses on bird species that have been identified in guidance and from the scientific literature as being of moderate to high conservation importance and vulnerability to the effects from construction and/or operation of onshore wind farms. Particular consideration has been given to those species whose populations are also of conservation concern in the UK and/or Europe, such as:

- species listed on Annex I of European Council Directive 2009/147/EC on the conservation of wild birds (i.e. 'Annex I' species), in particular, those that may be associated with populations of species that are qualifying interests of Special Protection Areas in the wider area;
- species listed in Schedule 1 to the Wildlife and Countryside Act 1981, as amended (i.e. 'Schedule 1' species); and
- species of national conservation concern, not included within the above categories, but that are potentially present within the study area in nationally or regionally important numbers.

8.22 Breeding raptors, such as northern goshawk (*Accipiter gentilis*) and hen harrier, breeding moorland waders and potential overflights by common gull (*Larus canus*), wintering / passage wildfowl have been the focus of the baseline surveys and of this assessment.

8.23 No significant effects on birds are anticipated from the proposed underground cable connection to the national grid. The grid connection would be to the same substation as the operational Clashindarroch Wind Farm.

## APPROACH AND METHODS

- 8.24 This section of the Chapter details the methods adopted to identify and characterise the sensitivity of the ornithological receptors, from a combination of desk study and field survey. It also outlines the method followed in the assessment of potentially significant effects and the approach to the avoidance, reduction and offsetting of adverse effects on ornithological receptors from the proposed development.

### Desk Study

- 8.25 A map showing the location of the proposed development area, including the main access route from the public road is shown in Figure 3.1.
- 8.26 An initial desk study was carried out in April 2015 and has subsequently been updated on several occasions, in order to collate existing available information on the key species of interest from a range of sources. The initial desk study included searches of available online data sources, for example for potentially relevant designated sites within c. 20km of the Site from sources such as the SNH Sitelink Website (<http://gateway.snh.gov.uk/sitelink/>). The desk study also focused on establishing the potential suite of species that may be present within the Site based on the consultant's general knowledge of the bird fauna of the region and previous surveys that were undertaken to inform the assessment of the operational Clashindarroch Wind Farm, which extended over a much larger area than the consented scheme and included most of the area where the proposed development would be located.
- 8.27 Requests for records of species of conservation concern for the desk study area were placed with a range of organisations, as follows:
- North East Scotland Raptor Study Group (NESRSG);
  - Royal Society for the Protection of Birds (RSPB);
  - Scottish Ornithologist Club (SOC) local recorder;
  - Forest Enterprise Scotland (FCS, now Scottish Forestry); and
  - North East Scotland Biological Record Centre (NESBReC).
- 8.28 Information on key species of interest was also collated from the ES for the Clashindarroch Wind Farm (dated 2009) and from various reports detailing the results of post-construction ornithological monitoring for that wind farm, up to and including surveys completed in 2017.
- 8.29 Information on designated sites (local, regional, national and international) that have ornithological interest were obtained for a core study area extending to 5km from the proposed development area. In addition to this, following SNH guidance on SPA bird populations and potential connectivity to habitats affected by onshore wind farm development, any potentially relevant SPAs up to 20km from the Site were also included in the desk study (SNH 2016, Ref. 8.15).
- 8.30 Details of international and national designated sites, such as Special Areas of Conservation (SACs) and Sites of Special Scientific Interest (SSSIs), National Nature Reserve (NNRs), were obtained through SNH's Sitelink website (<http://www.gateway.snh.gov.uk/>) and associated GIS (Geographic Information System) data made publicly available by SNH.

- 8.31 The websites of Aberdeenshire Council (<http://www.aberdeenshire.gov.uk>) and Scottish Wildlife Trust (SWT) (<http://scottishwildlifetrust.org.uk>) were searched for details of any Wildlife Sites, Local Biodiversity Sites (LBS), Local Nature Reserves (LNR), etc. within the desk study area.

## Survey Areas

- 8.32 Full details of survey methods are provided in Technical Appendix 8.1. Details of survey effort and weather conditions for Flight Activity Surveys are also provided in Technical Appendix 8.1. The various survey areas are shown on Figure 8.1.
- 8.33 Bird surveys were completed between May 2015 and July 2017 and were focused on the potential wind turbine area as defined at that time, which was a larger potential development than what is now proposed. Subsequently, the wind turbine area has been progressively reduced in extent in response to the emerging engineering and environmental constraints. The ornithological survey areas cover the full extent of the currently proposed development.
- 8.34 All areas that were within 500m of the proposed wind turbines, as defined at that time, were also surveyed for all other breeding birds during spring/summer 2016. This included some areas of moorland habitats on the fringes of the conifer plantation areas which had the potential to support breeding moorland waders of conservation concern (e.g. curlew). There are now no habitats, suitable for breeding moorland waders, within 500m of the proposed wind turbine layout. The 2016 breeding bird survey of the conifer plantation areas (see Figure 8.7) revealed a suite of breeding woodland songbirds, typical of commercial conifer plantations and is considered sufficient to characterise the woodland songbird assemblage. Following current SNH guidance (SNH 2014), no further surveys of songbirds were considered to be necessary to inform the EIA process.
- 8.35 Additional flight activity surveys and breeding raptor and black grouse (*Lyrurus tetrix*) breeding surveys were completed during spring/summer 2017. The flight activity surveys included additional vantage points to monitor potential movements by common gull within the wind farm and a wider area to the north, related to concerns about potential effects on birds associated with the Tips of Corsemaul and Tom Tor SPA population.
- 8.36 The various survey areas referred to in this chapter and shown on Figure 8.1 are defined as follows:
- 'breeding bird survey area' was based on the wind turbine area, as defined at the time of the 2016 survey, plus an additional 500m wide strip;
  - 'black grouse survey area' refers to the wind turbine area, as defined at the time of the survey, plus an additional 1.5km wide zone of suitable habitats; and
  - 'raptor & owl survey area' refers to the wind turbine area, as defined at the time of the survey, and up to an additional 2km wide zone depending on the focal species and presence of suitable habitats (e.g. goshawk survey effort focused on suitable habitats within 1km of the proposed wind turbine locations, merlin survey effort extended to 2km from the proposed wind turbines).
- 8.37 In this chapter, the 'Site' or 'proposed development area' are defined as the proposed wind turbine area, plus a 500m wide buffer zone around the outermost turbines.

## Survey Methods

- 8.38 The following is a summary of the methods followed for surveys completed between May 2015 and August 2017, which have provided most of the data used to inform the wind farm design process and this impact assessment.

### *Flight Activity Surveys (2015-2017)*

- 8.39 The aim of the flight activity surveys was to systematically quantify the proportion of time that key species spent in flight at different height bands above ground level (a.g.l.) relative to the potential turbine blade swept area. The five height bands used in the survey were as follows:
- Very low <5m;
  - Low 5-20m;
  - Medium 20-150m;
  - High 150-250m; and
  - Very high >250m.
- 8.40 The height a.g.l. of the bird(s) in flight was estimated by the observer and placed within one of the height bands. Following the SNH 'Band method' this data can be used to estimate bird collision risk from the proposed wind turbines.
- 8.41 Due to the proposed 70m blade length of the currently proposed wind turbines, the maximum height above ground of the blade tips (i.e. 180m) exceeds the upper threshold for the 'medium' height band. This has been addressed in the collision risk modelling process by incorporating a proportion of the flight activity recorded within the 'high' height band.
- 8.42 The flight activity data can be used to determine any apparent flight corridors and areas of relatively high activity, in order to inform an estimate of potential collision risk, displacement and disturbance impacts, and also to inform the wind farm design process.
- 8.43 The field survey methods were based on a widely adopted methodology, as available at the time, used to provide data for the assessment of ornithological impacts for onshore wind farm proposals published by SNH (SNH 2005, revised May 2014. (Ref. 8.4)).
- 8.44 Bird flight activity data (i.e. flight behaviour, direction and estimated height above ground level by key species) were collected from strategically located viewpoints during timed watches, following the methods described in Band *et al.* (2007, Ref. 8.22) and SNH (2014, Ref. 8.4)). Flight activity data was collected continuously from May 2015 to August 2016, and between April and August 2017.
- 8.45 The viewpoint locations, along with the other survey areas, are shown on Figure 8.1. Figure 8.2 shows the viewpoint locations along with their corresponding viewsheds (i.e. area in view from the viewpoint as defined by certain criteria relative to the observer and the operating height of the proposed wind turbines).
- 8.46 The data from these surveys were used to provide estimates of the frequency of flight activity, by certain target species, at wind turbine height across the survey area. Key species were divided into target and secondary species groups. Target species were recorded in preference to secondary

species if both a target and secondary species were in view at the same time. A list of target species is given in Table 8-3, along with their level of conservation concern.

**Table 8-3**  
**List of Target Species for Flight Activity Surveys**

Common Name	Scientific Name	Sch. 1 <sup>i</sup>	Ann. I <sup>ii</sup>	UK BoCC <sup>iii</sup>	BAP <sup>iv</sup>	SBL <sup>v</sup>
Pink-footed goose	<i>Anser brachyrhynchus</i>			Amber		
Greylag goose	<i>Anser</i>			Amber		
Black grouse	<i>Lyrurus tetrix</i>			Red	✓	✓
Hen harrier	<i>Circus cyaneus</i>	✓	✓	Red		✓
Goshawk	<i>Accipiter gentilis</i>	✓		Green		
Osprey	<i>Pandion haliaetus</i>	✓	✓	Amber		✓
Curlew	<i>Numenius arquata</i>			Red	✓	✓
Golden plover	<i>Pluvialis apricaria</i>		✓	Green		✓
Common gull	<i>Larus canus</i>			Amber		
Merlin	<i>Falco columbarius</i>	✓	✓	Red		✓
Peregrine	<i>Falco peregrinus</i>	✓	✓	Green		✓

*i. Species listed on Schedule 1 to the Wildlife and Countryside Act 1981 (as amended).*  
*ii. Species listed on Annex I of the EC Birds Directive (Directive 2009/147/EC on the conservation of wild birds - the codified version).*  
*iii. Birds of Conservation Concern (BoCC) in the UK (Eaton et al. 2015, Ref 8.23)).*  
*iv. Priority species in the 2007 UK Biodiversity Action Plan, The UK BAP has been superseded by the UK Post-2010 Biodiversity Framework (JNCC 2012, Ref. 8.2).*  
*v. Species included on the Scottish Biodiversity List (2005), which is part of the Scottish Biodiversity Strategy (originally published by the Scottish Government in May 2004).*

- 8.47 Three viewpoints were established in 2015 for the original, larger study area, and in excess of 36 hours of observation, as recommended under SNH guidance, was completed at each viewpoint for each survey period (i.e. May to September 2015; October 2015 to March 2016, April to August 2016 and April 2017 to August 2017). The number of viewpoints was extended to four in 2017, in consultation with SNH, to inform further consideration of potential effects on common gull. Further details of monthly observation effort from each of the viewpoints are provided in Technical Appendix 8.1.

## Breeding Raptor Surveys

- 8.48 Surveys were undertaken in 2015, 2016 and 2017 to determine the presence and location of breeding raptors and owls within the relevant survey areas (see Figure 8.1). Focal surveys for the following species were completed: goshawk, merlin, peregrine, hen harrier and barn owl. Potentially suitable nesting habitat and historical nest sites were surveyed, depending on species. The surveys carried out followed species-specific methods described in Hardey *et al.* (2013, Ref. 8.7).



- 8.49 Any behaviour by Annex I/Schedule 1 raptors and owls observed during the course of the flight activity surveys and other site surveys, which was indicative of breeding, was also taken into consideration in the determination of breeding locations and to assist in targeting the breeding raptor survey effort.

## Black Grouse Survey

- 8.50 Black grouse reconnaissance and lek surveys were undertaken in spring 2016 and 2017 within suitable habitats up to 1.5km from the wind turbine area considered to provide suitable habitat for black grouse, and where there were historical records within the study area, were searched for evidence of black grouse lekking and for any signs indicating their presence, including droppings and feathers. In locations where lekking activity was identified during the reconnaissance survey, a follow-up survey to record lekking birds was undertaken following the method described in Gilbert *et al.* (1998, Ref. 8.6).

## Breeding Bird Surveys

- 8.51 Surveys for breeding waders were completed in 2015 and 2016 for the larger areas of open moorland that were within the survey area for the proposed development at that time. The survey followed standard methods detailed in Gilbert *et al.* (1998, Ref. 8.6)) and SNH (2014, Ref. 8.4).
- 8.52 In order to assess the breeding bird community present within the woodland and to check for the presence of rarer species, walked transects to sample breeding songbird presence within the core survey area were carried out between April and July 2016. Further details of the breeding bird survey methodology are provided in Technical Appendix 8.1. This was not a comprehensive census of the populations present within the Site, but the data collected can be used to extrapolate breeding densities within the survey area. The location of birds exhibiting any breeding behaviour, or the location of any nests encountered, were annotated on a 1:10,000 scale map of the survey area using standard Common Birds Census recording codes and symbols (Marchant 1983, Ref 8.24).

## Constraints Analysis

- 8.53 Mapped data from the various ornithological surveys and desk studies were collated and 'sensitive areas' were identified if present, with appropriately sized set-back zones (e.g. nest sites of Schedule 1 and Annex I species, areas of critical supporting habitat, and areas or 'corridors' where there was a regular concentration of flight activity at wind turbine collision risk height). These were used for consideration in developing the wind farm layout and mitigation plans for the felling of plantation and construction of the wind farm.

## Assessment Methods

- 8.54 The methods adopted for this assessment follow current best practice, informed by the best available scientific evidence and experienced professional judgement. Where there are uncertainties, reasonable worst-case assumptions are made to minimise the risk of effects being under-estimated. The assessment method follows guidance produced by SNH and the Chartered Institute of Ecology and Environmental Management (CIEEM), such as CIEEM's Guidelines for Ecological Impact Assessment in the UK (2018, Ref. 8.9) and SNH's Environmental Impact Assessment Handbook (2018, Ref. 8.8). SNH guidance related to the assessment of the effects of onshore wind farm development on birds is also of relevance and has been taken into account where appropriate.



- 8.55 The EIA process involves the application of specific, standardised criteria to evaluate impacts and receptors. However, due to the complexities of species interactions with their environment and the potential uncertainty of some effects and the efficacy of mitigation measures, experienced professional judgement plays a key role in the evaluation of receptors and in the determination of the significance of residual effects.
- 8.56 The assessment of the potential effects on sensitive bird receptors from development projects is a process that can be summarised as a series of stages, as follows:
- identifying the ornithological receptors that could be significantly affected by the proposed development (effectively part of scoping);
  - evaluating the importance (i.e. importance at the relevant geographical scale, also referred to as receptor 'sensitivity') of the receptor informed by data from baseline surveys and other appropriate sources;
  - identifying and systematically characterising impacts and their effects (wherever possible based on best available scientific evidence), noting any uncertainties and taking a precautionary approach as appropriate;
  - incorporating measures to avoid and mitigate negative impacts and effects;
  - assessing the significance of any residual effects after the beneficial effects of any proposed mitigation has been taken into account;
  - identifying appropriate compensation measures to offset significant residual effects; and
  - identifying opportunities for ecological enhancement.
- 8.57 In this assessment, the terms 'impact' and 'effect' have the following meanings:
- Impacts - arise from the construction or operation / implementation of the proposals and result in a material change to a receptor; and
  - Effects - are the consequences of the impact, which may be varied, for the ornithological receptor under consideration.

## *Sensitivity of Receptors*

- 8.58 Assigning a sensitivity value to bird receptors can involve the consideration of a wide range of criteria. In practice, conservation status and relative rarity are often the most important criteria to consider. Ornithological receptor sensitivity is usually defined by consideration of international and/or national conservation status and relative rarity at different geographical scales (e.g. local, regional, national, international) and estimates of population size within the study area (or importance of the habitats within the study area in providing critical supporting habitat to populations present in the wider area). Where there is uncertainty about the accuracy of the available information used to inform judgements on receptor sensitivity, a precautionary approach has been adopted to minimise the risk of under-valuing any receptor.
- 8.59 Some explanatory definitions of ornithological receptor sensitivity (populations and supporting habitats) are given in Table 8-4.

**Table 8-4**  
**Receptor Sensitivity Levels and Summary Criteria**

Sensitivity Level	Typical Example Criteria
International	<p>Habitats or species that form part of the cited interest of an internationally protected site or candidate site (for example, SPA, SPA, Ramsar site).</p> <p>Bird species listed on Annex I of the EC Birds Directive if present in qualifying numbers/proportions of national/international population.</p>
National	<p>A nationally designated site (e.g. SSSI, NNR) and the habitats and species that form its cited interest.</p> <p>Regularly occurring but rare bird species (for example, &lt; 300 breeding pairs in the UK).</p> <p>Birds present in nationally important numbers (for example, &gt; 1% of the UK population).</p> <p>A site that provides critical habitat for any regularly occurring bird population of national importance, which is also considered a rare species in the UK.</p>
Regional (for example, NHZ or Local Authority Area)	<p>A LNR, some local-level designated sites depending on specific site conditions.</p> <p>Any regularly occurring population of a nationally important bird species which is threatened or rare in the region (for example, &gt; 1% of the regional population or Natural Heritage Zone (NHZ) population where reliable estimates are available).</p> <p>Regularly occurring, regionally important population of bird species listed on the current UK Red list, presence of regionally important habitats critical to such species.</p> <p>Regionally important populations of National and Local Biodiversity Action Plan species.</p>
Local	<p><b>High Local:</b></p> <p>Sites with an identified ornithological interest meeting the criteria for Council area designation (such as a Local Biodiversity Site), Wildlife Sites, which may include amenity and educational criteria in urban areas. Designated LNRs.</p> <p>Sites supporting viable breeding populations of species known to be Council rarities (for example, included in the Local Biodiversity Action Plan), and/or supplying critical elements of their habitat requirements. Any regularly occurring, locally significant population of bird species.</p> <p><b>Medium Local:</b></p> <p>A population of a species or assemblage of species which are not considered to qualify for non-statutory designation, but which are considered locally important (i.e. approx. 10km radius from the Site).</p> <p>Populations and supporting habitats of any bird species conservation importance in the context of the local area (i.e. approx. 10km radius from the Site).</p> <p><b>Low Local:</b></p> <p>A population of a species or assemblage of species which are not considered to qualify for non-statutory designation, but which are considered locally important in the context of the immediate surrounding area.</p> <p>Populations and supporting habitats of any bird species of conservation importance in the context of the immediate surrounding area.</p>
Negligible	<p>A commonplace bird population of little or no conservation significance at a local scale. Habitats of negligible value to any bird population.</p>

- 8.60 Although there is a range of factors to be considered, for the purposes of this assessment, the evaluation of importance in relation to population size is based on the estimated proportion of a population that a site supports in comparison to the wider geographical population. Where 1% of the bird population for a given geographical scale is regularly present, then that site is considered to be important for that species and scale. For example, where more than 1% of the national population of a target species is regularly present, the site would be considered to be of national and thus high importance. The 1% criterion for importance is well-established and can be applied at the regional, sub-regional or local scales, providing there is sufficiently accurate information available on population sizes within these geographical units. Where there is uncertainty about the accuracy of the available information a precautionary approach has been adopted to minimise the risk of under-valuing any receptor.
- 8.61 Current and accurate information on population sizes below the national level is frequently unavailable for many species. The evaluation of regional, sub-regional, and local importance must therefore often be based on the available information and professional judgement. Breeding population estimates, based on NHZ boundaries which divide Scotland into a number of distinct biogeographical areas, have been published for some key species (Wilson *et al* 2015, Ref. 8.25). The proposed development is located within the 'North East Glens' NHZ. Population estimates for the NHZ were used in this assessment where available to assist in informing judgements on the sensitivity of the populations using the site and their supporting habitats.
- 8.62 These estimates have been used in the assessment, for the relevant species, to assist in informing judgements on the sensitivity of the populations present within the study area and their supporting habitats. The level of confidence in any evaluation is dependent on the accuracy of the current available data. In this assessment, where there is uncertainty about site sensitivity evaluations a precautionary approach has been adopted to minimise the risk of under-valuing any receptor.

## Effect Characterisation

- 8.63 The overall character of an effect is a function of a wide range of variables, determined through informed professional judgement, including the following considerations:
- direction of effect: whether the effect benefits (positive) or detracts / harms (adverse) the value of the receptor;
  - extent of the effect: number or area affected or potentially affected (quantified where possible, as the percentage / proportion of the total receptor population lost or affected);
  - complexity of the effect: relating to whether an effect is direct or indirect, proximal or distal, immediate or delayed;
  - reversibility of the effect: reversible or irreversible (can the effect be reversed, within a reasonable timescale and with reasonable expectation of recovery, or is it permanent and irreversible);
  - frequency of the effect: is the effect acting constantly or intermittently (e.g. occasional noise disturbance in comparison to a longer-term change to the existing baseline levels of disturbance);
  - duration of the effect: is the effect occurring during a more or less sensitive period of the receptor (e.g. relative to the bird breeding season); and

- confidence: certain / near-certain, probably, unlikely or extremely unlikely.

8.64 The overall effect, considering all of the above factors, for each receptor is categorised for each phase of the proposed development (i.e. the construction phase, the operational phase and the decommissioning phase). To help illustrate this, summary descriptions of the various effect levels (primarily considering effect magnitude and duration) are provided in Table 8-5.

**Table 8-5**  
**Categorisation of Impact Magnitude**

Magnitude	Description
Very High	Would cause the loss of a major proportion of a regional population, or cause sufficient damage to a feature to immediately affect its viability/conservation status.
High	Major effects on the population, which would have a sufficient effect to alter the nature of the feature in the short-long term and affect its long-term viability/conservation status (for example, detectable long-term effects on the regional population).
Medium	Effects that are detectable in the short and medium-term but which should not alter the long-term viability of the population (for example, detectable short to medium-term effects on the regional population).
Low	Minor effects, either of sufficiently small-scale or short duration to cause no long-term harm to the population (for example, no long-term detectable effect on the regional population).
Negligible	Minimal change on a very small-scale.
Neutral	A potential effect that is not expected to affect the population in any way (or to have no measurable effect); therefore, no effects are predicted.
Duration	Long-term (15-25 years or longer) Medium-term (5-15 years) Short-term (<5 years)

## Relative Vulnerability to Wind Farm Development

- 8.65 Certain species are generally considered to be of greater relative vulnerability to the effects of wind farm developments than others. Relative vulnerability can be summarised by broad criteria which are assigned to each species based on certain aspects of their ecology, sensitivity to disturbance, biometrics and flight behaviour. Species-specific vulnerability to a wind farm development, as it is defined here, is considered within the impact assessment process (i.e. one of the factors considered in determining the level of effect magnitude) and does not form part of the determination of receptor importance which is undertaken without reference to the development type and impact parameters.
- 8.66 For individual species the criteria have been derived, in part, from a literature review completed by Bright *et al.* (2006, Ref. 8.26). It is important to note that these criteria are only presented here to illustrate intra-specific differences in potential responses to wind farm development. Such categorisation is an aid to assessment but is not a substitute for the detailed consideration and assessment of effects. They are applied very broadly and do not necessarily reflect variation in vulnerability between individuals, sexes and age-groups in the same population, and in the same individual over time (e.g. seasonal changes) or other influencing factors such as habitat type and

condition, wind farm size and layout, and topography. The categories used for classifying species, with regard to their vulnerability to wind farm development are shown in Table 8-6.

**Table 8-6**  
**Categorisation of Species General Vulnerability to Wind Farm Development**

Level	Description
High	Species or populations that are considered to be particularly vulnerable to human-related disturbance generally, but to wind farm development specifically, e.g. with a relatively high risk of collision (based on, e.g. behaviour, morphology, typical flight altitude, twilight/nocturnal activity and manoeuvrability), and that can potentially exhibit behavioural responses to sources of disturbance at greater distances (e.g. > 300m).
Medium	Species or populations that are considered to be moderately vulnerable to human-related disturbance generally, but to wind farm development specifically, e.g. with a moderate risk of collision (based on behaviour, morphology and manoeuvrability), and that can potentially exhibit behavioural responses to sources of disturbance at lesser distances (e.g. 100 – 300m).
Low	Species or populations that are relatively invulnerable to human-related disturbance and that are considered to have a low risk of collision or significant long-term disturbance from operating wind farms.

## Effect Significance

- 8.67 Significance is a measure of the importance that should be given to an effect in relation to the consideration of appropriate mitigation and the overall environmental impact of the proposals and the planning process. Effects can be significant at a wide range of geographical scales (i.e. from the local level to effects that are of international importance for the receptor under consideration) but which result in important consequences for the functioning and/or conservation status of the receptor. In general terms, significance is determined through the interaction between receptor sensitivity and the categorised effect level (i.e. taking into account effect extent, duration, reversibility etc.).
- 8.68 Effect significance is reported in categories, from No effect to Major, through Negligible, Minor and Moderate. A matrix is provided as Table 8-7 to help illustrate how effect level and receptor sensitivity relate to judgements of effect significance. For the purposes of this assessment, effects are considered significant (i.e. 'significant' in terms of the relevant EIA Regulations and of key importance in terms of planning consent decision-making) or critically adverse if they are reported as Moderate or above. In practice, the determination of significance involves the careful application of informed professional judgement and consideration of a wide range of factors, as outlined above.

**Table 8-7**  
**Illustrative Matrix for Determining the Significance of Effect on Ornithological Receptors**

Receptor Sensitivity	Effect Level (significant effects in bold)				
	Total/Near-Total	High	Medium	Low	Negligible
International	Major	Major	Major	Major - Moderate	Negligible
National	Major	Major	Major - Moderate	Moderate	
Regional	Major	Major - Moderate	Moderate	Moderate - Minor	
High Local	Major - Moderate	Moderate	Moderate - Minor	Minor	
Medium Local	Moderate	Moderate - Minor	Minor	Minor	
Low Local	Moderate - Minor	Minor	Minor	Minor	
Negligible	Negligible				

8.69 Only where the assessment has concluded that the effects are of a moderate to major level, are they considered to be significant in terms of the EIA Regulations. If significant effects have been predicted, the need for further mitigation measures is considered although lesser effects may also need to be addressed, depending on specific circumstances. The proposed mitigation measures are then assessed in relation to their potential to reduce the effect on the receptor, following exactly the same methodology as the assessment of potential adverse effects. Following this, the significance of the residual effect has been determined and reported taking into consideration any uncertainties about the time required for the mitigation to take effect, its efficacy or practicality.

## Collision Risk Assessment

8.70 Wind turbine collision risk for key species has been estimated following a method developed by Band *et al.* (2007, Ref. 8.22)). The calculations and parameters involved in the collision risk assessment are detailed in Technical Appendix 8.2. In summary, the process involves three stages:

- Stage one is the estimation of the number of transits through the proposed rotor swept volume per year based on observed flight activity data and parameters of the wind farm and wind turbine design;
- Stage two involves the estimation of the predicted proportion of transits through the rotor swept volume that would result in a collision between the bird and a wind turbine blade. All predicted collisions are assumed to be fatal. This provides an estimate of the number of fatalities per year for the wind farm but assumes that no bird takes avoiding action to prevent a collision; and
- finally, an assumed rate for collision avoidance is applied to the estimate.

8.71 This method is more suitable for some species than others. For example, small and/or fast-flying

birds such as merlin, golden plover and most songbirds are difficult to detect beyond a distance of a few hundred metres and therefore it is rarely possible to generate reliable estimates of flight activity. In the case of these species, the collision risk is probably best determined through informed reasoning rather than quantitative modelling.

- 8.72 In order to provide a biologically realistic estimate of collision risk, it is necessary to assume that birds take action to avoid a collision. However, reliable empirical data on which to base estimates for avoidance are generally lacking and therefore the collision rates derived from assumed avoidance values should be considered as cautious estimates.
- 8.73 In this assessment, estimates of collision risk/mortality have been calculated for key receptors where there was sufficient data to carry out the analysis. Species that are not included in the collision risk analysis are either not of conservation concern or are at low collision risk due to their flight behaviour, and/or are species which are infrequently present within the study area.
- 8.74 Various adjustments to the collision risk estimates have also been made, this was to account for the turbine blade parameters relative to the height bands which were used to record observations of target and secondary species in flight.
- 8.75 The potential collision risk was calculated for each species based on a number of assumptions. It is assumed that there is no influence on collision risk from weather conditions. In the case of diurnal raptors, as visual hunters, the risk of increased collision rates due to poor visibility is lessened by the likely reduction in flight activity during such periods, as hunting efficiency is greatly reduced. Flight speeds and biometrics were conservatively estimated following current SNH guidance ('Flight Speeds and Biometrics for Collision Risk Modelling' October 2014, Ref. 8.27).

## *Mitigation & Residual Effects*

- 8.76 Where potentially significant effects are predicted, mitigation measures have been recommended in order to reduce their severity. Mitigation measures are actions to prevent, reduce or compensate for any likely significant effect on sensitive ornithological receptors.
- 8.77 Mitigation has been a key consideration throughout the development of the wind farm design and in the assessment of the final proposals, and it has been addressed in the following ways:
  - by avoiding/minimising effects through alterations in the scheme layout design, based on available baseline data. This is termed embedded mitigation;
  - by avoiding/minimising effects through programming and the approach to construction (embedded mitigation);
  - by breeding bird monitoring prior to and following construction of the wind farm; and
  - by appropriate management of habitats, resulting from the proposed plantation felling to accommodate the wind farm, to reduce the risk of collision for certain vulnerable species.
- 8.78 The benefits of embedded mitigation (e.g. avoidance of sensitive locations by altering the layout of a wind farm, programming works to avoid sensitive times of year for particular receptors) are considered as part of the initial assessment of effects. The assessment then considers the effect magnitude after these embedded mitigation measures have been taken into consideration, in order to determine the significance of the residual effect.

## *Statement of Significance*

- 8.79 At the end of this Chapter, a statement of significance is provided. This is a summary of the complete assessment for each receptor, taking into consideration any proposed mitigation measures, and reports the significance of the residual impacts in compliance with the EIA Regulations.

## **Cumulative Effects Assessment**

- 8.80 The potential for cumulative impacts with other wind farm proposals has been assessed following current SNH guidance. This part of the assessment has focused on those sensitive receptors where there is considered to be a realistic potential for important cumulative effects. The assessment includes consideration of operational projects; projects under construction; consented projects which are not yet under construction; and projects for which planning applications have been submitted and for which ecological impact assessment information is available.

## **Assumptions, Limitations and Confidence**

### *Impact Assessment*

- 8.81 There are considered to be no significant limitations to this assessment. However, all impact assessments are subject to some degree of uncertainty in relation to the potential scope, scale, duration and magnitude of effects and the range and sensitivity of receptors affected (see discussion above).
- 8.82 Such factors can be accounted for in impact assessment by assuming a reasonable 'worst case scenario' in relation to the potential effects of construction works, taking into consideration prior experience and what can reasonably be expected from a prudent construction contractor given the nature of the proposed development.
- 8.83 The limitations of bird collision risk modelling are well recognised. As discussed above, the method is limited by the current understanding of how bird flight activity and behaviour is affected by wind farms in the long-term and in proximity to individual wind turbines. However, this method includes parameters that can be adjusted to some extent to account for species-specific differences in morphology and flight behaviour and incorporates variables for individual turbine design, wind farm layout and operational regime. A further advantage of the Band Model, which has become widely adopted in wind farm EIA, is that it enables comparison of collision risk between proposals, which also helps to inform cumulative assessment.

### *Survey Constraints*

- 8.84 There are considered to be no significant limitations or gaps to the surveys undertaken in 2015, 2016 and 2017. The survey methods and levels of survey effort over the various survey periods are considered to be robust and appropriate to the baseline reporting and assessment of the potential effects of the proposed development and there are no significant data shortfalls.
- 8.85 Due to the difficulty of entering areas of dense conifer plantation, access was limited during breeding bird surveys, although accessible areas within coniferous plantation were surveyed. Additionally, the forest harvesting operations in 2016-17 may have influenced the distribution of some bird species as a result of localised disturbance.



- 8.86 For all surveys where weather conditions were a consideration, observations were suspended when conditions deteriorated beyond an agreed acceptable threshold. Further discussion of generic and specific survey limitations is included in Technical Appendix 8.1.

## BASELINE CONDITIONS

### Site Context and Land Use

- 8.87 The proposed development would be located within an extensive area of predominantly upland conifer plantation known as Clashindarroch Forest, managed by Forestry and Land Scotland on behalf of Scottish Forestry. Clashindarroch Forest extends to 59km<sup>2</sup> in total and is dominated by non-native conifers such as Sitka spruce (*Picea sitchensis*), hybrid larch (*Larix x eurolepis*), lodgepole pine (*Pinus contorta*) and Japanese larch (*L. kaempferi*) of various age classes and planted at typical commercial stocking densities.
- 8.88 The forest is managed under commercial felling and re-stocking rotations. At the time of the surveys, during 2015-2017, a small number of mature coupes were undergoing harvesting. Within 500m of the wind turbines, the majority of the plantation is at high forest, pole or thicket stage. There are very limited areas of broadleaved plantation woodland composing less than 5% of the core study area.
- 8.89 The proposed development of 14 wind turbines would be located in an area of commercial conifer plantation to the immediate north and east of the existing Clashindarroch Wind Farm (18 wind turbines, operational since early 2015) and would be located on forested ridges and spurs, with the wind turbine cluster encompassing an area (based on a 500m wide buffer of the wind turbine locations) of approximately 546 hectares.
- 8.90 The proposed wind turbines are located towards the north-western edge of Clashindarroch Forest, at 350-400m above sea-level. To the west, at an elevation c. 500m, is the unplanted ridge of Grumack Hill which is comprised of open moorland habitats (i.e. dwarf-shrub heaths and blanket bog vegetation). All of the proposed wind turbines are located in areas which are currently thicket or pole stage conifer plantation, mostly comprised of Sitka spruce trees.
- 8.91 To the west is a swathe of upland moorland, part of Cabrach Estate, used predominantly for deer stalking, red grouse shooting, sheep and cattle grazing. To the north, east and south, there is more conifer plantation, part of the wider Clashindarroch Forest, and then the landform gradually drops down, through various small valleys, towards the River Bogie and Water of Bogie, into a more intensively managed landscape with enclosed improved pasture and arable fields and mature semi-natural and plantation woodland.
- 8.92 There are some areas of moorland within breeding raptor/owl and black grouse survey areas that have not been planted with conifers, the most significant of which is the dwarf shrub heath located to the south of the wind farm on a c. 2km long ridge form known as Cloicheduch Hill (see Figure 8.1). However, this area, which was initially considered for turbine placement, is no longer part of the proposed development.

### Designated Sites

- 8.93 Sites designated for nature conservation, of importance at an international or national context,

within 10km of the proposed development are shown in Figure 9.2 (Chapter 9: Ecology & Biodiversity). No such designated sites are located within or adjacent to the proposed development area. Brief details of the sites, within 10km of the proposed development, designated solely or in part for their ornithological interest are set out in the following text. Details of other sites designated for their nature conservation importance are given in Chapter 9: Ecology & Biodiversity.

- 8.94 The closest statutory site designated for its ornithological interest is the Tips of Corsemaul and Tom Tor SSSI, SPA and RSPB Important Bird Area (IBA). The closest part of the SPA (which consists of two separate locations) is approximately 6km north-west of the nearest proposed wind turbine. The IBA designation covers three separate areas to the north-west of the survey area; these are located at Gallow Hill, Tips of Corsemaul, and Ben Main. The ornithological interest of the site is related to breeding colonies of common gull. The site was estimated to have supported 15,870 pairs in 1998, representing 23% of the GB population and 3% of the world population. The results of more recent surveys and assessments (in 2003 and 2015) indicate that population is currently declining (number of fully formed nests were c. 50% and 5% of the 1998 baseline for Tor Mor and Tips of Corsemaul respectively) and the SSSI is in an 'unfavourable declining' condition (Sue Lawrence, SNH, *pers. comm.*).
- 8.95 There are a number of other biological SSSIs present within the wider area (for example, Craigs of Succoth SSSI and Hill of Towanreef SSSI). These sites are designated primarily for their botanical interest and the relative rarity of the grassland and heathland habitats associated with serpentine rock outcrops, an uncommon feature in Scotland.

## Desk Study Records

### *Previous Studies Relating to the Clashindarroch Wind Farm*

- 8.96 A review was completed of the data presented in the Clashindarroch Wind Farm ES (Chapter 11: Ornithology), published in April 2009, and also of the Ornithological Monitoring Reports, published from 2015 and 2017, which provides details of ornithological surveys that were carried out as part of an Ornithological Monitoring Programme for the now operational Clashindarroch Wind Farm. The surveys included general breeding bird and point count surveys, as well as breeding raptor surveys and flight activity surveys for specific notable species. The results of these surveys are summarised in the following text.
- 8.97 Goshawk was the only notable raptor species recorded as breeding during the initial baseline surveys for the proposed development. A single nest was found in the northern sector of the survey area, with a further probable nest located toward the southern end, where several display flights were also observed during raptor and flight activity surveys. Hen harrier were occasionally recorded west of the Site, and a breeding pair were confirmed well outside the survey area.
- 8.98 The baseline flight activity surveys for the Clashindarroch wind farm EIA were undertaken in 2004, 2005 and 2008 (full details are provided in the 2009 Environmental Statement). The proposals, at that time, were for a much larger wind farm development than was eventually consented. These surveys included the Clashindarroch II area. Focal surveys on common gull flight activity during the breeding season, specifically in relation to determining the potential effects of the wind farm proposal on the Tips of Corsemaul and Tom Mor SPA, were also completed in 2004, 2005 and 2008.
- 8.99 The 2004 - 2008 surveys demonstrated that flight activity within the wind farm study area (which at that time included the Clashindarroch II area) was infrequent and considerably lower than along

a corridor to the north (this corridor is c. 2km north of the Clashindarroch II wind farm proposals). A specific assessment of the potential effects of the Clashindarroch wind farm project on the SPA concluded that the proposed development would not result in an effect on the integrity of the SPA, alone or in combination with any other plans or projects.

- 8.100 Breeding raptor surveys, carried out in 2013, 2014, 2015 and 2017 as part of the pre-construction and post-construction monitoring, identified one pair of breeding goshawk and one pair of breeding hen harrier within the study area. Further goshawk nests were confirmed in the wider area (that is, within 2km of the operational Clashindarroch Wind Farm site). Following the breeding raptor surveys, it was concluded that the operational Clashindarroch Wind Farm was not having any negative impact on breeding goshawk or hen harrier populations. A pair of breeding merlin were confirmed in 2015, with at least two chicks fledging within the Clashindarroch Wind Farm raptor study area. A further breeding attempt was suspected in 2017. These locations are well outside of the potential zone of effect of the proposed development.
- 8.101 There were no records of black grouse from the surveys carried out in 2008 for the Clashindarroch EIA. However, they were believed to be present in the wider area, as records from external sources showed that lekking males had been observed approximately 1.5km to the south of the Clashindarroch II application site.
- 8.102 Surveys for black grouse leks were carried out in 2013, 2014, 2015 and 2017. No leks were observed within the survey area (encompassing the Site plus a 1.5km buffer). However, up to 31 lekking males were recorded outside of the buffer area in 2013; their close proximity to the buffer suggested that this species could possibly be breeding within the study area for the operational wind farm. None of these leks are within the black grouse survey area for the proposed development.
- 8.103 A total of 44 species were recorded during point count breeding bird surveys carried out in 2013 and 2014 as part of the Clashindarroch wind farm monitoring study. Notable observations include: one golden plover and two curlew breeding registrations in 2014; and 76 common crossbills (*Loxia curvirostra*) recorded in 2014.

## Survey Results

### 2015-17 Flight Activity Surveys

- 8.104 The location of the viewpoints selected for the flight activity survey of the Site are shown on Figure 8.1. The viewpoint viewsheds are shown on Figure 8.2 and the mapped flight lines, for target species, relative to the location of the proposed wind turbines are shown on Figures 8.3 to 8.6. Further details of the results of the flight activity surveys are provided in Technical Appendix 8.1. A summary of the number of observations of target species with flights wholly or partially at risk height within the wind turbine envelope (i.e. the 'flight risk area', within 500m of the outermost proposed wind turbines) are provided in Table 8-8.

**Table 8-8**

**Number of Flights of Target Raptor and Owl Species at Risk Height (total number of birds in parentheses)**

Year	Month	Target Species Flight Lines Recorded
2015	May	No target species recorded
	June	1 (1) honey buzzard; 1(1) osprey
	July	No target species recorded
	August	No target species recorded
	September	No target species recorded
	October	No target species recorded
	November	1 (1) goshawk; 1(1) hen harrier
	December	1 (45) golden plover
2016	January	1 (25) golden plover
	February	1 (1) goshawk
	March	10 (10) goshawk, 1 (55) pink-footed goose.
	April	1 (1) goshawk, 4 (484) pink-footed goose, 1 (2) curlew
	May	2 (2) goshawk, 1 (17) pink-footed goose
	June	1 (1) goshawk
	July	No target species recorded
2017	April	1 (37) pink-footed goose
	May	No target species recorded
	June	No target species recorded
	July	1 (1) osprey

- 8.105 The flight activity surveys did not reveal locations or ‘corridors’ where flight activity by key species was concentrated to such an extent that it would be appropriate to consider the wind farm design to reduce collision risk in those areas. In relation to goshawk, it was also necessary to consider that the pattern and level of flight activity would be expected to decrease markedly once trees had been cleared to accommodate the construction and operation of the wind turbines.
- 8.106 Goshawk was the most frequently recorded target raptor species during the flight activity surveys, with 22 flights recorded as a whole, all but one of these flights occurred between February and June, coinciding with the breeding season and peak display period for this species.
- 8.107 One hen harrier was recorded during the winter 2015/16 flight activity surveys. This was of a male bird on the eastern edge of the flight activity survey area, flying partly at collision risk height in November 2015.
- 8.108 A single osprey was recorded during the flight activity survey in June 2015. The record was of an

adult bird flying across the Red Hill/Craigie Beg area, partly at collision risk height.

- 8.109 A single female honey buzzard was recorded once during the flight activity surveys in June 2015, entirely within the collision risk height band. This was a notable record given the relative rarity of this species in the UK. Following this observation, the potential for a breeding attempt to occur in the raptor survey area was carefully considered during the 2015 and 2016 raptor surveys. No further evidence of the use of the survey area by this species was found.
- 8.110 Common kestrel (*Falco tinnunculus*, a secondary species, not included in the summary tables above), was the most frequently recorded raptor species during the flight activity surveys, with a total of 34 flight lines. This species was recorded in both the summer and winter periods, with the majority of flight activity occurring at and below collision risk height. Flight activity was concentrated in two key areas: at Craigie Beg /Red Hill towards the northern end of the flight activity survey area, and over the area of clear-fell north of The Shank, where birds were seen hunting on several occasions.

## Common Gull

- 8.111 Common gull does not breed within the Site or surrounding area, the nearest breeding colonies are associated with the Tips of Corsemaul and Tom Mor SSSI and SPA, located c. 6km north-west of the nearest proposed wind turbine.
- 8.112 Occasional flights of common gull were recorded during the flight activity surveys in May and June 2015. These were mainly of individual birds, with a small number of groups of two or three. During the spring/summer 2017 flight activity survey, when this was a focal species, a total of 2 flights (total of 2 birds) were recorded within the proposed development flight risk area and 10 flights (comprising 22 birds) were recorded well to the north of the proposed development. There was no evidence of a regularly used flight corridor by this species within the proposed wind turbine area. There was an apparent flight corridor to the north, similar to the pattern of activity recorded during baseline surveys for the existing Clashindarroch wind farm (see Technical Appendix 8.3 for further information).

## Breeding Raptors

- 8.113 The key findings from the breeding raptor and owl surveys during 2015, 2016 and 2017 are provided in Table 8-9. The mapped locations are provided on a figure within the Confidential Ornithological Annex to the EIA Report that will be provided to SNH (this information is confidential due to the potential risk to some species from human persecution, egg collectors, etc.).

**Table 8-9**  
**Summary of Breeding Raptor and Owl Survey Results 2015-17**

Species	Breeding Status (surveyed area)			Notes
	2015	2016	2017	
Goshawk	Confirmed (1) Probable (1) Possible/ unknown (1)	Possible (1)	No evidence of breeding	Confirmed breeding in 2015 at one location within the Site, with probable and possible breeding attempts in the wider survey area (see Confidential Annex for further details).  Some evidence of an early breeding attempt in 2016 but appears to have failed.  FLS ranger confirmed one breeding goshawk pair in the survey area during 2019.
Sparrowhawk	Confirmed (1)	Probable	Confirmed (1)	One confirmed sparrowhawk territory in 2015, but none confirmed in 2016. One breeding attempt confirmed in 2017 (NB this was not a focal species due to its relative abundance).
Common buzzard	Confirmed (1)	Probable	Probable	One confirmed common buzzard territory in 2015, but none confirmed in 2016 or 2017 (NB this was not a focal species due to its relative abundance).
Common kestrel	Confirmed (1)	Probable	Confirmed (1)	One successful common kestrel breeding attempt in 2015 with adults feeding young. None confirmed in 2016. One confirmed successful breeding attempt in 2017.
Long-eared owl	Probable			An adult bird was flushed in 2015 from the south of the 2km survey area and was probably nesting in the surrounding area. No evidence of this species breeding in 2016.
Hen harrier		Confirmed (1)		The 2016 confirmed breeding attempt was outwith the 2km survey area (see Confidential Annex for further details).
Tawny owl	Probable	Probable (6)	Probable	Approximately six breeding territories were recorded (calling males) in 2016 (NB this was not a focal species due to its relative abundance).

- 8.114 No goshawk pairs were confirmed as breeding within the raptor survey area in 2016 or 2017, however, there was one possible breeding attempt in 2016. An adult male was heard alarm-calling close to an old nest, however that nest was confirmed not to have been used as a breeding site in 2016. However, there was activity recorded during the early part of the breeding season, but not enough evidence to confirm a breeding attempt.
- 8.115 Outwith the survey area goshawk was confirmed as successfully breeding in 2015 and 2017; with nest sites located to the east and south of the 2km raptor survey area (see the Confidential

Ornithological Annex for further details). An adult female bird was observed with possibly two juveniles in close proximity to an empty nest that was considered likely to have been used by goshawk. A possible goshawk nest was identified towards the eastern 2km raptor survey boundary; however, there was insufficient evidence to confirm a breeding attempt at this location.

- 8.116 Whilst there is suitable habitat for hen harrier in a small number of locations to the west and south of the 2km raptor survey area, the only sighting of hen harrier in 2015 was a male bird recorded during the flight activity surveys.
- 8.117 Hen harrier were observed in the same location where breeding was suspected in 2015, which is outside of the 2km raptor survey area. In June 2016, a female was observed leaving and returning the same location on the ground, a food pass was recorded in the same area, and the birds were seen to chase a kestrel from this location, which strongly suggests that there was a nest in this area.
- 8.118 Evidence of the presence of breeding merlin was searched for during surveys in 2015, 2016 and 2017. No evidence indicating breeding or potential breeding was found within the raptor survey area in any of these years.
- 8.119 There was no evidence of breeding by short-eared owl occurring within the survey area during 2015 or 2016. A single bird was observed in flight within the Site on one occasion during November 2015.

## *Black Grouse*

- 8.120 The black grouse surveys were carried out in 2016 and 2017 in areas that were considered to be suitable habitat for the species, including potentially suitable lekking sites. No observations of this species were made during any of the surveys.

## *Breeding Birds (excluding raptors and owls)*

- 8.121 During the breeding woodland bird surveys that were carried out in 2016, a range of bird species were recorded that were considered to be typical of the habitats which are present in the proposed development area. Further details are provided in Appendix 8.1.
- 8.122 On the whole, there was a relatively low density of breeding territories recorded across both the open and wooded habitats within the survey area. There was also an absence of evidence of any breeding waders from the open moorland areas (and very few waders recorded during other surveys). Similarly, the number of red grouse and moorland passerines was also low overall.
- 8.123 Table 8-10 lists all bird species (with the exception of raptors and owls) that were recorded during the 2016 woodland breeding bird surveys, as well as their conservation status.

**Table 8-10**  
**List of all Species Recorded during Breeding Bird Surveys (excluding raptor and owls) and their Conservation Status**

Common Name	Scientific Name	Sch.1 <sup>i</sup>	BoCC <sup>iii</sup>	UK BAP <sup>iv</sup>	SBL <sup>v</sup>
Red grouse	<i>Lagopus lagopus</i>		Amber	✓	
Woodpigeon	<i>Columba palumbus</i>		Green		✓
Great spotted woodpecker	<i>Dendrocopos major</i>		Green		✓
Jay	<i>Garrulus glandarius</i>		Green		
Goldcrest	<i>Regulus regulus</i>		Green		✓
Coal tit	<i>Parus ater</i>		Green		
Chiffchaff	<i>Phylloscopus collybita</i>		Green		
Willow warbler	<i>Phylloscopus trochilus</i>		Amber		
Wren	<i>Troglodytes troglodytes</i>		Green		
Blackbird	<i>Turdus merula</i>		Green		
Song thrush	<i>Turdus philomelos</i>		Red		
Mistle thrush	<i>Turdus viscivorus</i>		Red		
Robin	<i>Erithacus rubecula</i>		Green	✓	✓
Dunnock	<i>Prunella modularis</i>		Amber		
Meadow pipit	<i>Anthus pratensis</i>		Amber		✓
Chaffinch	<i>Fringilla coelebs</i>		Green	✓	
Bulfinch	<i>Pyrrhula pyrrhula</i>		Amber		
Common crossbill <sup>vi</sup>	<i>Loxia curvirostra</i>	✓	Green		
Siskin	<i>Carduelis spinus</i>		Green	✓	✓

- i. Species listed on Schedule 1 to the Wildlife and Countryside Act 1981 (as amended).
- ii. Species listed on Annex I of the EC Birds Directive (Directive 2009/147/EC on the conservation of wild birds - the codified version).
- iii. Birds of Conservation Concern (BoCC) in the UK (Eaton et al. 2015 (Ref. 8.23). NB some species may currently have a different status in a Scottish context (e.g. mistle thrush appear to be increasing in Scotland, see 'Index of Abundance for Scottish Terrestrial Breeding Birds, 1994 to 2018', available from: [<https://www.nature.scot/information-hub/official-statistics/official-statistics-terrestrial-breeding-birds>]).
- iv. Priority species in the 2007 UK Biodiversity Action Plan (UK), The UK BAP has been superseded by the UK Post-2010 Biodiversity Framework (JNCC 2012).
- v. Species included on the Scottish Biodiversity List (2005), which is part of the Scottish Biodiversity Strategy (originally published by the Scottish Government in May 2004).
- vi. The species of crossbill was not confirmed but is considered likely to be common crossbill. Clashindarroch Forest is located within the distributional range of both common and Scottish crossbill (*Loxia scotia*). Visual identification, of free-ranging birds, is rarely reliable unless supported by analysis of specific calls. Scottish crossbill is the UK's only endemic breeding bird it is on the BoCC Amber List, the Scottish Biodiversity List, Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and Annex I of the EC Birds Directive.



## Other Notable Species

- 8.124 There were two records of crossbills during the flight activity surveys. These occurred in February and March 2016, one record being of a group of 16 birds. Crossbills were also occasionally observed during the walkover breeding bird surveys carried out in 2016. A specific survey of crossbills was not undertaken as part of the baseline surveys for this assessment. Neither species is considered to be particularly vulnerable to wind farm development, consequently they are not focal species for this assessment. The dominance of Sitka spruce within the Site indicates that it is not likely to be favoured by Scottish crossbill, which are more typically associated within old stands of pine. However, both common and Scottish crossbill have previously been confirmed as present in Clashindarroch Forest (i.e. during the national crossbill survey in 2008). It has been assumed in the outline SPP (see Technical Appendix 8.4) that both species are potentially present as breeders and could be affected by the felling proposals. They will be fully considered during the pre-works breeding bird surveys and in managing felling operations to avoid impacting on any breeding sites.
- 8.125 A woodcock (*Scolopax rusticola*), which is on the UK Red list and the Scottish Biodiversity List, was observed 'roding' (male breeding display flight) in March 2016 outside the core survey area at the south-eastern end of the 2km raptor survey area. A single woodcock was flushed from the edge of a forest track, towards the eastern edge of the survey area, in dense pole stage plantation at the eastern end of Cloichedubh Hill, in September 2016. Another roding male was noted during bat surveys at Corrydown during summer 2019.

## 2015-17 Survey Conclusions

- 8.126 The surveys completed between May 2015 and July 2017 confirmed the presence of at least one pair of breeding goshawk within the survey area and up to two others in the wider raptor survey area. North-east Scotland, along with the Scottish Borders, are strongholds for this species. The population in north-east Scotland has seen a rapid increase in breeding numbers since the mid-1990s (Roos *et al.* 2015). Hen harrier (1 pair) were confirmed as breeding in 2016, but the nest site was outside of the 2km raptor survey area.
- 8.127 Flight activity over the proposed development by any of the target species was relatively limited. The majority of the observed activity by pink-footed geese commuting over the general area was at heights well above the collision risk height band. Goshawk flights were recorded primarily within and above the collision risk height band during the breeding season. Activity by this species in the proposed development area would be expected to reduce markedly following any forestry felling for the proposed development. Common gull were recorded in low numbers passing through the survey area.
- 8.128 The proposed development is located in a commercially forested landscape which limits the number of bird species of conservation concern likely to be present, and the general area can be subject to high levels of disturbance depending on the intensity of tree harvesting and forest management. The open moorland areas to the west of the proposed development appear to provide suitable habitat to support breeding waders, although none were recorded during the 2016 or 2017 surveys and the proximity of the forest edge reduces the suitability of the moorland for ground-nesting birds.
- 8.129 There were no records of black grouse within the survey area in 2016 or 2017. However, they are known to be present within the surrounding area (i.e. >2 km from the proposed development), as shown through the results of the monitoring study for the operational Clashindarroch Wind Farm.

- 8.130 The breeding woodland bird surveys carried out in 2016 revealed the presence of a range of widespread and commonly occurring passerines that are considered to be typical of commercial conifer plantation. A number of territories of species whose populations are of high conservation concern at a national level were recorded in low numbers, including song thrush and mistle thrush. Crossbills were recorded on a number of occasions during surveys (the species of crossbill was not verified but is considered likely to be common crossbill) and are considered very likely to be breeding in suitable habitat within the survey area. The core survey area supports at least one breeding woodcock.

## Receptor Evaluation

- 8.131 The sensitivity evaluation of the bird populations within the survey area has been systematically evaluated based on data drawn from extensive desk study information and field surveys completed between 2015 and 2017. The sensitivity values for the various receptor species range from 'medium' (i.e. Regional importance) to 'low'. There are a number of species that breed within the wider study area and merit special attention due to their European or national conservation status (as a species) and/or potential sensitivity to wind farm development, in particular, black grouse and hen harrier.
- 8.132 Consideration in this evaluation has also been given to the potential for the wind farm area to increase in value for certain species due to the change in habitat quality resulting from forest felling (proposed under the existing felling plans and any additional felling required for the proposed development).
- 8.133 Table 8-11 provides a summary of the sensitivity of the survey area for all ornithological receptors (based on the criteria summarised in Table 8-4) along with the generic rating of their vulnerability to wind farm development (see Table 8-6). Only those receptors which have a greater than Low (high local) nature conservation evaluation and greater than low generic sensitivity to wind farm development have been considered in any detail within the impact assessment.

**Table 8-11**  
**Evaluated Ornithological Receptors**

Receptor	National / Regional Status	Clashindarroch II Study Area – Sensitivity	Species General Vulnerability to Wind Farm Development
Hen harrier	<ul style="list-style-type: none"> <li>• UK Red list (BoCC4 (Ref. 8.23))</li> <li>• Scottish Biodiversity List</li> <li>• Birds Directive Annex I</li> <li>• WCA 1981 Schedule 1</li> <li>• Scottish population c. 500 pairs</li> <li>• Regional population 3 pairs (NHZ 12 (Ref. 8.25))</li> </ul> <p>Not recorded as breeding within the proposed development area during the baseline surveys. However, there are recent breeding records in the wider area (c. 2 km from the proposed wind farm). Use of the proposed development area by this species could increase following tree felling and forest restructuring.</p>	Local (High)	High

Receptor	National / Regional Status	Clashindarroch II Study Area – Sensitivity	Species General Vulnerability to Wind Farm Development
Goshawk	<ul style="list-style-type: none"> <li>UK Green list (BoCC4)</li> <li>WCA 1981 Schedule 1</li> <li>Scottish population at least 136 pairs</li> <li>Regional population at least 39 pairs (NHZ 9 &amp; NHZ 12)</li> </ul> <p>One regularly used nesting area is located within 500m of the proposed wind farm. The wider area, within c. 2km of the proposed development, supports a population of 2-3 pairs, which is considered to be of Regional scale importance for the species.</p>	Regional	High
Merlin	<ul style="list-style-type: none"> <li>UK Red list (BoCC4)</li> <li>Scottish Biodiversity List</li> <li>Birds Directive Annex I</li> <li>WCA 1981 Schedule 1</li> <li>Scottish population c. 434 pairs</li> <li>Regional population 4 pairs (NHZ 12)</li> </ul> <p>Not recorded as breeding within the proposed development area during the baseline surveys. However, there are recent breeding records in the wider area (c. 1 km from the proposed wind farm) including tree and ground nests. Use of the proposed development area by this species could increase following tree felling and forest restructuring.</p>	Local (High)	High
Common kestrel	<ul style="list-style-type: none"> <li>UK Amber list (BoCC4)</li> <li>Scottish Biodiversity List</li> <li>Scottish population c. 3,850 pairs</li> <li>Regional population 171 pairs (NHZ 12)</li> </ul> <p>One pair recorded in the wider survey area, potential breeding species within the proposed development area.</p>	Local (High)	High
Black grouse	<ul style="list-style-type: none"> <li>UK Red list (BoCC4)</li> <li>UK BAP Priority Species</li> <li>Scottish Biodiversity List</li> <li>Scottish population c. 3,344 males</li> <li>Regional population 215 males (NHZ 12)</li> </ul> <p>Not recorded within the proposed development area during baseline surveys. However, there is a population present in the wider area (c. 2km from the proposed wind farm). Use of the proposed development area could increase following tree felling and forest restructuring.</p>	Local (High)	High
Geese	<p>Pink-footed goose:</p> <ul style="list-style-type: none"> <li>UK Amber list (BoCC4)</li> <li>Regional population c. 12,000 (NHZ 12)</li> </ul> <p>Recorded during Spring flight activity surveys passing over</p>	Local (High)	High

Receptor	National / Regional Status	Clashindarroch II Study Area – Sensitivity	Species General Vulnerability to Wind Farm Development
	the proposed development area. No roost sites or feeding areas located in the proposed development area or within at least 1km of the proposed wind turbines.		
Other woodland birds	<p>Including, Common crossbill:</p> <ul style="list-style-type: none"> <li>• UK Green list (BoCC4)</li> <li>• WCA 1981 Schedule 1</li> </ul> <p>Present in Clashindarroch Forest and in the proposed development area, potentially present as a breeding species. Scottish crossbill is also potentially present although the plantation areas near to the proposed wind farm are less suitable for this species.</p> <p>Other common and widespread breeding birds include tawny owl, sparrowhawk, woodcock, song thrush, cuckoo.</p>	Local (High)	Low

8.134 In addition to the above, breeding common gull have also been considered in terms of potential collision and displacement effects related to the Tips of Corsemaul and Tom Mor SPA. The proposed development does not provide any suitable habitat for this species, but common gulls do very occasionally fly across the proposed development area. Technical Appendix 8.3 provides a separate assessment of the potential implications of the proposals, in combination with other relevant plans and projects, to result in an effect on the integrity of the SPA. A summary of the conclusions of that assessment is provided at the end of this chapter.

## FUTURE BASELINE

8.135 It is anticipated that should the proposed development not be constructed, the use and management of the Site would continue in a broadly similar manner to current practice, with the primary land-use being commercial conifer forestry.

8.136 Under a 'do nothing' scenario, the future baseline for the Site has been considered in the context of the FLS Forest Plan period (further detail is provided in Technical Appendix 3.2). Over the next Forest Plan period the Clashindarroch Forest would broadly be expected to exhibit:

- a potential marginal decrease in open ground as a result of the implementation of the new LMP by c. 1.3% (21.7 to 20.4%);
- a small increase in the extent of the Sitka spruce component of the plantation of c. 3% (30.2 to 33.1%);
- mixed native broadleaved trees to increase in proportional cover by 3.6% (9.0 to 12.6%);
- continuation of existing commercial forestry operations and typical harvesting / replanting regimes;
- harvesting is planned to continue at an average rate of c. 288 ha per 5-year felling plan period, see Table 3.2.7 in Technical Annex 3.2 (this is c. 4.6% of the whole forest by area); and

- during the fell plan period there will be an increasing extent of recently felled and pre-thicket plantation which is likely to increase habitat availability for small mammals, potentially influencing use of the site by certain raptor species.

8.137 There is the potential for habitat quality for merlin, common kestrel and hen harrier, in particular, to improve as a result of the felling of maturing conifer plantations which may result in an increase in activity by these species from current baseline levels. The extent of suitable nesting habitat for goshawk will decrease although the availability of forest edge habitat, important for hunting, will increase.

## ASSESSMENT OF EFFECTS

8.138 The following section considers the potential effects during the construction, operation and decommissioning of the proposed development, on the key ornithological receptors. The mitigation measures proposed and the likely residual effects are also discussed. The assessment is based on the proposed development as described in Chapter 3: Description of the Development.

8.139 In summary, the proposed development involves the construction of up to 14 wind turbines and their associated access tracks (c. 11km of new and some limited upgrading of existing forestry tracks), a permanent meteorological mast, establishment of temporary and permanent compounds and the extraction of stone from the extension to an existing borrow-pit within the Site. The turbine blades are up to 70m long and the turbine hub height would be up to 110m above ground level. The pre-works felling, site clearance and construction works are anticipated to take 18 months in total.

8.140 Prior to construction works commencing, areas of existing conifer plantation would be felled to accommodate the works. Felling would be to wind-firm edges in order to minimise the risk of windthrow. The total felling area is estimated to be c. 125 hectares. Following construction, conifers would be replanted, at typical plantation densities, to within c. 80m of the wind turbine bases (further detail on the wind farm felling and replanting plans is provided in the Forestry Technical Appendix 3.2).

8.141 Two types of aircraft warning lighting are required to be fitted to the highest practical points on the wind turbines (i.e. on the nacelle). The turbines on the perimeter of the scheme are to be fitted with MOD accredited 25 candela, omni-directional, red or infrared lighting with an optimised flash pattern of 60 flashes per minute. All the wind turbine nacelles would also be fitted with medium intensity (2000 candela) steady red aviation warning lights to comply with CAA requirements.

8.142 The potential level of an effect depends on a range of factors, in particular, the breeding status/site use by the species at the time of the works. The status of various species within a site can vary markedly from year to year, successfully raising chicks in one year, failing early in another breeding season or not attempting to breed at all, due to variations in weather conditions, prey availability, disturbance, etc. Some species not recorded as breeding within the period 2015 - 2017, but present in the general area, may be breeding within or adjacent to the Site at the time of construction because of the presence of suitable habitat, therefore the assessment has attempted to account for this.

8.143 A summary assessment table (Table 8-13) is provided at the end of this Chapter which includes the conclusion of the pre-mitigation and post-mitigation (i.e. residual) assessment of effects for each receptor, where appropriate, and a summary of the proposed mitigation measures.

## Potentially Significant Effects

- 8.144 Based on the findings of the consultation, EIA scoping responses and professional judgement, this assessment considers effects associated with construction, operation and decommissioning of the proposed development. The main potentially significant effects during the construction phases are summarised as follows:
- potential disturbance to breeding, passage and wintering birds arising from tree felling and construction works (for example, through human presence, vehicle movements, noise, vibration, and light); and
  - potential short to medium-term loss and change to habitats through construction-related habitat damage (for example, from plant trafficking).
- 8.145 The main potentially significant operational effects are summarised as follows:
- long-term direct loss of and change to habitats associated with built structures and new permanent access tracks;
  - risk of mortality from collision with wind turbines and other structures (and the extent to which the proposed aviation warning lighting could increase collision risk);
  - behavioural displacement from important supporting habitats due to the presence of the wind turbines;
  - potential effects on free movement to and from roosting, feeding, nesting habitats;
  - disturbance during maintenance and emergency activities; and
  - potential effects from changes to forest structure and management within the wind farm area.
- 8.146 Potentially significant decommissioning phase effects are summarised as:
- works associated with the dismantling of the scheme infrastructure resulting in physical damage to habitats supporting bird species of conservation concern; and
  - disturbance to breeding birds arising from the dismantling works.
- 8.147 In addition to the above, there is the potential for cumulative impacts arising from additive, synergistic and/or antagonistic effects with other existing and proposed developments.

## Construction Effects

- 8.148 Chapter 3: Description of the Development describes the construction process and schedule for the proposed development. Construction effects include the potential disturbance to breeding/foraging birds (including dependent young) or sensitive sites, such as nests or roost sites, and the direct/indirect, temporary/permanent loss of habitat as a result of the works.
- 8.149 The construction phase of the proposed development is anticipated to be approx. 18 months in total. Depending on when the works commence during the year, this could result in up to two breeding seasons being affected by construction disturbance.

- 8.150 The proposed tree felling for the wind farm is detailed in Technical Appendix 3.2. In summary, prior to construction works commencing, areas of existing conifer plantation would be felled or cleared (in the case of young trees with no merchantable timber) to accommodate the wind farm construction works. An area of 88.5ha (as stated in Technical Appendix 3.2, see Table 3.2.10) would be left unplanted. Additional felling would be required, for the operational phase of the wind farm, within coupes at risk of windthrow. In those locations, felling would extend to wind-firm edges. This total felling area is estimated to be c. 125ha (see Technical Appendix 3.2, Table 3.2.7), accounting for the pole stage coupes that would reach harvesting age and be felled under the existing Forest Plan (i.e. coupes due to be felled prior to 2021, the assumed start of construction for the purposes of the assessment). As a result, the amount of harvesting would increase marginally during the 2017-2021 felling phase from 328.4ha to 453.7ha (i.e. from 5.23% to 7.2% of the Clashindarroch Forest) in comparison to what would occur under the existing (i.e. no wind farm) felling plan. Total harvesting would then be slightly reduced, by c. 44ha, in comparison to the existing felling plan for the subsequent 5-year phases (i.e. from 2022 to 2041). There would also be a very small reduction in the area of long-term retention of 2.9ha under the wind farm felling plan in comparison to the existing fell plan. The felling would be phased in a manner that ensures compliance with the Forest and Water Guidelines (Forestry Commission 2011).
- 8.151 This proposed additional felling is not a permanent loss of forest cover as, following construction, trees would be replanted to within c. 80m of the wind turbine bases. Replanting would be carried out with the conifer species identified in the restocking plan (see Technical Appendix 3.2, Figure 3.2.7) at a minimum density of 2,500 trees per hectare. Restocking within the proposed broadleaf woodland areas would be at a planting density of 1,600 trees per hectare. All restocking would be carried out to current standard practice and in accordance with the guidelines contained in the UK Forestry Standard (2017).
- 8.152 In the absence of good practice environmental measures and assuming the least favourable timing of works in relation to the bird breeding season, disturbance to common breeding birds arising from tree felling and vegetation/ground clearance, general construction noise, vehicles, vibration, lighting, presence of construction workers, etc., the construction works would have an effect on breeding success and potentially cause displacement of birds from the affected areas.
- 8.153 Birds would also be subject to disturbance from construction works during all/part of the breeding season for up to two breeding seasons in total, assuming the least favourable commencement date (e.g. mid-summer). Although this would be in the context of construction works within areas that had been cleared of trees which would reduce the potential for direct disturbance to tree-nesting species.
- 8.154 Any Schedule 1 species breeding sites should not be subject to direct disturbance during the breeding season, in compliance with the provisions Wildlife & Countryside Act 1981, as amended. It is therefore assumed that no nesting Schedule 1 species or their dependent young would be disturbed by the felling or constructions works. In addition, the active nest sites of all wild birds are protected, so it is also assumed that the felling works would be carried out in a manner that avoids damaging the active nest sites of all wild birds; measures to help achieve this are set out in Technical Appendix 8.4.
- 8.155 Noise from construction works may affect birds in a number of ways, including the ability to select, establish and defend a territory, foraging and breeding success and song learning. The degree of disturbance impact would be dependent on a range of variables, including the time of year, as the potential scale of the effect may vary depending on the stage of the breeding season, the species



affected, the duration and magnitude of the source of the disturbance, the nature of the surrounding habitats/tree cover and topography and the availability of suitable alternative habitats for birds to move into.

- 8.156 Breeding raptors are particularly vulnerable to disturbance at the nest site where repeated disturbance can cause adults to cease egg incubation; even temporary cooling or over-heating of eggs can result in failure to hatch or reduced brooding by the adult during the early chick-rearing period. Flushing of the adult birds from the nest site is also likely to increase the risk of predation of chicks or eggs abandoned at the nest. Hunting birds, particularly when provisioning chicks, may be disturbed by construction works/workers, adversely affecting foraging success and potentially resulting in a reduction in breeding success for the duration of the works.
- 8.157 It is also important to consider that construction works would move progressively across the wind farm site and would not be occurring simultaneously across the entire area, affecting all habitats continuously throughout the construction period.

## Hen Harrier

- 8.158 The potential effect on hen harrier from felling and construction disturbance is anticipated to be low. There is no recent history of breeding attempts by this species within 2km of the proposed development area. There is some potential for disturbance and displacement during the post-breeding and winter periods should birds be present. During construction, hen harrier displacement has been suggested to potentially to occur up to 500m around construction sites with some disruption up to 1km, depending on line of visibility (Madders 2004 (Ref. 8.28); cited in Bright *et al.* 2006, Ref 8.26)).
- 8.159 It is possible that felling and construction operations in the forest adjacent to open moorland area to the west could discourage hen harrier from hunting over these areas. However, taking into consideration the extent of unaffected similar habitats in the wider area, any short-term displacement due to tree felling or construction operations should have little adverse effect on this species.
- 8.160 The pre-mitigation assessment of felling and construction-related disturbance to, and displacement of, hen harrier is considered to be no greater than Low in the short-term, resulting in an effect significance level of Minor which is **Not Significant**.

## Goshawk

- 8.161 Felling and construction activities would potentially disturb hunting and breeding goshawk (at least one nesting range). Goshawk hunt over a wide variety of habitats, including mature open woodland and developing plantations. However, most prey is caught in forest edge habitats adjoining moorland and agricultural areas, where preferred prey is relatively plentiful and the habitat affords opportunities for surprise attacks. Mature forest within and near to the proposed development is used by one pair of breeding goshawk in most years, and is likely to be supporting at least two pairs that nest in the wider area.
- 8.162 Any active nests would require protection from felling or construction-related disturbance due to this species special protection from disturbance during the breeding season under the Wildlife & Countryside Act 1981 (as amended). Measures to help reduce the risk of disturbance to nesting goshawk during felling and construction have been set out within the outline bird protection plan



(see Technical Appendix 8.4).

- 8.163 The assessment of felling / construction-related disturbance and displacement of breeding goshawk is considered to be no greater than Low in the short-term, resulting in an effect significance level of Minor which is **Not Significant**.

## Merlin

- 8.164 There are historical records of breeding occurring within 2km of the proposed development, although there was no evidence from the 2015-17 baseline surveys that merlin have bred in or within 2km of the proposed development area. Based on the findings of the desk study and field surveys undertaken for this assessment, it is considered unlikely that there would be any merlin nest sites present within at least 500m of felling and construction works. As a Schedule 1 species, felling and construction-related disturbance near to merlin breeding sites would also be avoided through pre-construction works surveys and therefore significant disruption of any potential breeding attempts would be unlikely. Measures to help achieve this are outlined in Technical Appendix 8.4.
- 8.165 Hunting adults could be potentially disturbed from localised areas around felling and construction sites and this could affect their ability to incubate eggs and provision chicks and therefore affect breeding success. The proposed development area does not currently provide good foraging opportunities for merlin and any temporary displacement of foraging birds would probably result in a very small percentage loss in overall foraging resource.
- 8.166 Assuming a 'worst case' level of disruption for the duration of the construction period, the pre-mitigation assessment of construction-related disturbance and displacement of foraging or potentially breeding merlin is considered to be no greater than Low in the short-term, resulting in an effect significance level of Minor which is **Not Significant**.

## Common Kestrel

- 8.167 Based on the findings of the desk study and field surveys undertaken for this assessment, there have been no common kestrel nest sites recorded within 500m of the proposed felling and construction works. Hunting adults could be potentially disturbed from localised areas around felling and construction sites and this could affect their ability to incubate eggs and provision chicks and therefore affect breeding success. Any such temporary displacement of foraging birds would probably result in a very small percentage loss in overall foraging resource.
- 8.168 Assuming a 'worst case' level of disruption for the duration of the construction period, the pre-mitigation assessment of construction-related disturbance and displacement of foraging, or potentially nesting, common kestrel is considered to be no greater than Low in the short-term, resulting in an effect significance level of Minor, which is **Not Significant**.

## Black Grouse

- 8.169 There is the potential for black grouse to be disturbed by construction works near to lek sites, nesting, roosting, brood-rearing and wintering areas. However, based on surveys completed in 2016 and 2017 and desk study records from the past 10 years, the proposed development is located outside of the main areas of recent black grouse activity in the wider area. However, although the proposed development area currently provides relatively poor-quality habitat this may change

following existing and proposed felling.

- 8.170 In relation to the potential for disturbance to lek sites, based on the Ruddock & Whitfield disturbance review (2007 (Ref. 8.13), and Whitfield *et al.* 2008 (Ref. 8.29)), a potential maximum zone of disturbance to lekking black grouse from the felling and construction operations of 750m has been assumed in this assessment. Lek activity is typically focused around dawn and dusk and therefore works during the day between the times of two hours after sunrise and two hours before sunset is unlikely to result in any disturbance. There have been no active leks recorded within 750m of the proposed development during recent years.
- 8.171 For black grouse, pre-mitigation felling and construction disturbance/displacement is assessed to be no greater than Low in the short-term, resulting in an effect significance level of Minor, which is **Not Significant**.

## Wintering/Passage Geese

- 8.172 Evidence from surveys undertaken for the proposed development indicates that although the Site is overflowed by geese during passage periods there are no areas in the vicinity of the proposed development that are likely to attract appreciable numbers of wild geese, swans, or other wildfowl. Therefore, the effect of felling and construction disturbance and displacement is considered to be Negligible and **Not Significant** for geese.

## Common Gull

- 8.173 Common gull occasionally overfly the Site, but are not at any risk of disturbance from the felling or construction of the proposed development. Potential effects on common gull SPA populations are discussed in greater detail in Technical Appendix 8.3. The effect of felling and construction disturbance and displacement is considered to be Negligible and **Not Significant** for this species.

## Other Species

- 8.174 Some UK red-listed/specially protected songbirds present within 500m of the proposed development would be affected (e.g. common crossbill and potentially Scottish crossbill), however they are legally protected from disturbance at the nest and this risk should be minimised through the approach to felling operations following the existing FLS species protection methods. The effect of felling and construction disturbance and displacement is considered to be no greater than Low in the short-term for all woodland birds, not previously mentioned, resulting in an effect significance level of Minor, which is **Not Significant**.

## Mitigation

### General Best Practice During Construction

- 8.175 All of the potential effects on sensitive bird receptors arising from the felling and construction of the proposed development are considered to be no greater than Minor and are therefore not significant in terms of the EIA Regulations. As such, no specific mitigation measures are proposed. The following section provides a summary of the proposed best practice measures which would help to further reduce potential effects on all receptors and help ensure that the proposed works proceed lawfully with respect to the legal protection afforded to all wild birds and the additional protections of species listed on Schedule 1 to the Wildlife & Countryside Act (1981, as amended).

An outline bird protection plan, which further details the proposed approach to minimising effects on breeding birds during the wind farm felling operations and the construction works, is provided in Technical Appendix 9.4.

- 8.176 There is the potential for the proposed felling (i.e. felling beyond that required to accommodate the construction of the wind farm infrastructure) to disturb nesting Schedule 1 birds present within the Site (e.g. goshawk) and in the surrounding area. Pre-construction breeding raptor and owl surveys, completed by suitably experienced ornithologists, are proposed in order to help inform the approach to the construction works and felling operations associated with the proposed development so that breeding Schedule 1 species active nest sites would be protected and would not be disturbed during the breeding season.
  
- 8.177 In the spring/summer (i.e. during the bird breeding season) prior to any construction works being undertaken (including enabling works such as tree felling and the ground investigation) surveys would be undertaken to identify any Schedule 1 species breeding activity and to demarcate areas potentially sensitive to disturbance. The Applicant would appoint a suitably experienced Ecological Clerk of Works (ECoW) to the project. Construction works would be programmed to avoid areas within an appropriate buffer from active nest sites as agreed with the ECoW for identified breeding activity during sensitive periods. Site-specific buffer zones would be established, appropriate to the specific circumstances, under the advice of a suitably experienced ornithologist and in liaison with SNH, if required.
  
- 8.178 Tree felling for the wind farm would preferentially be undertaken outside of the main breeding bird season (i.e. March to August inclusive – NB crossbill species, listed on Schedule 1 of the WCA, may nest outside of this period). Where the programming of felling outside of the main breeding season is not possible, trees would only be felled following an assessment by an ornithologist (or suitably experienced ECoW) as to the likelihood that birds are nesting within the felling area. If it cannot be established, with reasonable certainty, that nesting birds are not present then felling would be delayed until there is reasonable certainty. This could be through further survey / monitoring of the area or by delaying felling until after the end of the main breeding season for the relevant species.
  
- 8.179 In addition to the pre-construction surveys for Schedule 1 bird species, all works areas would be checked by a suitably experienced ecologist/ornithologist or the ECoW for the presence of any nesting birds in advance of works commencing during the main bird breeding season. Should any active nest sites be found in areas where construction works are proposed, the location of the nest would be protected from damage and disturbance. An appropriate buffer zone would be demarcated clearly on the ground, and all construction workers made aware of the need to avoid access to the area.
  
- 8.180 All works would be monitored by a suitably experienced ecologist/ornithologist or the ECoW to help ensure that protection measures are properly implemented and maintained and that works proceed in accordance with best practice and the requirements of the legislation protecting breeding birds. The ECoW would provide a tool-box talk before any personnel start on site which will cover the issue of breeding birds, their legal protections, what to look for and what to do should breeding bird behaviour or a potential nest site be found. Should any active nest sites be discovered, or suspected, during the felling or construction phases, all works potentially disturbing the nest site (the ECoW will advise on appropriate distances, which may vary depending on the circumstances) will be halted and the ECoW will establish an appropriate protection zone for the period that the nest is in use.

## Residual Effects

- 8.181 No significant residual effects are predicted for any receptor. A summary of the assessment, proposed mitigation and residual effects from felling and construction for each receptor is provided in Table 8-13 towards the end of this chapter.

## Operational Effects

### Direct Habitat Loss and Change

- 8.182 Although habitat loss occurs initially during pre-construction tree clearance and during construction, the effect of habitat loss on receptors is a long-term effect which has therefore been assessed as an operational effect. Further details and discussion of habitat losses resulting from the construction of this project are provided in Chapter 9: Ecology.
- 8.183 The vast majority of habitats affected by the proposed development are associated with conifer plantations. Approximately 125ha of coniferous plantation would be felled (see Technical Appendix 3.2: Forestry for further details). Most of this area would be replanted with commercial conifers, leaving only a c. 80m radius zone around each wind turbine base unplanted. Allowing for other permeant wind farm infrastructure (e.g. new access tracks) the area that would be unplanted has been estimated at a maximum of c. 88.5ha in total.
- 8.184 Consideration has been given during the design of the proposed development to avoiding areas of sensitive habitat such as watercourses and remnant areas of dwarf shrub heath and bog. No significant loss (other than at a highly localised level) of any habitats is predicted from the construction of the wind farm.
- 8.185 Direct habitat loss, arising from tree clearance, the construction of site roads and the installation of the wind turbines for the proposed development, is considered unlikely to be significant for the majority of receptors in the long-term. A high proportion of the proposed felling would be of commercial conifer plantation, which would have been felled at some future point as part of the normal cycle of timber harvesting. The proposed felling is approximately 2% of the total area of Clashindarroch Forest and in this context is not considered to be significant for the majority of receptors at this scale.

### Hen Harrier

- 8.186 There was no evidence from the 2015-17 baseline surveys that hen harrier have bred in or within 2km of the proposed development area. No habitat loss for hen harrier is predicted. Following tree felling, there would be a temporary increase in potentially suitable foraging and winter roost habitat in comparison to the situation if the proposed development were not constructed. Overall, it is likely that the proposed felling could have a small beneficial effect on hen harrier habitat availability in the medium-term (this excludes consideration of the interaction with collision risk effect, which is discussed and assessed below). The potential effect of habitat loss on hen harrier is considered to be Negligible and **Not Significant**.

### Goshawk

- 8.187 The proposed development area is used by breeding and hunting goshawk. Forest felling activities associated with the proposed development would affect the availability of suitable nesting habitat

in the long-term and could increase the extent of goshawk hunting habitat along forest edges. The habitat loss/change would affect c. 2% of the wider Clashindarroch Forest. It is important to consider that the majority of the goshawk population in the UK successfully breed within commercial conifer plantations (Petty 1989). The proposed felling is not inconsistent with existing forest management and harvesting operations, which the goshawks within Clashindarroch Forest have successfully adapted to with sensitive management by FLS in relation to important nesting areas.

- 8.188 Taking into consideration that this is a conifer plantation subject to commercial rotational felling, this effect is considered to be no greater than Low, in the long-term, for the local goshawk population, resulting in an effect significance level of Minor, which is **Not Significant**.

## Merlin

- 8.189 There are historical records of breeding occurring within 2km of the proposed development, although there was no evidence from the 2015-17 baseline surveys that merlin have bred in or within 2km of the proposed development area. However, there is the potential for use of the proposed development area to increase following felling (with or without the wind farm). Tree felling could increase the extent of available forest edge and potential nesting opportunities for this species. The effect of habitat loss on merlin is considered to be Negligible and **Not Significant**.

## Common Kestrel

- 8.190 There was no evidence from the 2015-17 baseline surveys of common kestrel nesting within the proposed felling areas. Tree felling would increase the extent of small mammal habitat and thereby increase prey availability for this species. The effect of habitat loss on common kestrel is considered to be Negligible and **Not Significant**.

## Black Grouse

- 8.191 Based on surveys completed in 2016 and 2017 and desk study records from the past 10 years, the proposed development is located outside of the main areas of recent black grouse activity in the wider area. The effect of habitat loss / change on black grouse is not considered to be significant due to the small amount of suitable habitat affected and the absence of evidence of black grouse presence within the proposed development area. However, although the proposed development area currently provides relatively poor-quality habitat this may change following existing and proposed felling. The plantation forest felling, with re-planting of commercial conifers, would increase the availability of foraging habitat for black grouse in the medium-term. The effect on black grouse is considered to be Negligible and **Not Significant**.

## Wintering/Passage Geese

- 8.192 Evidence from surveys undertaken for the proposed development indicates that although the Site is overflowed by geese during passage periods there are no areas in the vicinity of the proposed development that are likely to attract appreciable numbers of wild geese, swans, or other wildfowl. Therefore, the effect of habitat loss / change is considered to be Negligible and **Not Significant** for geese.

## Common Gull

- 8.193 Common gull occasionally overfly the Site, but there is no evidence that they use it for foraging or roosting (the vast majority of habitats within the proposed development area are unsuitable for this species). Potential effects on common gull SPA populations are discussed in greater detail in Technical Appendix 8.3. The effect of habitat loss / change is considered to be Negligible and **Not Significant** for common gull.

## Other Species

- 8.194 The effect of habitat loss / change is considered to be no greater than Low, in the long-term, for all other woodland birds, resulting in an effect significance level of Minor which is **Not Significant**.

## Risk of Collision from Wind Turbines

- 8.195 Wind farms present a risk of birds colliding with the moving wind turbine blades. Bird fatalities due to collisions with wind turbines has been identified as one of the key adverse impacts on wildlife from wind farm development (Drewitt and Langston 2006, (Ref. 8.30)). The risk of collision is dependent on a wide range of factors, including time of year, bird age, size and flight behaviour, degree of displacement (i.e. avoidance of the wind farm area), nature of the surrounding topography, habitat quality, weather, wind speed and direction, wind turbine design, layout and spacing. Some of these factors may act in combination to increase collision risk (e.g. soaring species may use topographic features to help generate lift, turbines placed close to these features may increase collision risk for those species) others may interact to decrease risk (e.g. birds may avoid the wind farm as a whole resulting in a reduced potential for collisions to occur). Certain taxonomic groups are considered to be at greater risk of collision. They are larger, less manoeuvrable species and/or species (families, groups of species) which spend a considerable proportion of their life on the wing, for example, divers, grebes, herons, wildfowl, waders, raptors, owls and grouse.
- 8.196 Other groups of birds such as passerines are also at risk of collision with wind turbine blades, however, they are often present in high enough densities and have relatively high reproductive rates such that the effect of the additional mortality from turbine collision is less likely to be significant to the local population. Larger birds such as raptors tend to have a lower reproductive rate than smaller species, such as passerines and waders, a longer period before first breeding and a much lower population density. Consequently, although there may not be significant differences in the propensity for collision with wind turbines, differences in life history, reproductive strategy and population status can result in marked differences in the potential vulnerability of different species to additional mortality from wind farms.
- 8.197 The risk of collision is also influenced by wind farm site location. For example, wind farms sited near to migratory routes, particularly where there is a 'bottleneck' effect caused by the surrounding topography, migration staging areas, flyways between roosting and feeding areas or anywhere where high numbers of birds may congregate, for instance where there is a high concentration of food supply, are often the most hazardous to birds.
- 8.198 Although there are limited empirical studies of bird collision risk at operational wind farms in upland areas in the UK, most reviews of available data from studies of wind farms in the UK and the rest of Europe have found that collisions are generally rare in wind farms that have been well-sited to avoid locations that are likely to attract significant numbers of collision susceptible species (e.g. Crockford 1992 (Ref. 8.31), Benner *et al.* 1993 (Ref. 8.32), Winkelman 1995 (Ref. 8.33), Erickson *et*

*al* 2001 (Ref. 8.34), Hötter *et al.* 2006 (Ref. 8.35), Zwart *et al.* 2015 (Ref. 8.36), Hötter *et al.* 2017 (Ref. 8.37)).

- 8.199 Table 8-12 gives the estimated peak number of collisions per year (based on data from 2015 to 2017) for each relevant receptor, the estimated total number of collisions over the 25 year lifetime of the proposed development and the estimated rate of collision (further details are provided in Technical Appendix 8.2). Species with only a single flight at risk height across the wind farm during the survey period have not been included in the analysis. The species-specific collision avoidance rates are based on current guidance on onshore wind farm Collision Risk Model avoidance rates.
- 8.200 Collision risk with respect to the potential effects on common gull SPA populations is discussed within Technical Appendix 8.3.

**Table 8-12**

**Summary Results of the Collision Risk Model Results - Peak Annual Collisions Estimated for Target Species at the assumed Avoidance Rates**

Receptor	Avoidance Rate	Collisions per year	Collisions over 25 years	1 Collision every x years
Osprey	98%	0.036	0.90	27.90
Goshawk	98%	0.046	1.14	21.96
Common kestrel	95%	0.121	3.04	8.24
Pink-footed goose	99.8%	0.26	6.51	3.84
Common gull	99.2%	0.005	0.13	198.65

- 8.201 The potential for the proposed aircraft warning lighting to potentially increase the risk of collision has also been considered in this assessment. Two types of aircraft warning lighting are required to be fitted to the highest practical points on the wind turbines (i.e. on the nacelle). The turbines on the perimeter of the scheme are to be fitted with MOD accredited 25 candela, omni-directional, red or infrared lighting with an optimised flash pattern of 60 flashes per minute. All the wind turbine nacelles would also be fitted with medium intensity (2000 candela) steady red aviation warning lights to comply with CAA requirements. The towers would also be fitted with lighting, at intervals of not more than 52m, of a type and intensity to be agreed with the CAA. It is anticipated that the tower lighting would be of a lower intensity to the lighting on the nacelles.
- 8.202 Current CAA policy for onshore wind turbine lighting allows for the lights to operate in a lower intensity mode (e.g. 200 candela) when metrological visibility is more than 5km in all directions. It is proposed that visibility sensors would be fitted on the wind turbines to allow automated mode switching or potentially using a 'smart' aviation system to control the aircraft warning lighting (see Chapter 3 for further details). In this assessment the potential effect of the proposed aircraft warning lighting on birds (in particular the potential during poor visibility to increase collision risk) has been considered on a worst-case scenario, i.e. 2000 candela lighting in poor visibility.
- 8.203 The phenomenon of migrating birds being attracted to artificial lights at night has been known for centuries but has only received detailed study over the past few decades. There is an extensive literature from across the globe reporting on observations of nocturnal migrants flying around bright lights, such as lighthouses, oil rigs, flares, ceilometers and telecommunication towers.



Detailed scientific studies of the mechanisms by which this occurs are relatively rare in the literature. The mechanisms by which birds are 'drawn' to such lights are not fully understood but some disruption to navigational cues, rather than direct attraction, appears to be the main likely cause. There is evidence from laboratory-based studies of bird migration behaviour that dim red light interferes with the 'magnetic compass' (magnetoreceptors used in navigation, particularly in the absence of visual cues) of migratory birds (Gauthreaux & Belser 2006 (Ref. 8.38)).

- 8.204 The presence of lighting on guyed telecommunication masts can be a significant hazard to nocturnal migratory songbirds, particularly along migratory flyways. Some sites in North America have well-documented mass kills as a result of large flocks of nocturnally migrating passerines becoming disorientated by the lighting, under poor visibility conditions, and coming into contact with the guy wires. Steady burning or pulsating red lights seem to be more attractive to birds at night during inclement weather conditions than white strobe lights (Gehring *et al.* 2009 (Ref. 8.39)). Towers lit at night with only flashing lights were involved in significantly fewer fatalities than towers lit with systems that included a combination of flashing and static red lights. The results suggest that bird fatalities can be reduced, perhaps by 50-70% at guyed communication towers, by removing steady burning red lights.
- 8.205 Kerlinger *et al.* (2010 (Ref. 8.40)), in a study of the effect of wind turbine lighting on birds collisions at 30 operating wind farms North America, did not find any mass kill events similar to what has been documented at some guyed telecommunication towers. They did find that lighting and weather conditions may have been factors in four multi-bird fatality events. Flashing red lights, which are typically installed as aircraft warning lighting for wind farms in North America, were not involved in these events. They speculated that steady burning red lights, which are installed on telecommunication towers present a greater risk to nocturnal migrants. However, it was difficult to disentangle the influence of the greater height of the telecommunication towers (some are over 300m tall) and the presence of guy wires from the influence of the lighting type.
- 8.206 Rebke *et al.* (2019 (Ref. 8.41)), in a recent study of offshore wind farm lighting and birds, found that no light type was constantly avoided by nocturnally migrating songbirds. Birds were drawn more towards continuous than flashing lights, particularly in overcast conditions. However, steady burning red lights did not differ from flashing red light in apparent level of attractiveness. Rebke *et al.* recommended light sources at offshore wind farms should be restricted to the minimum required and if lighting is required, flashing lights are preferred over continuous lights, and if continuous light is required, red light should be used.
- 8.207 For many species, there will be negligible increased risk from the presence of the lights due to their predominantly diurnal habits (e.g. diurnal raptors, black grouse). There is some uncertainty, which is generally applicable to all wind farm proposals with lighting, as to the potential for infrequent conditions to occur that increase collision risk and for lighting to exacerbate this (e.g. low cloud/foggy conditions during migration periods). The risk to birds from onshore wind turbines, in upland sites, that are illuminated at night or in conditions of poor visibility during the day has been poorly studied but is assumed to be a potential risk factor. However, this is unlikely to be a significant issue unless the wind farm is located in a position that is likely to attract large numbers of nocturnal migrant birds. Evidence from published research that has considered the potential for lighting on wind turbines to increase the risk of collision does not indicate that it is an appreciable issue for key receptor species considered in this assessment with the exception of pink-footed goose (the potential risk to common gull is discussed in Technical Appendix 8.3).



- 8.208 Geese can be active at night and in poor-visibility conditions, during migration and moving between roosting and foraging areas. However, to date there is no evidence that lighting, of the type which would be installed at the proposed development, has resulted in a significantly increased rate of collision at any site in the UK. The proposed development is in a general area that is overflowed occasionally by pink-footed geese during passage periods in the spring and autumn. There was no evidence from the flight activity surveys of any clear concentration of flight activity across the wind farm area. Movements appeared to be on a relatively broad front and there was also no evidence of regular movements typically associated with commuting flight between favoured roosting and foraging sites.
- 8.209 Most migrant songbirds migrate at night, raptors and wildfowl normally migrate during the day, and all species tend to time the onset of migration flights during good weather. However, landfall at staging, wintering or breeding sites may be under very different weather conditions and may also be at night (Gill 2007 (Ref. 8.42)). Typically, migrants follow broad routes, or 'flyways', which may differ between spring and autumn migration, but tend to follow large-scale geographical features (e.g. coastlines, mountain ranges). Although certain features, such as passes in high mountains running perpendicular to flyways and narrow points between land for seas crossings, can focus birds into a much smaller area. The proposed wind farm is not located near to any such feature that would be expected to concentrate diurnal or nocturnal migrants over the proposed site. This does not exclude the potential for the Site to be over-flown by nocturnal migrants, but this activity is considered unlikely to be regular or significant. Additionally, in a study of migrant bird fatalities at wind farms on a migration corridor in northern Germany, Welcker *et al.* (2017 (Ref. 8.43)) found that nocturnal migrants did not have a higher risk of collision with wind farms in comparison to diurnally active species, and appeared to avoid collisions more effectively.
- 8.210 In conclusion, the risk of increased mortality rates due to aircraft warning lighting is considered to be negligible for all receptors considered in this assessment apart from geese. This is due to the absence of evidence of a particular risk to any other receptor species from lighting at upland wind farms (i.e. away from lowland agricultural areas and the coast) and the specific circumstances of the Site, with respect to the low levels of flight activity recorded within or near to the proposed wind farm for most species that could be active at night or during periods of poor visibility.

## Hen Harrier

- 8.211 Annual collision mortality of hen harrier is zero because only one flight was recorded within the flight risk area at risk height and so collision rates were not estimated. Assuming baseline levels of flight activity remain the same, the proposed development is very unlikely to result in any hen harrier deaths during the lifespan of the proposal. At this rate, any additional mortality from the proposed development would have a negligible influence on existing survival rates and consequently no effect on the long-term status of the regional population.
- 8.212 The flight activity data was collected when a high proportion of the conifer plantation within the Site is at thicket and pole stage and therefore of negligible value as hunting habitat for hen harrier. The proposed felling (i.e. early harvesting of c. 125ha) has the potential to result in an increase in hen harrier flight activity, in particular, within the Site in comparison to current baseline levels. This is due to the increase in small mammal prey populations that typically occurs in the years following commercial conifer plantation felling and the attendant flush of grass and rush growth. Assuming grazing intensity within the former plantation areas remains unchanged, most of the proposed felling area is likely to revert to a mosaic of acid, neutral and marshy grassland over the lifetime of the wind farm. Although unchecked natural regeneration of Sitka spruce saplings could affect large

parts of the clear-felled areas.

- 8.213 The hunting behaviour of hen harrier does not place them at particular risk of collision with the proposed wind turbines. Typical hen harrier hunting behaviour is to 'quarter' the ground, flying at less than 10m above the vegetation in order to surprise and rapidly seize prey (Cramp & Simmons 1980 (Ref. 8.44)). Such behaviour is likely to reduce the risk of collision with modern wind turbine blades (Madders & Whitfield 2006 (Ref. 8.45)) which, in the proposed development, would have an approximate clearance of 40m from the ground at the lowest point of the blade sweep. Reviews of studies of hen harrier mortality at operational wind farms indicated that lethal strikes are very rare (Whitfield & Madders 2005 (Ref. 8.46)).
- 8.214 If breeding or roosting activity were to occur in the vicinity of the wind turbines (e.g. within c. 500m), and birds were not deterred from nesting due to the presence of the wind turbines, then the risk of collision may increase from current baseline estimates. However, this is considered an unlikely scenario, given the currently unfavourable conservation status of the breeding hen harrier population in the wider region. Hen harriers are considered to be at greater risk of collision with wind turbines during breeding display flights or as recently fledged birds (Madders 2004 (Ref. 8.28)). Display flights, solo or mutual high circling, undulating flights are made by males and females, although the more intricate and intense 'sky-dancing' behaviour is typically exhibited by males. The peak period for this behaviour is early in the breeding season, from early April to early May, ranging from late February to late May (Hardey *et al.* 2013 (Ref. 8.7)).
- 8.215 In conclusion, in recognition of the degree of uncertainty about the future use of the area by hen harrier following tree felling, the collision mortality risk is considered to be no greater than Low in the long-term, resulting in an effect significance level of Minor, which is **Not Significant**.

## Goshawk

- 8.216 Goshawks typically spend most of their active time hunting at or below forest canopy height and are therefore at relatively low risk of collision with modern wind turbines (e.g. the proposed wind turbines would operation above existing mature forest canopy height). However, they may be at greater risk of collision mortality due to the nature of their display flights. Goshawk breeding display behaviour involves high-circling and plunging flights by single birds or pairs. Such behaviour can occur throughout the year but is more frequent over nesting areas in March and early April (Cramp & Simmons 1980 (Ref. 8.44), Hardey *et al.* 2013 (Ref. 8.7)). Typically, these displays occur early in the morning on fine, still days.
- 8.217 The collision risk analysis provided a peak estimate of annual collision mortality for goshawk of 0.05 (based on a 98% avoidance rate) which equates to one bird strike every c. 22 years. Additional mortality at this rate is considered highly unlikely to have a material adverse effect on existing adult survival rates for the goshawk population within the Clashindarroch Forest area. This effect would be negligible in the context of the regional population. There is the potential for the mortality rate to be an under-estimate due to the majority of the flight activity survey effort not coinciding with peak display periods when the closest nesting area to the proposed development was occupied. However, collision risk would have to increase significantly from the current estimate to result in a collision rate that could be considered meaningful in terms of influencing adult annual survival rates for the regional population.
- 8.218 The proposed felling plans (as outlined in Technical Appendix 3.2) would have the effect of removing nesting opportunities and removing hunting habitat for goshawk adjacent to the wind

turbines. Therefore, it is considered very unlikely that the baseline levels of flight activity would increase within the proposed development as a result of the proposed forest felling plans. The presence of the wind turbines could result in the displacement of breeding birds from the nearest nesting area to the proposed development. The potential for such displacement effects is discussed in the following section of the assessment. Should displacement from the nesting area occur then this will further reduce the risk of collision for this species.

- 8.219 In recognition of the uncertainties about this impact, the collision risk to the goshawk population is considered to be Low in the long-term, resulting in an effect significance level of Minor, which is **Not Significant**.

## Merlin

- 8.220 No flights by merlin were recorded during the 2015-17 flight activity surveys, although they are known to breed in the wider area, have in the past bred near to the proposed development and may breed again in the near future. When actively hunting, and during commuting flights, merlin typically fly low over the ground, well below turbine rotor height. Although, flight height can increase when birds are in pursuit of songbirds that try to evade capture by gaining height.
- 8.221 Merlin are considered to be at greater potential risk of collision during aerial display flights by adults and practice flights by juveniles. Both behaviours are expected to be concentrated within an area approximately 500m from a potential nest site. However, the proposed tree felling would ensure that potentially suitable tree-nesting opportunities for merlin are removed from the immediate vicinity of the proposed wind turbines minimising the potential for birds to be exposed to increased collision risk as a result of nesting attempts close to the proposed development. Tree-nesting merlin are dependent on re-using old stick nests made by other birds, primarily crows (Rebecca *et al.* 1992 (Ref. 8.48). Low trees (e.g. less than ten years old) and stands of low willow scrub, which may be retained within c. 500m of the proposed wind turbines, are unlikely to provide suitable nesting opportunities for this species. Typical ground-nesting habitat is generally lacking within the Site due to an absence of suitable tall heather stands or suitable nesting crags.
- 8.222 Collision risk for merlin is considered to be Negligible-Low in the long-term, resulting in an effect significance level of no greater than Minor, which is **Not Significant**.

## Common Kestrel

- 8.223 Kestrel is considered as a receptor for the assessment of collision risk due to the unfavourable conservation status of the national population (e.g. kestrel is on the UK Amber list and the Scottish population has suffered an estimated 58% decline between 1995 and 2009, Risely *et al.* 2012 (Ref. 8.47)) and the relatively high susceptibility of this species to turbine collision.
- 8.224 The peak estimate of annual collision mortality for kestrel (assuming the 95% avoidance rate) is 0.12 which equates to a bird strike every c. 8 years. The early harvesting of c. 125ha of conifer plantation as part of the proposed development may result in an increase in kestrel activity from current levels within the collision risk zone due to the anticipated increase in small mammal prey following felling and the recovery of grasses, sedges and rushes.
- 8.225 This species was frequently recorded hunting over felled areas of plantation, near to the proposed development, during the 2015-2017 breeding seasons and at other times of the year. Kestrels are known to be susceptible to collision with wind turbines, due primarily to their favoured hunting

behaviour and some evidence of a behavioural attraction to wind farms (Madders & Whitfield 2006 (Ref. 8.45)). The relatively high frequency of flight activity recorded during 2015-17 at collision risk height also supports this (see Technical Appendix 8.2).

- 8.226 The results of the collision risk modelling for this species, and experience from monitoring of operational wind farms, suggests that there could be a material effect on annual adult survival rates at the local population level. However, this low rate would not be relevant at the regional population level. Even if the rate of collisions were to increase following tree felling, and the increase in suitable hunting habitat near to the proposed wind turbines, to a rate of one adult every year, this would represent only 0.3% of the regional population and less than 1% of the assumed existing annual mortality rate (0.69, Village 1990 (Ref. 8.49)) for the regional population (c. 342 birds, Wilson *et al.* 2015 (Ref. 8.25)).
- 8.227 The predicted annual mortality rate from wind turbine collision, accounting for a potential increase in activity within the proposed development area following tree felling, would be a long-term Low effect for the local kestrel population and a Negligible effect at the regional (i.e. NHZ) breeding population scale, resulting in an effect significance level not greater than Minor, which is **Not Significant**.

## Black Grouse

- 8.228 No flight activity by black grouse was observed within the flight risk area during the various survey periods. There are no recently active lek sites within 1.5km of the proposed wind turbines. No evidence of breeding or foraging within 500m of wind turbines was found during the 2015-17 surveys. However, there is the possibility that breeding and foraging activity by black grouse could increase within the Site in the future as a result of an increase in the extent of open-space in the long-term. Although it is important to note that there has been no apparent increase in black grouse activity as a result of felling associated with the existing Clashindarroch Wind Farm (based on pre- and post-construction monitoring).
- 8.229 Considering the current baseline information, and taking into account the potential for activity to increase in the proposed development area post-felling, it has been concluded that the collision risk for black grouse is Negligible-Low in the long-term, resulting in an effect significance of Minor, which is **Not Significant**.

## Pink-footed Goose

- 8.230 Following current SNH guidance, the detailed assessment of collision risk for geese that are not being assessed as part of an SPA population is no longer a requirement in the EIA of onshore wind farms. On a precautionary basis, the estimated collision rates for pink-footed goose are given in Table 8-12. The peak collision rate is low (one collision every c. 4 years) and confirms that the risk of an appreciable effect on the passage and wintering populations present in the wider region is negligible. Collision rates would have to increase by more than an order of magnitude to affect 0.1% of the regional population (12,000 for NHZ 12, Wilson *et al.* 2015 (Ref. 8.25)). Even allowing for the proposed aircraft warning lighting to increase the collision risk to this species, particularly under low visibility conditions, it is highly improbable that the rate could increase to a level that would result in a meaningful effect on annual survival rates for the regional population.
- 8.231 The predicted annual mortality rate from wind turbine collision, accounting for a potential increased risk during low visibility conditions, would be Negligible for the regional pink-footed

goose population, which is **Not Significant**.

## Common Gull

- 8.232 The collision risk for common gull is very low (0.13 birds during the lifetime of the wind farm) and is considered to be a Negligible effect on the receptor population and therefore **Not Significant**. This effect in the context of the Tips of Corsemaul and Tom Mor SPA common gull population is considered in detail within Technical Appendix 8.3.

## Osprey

- 8.233 The estimated collision risk for osprey is very low (<1 bird during the lifetime of the wind farm) and is considered to be a Negligible effect on the receptor population and **Not Significant**.

## Collision Risk - Other Built Structures

- 8.234 The proposed permanent meteorological mast may pose a potential collision risk to birds. The proposed mast would be of a free-standing, lattice design. This would present a comparatively low risk to birds as the design lacks the fine wires that support guyed masts, which are considered to present a hazard to birds in flight.
- 8.235 Collision mortality/injury from other structures is considered to be no greater than a negligible-low effect magnitude and minor and therefore a **Not Significant** effect in the long-term for any receptor.

## Displacement/Disturbance/Barrier Effects

- 8.236 Turbine-related displacement, assuming no habituation over time, has the potential to affect breeding success and reduce individual fitness as it results in the effective loss of habitat for nesting, foraging and roosting. The scale of the effects is likely to vary considerably between species and could be dependent on factors such as the number of turbines affecting the same habitat/population of birds and the zone of displacement relative to territory size, etc.
- 8.237 Displacement of birds from suitable habitat by operating wind turbines has been observed in a number of studies of onshore wind farms (e.g. Larsen & Madsen 2000 (Ref. 8.50); Devereux, Denny & Whittingham 2008 (Ref. 8.51); Pearce-Higgins *et al.* 2008 (Ref. 8.52), 2009 (Ref. 8.53) and 2012 (Ref. 8.54)). From various published monitoring studies and literature reviews (e.g. Winkelman 1995 (Ref. 8.33), Green 1995 (Ref. 8.55), Leddy *et al.* 1999 (Ref. 8.56), Larsen and Madsen 2000 (Ref. 8.50), de Lucas *et al.* 2004 (Ref. 8.57), Hötter *et al.* 2006 (Ref. 8.35); Zwart *et al.* 2015 (Ref. 8.36), Hötter 2017 (Ref. 8.37)) it is apparent that displacement effects vary between locations and species, with some species showing remarkable tolerance of wind turbines and others being entirely displaced from a wind farm area.
- 8.238 Some common songbird species have either shown relatively small scale displacement of 100-200m from turbines or no apparent displacement at all (Hötter *et al.* 2006 (Ref. 8.35), Devereux, Denny & Whittingham 2008 (Ref. 8.51)) whereas some moorland wader species have shown significant apparent reductions in breeding density within c. 500m of turbines (Pearce-Higgins *et al.* 2009 (Ref. 8.53) and 2012 (Ref. 8.54)) and other species may show a high degree of avoidance of wind farms as a whole (e.g. golden eagle, Fielding & Haworth 2015 (Ref. 8.58)). However, with studies of operational wind farms it is often difficult to account for concurrent changes to habitat condition

within and outside of the wind farm area, either as a result of construction or from deliberate habitat enhancement, influencing habitat use within the wind farm area.

- 8.239 There is also the potential for the presence of the proposed development to affect flight behaviour and force birds to make deviations which are more costly in terms of energy expenditure or in extreme cases prevent access to important habitats. For infrequent movements this is less of a potential concern. However, the potential for the proposed development, given the findings from the baseline surveys and the size and location of the proposed development, to result in significant barrier effects for any receptor is considered to be negligible. Therefore, there is no further consideration of the potential barrier effect of the proposed development for any of the receptors with the exception of common gull, which is discussed in Technical Appendix 8.3.

## Hen Harrier

- 8.240 This effect is considered to be negligible for hen harrier in the context of the current lack of suitable habitat within the proposed development area and availability of better quality habitats for breeding hen harrier in the wider area, which would presumably not be lost or degraded during the lifetime of the proposed wind farm. The potential for operational displacement of hen harrier has been assessed as a Negligible, which is **Not Significant**.

## Goshawk

- 8.241 At least one pair of goshawk bred in the proposed development area during the baseline survey period and there is likely to have been hunting activity in the proposed development area by other pairs of goshawk that breed in the surrounding area. Although the goshawk population in north-east Scotland (NHZs 12 and 9) appears to be robust and has increased markedly since the mid-1990s to at least c. 40 pairs (Roos *et al.* 2015 (Ref. 8.59), Wilson *et al.* 2015 (Ref. 8.25)), it remains a relatively scarce breeding raptor. Goshawk is also listed on Schedule 1 of the Wildlife & Countryside Act 2018 (as amended) due to its relative rarity and the history of human persecution of this species.
- 8.242 Goshawk nest in trees and are present in their home range year-round. They typically re-use the same nesting areas (if not the exact same nest sites) each year, but may also have alternative nesting areas, up to four different locations, sometimes several kilometres apart (Hardey *et al.* 2013 (Ref. 8.7)). In Scotland, the nesting area typically comprises mature, south-facing conifer stands surrounding a cluster of nest trees, typically some distance from the forest edge. The nest trees are often taller than the surrounding trees with a relatively open sub-canopy zone, larch are often preferred, providing a suitable microclimate for the nest but also good access for the parent birds and for fledglings to undertake practice flights (Marquiss & Newton 1982 (Ref. 8.60), Petty 1989 (Ref. 8.61)).
- 8.243 Evidence from the 2015-2017 survey period and subsequent records from FLS suggests that the nesting area located closest to the proposed wind farm is favoured, but not used in all years. It is assumed for this assessment that this nesting area would be used in most years during the operation of the wind farm and would be at risk of disturbance (e.g. noise and visual disturbance from periodic wind turbine maintenance works and from the turbine itself). Although it is important to note that the coupe where this nesting area is located would be felled at some point under the existing FLS felling plans during the lifetime of the proposed wind farm (i.e. within the next 15-20 years). There is alternative nesting habitat (south-facing slopes with suitable mature trees in long-term retention coupes) for goshawk in the wider surrounding area, which would not be at risk of



any disturbance from the proposed development. There is also at least one known nesting area, that the relevant pair are believed to use in some years, which is outside of the potential zone of disturbance from the proposed wind farm.

- 8.244 There is very little information available in the scientific literature or from published wind farm monitoring studies on the potential displacement effects of wind turbines on this species. The proposed forest felling for the wind farm is considered likely to have a greater potential influence on the distribution of goshawk than the presence of wind turbines. Goshawks can change the location of their nesting areas, within their hunting range, in response to disturbance (e.g. forest harvesting) if alternative, suitable breeding habitat is available nearby. For example, Penteriani & Faivre (2001 (Ref. 8.62)) monitored breeding goshawk nesting in undisturbed woodland and woodland subject to felling. Goshawks were found to remain in woods where light thinning was conducted and there was no difference in occupancy or breeding productivity between pairs in thinned versus un-thinned woods. Where more than 30% of the wood was felled the majority of pairs relocated to the nearest suitable nesting area, typically less than 1.5km away.
- 8.245 Evidence from monitoring undertaken for Clashindarroch wind farm has not shown that the construction of the wind farm has had an adverse effect on the goshawk population within the vicinity of the wind farm. The number of breeding pairs has been greater during the operational phase of the wind farm (2 years have been monitored to date) than during the baseline and construction period (Natural Power 2018 (Ref. 8.63)).
- 8.246 The proposed tree felling would result in the felling of 125ha of conifer plantation (a large proportion of which would be replanted) some of which could provide potentially suitable nesting and roosting habitat. The extent for forest edge habitat, which is used for hunting, will increase within the Site as a result of the wind farm felling proposals.
- 8.247 The scale of operational disturbance and displacement effect on goshawk is difficult to quantify. Goshawk are considered to be at risk of disturbance from people up to 500m from the nest. Based on a review of expert opinion Whitfield *et al.* (2008, Ref. 8.29)) reported the range of estimated disturbance distances (e.g. parent bird alert response during chick-rearing) was 300-500m (90% of responses) with a median value of 175m. The proximity of the closest nesting area to the wind farm indicates that it is at risk of abandonment as a result of the felling required to accommodate the proposed wind farm. However, it is considered too precautionary to assume that this would result in the loss of breeding pair from the population given the potential for alternative nesting areas to be used and new ones established in the wider area.
- 8.248 Overall, the effect is likely to be short-term, potentially resulting in reduced breeding success during the 18-month felling/construction phase only (this effect is assessed under the section of the chapter dealing with felling/construction disturbance). However, on the assumption that long-term displacement could occur, this is considered to be a Low effect on the goshawk population within Clashindarroch Forest and Negligible in relation to the conservation status of the regional (i.e. NHZ) population. The potential effect significance level is no greater than Minor, in the long-term, which is **Not Significant**.

## Merlin

- 8.249 This effect is considered to be negligible for merlin in the context of the general lack of suitable habitat within the proposed development area currently, and the availability of better quality habitats for breeding merlin in the wider area, which would presumably not be lost or degraded

during the wind farm operational period. The potential for operational displacement of merlin has been assessed as a Negligible, which is **Not Significant**.

## Black Grouse

- 8.250 No lekking activity, or any other evidence of black grouse, was recorded in or within 1.5km of the proposed development during the 2015-17 survey period. There is the potential for breeding and foraging activity to increase within the Site in the future as a result of the proposed tree felling and an increase in the extent of open space in the medium-term. However, this effect is considered to be Negligible in the context of the availability of better quality habitats in the wider area, which would presumably not be lost or degraded during the lifetime of the proposed wind farm given the focus on black grouse conservation in the area (including efforts by FLS to improve habitat quality for this species under the Clashindarroch Forest LMP).
- 8.251 The potential for operational displacement of black grouse has been assessed as a Negligible, which is **Not Significant**.

## Geese

- 8.252 The proposed development and surrounding area (i.e. within c. 1km) does not provide any suitable habitat for feeding or roosting geese. There is no potential for geese to be displaced from any important supporting habitats as a result of the operational wind turbines. There was no evidence during the baseline surveys of any regular movement of geese over the Site (e.g. commuting between night-time roosts and feeding areas). Therefore, the potential for the presence of the proposed development to cause geese to have to regularly alter their flight paths to divert around the wind farm and incur significant energy costs is considered to be negligible in this case. Overall, the effect of operational displacement is considered to be Negligible for geese and **Not Significant**.

## Common Gull

- 8.253 The proposed development and surrounding area (i.e. within c. 500m) does not provide any suitable habitat for feeding or roosting common gull. There is no potential for this species to be displaced from important supporting habitats. Given the low levels of flight activity recorded within or near to the Site the potential for the presence of the proposed wind farm to force gulls to alter their flight paths to divert around the wind farm, and incur significant additional energy costs, is considered to be negligible in this case. Overall, the effect of operational displacement is considered to be Negligible for common gull and **Not Significant**.

## Other Birds

- 8.254 The effect of operational displacement is considered to be Negligible for all other receptor populations not covered above.

## *Disturbance / Displacement during Maintenance Activities*

- 8.255 The proposed wind turbines would require periodic routine maintenance and occasionally there may be the need to replace large components such as rotor blades. Consequently, the amount of potential disturbance would vary depending on the scale, duration and timing of the maintenance activities. However, it is reasonable to assume that disturbance from such activities during the operation of the proposed development would be significantly lower than that which could occur



during the construction phase.

- 8.256 Assuming that maintenance works could be carried out at the least favourable time for birds, i.e. during the breeding season, this has been assessed as a Minor effect which is **Not Significant** for all raptor species of conservation concern as well as for black grouse.

## *Disturbance Related to Public Access*

- 8.257 New site roads would have the potential to cause disturbance to nesting and foraging birds through increased human access to the proposed development area. Although no vehicles other than authorised vehicles and those associated with the operation and maintenance of the wind farm would be allowed access to the proposed development area, the presence of roads leading into the Site may encourage walkers, some with dogs, cyclists and horse riders to make use of the new site roads.
- 8.258 Assuming that any additional activity occurs consistently over the longer-term and that there is no initial 'novelty' period with human activity decreasing after a period of time, and no efforts are made to control/direct this access, then the unmitigated effect could potentially be Low in the long-term. This would result in a Minor and **Not Significant** effect for raptors of conservation concern and for black grouse. For all other species, the effect is considered to be Negligible, and therefore **Not Significant**.

## *Mitigation*

- 8.259 The potential increased collision risk to hen harrier as a result of clear-felling would be monitored as part of the proposed post-construction breeding bird surveys. If monitoring indicates a greater level of impact than has been anticipated in this assessment, then the wind farm operator would, in consultation with SNH, seek solutions to attempt to further mitigate these effects through habitat management measures.

## *Residual Effects*

- 8.260 No significant residual operational effects are anticipated for any receptor. A summary of the assessment of the operational phase effects of the proposed development, proposed mitigation and the residual effects are provided for each receptor in Table 8-13 at the end of the main assessment section in this Chapter.

## **Decommissioning Effects**

- 8.261 Works associated with the decommissioning of the proposed development have the potential to disturb breeding and wintering birds. The exact timing of this work (approximately 25-30 years after the commencement of the scheme), relative to the more sensitive periods of the year for breeding birds, is not known at this time; it has therefore been assumed that work may occur at the least favourable time relative to the relevant key avian receptors within the proposed development area.
- 8.262 The decommissioning works would lead to broadly similar potential sources of disturbance and effects on birds, as identified during the construction phase. These effects are discussed in the previous section and are therefore not repeated here, however it is likely that the duration and intensity of works at each of the wind turbines to be dismantled would be less than that required to construct a replacement wind turbine.

- 8.263 In comparison to the construction of the proposed development, there would be less tree clearance required to enable the decommissioning works to proceed. This would result in a lower potential magnitude of disturbance effect from felling operations on goshawk and other woodland birds.
- 8.264 The decommissioning of the wind turbines would have a positive beneficial effect in terms of removing the potential collision risk. Habitat reinstatement would be decided in consultation with the statutory authorities at the time of decommissioning. It is assumed that habitats lost to the wind farm infrastructure would be reinstated. Disturbance effects due to decommissioning and reinstatement of turbine hardstandings would last no longer than 12 months. Apart from the shorter duration, the effects on birds would be similar to those during the construction phase.
- 8.265 There would probably be disturbance to birds arising from the works required to decommission the wind farm at the end of its operational life. Assuming the least favourable timing of the works, the removal of the wind turbines, sub-station and associated infrastructure has the potential to disturb common breeding birds nesting in the local area. The effects should be restricted to the short-term, one breeding season only and would not be of the same potential scale as the construction effects.
- 8.266 The magnitude of decommissioning effects on raptors of conservation concern and black grouse is considered to be Low in the short-term, resulting in an effect significance level no greater than Minor, which is **Not Significant**. For all other species, decommissioning effects are considered to be Negligible or Low in the short-term, resulting a Negligible-Minor effect which is **Not Significant**.

## Mitigation

- 8.267 The potential effects associated with decommissioning primarily relate to disturbance of species of conservation concern. Effects are likely to be much reduced in comparison with the construction phase. The development, during the 25-30 year operating period, of new and enhanced habitats away from the wind farm area would also reduce the magnitude of the potential effects. Disturbance during decommissioning works would be minimised through pre-works surveys and programming potential disturbing works away from sensitive sites and outside of sensitive periods in the same manner as for construction disturbance mitigation.

## Residual Effects

- 8.268 No significant residual decommissioning effects are anticipated for any receptor. A summary of the assessment, proposed mitigation and residual effects is provided in Table 8.13.

**Table 8-13**  
**Summary of the Assessment of Effects for the Key Ornithological Receptors (significant effects highlighted in bold)**

Category of Effect	Receptor(s)	Effect w/o Mitigation	Best Practice/Mitigation Measures	Overall Residual Effect/Level of Confidence
Felling/construction-related disturbance and displacement	Hen harrier	Minor, short-term	<ul style="list-style-type: none"> <li>Felling outside of main nesting period (where possible)</li> <li>Pre-felling surveys</li> <li>Nest protection zones</li> <li>ECoW tool-box talk prior to all workers starting onsite</li> <li>ECoW &amp; watching brief during works</li> <li>Halt all works near to a discovered nest, ECoW to implement location and species-specific protection zone.</li> </ul>	Negligible, Near-certain
	Goshawk	Minor, short-term		Minor-Negligible, Near-certain
	Merlin	Minor, short-term		Negligible, Near-certain
	Kestrel	Minor, short-term		Negligible, Near-certain
	Black grouse	Minor, short-term		Negligible, Near-certain
	Geese	Negligible		Negligible, Certain
	Common gull	Negligible		Negligible, Certain
	Other woodland birds	Minor, short-term		Minor-Negligible, Near-certain
Direct habitat loss and change	Hen harrier	Negligible	<ul style="list-style-type: none"> <li>Habitat loss/change is not considered to be significant for any receptor, no specific mitigation is proposed.</li> <li>Monitoring of breeding birds (key species being goshawk, merlin, hen harrier and black grouse).</li> <li>Vegetation management within the proposed wind farm if risk to ground-nesting raptors identified.</li> </ul>	Negligible, Near-certain
	Goshawk	Minor, long-term		Minor, long-term, Probable
	Merlin	Negligible		Negligible, Near-certain
	Kestrel	Negligible		Negligible, Near-certain
	Black grouse	Negligible		Negligible, Near-certain
	Geese	Negligible		Negligible, Near-certain
	Common gull	Negligible		Negligible, Near-certain
	Other woodland birds	Minor, long-term		Minor, long-term, Near-certain

Category of Effect	Receptor(s)	Effect w/o Mitigation	Best Practice/Mitigation Measures	Overall Residual Effect/Level of Confidence
Wind turbine collision risk	Hen harrier	Minor, long-term	<ul style="list-style-type: none"> <li>Collision risk is not considered to be significant for any receptor, no specific mitigation is proposed.</li> <li>Monitoring of breeding birds (key species being goshawk, merlin, hen harrier and black grouse).</li> <li>Vegetation management within the proposed wind farm if risk to ground-nesting raptors identified.</li> </ul>	Minor, long-term, Probable
	Goshawk	Minor, long-term		Minor, long-term, Probable
	Merlin	Minor, long-term		Minor, long-term, Probable
	Kestrel	Minor, long-term		Minor, long-term, Probable
	Black grouse	Minor, long-term		Minor, long-term, Probable
	Geese	Negligible		Negligible, Near-certain
	Common gull	Negligible		Negligible, Near-certain
	Osprey	Negligible		Negligible, Near-certain
Operational displacement/ disturbance/ barrier effects	Hen harrier	Negligible	<ul style="list-style-type: none"> <li>Operational displacement is not considered to be significant for any receptor, no specific mitigation is proposed.</li> <li>Monitoring of breeding birds (key species being goshawk, merlin, hen harrier and black grouse).</li> </ul>	Negligible, Probable
	Goshawk	Minor, long-term		Minor, long-term, Probable
	Merlin	Negligible		Negligible, Probable
	Kestrel	Negligible		Negligible, Probable
	Black grouse	Negligible		Negligible, Probable
	Geese	Negligible		Negligible, Near-certain
	Common gull	Negligible		Negligible, Near-certain
	Other woodland birds	Negligible		Negligible, Probable

## CUMULATIVE EFFECTS ASSESSMENT

### Methodology

- 8.269 The approach to the cumulative assessment is based on relevant current national policy and best practice guidance. The primary relevant guidance documents are the SNH publications 'Assessing the Cumulative Impact of Onshore Wind Energy Developments' (SNH 2018 (Ref. 8.10)) and 'Assessing Significance of Impacts from Onshore Windfarms on Birds outwith Designated Areas' (SNH 2018 (Ref. 8.11)). Potential cumulative effects in relation to common gull and the Taps of Corsemal and Tom Mor SPA are considered separately within Technical Appendix 8.3.
- 8.270 Broadly, there are three main sources for cumulative effects:
- Type 1 - those arising from the proposed development being assessed;
  - Type 2 - those arising from the proposed development being assessed in combination with those arising from other proposed development projects; and
  - Type 3 - those arising from the proposed development in combination with those that are predicted to arise from completed development projects.
- 8.271 Type 1 effects are associated with the proposed development and were, therefore, the focus of the majority of the preceding text in this Chapter. Types 2 and 3 are potential 'in combination' effects associated with existing and proposed developments and are considered in this section of the assessment. This assessment focuses on wind farm development only. Past and ongoing Type 3 effects would be, to some extent, reflected in baseline data for this EIA. For example, the baseline surveys commenced after the existing Clashindarroch Wind Farm became operational. Therefore, short-term effects will have been acting, within the influence of the proposed development, prior to and during the data collection phase for this assessment.
- 8.272 Cumulative effects, from two or more development proposals, can be additive (i.e. the effect of each of the proposals can be summed), antagonistic (i.e. the combined effects are less than if they were summed) or synergistic (i.e. the combined effects are greater than if they were summed). In relation to combined collision mortality estimates the approach has been to assume, on a precautionary basis, that the effect on key receptor populations would be additive. However, combining collision mortality estimates from a number of different projects is not a simple summing process, as in practice individual birds taken from a population, as a result of collision mortality, can be removed only once and this then reduces the number of birds subject to collision risk from other sources.
- 8.273 In relation to Type 2 effects, priority is given in this assessment to consideration of proposals which have planning consent. There is clearly greater uncertainty about projects which are at the EIA Scoping stage. Additionally, projects at this stage rarely have any detailed baseline survey information or assessments available for review. Therefore, the assessment of potential cumulative effects is inevitably more speculative for such proposals.
- 8.274 The relevant spatial scale is also an important consideration in determining the scope of the cumulative assessment. The assessment of potential cumulative effects has been restricted to those projects that have the potential to interact with the same key receptor populations at a similar scale of influence of the proposed development.

- 8.275 As the assessment has concluded that there are receptor populations of regional sensitivity, it is considered appropriate that this assessment focuses on the potential for cumulative effects with plans or projects at a local (i.e. within c. 10km) scale. It is considered very unlikely that the proposed development could result in cumulative effects to any receptor which would result in a potentially significant effect at the NHZ population scale. Therefore, the assessment has focused on those plans or projects with the potential to affect the same populations at a regional-scale that would be affected by the proposed development.
- 8.276 The assessment focuses on those receptors for which the study area is considered to be of potential regional importance (i.e. goshawk).

## Summary of Available Information

- 8.277 Table 8-14 lists the proposals within approximately 10km of the proposed development which are currently in the planning process or post-consent/pre-construction stage that are considered to have the potential to result in cumulative effects on goshawk as the key bird receptor considered in the cumulative assessment. Smaller proposals of three or fewer turbines have been excluded from further consideration.

**Table 8-14**  
**Proposed Wind Farm Projects Considered in the Cumulative Assessment**

Name	No. Turbines	Distance from Proposed Development (km)	Direction from Proposed Development	Status	Assessment Information Available
Cairnmore Farm Extension	5	8.2	South-east	Operational	Environmental report and associated planning documents
Clashindarroch	18	0.3	South-west	Operational	Environmental report and associated planning documents
Dorenell	59	8.8	West	Operational	Environmental statement and associated planning documents
Dummuie	7	10.9	North-east	Operational	Planning documents
Kildrummy	8	10.3	South	Operational	Planning documents

- 8.278 Following a review of the available information, and consideration of receptors where there was a potential for material cumulative effects to occur, the assessment focused on potential effects on the breeding population of goshawk from cumulative collision mortality. Details of the status and significance of impacts for goshawk for each site are included in Table 8-15. None of the available assessments reported significant residual effects for goshawk at a scale greater than the local population level.

**Table 8-15**  
**Information on Goshawk Impact from Projects Considered in the Cumulative Assessment**

Site Name	Summary Information
Cairnmore Farm Extension	Not recorded in the assessment.
Clashindarroch	The survey data lead to predicted collision rates ranging from one goshawk every six years (95 % avoidance) to one every 32 years (99 % avoidance). There was also one confirmed nest and a probable nest within the survey area.
Dorenell	Not present, included in the assessment.
Dummuie	No information available.
Kildrummy	Not included in the assessment.

## Assessment

- 8.279 None of the published assessments reported significant residual effects for goshawk at a scale greater than the local population level. The only project listed on Table 8-14 where collision mortality on breeding goshawk was considered as a potential effect was Clashindarroch wind farm, where an estimated collision rate of 0.13 per annum (at an avoidance rate of 98%) was reported.
- 8.280 This relatively low level of estimated level of annual collision, in combination with the lower predicted rate for the proposed development (0.05), would not result in a meaningful effect on the annual survival rate for the population present in the region and does not warrant any change to the assessment of collision risk for goshawk for the Clashindarroch II wind farm.
- 8.281 As was discussed within the assessment, the tree felling to accommodate the proposed development likely to have a greater influence on the goshawk population within Clashindarroch Forest than the presence of the wind turbines. Monitoring studies, completed to date, have not shown any apparent adverse effect on the breeding goshawk population since the existing wind farm became operational in 2015. The potential for important cumulative effects arising from the combined habitat change from both developments are therefore considered to be unlikely. The potential for this species to successfully adapt in response to changes in forest structure, as a result of standard commercial forest management, has been demonstrated at Clashindarroch and is also evident in many other conifer plantations across Scotland where goshawk have established breeding populations which are stable or gradually expanding.

## Tor Mor and Tips of Corsemaul SPA

- 8.282 Consideration of the potential implications of the proposed development, alone and in combination with other plans and projects, for the Tor Mor and Tip of Corsemaul SPA is provided in Appendix 8.3 to this Chapter. The following summarises the approach to and conclusions of that assessment.
- 8.283 Appendix 8.3 provides information to allow the competent authority (in this case the Scottish Ministers) to determine, under the relevant provisions of the Habitats Regulations 1994 (as amended), whether the integrity of the SPA would be adversely affected by the proposed development, in view of the site's qualifying interests and conservation objectives (i.e. the reasons for which the SPA was classified or designated).

- 8.284 The SPA is in two parts, the closest of which is c. 6km to the north-west of the proposed development. The sole qualifying species for the SPA is breeding common gull. The SPA includes two areas of moorland on the summits of two adjacent hills. The boundary of the SPA is coincident with the Tips of Corsemaul and Tom Mor SSSI.
- 8.285 The Conservation Objectives for the Tor Mor and Tips of Corsemaul SPA are as follows:
- to avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained;
  - to ensure for the qualifying species that the following are maintained in the long term:
    - population of the species as a viable component of the site;
    - distribution of the species within site;
    - distribution and extent of habitats supporting the species;
    - structure, function and supporting processes of habitats supporting the species; and
    - no significant disturbance of the species.
- 8.286 Each of these objectives has been considered separately in the report to inform the HRA (see Appendix 8.3). The only potential risk to this species from the proposed development is in relation to collision mortality and displacement of common gull. The assessment, based on available data, has concluded that the proposed development would result in negligible effects on this species even taking into account the unfavourable conservation status of the SPA population at this time. It has been concluded that the proposed development, in combination with relevant plans or projects, would not prevent any of the SPA conservation objectives from being maintained.
- 8.287 Taking into consideration the conclusions of this assessment the proposed development, alone or in combination with current plans and projects, would not result in an adverse effect on the integrity of the Tor Mor and Tips of Corsemaul SPA.

## STATEMENT OF SIGNIFICANCE

- 8.288 This Chapter assessed the likely effects on ornithological receptors predicted to arise from the proposed development, in order to identify any likely significant effects. Following consideration of a range of best practice and mitigation measures for the construction, operational and decommissioning phases of the development, the residual (mitigated) effects for all receptors combined would be not greater than minor/negligible and would therefore not be significant.
- 8.289 The baseline description of the bird fauna present within the Clashindarroch II wind farm site and the surrounding area has been derived from desk study and field surveys completed between May 2015 and August 2017 (inclusive). Surveys were carried out across the wind farm site and the wider survey area in order to assess the distribution of wintering, migratory and breeding bird species of conservation concern, as well as the potential sensitivity to wind farm development. The species present can be grouped broadly into raptors and owls, waders, wintering/passage geese, gulls and black grouse.
- 8.290 Within these groups there are a number of species periodically using the Site that merit special attention due to their European or national conservation status as a species, and/or for their potential sensitivity to wind farm development. Recognition of their conservation status is through



listing on either Annex I of the EU Birds Directive, and/or Schedule 1 of the Wildlife and Countryside Act. Annex I and/or Schedule 1 species that occasionally hunt or pass through the proposed wind farm site include hen harrier. The Site is considered to be of regional importance to breeding goshawk. It is also overflowed by relatively low numbers of common gull, particularly during the mid-summer periods, some of which are likely to be associated with the breeding population at Tor Mor and Tips of Corsemaul SPA (which is located c. 6 km to the northwest of the Site).

- 8.291 This assessment has considered the various potential impacts arising from the construction, operation and decommissioning of the proposed wind farm, and evaluated the significance of these impacts on the identified key receptors in the context of their conservation value, sensitivity to wind farm development and the magnitude of the potential impacts.
- 8.292 During construction of the wind farm, impacts on birds may arise from loss of forest habitat and from disturbance associated with construction activities. No significant habitat loss is predicted for any species, taking into consideration the scale of the proposal, the extent of direct habitat loss in comparison to the abundance of similar habitats unaffected in the wider area and accounting for felling that would occur anyway as part of normal commercial forestry management. Disturbance impacts will be mitigated to some extent through careful management and scheduling of felling and construction works and pre-construction surveys, to avoid disturbance to birds during the breeding season.
- 8.293 During wind farm operation, impacts may arise from collision with turbines and other structures resulting in injury or death, displacement/disturbance from areas where turbines are operating and disturbance by maintenance activities and pedestrian access via newly created site roads. Collision risk has been assessed using data systematically gathered during flight activity and a standard model used in wind farm EIA. However, due to the low levels of flight activity of sensitive species within the collision risk height band, the residual impact of wind turbine collision for all species is not considered to be significant at the regional population level.
- 8.294 The operation of the wind farm could result in impacts through displacement and/or disturbance of breeding birds, potentially reducing breeding success and/or feeding opportunities. There is also the potential for the presence of the wind farm to result in displacement of non-breeding birds, or birds breeding in the wider area (e.g. geese, common gull). No significant residual impacts of disturbance from the operation of the wind farm are predicted in this assessment.
- 8.295 Other operational residual impacts, including track maintenance, public access and collision with other built structures are assessed as being not significant for all species.
- 8.296 The residual impacts on all species of decommissioning the wind farm are considered to be broadly similar to those during construction and are therefore not more than Minor for all species and not significant. Prior to decommissioning, a re-assessment of the avifauna using the Site will be required in order to determine the specific mitigation measures required to reduce any potentially significant impacts.
- 8.297 The potential for cumulative impacts on certain key receptors (e.g. goshawk) to occur as a result of interactions with proposed and existing wind farms in the wider area has been considered based on the available information obtained from the published impact assessments of these proposals. No significant cumulative impacts on any receptor were identified in the assessment.
- 8.298 Finally, the Clashindarroch II Wind Farm proposal, in combination with other plans or projects

considered in the cumulative assessment, would not result in any material adverse effect on any bird populations associated with SPAs in the region or adversely affect, directly or indirectly, any other statutory or non-statutory site designated for its ornithological importance.

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