



OVER HILL WIND FARM

ORNITHOLOGY

Appendix 8.1

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1 INTRODUCTION

MacArthur Green was commissioned by EnergieKontor UK Ltd to complete ornithological surveys at the proposed Over Hill Wind Farm, near Dalmellington in East Ayrshire (hereafter referred to as ‘the Proposed Development’). Surveys from November 2013 to October 2014 were undertaken by Envirocentre and from October 2014 to August 2016 by MacArthur Green to inform an assessment of the likely significant environmental effects of the Proposed Development on the species assemblage present.

This technical report summarises the methods employed and the results of the field surveys and is supported by the following Annexes:

- Annex A: Ornithological Legal Protection;
- Annex B: Ornithological Survey Methodologies;
- Annex C: Ornithological Survey Effort and General Information;
- Annex D: Ornithological Survey Results; and
- Annex E: Collision Risk Assessments.

A range of surveys were employed to accurately record baseline conditions within the Proposed Development Area and appropriate survey buffers (detailed in Annex B). In this Technical Appendix, associated Annexes (A – E) and Chapter 8 (Ornithology) of the Environmental Statement, terms referred to are as follows:

- ‘the Proposed Development Area’ refers to the area within the red line boundary;
- ‘survey area’ is defined as the area covered by each survey type at the time of survey, subject to access restrictions outwith the Development Area; and
- ‘study area’ is defined as the area of consideration of effects on each species at the time of assessment (**Figure 8.2** in Volume 2 of the ES).

2 LEGAL PROTECTION

With limited exceptions, all wild birds and their eggs are protected by law. Specific levels of protection are determined by a species’ inclusion on certain lists. Annex A to this report details the various levels of legal protection afforded to UK bird species.

3 METHODS

3.1 Consultations and Desk-Based Study

Scottish Natural Heritage (SNH) SiteLink website (www.snh.gov.uk/sitelink) was consulted regarding the ornithological interests on and adjacent to the Proposed Development Area.

3.2 Field Surveys

Envirocentre undertook the following field surveys within the Proposed Development Area between November 2013 and October 2014:

- Flight activity surveys (one breeding season and one non-breeding season, November 2013 to October 2014);
- Breeding bird surveys (one breeding seasons, April to July 2014);
- Winter walkover surveys (one non-breeding season, November 2013 to March 2014);
- Barn owl surveys (one breeding season, April 2014); and
- Black grouse surveys (one breeding season, March to May 2014).

MacArthur Green undertook the following field surveys within and around the Proposed Development Area between October 2014 and August 2016:

- Flight activity surveys (two breeding seasons and one non-breeding season, October 2014 to August 2015 and May to August 2016);
- Breeding bird surveys (two breeding seasons, April to July 2015; and May to July 2016 (south of Development Area);
- Winter walkover surveys (one non-breeding season, November 2014 to February 2015);
- Scarce breeding bird surveys (two breeding seasons, March to July 2015 and May to July 2016); and
- Black grouse surveys (two breeding seasons, March to May 2015 and May 2016).

Survey methods followed the recommended SNH (2013ⁱ and 2014ⁱⁱ) guidance available at the time and methods are described in detail within Annex B. Where possible, survey coverage was extended beyond the Proposed Development Area within a buffer distance specific to that method (e.g. up to 2 km buffer for the scarce breeding bird surveys) and these are detailed within Annex B.

The relative importance of the data collected was determined by the specific level of protection assigned to those species recorded, coupled with their perceived susceptibility to potential impacts resulting from the Proposed Development Area. The resulting 'target species' and 'secondary species' lists are a standard assessment tool for wind farm ornithological studies (see Annex B).

4 RESULTS

4.1 Consultations and Desk-Based Study

Information gathered from the consultation exercise revealed that the Proposed Development is within 20 km of one Special Protection Area (SPA) (**Figure 8.1** in Volume 2 of the ES):

- Muirkirk and North Lowther Uplands SPAⁱⁱⁱ,

- Table 8-1 (underpinned by North Lowther Uplands SSSI^{iv} and Muirkirk Uplands SSSI^v), 12 km to the North East.

Table 8-1 Summary of qualifying features of Muirkirk and North Lowther Uplands SPA (underpinned by North Lowther Uplands SSSI and Muirkirk Uplands SSSI)

Feature	Qualifying feature category	Status	Description
Golden plover <i>Pluvialis apricaria</i> Breeding	SPA	June 2015: unfavourable declining	Breeding population of European importance: minimum of 154 pairs (1999), 0.7% of the UK population.
Hen harrier <i>Circus cyaneus</i> Breeding	SPA, SSSI	July 2008: unfavourable declining	Breeding population of European importance: average of 29.2 breeding females (1994-96), 6% of the UK population. This is one of the largest hen harrier populations in the UK.
Hen harrier <i>Circus cyaneus</i> Non-breeding	SPA, SSSI	December 2004: unfavourable declining	Wintering population of European importance: average of 12 individuals (1991-95), 2% of the UK population.
Merlin <i>Falco columbarius</i> Breeding	SPA	July 2009: unfavourable no change	Breeding population of European importance: average of 9 breeding pairs (1989-98), 0.7% of the UK population.
Peregrine <i>Falco peregrinus</i> Breeding	SPA	August 2004: unfavourable no change	Breeding population of European importance: average of 6 breeding pairs (1992-96), 0.5% of the UK population.
Short-eared owl <i>Asio flammeus</i> Breeding	SPA, SSSI	July 1998: favourable maintained	Breeding population of European importance: average of 26 breeding pairs (1997-98), 3% of the UK population
Breeding bird assemblage (Muirkirk Uplands)	SSSI	August 2008: favourable maintained	Upland moorland assemblage of national importance including buzzard <i>Buteo buteo</i> , curlew <i>Numenius arquata</i> , dunlin <i>Calidris alpina</i> , golden plover <i>Pluvialis apricaria</i> , merlin <i>Falco columbarius</i> , peregrine <i>Falco peregrinus</i> , red grouse <i>Lagopus lagopus scotica</i> , redshank <i>Tringa totanus</i> , ring ouzel <i>Turdus torquatus</i> , snipe <i>Gallinago gallinago</i> , stonechat <i>Saxicola torquatus</i> , teal <i>Anas crecca</i> , wheatear <i>Oenanthe oenanthe</i> and whinchat <i>Saxicola rubetra</i> .
Breeding bird assemblage (North Lowther Uplands)	SSSI	May 2015: unfavourable no change	Upland moorland assemblage of national importance including curlew <i>Numenius arquata</i> , dunlin <i>Calidris alpina</i> , golden plover <i>Pluvialis apricaria</i> , merlin <i>Falco columbarius</i> , peregrine <i>Falco peregrinus</i> , raven <i>Corvus corax</i> , red grouse <i>Lagopus lagopus scotica</i> , redshank <i>Tringa totanus</i> , snipe <i>Gallinago gallinago</i> , teal <i>Anas crecca</i> , wheatear <i>Oenanthe oenanthe</i> and whinchat <i>Saxicola rubetra</i> .

In addition, two Sites of Special Scientific Interest (SSSIs), are within 20 km of the Proposed Development (**Figure 8.1** in Volume 2 of the ES):

- Bogton Loch SSSI^{vi} (7.4 km to the South West) breeding bird assemblage including – black-headed gull *Chroicocephalus ridibundus*, grasshopper warbler *Locustella naevia*, reed bunting *Emberiza schoeniclus*, song thrush *Turdus philomelos*, spotted flycatcher *Muscicapa striata* and willow tit *Poecile montana*; and
- Merrick Kells SSSI^{vii} (19 km to the South South West) – citation includes a breeding bird assemblage, however no further details are supplied.

4.2 Field Survey

All valid MacArthur Green surveys were undertaken during suitable weather conditions (as described within Annex B – Survey Methodologies). Where weather conditions deteriorated below acceptable conditions (Annex B), surveys were either suspended or additional surveys were undertaken. In the case of flight activity surveys, any time where the visibility was <1km was excluded from total survey effort and subsequent analysis (further detail in section 4.2.1). Schedule 1/Annex 1 surveys conducted by MacArthur Green were carried out by appropriately licensed surveyors. From October 2014, all survey data were reviewed, inputted, and analysed by MacArthur Green. Data from Envirocentre were provided (November 2013 to October 2014), however full methods were not supplied. The Envirocentre data have been referenced in this Technical Appendix (8.1) and Annex E.

A total 71 bird species were recorded within, or adjacent to, the Proposed Development Area during the various ornithological surveys conducted. Survey effort and results of the field surveys are detailed within Annexes C & D and survey results are also illustrated within **Figure 8.4** to **Figure 8.14** in Volume 2 of the ES. The following sections summarise the results from each survey undertaken.

4.2.1 Flight Activity

The flight activity surveys recorded all target species' flight activity within the Proposed Development Area and beyond, for the purposes of collision risk modelling. The flights used were those within the 'Collision Risk Analysis Area' (CRAA) (i.e. the area to be occupied by operational turbines, together with a 250 m buffer, **Figure 8.2** in Volume 2 of the ES).

Flight activity surveys across the 2014 and 2015 breeding seasons and 2013/2014 and 2014/2015 non-breeding seasons were undertaken from Vantage Point (VP) 1 and VP 2 (**Figure 8.3** in Volume 2 of the ES). In response to a change in the Proposed Development turbine layout, additional flight activity surveys were undertaken during the 2016 breeding season at two new VPs (VP 3 and VP 4, **Figure 8.3** in Volume 2 of the ES). The final layout did not overlap with viewsheds of VP 3 or VP 4. Valid survey effort¹ is detailed in

¹ Hours where visibility was >1 km are not considered valid for use in collision risk modelling as less than half the 2 km viewshed can be seen.

Table 8-2 and full details of flight activity surveys are contained in Annex C with methodology in Annex B.

Table 8-2 Summary of total hours of valid survey per VP in each season

Period	VP1	VP2	VP3	VP4
2013/2014 non-breeding season	38.5	31	-	-
2014 breeding season	30	38	-	-
2014/2015 non-breeding season	39	33	-	-
2015 breeding season	35	36	-	-
2016 breeding season	-	-	36	35

A total of twelve target species were recorded during the flight activity surveys (**Figure 8.4** to **Figure 8.8** in Volume 2 of the ES) present observed flightlines and further details are provided in Annex D). For each species across the whole flight activity survey period, Table 8-3 shows the number of flights recorded and the number of birds recorded². The bird seconds are calculated for each observation as the product of flight duration and number of individuals. This is then summed per species to give the total bird seconds recorded across the entire survey period.

Table 8-3 Target species recorded and total number of flights recorded during flight activity surveys: 2014-2016

Species	Total number of flightlines recorded	Total number of birds recorded	Total bird seconds recorded
Black grouse	6	8	162
Goshawk	2	2	107
Greylag goose	2	6	448
Hen harrier	8	9	369
Herring gull	1	1	24
Jack snipe	1	1	12
Lapwing	1	1	19
Merlin	1	1	11
Pink-footed goose	2	233	18,791
Red kite	1	1	128
Short-eared owl	1	1	47
Snipe	3	14	1,250

4.2.1.1 Flightlines Used in Collision Risk Modelling

Only flightlines identified to be within the CRAA and recorded within the 2 km viewshed of the associated VP are discussed in the sections below. Table 8-4 summarises the number of flightlines identified and the number of those flightlines considered 'at-risk'.

- 'At-risk' is defined as – a flight having at least part of its duration (i) at Potential Collision Height (PCH)³; (ii) within the CRAA; and (iii) recorded within the 2 km viewshed of the associated VP.
- PCH is defined as – the altitude between the minimum and maximum blade height⁴ (36 m to 149.9 m).

² This includes flights that would not technically be 'at-risk' of collision (e.g. recorded outwith the CRAA and/or not at rotor height).

³ In some cases only part of a total flight duration was recorded at PCH, and it is assumed that this proportion is applicable for that part of the flight within the CRAA and 2 km viewshed area.

Six target species recorded during flight activity surveys were not identified within the CRAA and associated viewsheds and so are not considered within the sections below. These species are: goshawk, greylag goose, jack snipe, lapwing, merlin and short-eared owl. Full survey results detailing the findings from each survey visit (including target species flightlines considered not 'at-risk' and secondary species information) can be found within Annex D.

Table 8-4 Flightlines identified within the CRAA and associated viewshed and the proportion of these 'at-risk': 2014-2016

Species	Number of flightlines identified within the CRAA and associated viewshed	Number of these flightlines identified to be 'at-risk'
Black grouse	1	0
Hen harrier	7	2
Herring gull	1	1
Pink-footed goose	1	1
Red kite	1	1
Snipe	3	2

Table 8-5 and

⁴ Where the actual rotor blade altitude differs from the pre-defined survey height bands, the collision risk model accounts for this difference on the assumption of an even flight distribution within each particular survey height band, and an adjustment can be made to estimate total flight duration at actual rotor blade altitude.

Table 8-6 detail per species the number and proportion of flight activity within each flight height category (below, at, and above PCH) for each season surveyed. Only bird seconds for observations identified as within the CRAA and associated viewshed are considered in the following discussions. Full target species results are detailed within Annex D and the collision risk calculations are detailed in Annex E.

Table 8-5 Target species bird seconds within the CRAA (2014/2015 non-breeding season)

Species		Bird seconds within height bands (non-breeding season ⁵)				
		Flights	Below PCH	At PCH	Above PCH	Total
Black grouse	Seconds	1	8.00	0.00	0.00	8.00
	Percentage		100.00	0.00	0.00	100.00
Hen harrier	Seconds	7	172.01	9.25	0.00	181.26
	Percentage		94.90	5.10	0.00	100.00
Pink-footed goose	Seconds	1	0.00	6003.81	0.00	6003.81
	Percentage		0.00	100.00	0.00	100.00
Snipe	Seconds	3	132.25	1029.75	0.00	1162.01
	Percentage		11.38	88.62	0.00	100.00

⁵ The general non-breeding season is defined as September to mid-March inclusive by SNH (2014). These observations were collected between the dates of 20th October 2014 to 11th March 2015.

Table 8-6 Target species bird seconds within the CRAA (2015 breeding season)

Species		Bird seconds within height bands (breeding season ⁶)				
		Flights	Below PCH	At PCH	Above PCH	Total
Herring gull	Seconds	1	15.65	3.91	0.00	19.57
	Percentage		80.00	20.00	0.00	100.00
Red kite	Seconds	1	0.00	98.01	0.00	98.01
	Percentage		0.00	100.00	0.00	100.00

4.2.1.2 Collision Risk Model Outputs

The bird seconds for target species flights within the CRAA at PCH were then input into a CRM to calculate the predicted collision rates per season. The CRM calculations for each species can be found in Annex E. Table 8-7 and Table 8-8 provide the estimated collision rates and number of seasons per collision for each species. A dashed line indicates that no “at-risk” flights were recorded during that season, and estimated collision risk is consequently zero.

Table 8-7 Estimated weighted collision rate per season

Species	2013/2014 non-breeding season	2014 breeding season	2014/2015 non-breeding season	2015 breeding season
Hen harrier	-	-	0.0012	-
Herring gull	-	-	-	0.0016
Pink-footed goose	-	-	0.2194	-
Red kite	-	-	-	0.0404
Snipe	-	-	0.2622	-

Table 8-8 Estimated number of seasons per collision (equivalent to one bird per season)

Species	2013/2014 non-breeding season	2014 breeding season	2014/2015 non-breeding season	2015 breeding season
Hen harrier	-	-	863.21	-
Herring gull	-	-	-	625.41
Pink-footed goose	-	-	4.56	-
Red kite	-	-	-	24.74
Snipe	-	-	3.81	-

4.2.2 Breeding Birds

Three complete breeding bird surveys (comprising of four visits each) were conducted in the 2014, 2015 and 2016 breeding seasons (April to July 2014/2015 and May to July 2016). Surveys recorded six wader species (Table 8-9) and wader activity is detailed on **Figure 8.11** and **Figure 8.12** in Volume 2 of the ES. No waders were recorded during 2016 surveys. Full details of the breeding bird surveys are provided within Annexes C and D and survey methodology is provided within Annex B.

⁶ The general breeding season is defined as mid-March to August inclusive by SNH (2014). These observations were collected between the dates of 17th March to 21st August 2015.

Table 8-9 Breeding wader territories: 2014 and 2015

Species	Number of territories 2014	Number of territories 2015	Distribution
Common sandpiper	0	0-1	South of Lounsheugh Rig
Curlew	max. 3	0	Activity concentrated around Upper Beoch, Martyr's Moss and Harecraigs Hill
Jack snipe	max. 2	0	Whig Hole and Lirgie Hill
Lapwing	1	0	Upper Beoch
Snipe	8-10	max. 10	Activity scattered across the Proposed Development Area (mainly along small watercourses), absent from the south.
Woodcock	max. 2	0	Bught Knowe and West Knowe

4.2.3 Winter Walkover

Winter walkover surveys were conducted during the 2013/2014 and 2014/2015 non-breeding seasons. Surveys recorded 34 species of which five are considered to be target species (Table 8-10, **Figure 8.13** and **Figure 8.14** in Volume 2 of the ES). Full details of the winter walkover surveys are provided within Annexes C and D and survey methodology is provided within Annex B.

Table 8-10 Winter walkover: target species records

Species	2013/2014 non-breeding season		2014/2015 non-breeding season	
	Number of records	Total number of birds	Number of records	Total number of birds
Hen harrier ⁷	0	0	3	3
Jack snipe	6	6	2	2
Lapwing	3	3	0	0
Snipe	10	10	3	3
Woodcock	0	0	2	2

4.2.4 Scarce Breeding Birds

Scarce breeding bird surveys were conducted during the 2015 (March to July) and 2016 (May to July) breeding seasons.

Barn owl were recorded roosting at Upper Beoch on two occasions, however no breeding behaviour was recorded. Envirocentre also checked for barn owl in April 2014, with no birds recorded. Goshawk and peregrine (target raptor species) were also recorded during surveys (**Figure 8.10** in Volume 2 of the ES) but were not considered to be breeding/no breeding attempts were located.

Buzzard, kestrel, sparrowhawk and tawny owl (secondary raptor species) were also recorded across the survey area and are likely to have bred within the wider area.

Full details of the scarce breeding bird surveys are provided within Annexes C and D and survey methodology is provided within Annex B.

⁷ Three records of the same male on the same day.

4.2.5 *Black Grouse*

Surveys to identify areas of black grouse activity, locate lek locations and establish lek size were conducted in the 2014, 2015 and 2016 breeding seasons during March (2014), April and May. Surveys identified one lek location with a maximum of three, four and one male(s) recorded in 2014, 2015 and 2016 respectively (**Figure 8.9**). From the summary provided by Envirocentre, 2014 lek activity did not appear to be tied to one main lek site, with the lek location proving to be quite mobile (although small). Full details of the black grouse surveys are provided within Annexes C and D and survey methodology is provided within Annex B.

ⁱ Scottish Natural Heritage (2013) Recommended Bird Survey Methods to inform impact assessment of Onshore Windfarms.

ⁱⁱ Scottish Natural Heritage (2014) Recommended Bird Survey Methods to inform impact assessment of Onshore Windfarms.

ⁱⁱⁱ EC Directive 79/409 on the Conservation of Wild Birds. Special Protection Area (SPA) citation: Muirkirk and North Lowther Uplands, Strathclyde and Ayrshire / Dumfries and Galloway, UK9003261.

^{iv} Site of Special Scientific Interest (SSSI) citation: Muirkirk Uplands, East Ayrshire / South Lanarkshire, Site Code 8166.

^v Site of Special Scientific Interest (SSSI) citation: North Lowther Uplands, Dumfries and Galloway / South Lanarkshire, Site Code 8161.

^{vi} Site of Special Scientific Interest (SSSI) citation: Bogton Lochs, East Ayrshire, Site Code 240.

^{vii} Site of Special Scientific Interest (SSSI) citation: Merrick Kells, Dumfries and Galloway / South Ayrshire / East Ayrshire, Site Code 1148.

ANNEX A ORNITHOLOGICAL LEGAL PROTECTION

In Scotland, all wild birds are protected under the Wildlife and Countryside Act 1981 (the 'Act'), as amended by the Nature Conservation (Scotland) Act 2004. This protection also extends to their eggs and nests, with it being an offence to intentionally or recklessly¹:

- Kill, injure or take any wild bird²;
- Take, damage, destroy or otherwise interfere with the nest of any wild bird while it is being built or is in use³;
- At any other time take, damage, destroy or otherwise interfere with any nest habitually used by any wild bird included in Schedule A1 (Protected Nests and Nest Sites for Birds: white-tailed eagle and golden eagle)⁴;
- Obstruct or prevent any wild bird from using its nest⁵; or
- Take or destroy an egg of any wild bird⁶.

It is also an offence to have in possession or control any live or dead wild bird or any part thereof; or any egg or part of an egg of any wild bird⁷.

Further special protection under this legislation is afforded to those species listed on Schedule 1 of the Act. For these species, it is an offence to:

- Intentionally or recklessly disturb any wild bird listed on Schedule 1 while it is nest building, or is in, on or near a nest containing eggs or young, or disturb the dependent young of such a bird⁸;
- Intentionally or recklessly disturb any wild birds included on Schedule 1 which leks, while it is doing so⁹ (capercaillie is the only bird this offence applies to in Scotland);
- Intentionally or recklessly harass any wild bird included in Schedule 1A¹⁰. Section 1, subsection 5B states, '*Subject to the provisions of this Part, any person who intentionally or recklessly harasses any wild bird included in Schedule 1A shall be guilty of an offence*'. At this time, Schedule 1A includes golden eagle, hen harrier, red kite and white-tailed eagle. This updated legislation was introduced on 16 March 2013; or

¹ Exceptions to these offences exist under various circumstances (e.g. controlling pest species; taking birds during specific season; and killing sick or injured birds etc.).

² Wildlife and Countryside Act 1981, Section 1(1)(a)

³ Wildlife and Countryside Act 1981, Section 1(1)(b)

⁴ Wildlife and Countryside Act 1981, Section 1(1)(ba)

⁵ Wildlife and Countryside Act 1981, Section 1(1)(bb)

⁶ Wildlife and Countryside Act 1981, Section 1(1)(c)

⁷ Wildlife and Countryside Act 1981, Section 1(2)

⁸ Wildlife and Countryside Act 1981, Section 1(5)

⁹ Wildlife and Countryside Act 1981, Section 1(5A)

¹⁰ Wildlife and Countryside Act 1981, Section 1(5B)

- Intentionally or recklessly take, damage, destroy or otherwise interfere with any nest and/or nest site habitually used by any bird on Schedule A1 at any time. At this time, Schedule 1A includes golden eagle and white-tailed eagle¹¹;

It is also an offence to knowingly cause or permit to be done an act which is made unlawful by any of the above provisions.

Further protection is described under the EU Birds Directive which requires member states to maintain wild bird species in favourable conservation status¹² and promote the conservation of bird species listed within Annex 1 of the Birds Directive through the protection of their habitat. This is achieved via the designation of Special Protection Areas (SPAs).

Red List bird species are those deemed to be globally threatened and to be suffering population declines within the UK. Although not legally enforceable, the conservation of Red List bird species represents a material consideration, in planning terms.

¹¹ This reflects the changes introduced by the Wildlife and Countryside Act 1981 (as amended by: Variation of Schedules A1 and 1A (Scotland) Order 2013

¹² While the term 'favourable conservation status' is not used in the Birds Directive, EU court cases over recent years have progressively interpreted the concept as meaningful in a Birds Directive context (SNH, 2006).

ANNEX B ORNITHOLOGICAL SURVEY METHODOLOGIES

A range of ornithological surveys have been conducted at the proposed Over Hill Wind Farm (hereafter referred to as the 'Proposed Development'). The methodologies used by MacArthur Green in these surveys are summarised in the sections below; more detailed descriptions are provided in the SNH guidance (2014ⁱ), Hardey *et al.* (2013ⁱⁱ) and Gilbert *et al.* (1998ⁱⁱⁱ).

Survey Area

Surveys were undertaken by MacArthur Green during the 2015 and 2016 breeding and 2014/2015 non-breeding season. General flight activity, black grouse, winter walkover, breeding and scarce breeding bird surveys were buffered from the Proposed Development Area provided by the client at the time of surveys. The Proposed Development Area was larger than the final turbine layout and therefore all surveys covered the infrastructure shown on Figure 8.2 in Volume 2 of the ES.

The Collision Risk Analysis Area (CRAA) was created by buffering each turbine by 250 metres (m) and joining up the outer boundaries of the buffers (Figure 8.2 in Volume 2 of the ES). Using a 250 m area around the turbines is suitable because of the small site and change in habitat type outside the site boundary. Target species flight activity within this area was used to inform the Collision Risk Model (CRM).

B.1 Flight Activity Survey

The aims of the flight activity (vantage point) surveys are: (1) to record flight activity within the vicinity of the site in order to identify areas of importance to birds; and (2) to quantify flight activity within 500 m of the proposed turbine in order to estimate the likelihood of collision (SNH 2014 P.14-15ⁱ).

Timing

- A survey period of 36 hours is recommended as the minimum level of sampling intensity at each Vantage Point (VP) for each season (breeding, non-breeding) (SNH 2014 P.17ⁱ);
- Watches were spread as evenly throughout the year as possible to ensure that temporally representative data are collected (see Annex C). Specific consideration was given to the period around dawn and twilight for breeding waders and to changing raptor behaviour across seasons (SNH 2014 P.16ⁱ); and
- Watches were suspended and resumed to take account of changes in visibility (e.g. fluctuations in cloud base). Watches were undertaken in conditions of good ground visibility when the cloud base was higher than the most elevated ground being observed.
- Watches were conducted in a range of weather conditions and were spread throughout the day (see Annexes C and D).

Field Methods

- Viewshed analysis was conducted using Arc GIS to confirm suitable VP locations and their associated visible areas¹;
- Reconnaissance surveys were undertaken to refine VP locations;
- The VP locations and associated viewsheds are detailed in Figure 8.3 in Volume 2 of the ES;
- Care was taken to maximize the area visible whilst minimising disturbance to birds;
- The final VP locations were selected with the aim of achieving coverage of the whole study area such that no point was greater than 2 km from a VP. This objective was achieved for the majority of the CRAA, although a section along the North East and South East Proposed Development boundary within the CRAA (18.31%) remained not visible² at 20 m;
- A maximum 180° view arc was scanned. This rule did not however apply when tracking migratory waterfowl, or raptors across the CRAA;
- Each watch lasted a maximum of three hours but was suspended and then resumed to take account of changes in visibility (e.g. fluctuations in the cloud base).

For species of high nature conservation importance (target species) the following data were recorded (SNH 2014 P.17-18¹):

- The flightlines by individuals or flocks of birds;
- The time the target bird was detected and the duration (seconds) spent flying over a defined study area (the viewshed);
- The birds' flight heights (defined into the following height bands: 0-20 m, 21-40 m, 41-100 m, 101-150 m, >151 m) were recorded at the point of detection and at 15 second intervals thereafter. From this the proportion of time spent flying below, within (referred to as Potential Collision Height (PCH)) and above approximate rotor height could be estimated. The actual rotor height is 36 - 150 m. This difference is accounted for within the collision risk models on the assumption of even flight distribution;
- The route followed was plotted in the field onto 1:25,000 scale maps;
- For secondary species, activity summaries were sub-divided into 5 minute periods at the end of which the number and activity of all secondary species were recorded;
- If a target species was being tracked during a 5 minute period, then the activity summary for that period was abandoned and a new one started once observations of the target species had ended;
- Observation of target species took priority over recording secondary species;

¹ The viewsheds are based on a 5m DTM to provide a representation of visibility from the observer locations; this is confirmed and refined through field site visits.

² The habitat here is of sufficient similarity such that the survey data collected and subsequently assessed are considered to be representative of the whole CRAA. In addition, there were no records made during any of the BBS, breeding raptor and walkover surveys which would suggest that this area was of any importance to target species.

- The number of birds recorded were the minimum number of individuals that could account for the activity observed; and
- Observers only recorded perched birds and birds on water-bodies once only on arrival at the VP. Thereafter only flying birds and newly noticed perched/swimming birds were included in the activity summaries.

B.2 Moorland Breeding Bird Survey

Upland breeding bird survey methodology was employed as detailed within SNH Guidance (SNH 2014 P.11-13ⁱ). In summary, surveys involved the following:

- Open upland (including hedgerows, scrub, isolated trees and copses) was surveyed using an intensive version of the Brown and Shepherd (1993^{iv}) method for upland bird survey;
- The objectives were to map the distribution of breeding bird territories and estimate the approximate size of breeding bird populations;
- Due to the cryptic nature of many breeding birds, a minimum and maximum number of pairs was identified for each target species;
- The survey covered all areas within 500 m of the Proposed Development Area where coverage was possible; and
- All upland wader species were recorded during the breeding bird survey.

Timing

- The area was surveyed four times during each breeding season (2015 and 2016) as per Calladine *et al.* (2009^v);
- Fieldwork was undertaken between sunrise and sunrise and 1800hrs; and
- Fieldwork was not undertaken in conditions considered likely to affect bird detection rates, for example in winds greater than Beaufort Scale Force 4, persistent precipitation, poor visibility (less than 300 m), or in unusually hot weather.

Field Methods

- Walk-routes which optimised ground visibility were used;
- Surveyors paused at appropriate vantage and listening points;
- Isolated trees, copses and patches of scrub were approached and examined;
- Streams, ditches and hedgerows were walked;
- All other areas were approached to within 100 m; and
- Registrations were mapped at the first location that behaviour indicative of breeding was observed; and
- Standard BTO³ activity codes were used.

³ British Trust for Ornithology

B.3 Winter Walkover

Winter walkovers were performed in the 2014/2015 non-breeding season to map wintering populations of birds.

- The area was surveyed three times during each non-breeding season;
- These surveys involved following a route that optimised ground coverage, such that observers walked within 250 m of every point; and
- Observers periodically stopped at appropriate viewing and listening points along the route and longer vantage point watches were included within the walkover to allow potentially important areas to be monitored in greater detail.

B.4 Scarce Breeding Bird Survey

The aim of the scarce breeding bird surveys was to determine the distribution of occupied nests/territories for target raptor and owl species within 2 km of the Proposed Development Area and record breeding success. Secondary species such as buzzard, sparrowhawk and kestrel were included within 1 km of the Proposed Development Area. Surveys were undertaken during the 2015 and 2016 breeding seasons.

Surveys were undertaken by experienced and licensed⁴ field ornithologists. Extreme care was taken to avoid unnecessary disturbance to breeding birds.

Guidance from SNH (SNH 2014 P.11-13ⁱ), Gilbert *et al.* (1998ⁱⁱⁱ) and Hardey *et al.* (2013ⁱⁱ) were all consulted to inform survey methodology and are referenced where appropriate in the species methodologies below.

Barn Owl

- The surveys followed methodology outlined in Gilbert *et al.* (1998ⁱⁱⁱ), as mentioned in SNH Guidance (SNH 2014 P.12-13ⁱ);
- Surveys were undertaken within 1 km of the Proposed Development; and
- Surveyors checked for signs of occupation (moulted feathers, pellets) in all suitable buildings within this 1 km buffer where access was possible.

Goshawk

Methodology outlined in Hardey *et al.* (2013ⁱⁱ) was used as guidance for the surveying of areas for potential goshawk breeding. Extreme care was taken not to disturb potential nests especially around the time of year when females were likely to be laying or incubating.

- Areas of suitable woodland were observed for the presence of nests. Searches for goshawk nests were focused on mature forestry blocks, although their presence was not ruled out of other wooded areas;
- Searches carried out between March and April focussed on observing territorial and nest building behaviours;

⁴ All surveyors hold SNH Schedule 1 Licences.

- Where nests were known to be present, scans were carried out between mid-March and May to confirm breeding. Scans were kept brief – carried out for between 5-10 minutes and from a distance; and
- When breeding was confirmed, searches for further nests were deferred until such a time as the young had hatched. Searches were then undertaken between late May and late June for evidence of provisioning young and then between late July and early August to watch for fledgling activity, this included listening for the begging calls of newly fledged young.

Hen Harrier

Methodology outlined in Hardey *et al.* (2013ⁱⁱ) was used as guidance for the surveying of areas for potential hen harrier breeding. Extreme care was taken not to disturb potential nests especially around the time of year when females were likely to be laying or in cold/wet weather when females were likely to be incubating or brooding. Areas of suitable habitat⁵ were visited during four time periods across the breeding season to:

- Check for territory occupancy (between March and mid-April) – this consisted of watching over suitable habitat from a good vantage point for displaying males (and females) and checking all areas of suitable habitat to within 250 m (watching out for signs of kills);
- Locate incubating females (between mid-April and late May) by listening for female begging calls and watching for food passes between the male and female – surveyors watched for at least four hours as Hardey *et al.* (2013ⁱⁱ) notes that when the female is incubating it can be up to six hours between feeding visits from the male, but on average it is less than every four hours. Surveys were undertaken between 06:00 to 12:00 or 16:00 to 20:00;
- Check for young or breeding evidence (between late May and late June) again by listening for female begging calls and watching for food passes between male and female when the female is brooding and watching for the male and female provisioning the nest with food once brooding has ended– surveyors watched for at least two hours as Hardey *et al.* (2013ⁱⁱ) notes that an adult bird will visit the nest every 1-2 hours. Surveyors also watched for display behaviour which could indicate a failed breeding attempt; and
- Check for fledged young (between late June and late August).

Merlin

Methodology outlined in Hardey *et al.* (2013ⁱⁱ) was used as guidance for the surveying of areas for potential merlin breeding.

- Areas of suitable nesting habitat (including forest edge where trees are >5 m high) were closely observed between 20th March and 30th April;
- Boulders, fence lines, isolated posts, stone dykes, grouse butts, hummocks, stream banks, crags, trees and recently burnt areas of heather were checked for signs of occupation (e.g. plucked prey, moulted feathers, pellets and faeces);

⁵ Unsuitable habitat areas include: land above 600 m; improved pasture and arable land; extensive areas of degraded land with no heather cover and low vegetation; the vicinity of cliffs, rocky outcrops, boulder fields and scree; areas within 100m of hill farms and occupied dwellings.

- If merlin were observed, or signs found, areas were visited at least twice to verify occupation of the site; and
- Potential nest areas were watched for 4-6 hours if necessary.

Osprey

Methodology outlined in Hardey *et al.* (2013ⁱⁱ) and Gilbert *et al.* (1998ⁱⁱⁱ) was used as guidance for the surveying of areas for potential osprey breeding. Care was taken when carrying out the searches so as not to disturb any displaying or nesting birds, with nests checked from a distance.

- All wooded areas within the study area were searched for the possible presence of nests, especially those located close to freshwater lochs and rivers that could provide feeding sites. Artificial platforms were also checked;
- If breeding was suspected within the study area, the location was visited between April and May until nesting was confirmed;
- In line with the methods suggested by Gilbert *et al.* (1998ⁱⁱⁱ) and Hardey *et al.* (2013ⁱⁱ), proof of occupancy was determined by:
 - Two ospreys seen on the same eyrie on more than one occasion (with a week separating observations);
 - Incubation; or
 - Feeding of chicks.
- Further scans were undertaken between late May and early July to try and observe any young in the nests.

Peregrine Falcon

- Potential nest sites were visited and checked for evidence of occupation between March and April;
- Sites checked included crags and steep banks identified from OS maps and searches of the study area;
- Surveyors checked for signs of occupation (e.g. faecal splash, fresh plucked prey);
- If occupied sites were found they were re-visited to verify incubation; and
- Searches were made for eyries. Where this was not possible sites were watched from a suitable vantage point for 3-4 hours or until a nest was located.

Short-Eared Owl

- At least two visits between early April and the end of May were carried out;
- Suitable habitat was visited and checked for evidence of hunting males, territorial activity and other signs of presence; and
- If breeding was confirmed, a further visit was made in June to watch birds, locate nest-sites and confirm breeding behaviour wherever possible.

B.5 Black Grouse Survey

The survey methodology used is detailed in SNH Guidance (SNH 2007^{vi} and SNH 2014 P.12ⁱ) and a summary is provided below. Surveys were conducted in April and May in 2014 and May 2015.

- Breeding black grouse were surveyed within 1.5 km of the Proposed Development Area by counting total numbers of males and females at leks, most lekking activity taking place at or soon after dawn in spring.
- Known lek sites and other areas of suitable habitat which can host leks were identified and visited during April within 2 hours of dawn on calm dry days with good visibility;
- Visits involved listening and scanning for lekking black grouse from strategic locations (avoiding disturbance of leks) and during walks between these locations ensuring that all potential habitat was covered;
- The maximum count of males in the 2 hours around dawn gives the standard count estimate but the maximum number of females seen was also presented; and
- Leks that were at least 200 m apart within the same year were treated as separate leks.

ⁱ Scottish Natural Heritage (2014) Recommended bird survey methods to inform impact assessment of onshore windfarms.

ⁱⁱ Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. and Thompson, D. (2013) Raptors: a field guide for surveys and monitoring (3rd edition). The Stationery Office, Edinburgh.

ⁱⁱⁱ Gilbert, G., Gibbons, D. W. and Evans, J. (1998) Bird Monitoring Methods. RSPB, Sandy.

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

^v Calladine, J., Garner, G., Wernham, C., and Thiel, A. (2009) The influence of survey frequency on population estimates of moorland breeding birds. Bird Study, 56: 3, 381-388.

^{vi} Scottish Natural Heritage (2007) Black grouse survey methodology.

ANNEX C ORNITHOLOGICAL SURVEY EFFORT & GENERAL INFORMATION

Table C-1 shows the system used for recording weather conditions on all the surveys detailed in sections C1 to C6 below. Sections C.1 to C.5 contain all data collected by MacArthur Green (see Technical Appendix 8.1 for a summary of data collected by Envirocentre).

Table C-1 Key to meteorological conditions recorded during all surveys

Wind speed		Rain		Cloud cover		Cloud height	
Calm	0	None	0	In eighths		<150m	0
Light air	1	Drizzle/Mist	1	<i>e.g.</i>	3/8	150-500m	1
Light breeze	2	Light showers	2			>500m	2
Gentle breeze	3	Heavy showers	3				
Moderate breeze	4	Heavy rain	4				
Fresh breeze	5						
Strong breeze	6	Snow		Frost		Visibility	
Moderate gale	7	None	0	None	0	Poor (<1km)	0
Fresh gale	8	On site	1	Ground	1	Moderate (1-2km)	1
Strong gale	9	High ground	2	All day	2	Good (>2km)	2
Whole gale	10						
Storm	11						
Hurricane	12						

C.1 Flight Activity Surveys

Flight activity surveys were undertaken during the 2015 and 2016 breeding seasons and 2014/2015 non-breeding season to record the presence and activity of target and secondary species. Details of the flight activity surveys undertaken across each Vantage Point (VP) location are supplied in Table C-2 (see Technical Appendix 8.1, Table 8-2 for a summary of hours surveyed at each VP per season) and the associated weather data recorded is detailed in Table C-3. See Annex B for the survey methodology and Annex D for the survey results.

Table C-2 Summary of flight activity surveys undertaken at Over Hill Wind Farm (sorted by VP per season)

Date	Season	Observer	VP	Survey start time	Survey finish time	No. hours ¹ surveyed
28/10/2014	NBR 2014/2015	JM	1	1030	1330	3
28/10/2014	NBR 2014/2015	JM	1	1400	1600	2
28/11/2014	NBR 2014/2015	JM	1	0855	1155	3
28/11/2014	NBR 2014/2015	JM	1	1225	1425	2
11/12/2014	NBR 2014/2015	JM	1	1050	1250	2
11/12/2014	NBR 2014/2015	JM	1	1320	1520	2
12/01/2015	NBR 2014/2015	JM	1	0930	1130	2
12/01/2015	NBR 2014/2015	JM	1	1200	1400	2
02/02/2015	NBR 2014/2015	JM	1	0930	1230	3
02/02/2015	NBR 2014/2015	JM	1	1300	1500	2
23/02/2015	NBR 2014/2015	JM	1	1120	1420	3
23/02/2015	NBR 2014/2015	JM	1	1450	1650	2
05/03/2015	NBR 2014/2015	JR	1	0730	1030	3
05/03/2015	NBR 2014/2015	JR	1	1100	1300	2
29/10/2014	NBR 2014/2015	JM	2	1015	1315	3
29/10/2014	NBR 2014/2015	JM	2	1345	1545	2
12/11/2014	NBR 2014/2015	RD	2	1005	1305	3
12/11/2014	NBR 2014/2015	RD	2	1335	1535	2
19/12/2014	NBR 2014/2015	JM	2	0930	1230	3
16/01/2015	NBR 2014/2015	JM	2	1000	1200	2
16/01/2015	NBR 2014/2015	JM	2	1230	1430	2
18/02/2015	NBR 2014/2015	JR	2	1000	1300	3
18/02/2015	NBR 2014/2015	JR	2	1330	1530	2
02/03/2015	NBR 2014/2015	JR	2	1200	1500	3
02/03/2015	NBR 2014/2015	JR	2	1530	1730	2
11/03/2015	NBR 2014/2015	SS	2	0630	0930	3
11/03/2015	NBR 2014/2015	SS	2	1000	1300	3

¹ Note: only valid hours (i.e. where visibility was at least 1km) are presented in this column.

Date	Season	Observer	VP	Survey start time	Survey finish time	No. hours ¹ surveyed
17/03/2015	BR 2015	JR	1	1115	1415	3
17/03/2015	BR 2015	JR	1	1445	1745	3
13/04/2015	BR 2015	MW	1	0700	1000	3
13/04/2015	BR 2015	MW	1	1030	1330	3
29/05/2015	BR 2015	HW	1	0900	1200	3
29/05/2015	BR 2015	HW	1	1230	1530	3
19/06/2015	BR 2015	HW	1	0545	0845	3
19/06/2015	BR 2015	HW	1	0915	1245	3
21/07/2015	BR 2015	AM	1	0600	0900	2
21/07/2015	BR 2015	AM	1	0930	1230	3
21/08/2015	BR 2015	HW	1	0840	1140	3
21/08/2015	BR 2015	HW	1	1210	1510	3
23/03/2015	BR 2015	JR	2	1000	1300	3
23/03/2015	BR 2015	JR	2	1330	1630	3
09/04/2015	BR 2015	JR/HW	2	0700	1000	3
09/04/2015	BR 2015	JR/HW	2	1030	1230	2
08/05/2015	BR 2015	JM	2	0745	1045	3
08/05/2015	BR 2015	JM	2	1115	1415	3
30/06/2015	BR 2015	MW	2	1500	1800	3
30/06/2015	BR 2015	MW	2	1830	1930	1
24/07/2015	BR 2015	AM	2	0530	0830	3
24/07/2015	BR 2015	AM	2	0900	1200	3
17/08/2015	BR 2015	MW	2	0930	1230	3
17/08/2015	BR 2015	MW	2	1300	1600	3
20/08/2015	BR 2015	MW	2	1100	1400	3
19/05/2016	BR 2016	MW	3	0930	1230	3
19/05/2016	BR 2016	MW	3	1300	1600	3
26/05/2016	BR 2016	AM	3	1115	1415	3
26/05/2016	BR 2016	AM	3	1445	1745	3
28/05/2016	BR 2016	AM	3	1900	2200	3
05/06/2016	BR 2016	AM	3	1515	1815	3

Date	Season	Observer	VP	Survey start time	Survey finish time	No. hours ¹ surveyed
18/06/2016	BR 2016	AM	3	1230	1530	3
25/06/2016	BR 2016	AM	3	1730	2030	3
08/07/2016	BR 2016	MW	3	0745	1045	3
08/07/2016	BR 2016	MW	3	1115	1415	3
22/08/2016	BR 2016	MW	3	0600	0900	3
22/08/2016	BR 2016	MW	3	0930	1230	3
13/05/2016	BR 2016	AM	4	0820	1120	3
13/05/2016	BR 2016	AM	4	1150	1450	3
20/05/2016	BR 2016	MW	4	0445	0745	3
20/05/2016	BR 2016	MW	4	0815	1115	3
28/05/2016	BR 2016	AM	4	1520	1820	3
05/06/2016	BR 2016	AM	4	1850	2150	3
18/06/2016	BR 2016	AM	4	0850	1150	3
25/06/2016	BR 2016	AM	4	1400	1700	3
15/07/2016	BR 2016	MW	4	0930	1230	3
15/07/2016	BR 2016	MW	4	1300	1600	2
23/08/2016	BR 2016	JR	4	1330	1630	3
23/08/2016	BR 2016	JR	4	1700	2000	3

Table C-3 Meteorological conditions during flight activity surveys at Over Hill Wind Farm (sorted chronologically)

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
28/10/2014	1	JM	1030	1330	1	4	W	4	8	1	2	0	0
28/10/2014	1	JM	1030	1330	2	4	W	4	8	1	2	0	0
28/10/2014	1	JM	1030	1330	3	3	W	4	8	1	2	0	0
28/10/2014	1	JM	1400	1600	1	3	W	0	7	2	2	0	0
28/10/2014	1	JM	1400	1600	2	3	W	0	4	2	2	0	0
29/10/2014	2	JM	1015	1315	1	0	0	0	6	2	2	0	0
29/10/2014	2	JM	1015	1315	2	0	0	0	7	2	2	0	0
29/10/2014	2	JM	1015	1315	3	1	SSE	0	3	2	2	0	0
29/10/2014	2	JM	1345	1545	1	0	0	0	4	2	2	0	0
29/10/2014	2	JM	1345	1545	2	1	SSE	0	5	2	2	0	0
12/11/2014	2	RD	1005	1305	1	4	SE	2	8	1	2	0	0
12/11/2014	2	RD	1005	1305	2	4	SE	0	8	1	2	0	0
12/11/2014	2	RD	1005	1305	3	4	SE	0	8	1	2	0	0
12/11/2014	2	RD	1335	1535	1	4	SE	2	8	1	2	0	0
12/11/2014	2	RD	1335	1535	2	4	SE	2	8	1	2	0	0
28/11/2014	1	JM	0855	1155	1	2	SE	0	2	2	2	1	0
28/11/2014	1	JM	0855	1155	2	2	SE	0	5	2	2	0	0
28/11/2014	1	JM	0855	1155	3	2	SE	0	6	2	2	0	0
28/11/2014	1	JM	1225	1425	1	3	SE	0	6	2	2	0	0
28/11/2014	1	JM	1225	1425	2	3	SE	0	7	2	2	0	0
11/12/2014	1	JM	1050	1250	1	5	W	3	6	2	2	0	2
11/12/2014	1	JM	1050	1250	2	5	W	3	7	1	2	0	2
11/12/2014	1	JM	1320	1520	1	6	W	3	8	1	2	0	2
11/12/2014	1	JM	1320	1520	2	5	W	3	8	2	2	0	2
19/12/2014	2	JM	0930	1230	1	5	W	3	6	2	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
19/12/2014	2	JM	0930	1230	2	6	W	3	7	1	2	0	0
19/12/2014	2	JM	0930	1230	3	6	W	3	8	1	2	0	0
12/01/2015	1	JM	0930	1130	1	6	W	3	6	2	2	0	0
12/01/2015	1	JM	0930	1130	2	6	W	3	5	2	2	0	0
12/01/2015	1	JM	1200	1400	1	5	W	0	7	2	2	0	0
12/01/2015	1	JM	1200	1400	2	6	W	0	6	2	2	0	0
16/01/2015	2	JM	1000	1200	1	2	W	0	6	2	2	1	0
16/01/2015	2	JM	1000	1200	2	3	W	2	6	2	2	1	0
16/01/2015	2	JM	1230	1430	1	3	W	2	5	2	2	1	0
16/01/2015	2	JM	1230	1430	2	3	W	0	3	2	2	1	0
02/02/2015	1	JM	0930	1230	1	1	NW	0	5	2	2	2	1
02/02/2015	1	JM	0930	1230	2	1	NW	0	5	2	2	2	1
02/02/2015	1	JM	0930	1230	3	1	NW	0	4	2	2	2	1
02/02/2015	1	JM	1300	1500	1	1	NW	0	6	2	2	2	1
02/02/2015	1	JM	1300	1500	2	1	NW	0	6	2	2	2	1
18/02/2015	2	JM	1000	1300	1	2	SSW	4	8	1	1	0	0
18/02/2015	2	JM	1000	1300	2	3	SSW	0	7	2	2	0	0
18/02/2015	2	JM	1000	1300	3	3	SSW	1	8	2	2	0	0
18/02/2015	2	JM	1330	1530	1	4	SSW	0	8	1	2	0	0
18/02/2015	2	JM	1330	1530	2	5	SSW	0	8	1	2	0	0
23/02/2015	1	JM	1120	1420	1	5	SSW	2	8	2	2	1	1
23/02/2015	1	JM	1120	1420	2	5	SSW	0	8	2	2	1	1
23/02/2015	1	JM	1120	1420	3	5	SSW	0	8	2	2	0	1
23/02/2015	1	JM	1450	1650	1	5	SSW	0	8	2	2	0	1
23/02/2015	1	JM	1450	1650	2	5	SSW	2	8	2	2	0	1
02/03/2015	2	JR	1200	1500	1	1	W	3	7	2	2	1	1
02/03/2015	2	JR	1200	1500	2	3	W	2	7	2	2	1	1

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
02/03/2015	2	JR	1200	1500	3	3	W	0	7	2	2	1	1
02/03/2015	2	JR	1530	1730	1	3	W	2	6	2	2	1	1
02/03/2015	2	JR	1530	1730	2	3	W	2	7	2	2	1	1
05/03/2015	1	JR	0730	1030	1	3	SSW	0	8	1	2	0	2
05/03/2015	1	JR	0730	1030	2	3	SSW	1	8	1	2	0	2
05/03/2015	1	JR	0730	1030	3	3	SSW	1	8	2	2	0	2
05/03/2015	1	JR	1100	1300	1	3	SSW	0	8	2	2	0	2
05/03/2015	1	JR	1100	1300	2	3	SSW	0	6	2	2	0	2
11/03/2015	2	SS	0630	0930	1	4	SE	0	2	2	2	1	0
11/03/2015	2	SS	0630	0930	2	4	SE	0	5	2	2	1	0
11/03/2015	2	SS	0630	0930	3	5	SE	0	7	2	2	1	0
11/03/2015	2	SS	1000	1300	1	6	SE	1	8	2	2	0	0
11/03/2015	2	SS	1000	1300	2	7	SE	3	8	2	1	0	0
11/03/2015	2	SS	1000	1300	3	8	SE	3	8	2	1	0	0
17/03/2015	1	JR	1115	1415	1	0	0	0	8	2	2	0	0
17/03/2015	1	JR	1115	1415	2	1	E	0	7	2	2	0	0
17/03/2015	1	JR	1115	1415	3	1	E	0	8	2	2	0	0
17/03/2015	1	JR	1445	1745	1	0	0	0	8	2	2	0	0
17/03/2015	1	JR	1445	1745	2	0	0	0	8	2	2	0	0
17/03/2015	1	JR	1445	1745	3	0	0	0	8	2	2	0	0
23/03/2015	2	JR	1000	1300	1	3	NW	2	4	2	2	0	0
23/03/2015	2	JR	1000	1300	2	3	NW	0	4	2	2	0	0
23/03/2015	2	JR	1000	1300	3	3	NW	0	3	2	2	0	0
23/03/2015	2	JR	1330	1630	1	3	NW	0	4	2	2	0	0
23/03/2015	2	JR	1330	1630	2	3	NW	0	4	2	2	0	0
23/03/2015	2	JR	1330	1630	3	3	NW	2	5	2	2	0	0
09/04/2015	2	JR/HW	0700	1000	1	1	S	0	1	2	2	1	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
09/04/2015	2	JR/HW	0700	1000	2	2	S	0	2	2	2	0	0
09/04/2015	2	JR/HW	0700	1000	3	2	S	0	2	2	2	0	0
09/04/2015	2	JR/HW	1030	1230	1	3	S	0	3	2	2	0	0
09/04/2015	2	JR/HW	1030	1230	2	3	S	0	3	2	2	0	0
13/04/2015	1	MW	0700	1000	1	1	SW	0	3	2	2	1	0
13/04/2015	1	MW	0700	1000	2	1	SW	0	4	2	2	1	0
13/04/2015	1	MW	0700	1000	3	1	SW	0	7	2	2	0	0
13/04/2015	1	MW	1030	1330	1	2	SW	0	5	2	2	0	0
13/04/2015	1	MW	1030	1330	2	3	SW	0	7	2	2	0	0
13/04/2015	1	MW	1030	1330	3	4	SW	0	8	2	2	0	0
29/05/2015	1	HW	0900	1200	1	4	SW	0	7	2	2	0	0
29/05/2015	1	HW	0900	1200	2	3	SW	0	6	2	2	0	0
29/05/2015	1	HW	0900	1200	3	3	W	3	6	2	2	0	0
29/05/2015	1	HW	0900	1200	1	3	W	3	6	2	2	0	0
29/05/2015	1	HW	0900	1200	2	3	W	2	6	2	2	0	0
29/05/2015	1	HW	0900	1200	3	3	W	2	5	2	2	0	0
08/05/2015	2	JM	0745	1045	1	1	NE	0	6	2	2	0	0
08/05/2015	2	JM	0745	1045	2	2	SE	0	6	2	2	0	0
08/05/2015	2	JM	0745	1045	3	3	SE	0	5	2	2	0	0
08/05/2015	2	JM	1115	1415	1	2	SE	0	7	2	2	0	0
08/05/2015	2	JM	1115	1415	2	2	SE	0	7	2	2	0	0
08/05/2015	2	JM	1115	1415	3	3	SE	0	8	2	2	0	0
19/06/2015	1	HW	0545	0845	1	1	0	0	8	1	2	0	0
19/06/2015	1	HW	0545	0845	2	2	W	0	8	1	2	0	0
19/06/2015	1	HW	0545	0845	3	3	W	0	8	1	2	0	0
19/06/2015	1	HW	0915	1215	1	4	SW	0	8	1	2	0	0
19/06/2015	1	HW	0915	1215	2	4	SW	0	8	2	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
19/06/2015	1	HW	0915	1215	3	5	SW	0	8	1	2	0	0
30/06/2015	2	MW	1500	1800	1	6	SSE	0	7	2	2	0	0
30/06/2015	2	MW	1500	1800	2	6	SSE	0	6	2	2	0	0
30/06/2015	2	MW	1500	1800	3	6	SSE	0	5	2	2	0	0
30/06/2015	2	MW	1500	1800	1	6	SSE	0	7	2	2	0	0
21/07/2015	1	AM	0600	0700	1	2	SSW	1	8	0	0	0	0
21/07/2015	1	AM	0700	0800	1	3	SSW	0	8	1	1	0	0
21/07/2015	1	AM	0800	0900	1	3	SW	2	8	2	2	0	0
21/07/2015	1	AM	0930	1030	1	3	SW	2	8	2	2	0	0
21/07/2015	1	AM	1030	1130	1	4	SW	0	7	2	2	0	0
21/07/2015	1	AM	1130	1230	1	4	SW	2	8	2	2	0	0
24/07/2015	2	AM	0530	0630	1	0	0	0	5	2	2	1	0
24/07/2015	2	AM	0630	0730	1	1	W	0	5	2	2	1	0
24/07/2015	2	AM	0730	0830	1	1	W	0	5	2	2	0	0
24/07/2015	2	AM	0900	1000	1	1	W	0	5	2	2	0	0
24/07/2015	2	AM	1000	1100	1	1	W	3	6	2	2	0	0
24/07/2015	2	AM	1100	1200	1	1	W	2	7	2	2	0	0
17/08/2015	2	MW	0930	1030	1	1	NE	0	2	2	2	0	0
17/08/2015	2	MW	1030	1130	1	2	NE	0	2	2	2	0	0
17/08/2015	2	MW	1130	1230	1	3	NE	0	3	2	2	0	0
17/08/2015	2	MW	1300	1400	1	3	NE	0	4	2	2	0	0
17/08/2015	2	MW	1400	1500	1	3	NE	0	4	2	2	0	0
17/08/2015	2	MW	1500	1600	1	3	NE	0	5	2	2	0	0
20/08/2015	2	MW	1100	1200	1	4	SW	0	8	2	2	0	0
20/08/2015	2	MW	1200	1300	1	5	SW	0	7	2	2	0	0
20/08/2015	2	MW	1300	1400	1	5	SW	0	8	2	2	0	0
21/08/2015	1	HW	0840	0940	1	1	S	1	8	1	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
21/08/2015	1	HW	0940	1040	1	3	S	2	8	1	2	0	0
21/08/2015	1	HW	1040	1140	1	4	S	2	8	2	2	0	0
21/08/2015	1	HW	1210	1310	1	5	S	0	6	2	2	0	0
21/08/2015	1	HW	1310	1410	1	4	S	0	5	2	2	0	0
21/08/2015	1	HW	1410	1510	1	3	S	0	4	2	2	0	0
15/07/2016	4	MW	0930	1230	1	5	S	0	8	2	2	0	0
15/07/2016	4	MW	0930	1230	2	6	SSW	4	8	2	2	0	0
15/07/2016	4	MW	0930	1230	3	5	SSW	4	8	1	1	0	0
15/07/2016	4	MW	1300	1600	1	5	SSW	4	8	1	1	0	0
15/07/2016	4	MW	1300	1600	2	5	SSW	4	8	1	1	0	0
15/07/2016	4	MW	1300	1600	3	5	SSW	4	8	0	0	0	0
08/07/2016	3	MW	0745	1045	1	3	WSW	0	8	2	2	0	0
08/07/2016	3	MW	0745	1045	2	3	WSW	0	7	2	2	0	0
08/07/2016	3	MW	0745	1045	3	4	WSW	0	8	2	2	0	0
08/07/2016	3	MW	1115	1415	1	4	WSW	2	8	2	2	0	0
08/07/2016	3	MW	1115	1415	2	4	WSW	3	8	2	2	0	0
08/07/2016	3	MW	1115	1415	3	3	WSW	3	8	2	2	0	0
20/05/2016	4	MW	0445	0745	1	2	SSW	0	8	2	2	0	0
20/05/2016	4	MW	0445	0745	2	3	SSW	0	8	2	2	0	0
20/05/2016	4	MW	0445	0745	3	5	SSW	0	8	2	2	0	0
20/05/2016	4	MW	0815	1115	1	5	SSW	0	7	2	2	0	0
20/05/2016	4	MW	0815	1115	2	5	SSW	0	7	2	2	0	0
20/05/2016	4	MW	0815	1115	3	5	SSW	0	7	2	2	0	0
19/05/2016	3	MW	0930	1230	1	3	SW	0	8	2	2	0	0
19/05/2016	3	MW	0930	1230	2	4	SW	0	8	2	2	0	0
19/05/2016	3	MW	0930	1230	3	5	S	0	8	2	2	0	0
19/05/2016	3	MW	1300	1600	1	5	S	4	8	2	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
19/05/2016	3	MW	1300	1600	2	6	S	4	8	2	2	0	0
19/05/2016	3	MW	1300	1600	3	6	S	4	8	2	2	0	0
18/06/2016	3	AM	1230	1530	1	2	SW	0	5	2	2	0	0
18/06/2016	3	AM	1230	1530	2	2	SW	0	5	2	2	0	0
18/06/2016	3	AM	1230	1530	3	2	SW	0	5	2	2	0	0
18/06/2016	4	AM	0850	1150	1	1	NW	0	7	2	2	0	0
18/06/2016	4	AM	0850	1150	2	2	WNW	0	7	2	2	0	0
18/06/2016	4	AM	0850	1150	3	3	WNW	0	6	2	2	0	0
25/06/2016	4	AM	1400	1700	1	1	NE	3	7	2	2	0	0
25/06/2016	4	AM	1400	1700	1	1	NE	0	7	2	2	0	0
25/06/2016	4	AM	1400	1700	1	2	WNW	2	7	2	2	0	0
25/06/2016	3	AM	1730	2030	1	2	WNW	3	7	2	2	0	0
25/06/2016	3	AM	1730	2030	2	2	WNW	3	7	2	2	0	0
25/06/2016	3	AM	1730	2030	3	2	WNW	3	7	2	2	0	0
26/05/2016	3	AM	1115	1415	1	2	NE	4	8	2	2	0	0
26/05/2016	3	AM	1115	1415	2	2	NE	4	8	2	2	0	0
26/05/2016	3	AM	1115	1415	3	2	NE	3	8	2	2	0	0
26/05/2016	3	AM	1445	1745	1	2	NE	3	8	2	2	0	0
26/05/2016	3	AM	1445	1745	2	2	NE	2	8	2	2	0	0
26/05/2016	3	AM	1445	1745	3	2	NE	2	8	2	2	0	0
28/05/2016	4	AM	1520	1820	1	1	ENE	0	6	2	2	0	0
28/05/2016	4	AM	1520	1820	2	1	NNE	2	7	2	2	0	0
28/05/2016	4	AM	1520	1820	3	1	NNW	2	7	2	2	0	0
28/05/2016	3	AM	1900	2200	1	1	NNW	0	7	2	2	0	0
28/05/2016	3	AM	1900	2200	2	1	NW	0	7	2	2	0	0
28/05/2016	3	AM	1900	2200	3	1	WSW	0	7	2	2	0	0
05/06/2016	3	AM	1515	1815	1	1	NW	0	7	2	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
05/06/2016	3	AM	1515	1815	2	1	NW	0	7	2	2	0	0
05/06/2016	3	AM	1515	1815	3	1	WNW	2	7	2	2	0	0
05/06/2016	4	AM	1850	2150	1	1	NNW	0	6	2	2	0	0
05/06/2016	4	AM	1850	2150	2	1	NNW	0	5	2	2	0	0
05/06/2016	4	AM	1850	2150	3	1	N	0	5	2	2	0	0
22/08/2016	3	MW	0600	0900	1	2	WSW	4	8	1	1	0	0
22/08/2016	3	MW	0600	0900	2	3	WSW	4	8	1	1	0	0
22/08/2016	3	MW	0600	0900	3	3	WSW	3	8	2	2	0	0
22/08/2016	3	MW	0930	1230	1	3	WSW	3	8	2	2	0	0
22/08/2016	3	MW	0930	1230	2	3	WSW	0	8	2	2	0	0
22/08/2016	3	MW	0930	1230	3	3	WSW	2	8	2	2	0	0
23/08/2016	4	JR	1330	1630	1	3	SSE	0	7	2	2	0	0
23/08/2016	4	JR	1330	1630	2	3	SSE	3	8	1	2	0	0
23/08/2016	4	JR	1330	1630	3	2	SSE	4	8	1	1	0	0
23/08/2016	4	JR	1700	2000	1	3	S	0	8	1	2	0	0
23/08/2016	4	JR	1700	2000	2	2	S	0	8	1	2	0	0
23/08/2016	4	JR	1700	2000	3	2	S	0	8	1	2	0	0
13/05/2016	4	AM	0820	1120	1	3	ENE	0	6	2	2	0	0
13/05/2016	4	AM	0820	1120	2	3	ESE	0	6	2	2	0	0
13/05/2016	4	AM	0820	1120	3	3	ESE	0	7	2	2	0	0
13/05/2016	4	AM	1150	1450	1	3	ESE	0	7	2	2	0	0
13/05/2016	4	AM	1150	1450	2	3	ESE	0	7	2	2	0	0
13/05/2016	4	AM	1150	1450	3	3	ESE	0	7	2	2	0	0

C.2 Moorland Breeding Bird Surveys

Moorland breeding bird surveys were undertaken during the 2015 and 2016 breeding seasons and were conducted monthly from April to July 2015 and May to July 2016. See Table C-4 for the survey dates and weather data recorded during these surveys, Annex B for the survey methodology and Annex D for the survey results.

Table C-4 Meteorological conditions during breeding bird surveys at Over Hill Wind Farm (sorted chronologically)

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
17/04/2015	1	MW	0630	1230	1	0	0	0	1	2	2	1	0
17/04/2015	1	MW	0630	1230	2	1	NE	0	2	2	2	0	0
17/04/2015	1	MW	0630	1230	3	2	NE	0	3	2	2	0	0
17/04/2015	1	MW	0630	1230	4	2	NE	0	4	2	2	0	0
17/04/2015	1	MW	0630	1230	5	2	NE	0	4	2	2	0	0
17/04/2015	1	MW	0630	1230	6	3	NE	0	5	2	2	0	0
15/05/2015	2	MW	0730	1330	1	3	S	0	3	2	2	0	0
15/05/2015	2	MW	0730	1330	2	3	S	0	4	2	2	0	0
15/05/2015	2	MW	0730	1330	3	4	SSE	0	5	2	2	0	0
15/05/2015	2	MW	0730	1330	4	4	SSE	0	6	2	2	0	0
15/05/2015	2	MW	0730	1330	5	5	SSE	0	7	2	2	0	0
15/05/2015	2	MW	0730	1330	6	5	SSE	0	7	2	2	0	0
29/06/2015	3	MW	0900	1500	1	3	SSW	0	8	2	2	0	0
29/06/2015	3	MW	0900	1500	2	4	SSW	0	7	2	2	0	0
29/06/2015	3	MW	0900	1500	3	4	SSW	0	7	2	2	0	0
29/06/2015	3	MW	0900	1500	4	5	SSW	0	6	2	2	0	0
29/06/2015	3	MW	0900	1500	5	5	SSW	0	6	2	2	0	0
29/06/2015	3	MW	0900	1500	6	5	SSW	0	6	2	2	0	0
30/06/2015	3	MW	1230	1430	1	5	SSE	0	6	2	2	0	0

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
30/06/2015	3	MW	1230	1430	2	5	SSE	0	5	2	2	0	0
22/07/2015	4	AM	0900	1230	1	1	WSW	0	8	2	2	0	0
22/07/2015	4	AM	0900	1230	2	1	WNW	0	7	2	2	0	0
22/07/2015	4	AM	0900	1230	3	2	SW	0	7	2	2	0	0
22/07/2015	4	AM	0900	1230	4	2	WSW	0	7	2	2	0	0
24/07/2015	4	AM	1230	1540	1	1	WNW	2	6	2	2	0	0
24/07/2015	4	AM	1230	1540	2	1	WNW	2	6	2	2	0	0
24/07/2015	4	AM	1230	1540	3	1	WNW	2	6	2	2	0	0
11/05/2016	5	AM	0715	1215	1	3	ENE	0	5	2	2	0	0
11/05/2016	5	AM	0715	1215	2	3	ENE	0	5	2	2	0	0
11/05/2016	5	AM	0715	1215	3	3	ENE	0	5	2	2	0	0
11/05/2016	5	AM	0715	1215	4	3	ENE	0	5	2	2	0	0
11/05/2016	5	AM	0715	1215	5	3	ENE	0	5	2	2	0	0
30/05/2016	6	AM	0600	1130	1	1	NE	0	6	2	2	0	0
30/05/2016	6	AM	0600	1130	2	1	NE	0	5	2	2	0	0
30/05/2016	6	AM	0600	1130	3	1	NE	0	4	2	2	0	0
30/05/2016	6	AM	0600	1130	4	2	NE	0	4	2	2	0	0
30/05/2016	6	AM	0600	1130	5	2	NE	0	4	2	2	0	0
30/05/2016	6	AM	0600	1130	6	2	NE	0	4	2	2	0	0
23/06/2016	7	AM	0600	1200	1	1	SW	0	5	2	2	0	0
23/06/2016	7	AM	0600	1200	2	1	SW	0	6	2	2	0	0
23/06/2016	7	AM	0600	1200	3	1	WSW	0	6	2	2	0	0
23/06/2016	7	AM	0600	1200	4	1	WSW	0	5	2	2	0	0
23/06/2016	7	AM	0600	1200	5	1	SW	0	5	2	2	0	0
23/06/2016	7	AM	0600	1200	6	2	SW	0	5	2	2	0	0
06/07/2016	8	MW	0730	1330	1	2	SSW	0	8	2	2	0	0
06/07/2016	8	MW	0730	1330	2	3	SSW	0	7	2	2	0	0

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
06/07/2016	8	MW	0730	1330	3	3	SSW	0	8	2	2	0	0
06/07/2016	8	MW	0730	1330	4	4	SSW	2	8	1	1	0	0
06/07/2016	8	MW	0730	1330	5	4	SSW	4	8	1	1	0	0
06/07/2016	8	MW	0730	1330	6	4	SSW	4	8	2	2	0	0
07/07/2016	8	MW	0800	1400	1	2	WSW	0	6	2	2	0	0
07/07/2016	8	MW	0800	1400	2	3	WSW	0	7	2	2	0	0
07/07/2016	8	MW	0800	1400	3	3	WSW	0	6	2	2	0	0
07/07/2016	8	MW	0800	1400	4	3	WSW	0	6	2	2	0	0
07/07/2016	8	MW	0800	1400	5	3	WSW	0	6	2	2	0	0
07/07/2016	8	MW	0800	1400	6	2	WSW	0	5	2	2	0	0

C.3 Winter Walkover Surveys

Winter walkover surveys were undertaken during the 2014/2015 non-breeding season and were conducted between November 2014 and February 2015. See Table C-5 for the survey dates and weather data recorded during these surveys, see Annex B for the survey methodology and Annex D for the survey results.

Table C-5 Meteorological conditions during winter walkover surveys at Over Hill Wind Farm (sorted chronologically)

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
24/11/2014	1	JM	0930	1530	1	0	0	0	8	2	2	0	0
24/11/2014	1	JM	0930	1530	2	0	0	0	8	2	2	0	0
24/11/2014	1	JM	0930	1530	3	0	0	0	5	2	2	0	0
24/11/2014	1	JM	0930	1530	4	3	SE	0	4	2	2	0	0
24/11/2014	1	JM	0930	1530	5	3	SE	0	6	2	2	0	0
24/11/2014	1	JM	0930	1530	6	2	SE	0	7	2	2	0	0
26/01/2015	2	JM/MH	0915	1435	1	3	N	0	5	2	2	0	0
26/01/2015	2	JM/MH	0915	1435	2	4	NW	0	7	2	2	0	0
26/01/2015	2	JM/MH	0915	1435	3	4	NW	0	6	2	2	0	0
26/01/2015	2	JM/MH	0915	1435	4	5	NW	0	7	2	2	0	0
26/01/2015	2	JM/MH	0915	1435	5	3	NW	0	4	2	2	0	0
26/01/2015	2	JM/MH	0915	1435	6	3	NW	0	6	2	2	0	0
23/02/2015	3	JR/MH	0820	1320	1	1	SE	0	7	2	2	1	1
23/02/2015	3	JR/MH	0820	1320	2	1	SE	0	8	2	2	1	1
23/02/2015	3	JR/MH	0820	1320	3	1	SE	0	8	2	2	0	1
23/02/2015	3	JR/MH	0820	1320	4	1	SE	0	7	2	2	0	1
23/02/2015	3	JR/MH	0820	1320	5	2	SE	2	8	2	2	0	1

C.4 Scarce Breeding Bird Surveys

Scarce breeding bird surveys were undertaken during the 2015 and 2016 breeding seasons and were conducted monthly from March to July 2015 and May to July 2016. See Table C-6 for the survey dates and weather data recorded during these surveys, Annex B for the survey methodology and Annex D for the survey results.

Table C-6 Meteorological conditions during scarce breeding bird surveys at Over Hill Wind Farm (sorted chronologically)

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
31/03/2015	1	JR	0800	1200	1	4	W	0	4	2	2	0	2
31/03/2015	1	JR	0800	1200	2	4	W	0	5	2	2	0	2
31/03/2015	1	JR	0800	1200	3	5	W	0	4	2	2	0	2
31/03/2015	1	JR	0800	1200	4	6	W	3	3	2	2	0	2
31/03/2015	1	MW	0800	1200	1	7	WNW	3	8	2	2	0	0
31/03/2015	1	MW	0800	1200	2	7	WNW	0	7	2	2	0	0
31/03/2015	1	MW	0800	1200	3	8	WNW	0	8	2	2	0	0
31/03/2015	1	MW	0800	1200	4	8	WNW	3	8	2	2	0	0
01/04/2015	1	JR	0800	1200	1	2	W	2	6	1	2	0	1
01/04/2015	1	JR	0800	1200	2	3	WSW	3	7	2	1	0	1
01/04/2015	1	JR	0800	1200	3	4	WSW	3	6	2	1	0	1
01/04/2015	1	JR	0800	1200	4	4	SW	3	6	2	1	0	1
01/04/2015	1	MW	0800	1200	1	6	WNW	0	7	2	2	0	1
01/04/2015	1	MW	0800	1200	2	6	WNW	0	8	2	2	0	1
01/04/2015	1	MW	0800	1200	3	6	WNW	3	8	2	2	0	1
01/04/2015	1	MW	0800	1200	4	6	WNW	0	8	2	2	0	1
12/05/2015	2	MW	0900	1500	1	6	SSW	0	7	2	2	0	0
12/05/2015	2	MW	0900	1500	2	6	SSW	0	8	2	2	0	0
12/05/2015	2	MW	0900	1500	3	7	SSW	0	8	2	2	0	0

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
12/05/2015	2	MW	0900	1500	4	7	SSW	2	8	2	2	0	0
12/05/2015	2	MW	0900	1500	5	7	SSW	2	8	2	2	0	0
12/05/2015	2	MW	0900	1500	6	7	SSW	2	8	2	2	0	0
13/05/2015	2	MW	0400	1000	1	4	NW	0	7	2	2	0	0
13/05/2015	2	MW	0400	1000	2	4	NW	0	8	2	2	0	0
13/05/2015	2	MW	0400	1000	3	3	NW	0	8	2	2	0	0
13/05/2015	2	MW	0400	1000	4	3	NW	0	8	2	2	0	0
14/05/2015	2	MW	0345	0945	1	2	SSE	0	4	2	2	0	0
14/05/2015	2	MW	0345	0945	2	3	SSE	0	3	2	2	0	0
14/05/2015	2	MW	0345	0945	3	3	SE	0	2	2	2	0	0
14/05/2015	2	MW	0345	0945	4	3	SSE	0	3	2	2	0	0
23/06/2015	3	AM	0940	1550	1	1	WNW	0	6	2	2	0	0
23/06/2015	3	AM	0940	1550	2	2	WNW	0	6	2	2	0	0
23/06/2015	3	AM	0940	1550	3	2	WNW	0	7	2	2	0	0
23/06/2015	3	AM	0940	1550	4	3	SW	0	7	2	2	0	0
23/06/2015	3	AM	0940	1550	5	3	SW	0	7	2	2	0	0
23/06/2015	3	AM	0940	1550	6	3	SW	0	7	2	2	0	0
24/06/2015	3	AM	0900	1500	1	1	WNW	0	7	2	2	0	0
24/06/2015	3	AM	0900	1500	2	1	WNW	0	7	2	2	0	0
24/06/2015	3	AM	0900	1500	3	1	WSW	0	7	2	2	0	0
24/06/2015	3	AM	0900	1500	4	1	SW	0	7	2	2	0	0
24/06/2015	3	AM	0900	1500	5	1	SW	0	7	2	2	0	0
24/06/2015	3	AM	0900	1500	6	1	SW	0	7	2	2	0	0
22/07/2015	4	AM	1300	1800	1	3	WSW	0	7	2	2	0	0
22/07/2015	4	AM	1300	1800	2	3	WSW	0	7	2	2	0	0
22/07/2015	4	AM	1300	1800	3	3	WSW	0	6	2	2	0	0
22/07/2015	4	AM	1300	1800	4	3	SW	0	5	2	2	0	0

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
22/07/2015	4	AM	1300	1800	5	3	SW	0	5	2	2	0	0
23/07/2015	4	AM	1100	1600	1	4	SW	2	6	2	2	0	0
23/07/2015	4	AM	1100	1600	2	4	SW	0	6	2	2	0	0
23/07/2015	4	AM	1100	1600	3	3	SW	0	7	2	2	0	0
23/07/2015	4	AM	1100	1600	4	3	SW	2	7	2	2	0	0
23/07/2015	4	AM	1100	1600	5	3	SW	2	7	2	2	0	0
12/05/2016	5	AM	1030	1645	1	3	ENE	0	3	2	2	0	0
12/05/2016	5	AM	1030	1645	2	3	ENE	0	3	2	2	0	0
12/05/2016	5	AM	1030	1645	3	3	ENE	0	3	2	2	0	0
12/05/2016	5	AM	1030	1645	4	3	ENE	0	3	2	2	0	0
12/05/2016	5	AM	1030	1645	5	3	ENE	0	3	2	2	0	0
12/05/2016	5	AM	1030	1645	6	3	ENE	0	3	2	2	0	0
25/05/2016	6	AM	1130	1730	1	3	NE	0	8	2	2	0	0
25/05/2016	6	AM	1130	1730	2	3	NE	0	7	2	2	0	0
25/05/2016	6	AM	1130	1730	3	4	NNE	0	7	2	2	0	0
25/05/2016	6	AM	1130	1730	4	4	NNE	0	7	2	2	0	0
25/05/2016	6	AM	1130	1730	5	3	NNE	0	6	2	2	0	0
25/05/2016	6	AM	1130	1730	6	3	NE	0	6	2	2	0	0
24/06/2016	7	AM	1030	1530	1	3	WNW	0	6	2	2	0	0
24/06/2016	7	AM	1030	1530	2	3	WNW	3	6	2	2	0	0
24/06/2016	7	AM	1030	1530	3	2	W	3	7	2	2	0	0
24/06/2016	7	AM	1030	1530	4	2	W	0	7	2	2	0	0
24/06/2016	7	AM	1030	1530	5	2	WNW	0	6	2	2	0	0
06/07/2016	8	MW	0730	1330	1	2	SSW	0	8	2	2	0	0
06/07/2016	8	MW	0730	1330	2	3	SSW	0	7	2	2	0	0
06/07/2016	8	MW	0730	1330	3	3	SSW	0	8	2	2	0	0
06/07/2016	8	MW	0730	1330	4	4	SSW	2	8	1	1	0	0

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
06/07/2016	8	MW	0730	1330	5	4	SSW	4	8	1	1	0	0
06/07/2016	8	MW	0730	1330	6	4	SSW	4	8	2	2	0	0
07/07/2016	8	MW	0800	1400	1	2	WSW	0	6	2	2	0	0
07/07/2016	8	MW	0800	1400	2	3	WSW	0	7	2	2	0	0
07/07/2016	8	MW	0800	1400	3	3	WSW	0	6	2	2	0	0
07/07/2016	8	MW	0800	1400	4	3	WSW	0	6	2	2	0	0
07/07/2016	8	MW	0800	1400	5	3	WSW	0	6	2	2	0	0
07/07/2016	8	MW	0800	1400	6	2	WSW	0	5	2	2	0	0

C.5 Black Grouse Surveys

Black grouse surveys were undertaken during the 2015 and 2016 breeding seasons and were conducted monthly in April and May 2015 and May 2016. See Table C-7 for the survey dates and weather data recorded during these surveys, Annex B for the survey methodology and Annex D for the survey results.

Table C-7 Meteorological conditions during black grouse surveys at Over Hill Wind Farm (sorted chronologically)

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Snow	Frost
31/03/2015	1	JR	0600	0800	1	3	W	3	0	2	2	0	2
31/03/2015	1	JR	0600	0800	2	4	W	3	3	2	2	0	2
01/04/2015	1	JR	0600	0800	1	2	W	3	0	2	2	1	1
01/04/2015	1	JR	0600	0800	2	2	W	0	5	2	2	1	1
31/03/2015	1	MW	0600	0800	1	6	WNW	3	8	2	2	1	1
31/03/2015	1	MW	0600	0800	2	7	WNW	0	8	2	2	0	0
01/04/2015	1	MW	0600	0800	1	4	WNW	3	8	2	2	1	1
01/04/2015	1	MW	0600	0800	2	5	WNW	0	8	2	2	1	1
13/05/2015	2	MW	0400	0600	1	4	NW	0	6	2	2	0	0
13/05/2015	2	MW	0400	0600	2	5	NW	0	7	2	2	0	0
14/05/2015	2	MW	0345	0545	1	1	SSW	0	3	2	2	0	0
14/05/2015	2	MW	0345	0545	2	2	S	0	3	2	2	0	0
13/05/2016	3	AM	0415	0730	1	2	NE	0	5	2	2	0	0
13/05/2016	3	AM	0415	0730	2	2	NE	0	5	2	2	0	0
13/05/2016	3	AM	0415	0730	3	3	NE	0	5	2	2	0	0

ANNEX D ORNITHOLOGICAL SURVEY RESULTS

D.1 Flight Activity Records: Target Species

In accordance with SNH Guidance (2014), target species are those which may be considered to be at risk from the potential effects of wind farms. All flights of target species within the turbine area and the surrounding area were mapped and are detailed in Table D-1.

Table D-1 Details of target species recorded during flight activity surveys

Date	V P	Observer	Flight start time	Species	No. of birds	Duration (s)	Inside CRAA (seconds)					Outside CRAA (seconds)				
							0- 20m	21- 40m	41- 100m	101- 150m	>150 m	0- 20m	21- 40m	41- 100m	101- 150m	>150 m
06/02/2014	2	MJD	0910	Black grouse	2	3	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00
18/02/2014	1	MC	1729	Pink-footed goose	63	77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.00	0.00	0.00
18/02/2014	2	MC	1302	Short-eared owl	1	47	0.00	0.00	0.00	0.00	0.00	47.00	0.00	0.00	0.00	0.00
19/02/2014	1	MC	1146	Hen harrier	1	139	0.00	0.00	0.00	0.00	0.00	139.0	0.00	0.00	0.00	0.00
21/03/2014	1	AC	0937	Black grouse	1	16	0.00	0.00	0.00	0.00	0.00	16.00	0.00	0.00	0.00	0.00
21/03/2014	1	AC	0937	Black grouse	1	24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	0.00	0.00
19/06/2014	1	AC	1419	Black grouse	1	86	0.00	0.00	0.00	0.00	0.00	37.00	0.00	49.00	0.00	0.00
28/10/2014	1	JM	1424	Greylag goose	2	56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.00	0.00	0.00
12/11/2014	2	RD	1028	Snipe	1	20	3.12	1.04	0.00	0.00	0.00	11.88	3.96	0.00	0.00	0.00
12/11/2014	2	RD	1033	Snipe	3	10	4.64	0.00	0.00	0.00	0.00	5.36	0.00	0.00	0.00	0.00
12/11/2014	2	RD	1127	Snipe	10	120	0.00	14.30	57.20	42.90	0.00	0.00	0.70	2.80	2.10	0.00
12/11/2014	2	RD	1425	Hen harrier	1	15	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/11/2014	2	RD	1518	Hen harrier	1	20	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28/11/2014	1	JM	0908	Black grouse	2	11	0.00	0.00	0.00	0.00	0.00	11.00	0.00	0.00	0.00	0.00
28/11/2014	1	JM	1131	Hen harrier	2	16	16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11/12/2014	1	JM	1117	Hen harrier	1	37	4.32	0.00	0.00	0.00	0.00	32.68	0.00	0.00	0.00	0.00

Date	V P	Observer	Flight start time	Species	No. of birds	Duration (s)	Inside CRAA (seconds)					Outside CRAA (seconds)				
							0- 20m	21- 40m	41- 100m	101- 150m	>150 m	0- 20m	21- 40m	41- 100m	101- 150m	>150 m
16/01/2015	2	JM	1318	Hen harrier	1	61	61.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16/01/2015	2	JM	1327	Hen harrier	1	22	0.00	19.24	0.00	0.00	0.00	0.00	2.76	0.00	0.00	0.00
02/02/2015	1	JM	0954	Hen harrier	1	43	13.50	13.50	2.70	0.00	0.00	1.50	1.50	0.30	0.00	0.00
02/03/2015	2	JR	1229	Jack snipe	1	12	0.00	0.00	0.00	0.00	0.00	12.00	0.00	0.00	0.00	0.00
02/03/2015	2	JR	1700	Black grouse	1	8	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
09/04/2015	2	JR	0944	Pink-footed goose	170	82	0.00	0.00	35.32	0.00	0.00	0.00	0.00	46.68	0.00	0.00
13/04/2015	1	MW	1236	Goshawk	1	45	0.00	0.00	0.00	0.00	0.00	45.00	0.00	0.00	0.00	0.00
08/05/2015	2	JM	1141	Red kite	1	128	0.00	0.00	98.01	0.00	0.00	0.00	0.00	29.99	0.00	0.00
29/05/2015	1	HW	1054	Lapwing	1	19	0.00	0.00	0.00	0.00	0.00	19.00	0.00	0.00	0.00	0.00
19/06/2015	1	HW	1136	Herring gull	1	24	0.00	19.57	0.00	0.00	0.00	0.00	4.43	0.00	0.00	0.00
19/06/2015	1	HW	1201	Merlin	1	11	0.00	0.00	0.00	0.00	0.00	11.00	0.00	0.00	0.00	0.00
05/06/2016	4	AM	2100	Goshawk	1	62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	62.00	0.00	0.00
05/06/2016	4	AM	2130	Greylag goose	4	84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	84.00	0.00	0.00

D.2 Flight Activity Records: Secondary Species

Secondary species were recorded to give an indication of their use of the Proposed Development Area. A summary per season of the secondary species recorded, the number of flights and birds is provided in Table D-2.

Table D-2 Details of secondary species recorded during flight activity surveys

Species	2014/2015 non-breeding season		2015 breeding season		2016 breeding season	
	Number of records	Total number of birds	Number of records	Total number of birds	Number of records	Total number of birds
Black-headed gull			7	41	3	14
Buzzard	8	9	35	43	31	35
Canada goose			6	13	2	4
Carrion crow			14	20		
Great black-backed gull			3	5		
Grey heron					2	2
Kestrel	9	9	24	26	3	3
Lesser black-backed gull			5	6		
Mallard			3	6		
Raven	18	29	25	52	3	6
Red grouse	3	3	1	1		
Sparrowhawk			2	2	1	1

D.3 Moorland Breeding Bird Records

Moorland breeding bird surveys were undertaken during the 2015 and 2016 breeding seasons and focussed on recording activity of wader species within the survey area (Table D-3, note no waders were recorded during 2016 surveys). Survey methodology is detailed in Annex B and survey timing/weather conditions in Annex C. Although the focus of the surveys was breeding waders, all other species were also recorded, with 43 additional species recorded (these are included within the full species index, Table D-7) of which 37 were passerine species commonly associated with forestry and upland habitats.

Table D-3 Wader activity recorded during breeding bird surveys: 2015

Date	Survey visit	Observer	Species	Number recorded
31/03/2015	SBBS 1	JR	Snipe	1
31/03/2015	SBBS 1	JR	Snipe	1
31/03/2015	SBBS 1	JR	Snipe	2
01/04/2015	SBBS 1	MW	Snipe	6
17/04/2015	BBS 1	MW	Snipe	1
17/04/2015	BBS 1	MW	Snipe	1
17/04/2015	BBS 1	MW	Snipe	1
17/04/2015	BBS 1	MW	Snipe	1
17/04/2015	BBS 1	MW	Snipe	1
17/04/2015	BBS 1	MW	Snipe	1
17/04/2015	BBS 1	MW	Snipe	1
17/04/2015	BBS 1	MW	Snipe	1
17/04/2015	BBS 1	MW	Snipe	1
17/04/2015	BBS 1	MW	Snipe	1
17/04/2015	BBS 1	MW	Snipe	1
17/04/2015	BBS 1	MW	Snipe	1
12/05/2015	SBBS 2	MW	Snipe	1
12/05/2015	SBBS 2	MW	Snipe	1
13/05/2015	SBBS 2	MW	Common sandpiper	1
13/05/2015	SBBS 2	MW	Lapwing	1
13/05/2015	SBBS 2	MW	Snipe	1
23/06/2015	SBBS 3	AM	Oystercatcher	1
23/06/2015	SBBS 3	MW	Common sandpiper	1

D.4 Winter Walkover Records

A series of three winter walkovers was undertaken during the 2014/2015 non-breeding season. Table D-4 details all the species recorded with survey methodology detailed in Annex B and survey timing/weather conditions in Annex C.

Table D-4 Winter walkover survey records: 2014/2015

Date	Survey visit	Observer	Species	Number recorded	Notes
24/11/2014	1	JM	Blackbird	1	
24/11/2014	1	JM	Buzzard	2	
24/11/2014	1	JM	Carrion crow	17	
24/11/2014	1	JM	Chaffinch	4	
24/11/2014	1	JM	Fieldfare	5	
24/11/2014	1	JM	Goldfinch	13	
24/11/2014	1	JM	Great tit	2	
24/11/2014	1	JM	Hen harrier	1	Male seen at height band 1 above woodland edge
24/11/2014	1	JM	Hen harrier	1	Male, same bird
24/11/2014	1	JM	Hen harrier	1	Male, same bird
24/11/2014	1	JM	Kestrel	1	
24/11/2014	1	JM	Kestrel	1	
24/11/2014	1	JM	Kestrel	1	
24/11/2014	1	JM	Kestrel	1	
24/11/2014	1	JM	Meadow pipit	26	
24/11/2014	1	JM	Red grouse	1	
24/11/2014	1	JM	Robin	1	
24/11/2014	1	JM	Snipe	1	
24/11/2014	1	JM	Snipe	1	
24/11/2014	1	JM	Snipe	1	
24/11/2014	1	JM	Stonechat	1	
24/11/2014	1	JM	Woodpigeon	1	
26/01/2015	2	JM	Meadow pipit	32	
26/01/2015	2	JM	Carrion crow	5	
26/01/2015	2	JM	Great tit	3	
26/01/2015	2	JM	Coal tit	2	
26/01/2015	2	JM	Chaffinch	5	
26/01/2015	2	JM	Blackbird	1	
26/01/2015	2	JM	Robin	1	
26/01/2015	2	JM	Red grouse	1	
26/01/2015	2	JM	Jack snipe	1	
26/01/2015	2	JM	Sparrowhawk	1	
25/02/2015	3	JM/MH	Goosander	1	Flew north-east following the burn
25/02/2015	3	JR/MH	Wren	5	Common throughout plantation areas
25/02/2015	3	JR/MH	Mistle thrush	1	

Date	Survey visit	Observer	Species	Number recorded	Notes
25/02/2015	3	JR/MH	Lesser redpoll	4	Common throughout plantation areas
25/02/2015	3	JR/MH	Blue tit	6	Common throughout plantation areas
25/02/2015	3	JR/MH	Chaffinch	8	Common throughout plantation areas
25/02/2015	3	JR/MH	Meadow pipit	1	
25/02/2015	3	JR/MH	Jack snipe	1	
25/02/2015	3	JR/MH	Coal tit	1	Common throughout plantation areas
25/02/2015	3	JR/MH	Bullfinch	2	
25/02/2015	3	JR/MH	Woodcock	1	
25/02/2015	3	JR/MH	Woodcock	1	
25/02/2015	3	JR/MH	Robin	1	
25/02/2015	3	JR/MH	Raven	6	
25/02/2015	3	JR/MH	Great tit	1	Common throughout plantation areas
25/02/2015	3	JR/MH	Goldcrest	1	
25/02/2015	3	JR/MH	Song thrush	2	
25/02/2015	3	JR/MH	Redwing	6	

D.5 Scarce Breeding Bird Records

Scarce Breeding Bird Surveys (SBBS) were undertaken during the 2015 and 2016 breeding seasons. Survey methodology is detailed in Annex B and survey timing/weather conditions in Annex C.

Table D-5 details all records of raptors and owls along with their behaviour (showing their protection status where applicable), however only Annex 1¹ or Schedule 1² species are considered to be scarce breeding birds. No target species were confirmed to be breeding within the Proposed Development Area, however goshawk was suspected to have held a territory to the west. Survey methodology is detailed in Annex B and survey timing/weather conditions in Annex C.

Table D-5 Raptor, owl and diver records: 2015 and 2016 breeding seasons

Date	Survey visit	Observer	Species	Protection status	Number recorded	Notes
02/03/2015	VP 2	JR	Buzzard	BoCC ³ Green	1	Seen on walk in
05/03/2015	VP 1	JR	Buzzard	BoCC Green	1	Seen on walk in
23/03/2015	VP 2	JR	Buzzard	BoCC Green	1	Seen on walk in
31/03/2015	1	JR	Buzzard	BoCC Green	3	
31/03/2015	1	JR	Goshawk	Schedule 1, BoCC Green	1	Female
31/03/2015	1	JR	Kestrel	BoCC Amber	1	Hunting
31/03/2015	1	JR	Peregrine	Annex 1, Schedule 1, BoCC Green	1	Male
31/03/2015	1	MW	Barn owl	Schedule 1, BoCC Green	1	Resting
31/03/2015	1	MW	Buzzard	BoCC Green	1	
01/04/2015	1	MW	Goshawk	Schedule 1, BoCC Green	1	Calling
01/04/2015	1	MW	Peregrine	Annex 1, Schedule 1, BoCC Green	1	Male
09/04/2015	VP 2	JR/HW	Buzzard	BoCC Green	1	Seen on walk in
09/04/2015	VP 2	JR/HW	Buzzard	BoCC Green	3	
17/04/2015	BBS 1	MW	Buzzard	BoCC Green	1	
12/05/2015	2	MW	Buzzard	BoCC Green	1	
12/05/2015	2	MW	Sparrowhawk	BoCC Green	1	
13/05/2015	2	MW	Buzzard	BoCC Green	4	
13/05/2015	2	MW	Goshawk	Schedule 1, BoCC Green	1	Male
13/05/2015	2	MW	Sparrowhawk	BoCC Green	1	
14/05/2015	2	MW	Barn owl	Schedule 1, BoCC Green	1	In nest box
14/05/2015	2	MW	Buzzard	BoCC Green	1	
14/05/2015	2	MW	Sparrowhawk	BoCC Green	1	
14/05/2015	2	MW	Tawny owl	BoCC Amber	1	

¹ Annex 1 of the EU Bird Directive

² Schedule 1 of the Wildlife and Countryside Act 1981, as amended by the Nature Conservation Act (Scotland) 2004

³ BoCC – Birds of Conservation Concern (Eaton *et al.* 2015)

Date	Survey visit	Observer	Species	Protection status	Number recorded	Notes
15/05/2015	BBS 2	MW	Buzzard	BoCC Green	1	
15/05/2015	BBS 2	MW	Sparrowhawk	BoCC Green	1	
23/06/2015	3	AM	Buzzard	BoCC Green	3	3 different individuals
23/06/2015	3	AM	Buzzard	BoCC Green	1	
23/06/2015	3	AM	Kestrel	BoCC Amber	1	Hunting, hovering
23/06/2015	3	AM	Sparrowhawk	BoCC Green	1	
24/06/2015	3	AM	Buzzard	BoCC Green	1	
24/06/2015	3	AM	Buzzard	BoCC Green	1	
24/06/2015	3	AM	Buzzard	BoCC Green	1	
24/06/2015	3	AM	Buzzard	BoCC Green	1	
24/06/2015	3	AM	Kestrel	BoCC Amber	1	Hunting, hovering
29/06/2015	BBS 3	MW	Buzzard	BoCC Green	4	
29/06/2015	BBS 3	MW	Sparrowhawk	BoCC Green	2	
30/06/2015	VP 2	MW	Buzzard	BoCC Green	1	
30/06/2015	VP 2	MW	Kestrel	BoCC Amber	1	
22/07/2015	4	AM	Buzzard	BoCC Green	1	Hunting, hovering
22/07/2015	4	AM	Buzzard	BoCC Green	1	
22/07/2015	4	AM	Kestrel	BoCC Amber	1	
22/07/2015	4	AM	Kestrel	BoCC Amber	1	
23/07/2015	4	AM	Buzzard	BoCC Green	4	
23/07/2015	4	AM	Kestrel	BoCC Amber	1	Adult in wing moult, hunting
11/12/2015	VP 1	JM	Kestrel	BoCC Amber	1	Seen on way to VP1
12/05/2016	5	AM	Buzzard	BoCC Green	1	Soaring, a little display, drifted off east
12/05/2016	5	AM	Buzzard	BoCC Green	1	In flight
12/05/2016	5	AM	Buzzard	BoCC Green	1	In flight
12/05/2016	5	AM	Buzzard	BoCC Green	1	Soaring - flew off towards/into forestry
20/05/2016	VP 4	MW	Buzzard	BoCC Green	1	
20/05/2016	VP 4	MW	Kestrel	BoCC Amber	1	
25/05/2016	6	AM	Buzzard	BoCC Green	1	Soaring, dropped down quickly into forestry
25/05/2016	6	AM	Buzzard	BoCC Green	1	In flight
25/05/2016	6	AM	Buzzard	BoCC Green	1	On new pylon ride
25/05/2016	6	AM	Buzzard	BoCC Green	1	On new pylon ride
25/05/2016	6	AM	Buzzard	BoCC Green	1	On new pylon ride
25/05/2016	6	AM	Buzzard	BoCC Green	1	In flight
25/05/2016	6	AM	Buzzard	BoCC Green	1	In flight
24/06/2016	7	AM	Buzzard	BoCC Green	1	In flight
24/06/2016	7	AM	Buzzard	BoCC Green	1	In flight
24/06/2016	7	AM	Buzzard	BoCC Green	1	Perched
24/06/2016	7	AM	Buzzard	BoCC Green	1	On pylon
24/06/2016	7	AM	Buzzard	BoCC Green	1	In heavy wing/tail moult

Date	Survey visit	Observer	Species	Protection status	Number recorded	Notes
24/06/2016	7	AM	Buzzard	BoCC Green	1	Initially came up from within forestry, flew east
07/07/2016	8	MW	Buzzard	BoCC Green	2	

D.6 Black Grouse Records

Black grouse surveys were undertaken during the 2015 and 2016 breeding seasons. Table D-6 details all black grouse records with lek numbers indicated where appropriate (see Technical Appendix 8.1, Table 8-14 for a summary of lek activity). Survey methodology is detailed in Annex B and survey timing/weather conditions in Annex C.

Table D-6 Black grouse activity records: 2015 and 2016

Lek number	Date	Survey visit	Observer	No. birds	Notes
-	19/12/2014	VP2	JM	1	Flushed on walk in, east of Whig Hole
-	19/12/2014	VP2	JM	2	Flushed on walk out
-	16/01/2015	VP2	JM	1	1208: Seen during break flying towards Bught Knowe from the north east
-	26/01/2015	WWO 2	JM	2	
-	18/02/2015	VP2	JR	1	
-	18/02/2015	VP2	JR	1	
1	09/04/2015	VP2	JR/HW	1	Seen on walk in, lekking. Heard behind Sitka 0645-0650; still heard at 0825
-	17/04/2015	BBS 1	MW	1	Male heard lekking nearby (approx. 251680,611840)
1	13/05/2015	2	MW	4	Lekking males
-	13/05/2015	2	MW	1	Female
-	13/05/2015	2	MW	1	Male
-	13/05/2015	2	MW	1	Female
-	13/05/2015	2	MW	1	
1	14/05/2015	2	MW	3	Lekking males
-	13/05/2016	1	AM	1	One male lekking from 0530-0620, still displaying strongly at 0620. Bird mobile, initially within former opencast site, flew short distance to the east north east, landed, displayed again, and then flew to the north east to stump within cleared area at edge of forestry. Displaying strongly throughout. Central point marked
-	20/05/2016	VP4	MW	1	Heard only

D.7 Bird Species Index

A total of 71 bird species or signs was recorded at, or adjacent, to the Proposed Development Area during the MacArthur Green ornithological surveys. Table D-7 comprises a list of all these species along with their conservation status.

Table D-7 All bird species recorded at Over Hill Wind Farm (October 2014 to August 2016)

Species	Conservation status	Species	Conservation status
Barn owl	Schedule 1, BoCC Green	Lesser black-backed gull	BoCC Amber
Black grouse	BoCC Red	Lesser redpoll	BoCC Red
Blackbird	BoCC Green	Linnet	BoCC Red
Blackcap	BoCC Green	Long-tailed tit	BoCC Green
Black-headed gull	BoCC Amber	Mallard	BoCC Amber
Blue tit	BoCC Green	Meadow pipit	BoCC Amber
Bullfinch	BoCC Green	Merlin	Annex 1, Schedule 1, BoCC Red
Buzzard	BoCC Green	Mistle thrush	BoCC Red
Canada goose	Not Assessed	Oystercatcher	BoCC Amber
Carrion crow	BoCC Green	Peregrine falcon	Annex 1, Schedule 1, BoCC Green
Chaffinch	BoCC Green	Pied wagtail	BoCC Green
Coal tit	BoCC Green	Pink-footed goose	BoCC Amber
Common crossbill	Schedule 1, BoCC Green	Raven	BoCC Green
Common sandpiper	BoCC Amber	Red grouse	BoCC Amber
Cuckoo	BoCC Red	Red kite	Annex 1, Schedule 1, Schedule 1A, BoCC Green
Curlew	BoCC Red	Redwing	Schedule 1, BoCC Red
Duncock	BoCC Green	Reed bunting	BoCC Amber
Fieldfare	Schedule 1, BoCC Red	Robin	BoCC Green
Goldcrest	BoCC Green	Sand martin	BoCC Green
Goldfinch	BoCC Green	Siskin	BoCC Green
Goosander	BoCC Green	Skylark	BoCC Red
Goshawk	Schedule 1, BoCC Green	Snipe	BoCC Amber
Grasshopper warbler	BoCC Green	Song thrush	BoCC Red
Great black-backed gull	BoCC Amber	Sparrowhawk	BoCC Green
Great spotted woodpecker	BoCC Green	Stonechat	BoCC Green
Great tit	BoCC Green	Swallow	BoCC Green
Grey heron	BoCC Green	Tawny owl	BoCC Amber

Species	Conservation status	Species	Conservation status
Grey wagtail	BoCC Green	Tree pipit	BoCC Red
Greylag goose	Schedule 1 Part 2 ⁴ , BoCC Amber	Whinchat	BoCC Red
Hen harrier	Annex 1, Schedule 1, Schedule 1A, BoCC Red	Whitethroat	BoCC Green
Herring gull	BoCC Red	Whooper swan	Annex 1, Schedule 1, BoCC Amber
House martin	BoCC Amber	Willow warbler	BoCC Amber
Jack snipe	BoCC Green	Woodcock	BoCC Amber
Jay	BoCC Green	Woodpigeon	BoCC Green
Kestrel	BoCC Amber	Wren	BoCC Green
Lapwing	BoCC Red		

⁴ Schedule 1 status only applies to greylag geese considered to be part of the Outer Hebrides, Caithness, Sutherland and Wester Ross populations.

ANNEX E COLLISION RISK ASSESSMENTS

Table E-1, Table E-2 and Table E-3 present the parameters which apply to each Collision Risk Model (CRM).

Table E-1 Wind farm parameters

Size of wind farm envelope	250.6560	hectares (ha)
Number of turbines	11	turbines
Rotor diameter	114	metres (m)
Hub height	93	m
Max. rotor depth	1.1647	m (at 15° pitch angle)
Max. chord	4.5	m
Pitch	15	degrees (°)
Rotation period	4.96	seconds (secs)
Turbine operation time	85	percent (%)
Risk height: highest	36	m
Rick height: lowest	149.9	m
Flight risk volume	285747847	m ³

Table E-2 CRM parameters per species

Species	Length (m)	Wingspan (m)	Assumed flight speed, v (ms ⁻¹)	Avoidance rate	Probability of collision	Bird transit time (secs)
Hen harrier	0.48	1.1	12	0.99	0.0761	0.1371
Herring gull	0.64	1.5	12.8	0.98	0.0826	0.1410
Pink-footed goose	0.675	1.525	17.3	0.998	0.0755	0.1063
Red kite	0.66	1.95	12	0.98	0.0889	0.1521
Snipe	0.27	0.47	17.1	0.98	0.0571	0.0839

Table E-3 Visible area within the CRAA per vantage point

VP	Area (ha)
1	116.5490
2	204.7220
3	0.0000
4	0.0000
Total	321.2710

Birds are assumed to be active during all daylight hours and this is estimated by calculating the number of hours per day between sunrise and sunset (adjusting for correct latitude) for the survey seasons as defined in Table E-4 below.

Table E-4 Season definitions per species/species group

Species	Breeding season			Non-breeding season		
	Start date	End date	Hours presumed present	Start date	End date	Hours presumed present
Geese and swans	15 th May	31 st August	1790	1 st September	14 th May	2705
Raptors	15 th March	31 st August	2642	1 st September	14 th March	1853
Waders	1 st April	31 st July	2433	1 st August	31 st March	2062
<i>Other</i>	<i>15th March</i>	<i>31st August</i>	<i>2642</i>	<i>1st September</i>	<i>14th March</i>	<i>1853</i>

Outputs for the CRM for the following species are presented in the following order below:

- Hen harrier,
- Herring gull,
- Pink-footed goose;
- Red kite; and
- Snipe.

E.1 Hen harrier

Non-Breeding Season 2014/2015

Table E-5 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr ⁻¹)
1	5.40	4545.4111	1.3274E-07
2	3.85	6755.8260	9.4571E-08

Table E-6 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	5.6978E-05	hr ⁻¹
Total Combined rotor swept volume	184661	m ³
Bird occupancy	0.1056	hrs/season
Bird occupancy of rotor swept volume	0.2456	bird-sec
No. of transits through rotors	1.7918	per season
Estimated collisions	0.1363	per season
Estimated collisions after correction for operation	0.1158	per season
Estimated collisions after avoidance factor	0.0012	per season
Equivalent to 1 bird every	863.2115	seasons

E.2 Herring gull

Breeding Season 2015

Table E-7 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr ⁻¹)
1	3.91	4079.2151	9.4949E-08
2	0.00	7369.9920	0.0000

Table E-8 Herring gull mortality estimates

Mean activity in wind farm at rotor height	2.3800E-05	hr ⁻¹
Total Combined rotor swept volume	202625	m ³
Bird occupancy	0.0629	hrs/season
Bird occupancy of rotor swept volume	0.1605	bird-sec
No. of transits through rotors	1.1387	per season
Estimated collisions	0.0941	per season
Estimated collisions after correction for operation	0.0799	per season
Estimated collisions after avoidance factor	0.0016	per season
Equivalent to 1 bird every	625.4098	seasons

E.3 Pink-footed goose

Non-Breeding Season 2014/2015

Table E-9 Pink-footed goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr ⁻¹)
1	0.00	5943.9992	0.0000
2	6003.81	10236.1000	1.0307E-04

Table E-10 Pink-footed goose mortality estimates

Mean activity in wind farm at rotor height	0.0258	hr ⁻¹
Total Combined rotor swept volume	206555	m ³
Bird occupancy	69.8760	hrs/season
Bird occupancy of rotor swept volume	181.8375	bird-sec
No. of transits through rotors	1709.9596	per season
Estimated collisions	129.0726	per season
Estimated collisions after correction for operation	109.7117	per season
Estimated collisions after avoidance factor	0.2194	per season
Equivalent to 1 bird every	4.5574	seasons

E.4 Red kite

Breeding Season 2015

Table E-11 Red kite flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr ⁻¹)
1	0.00	4079.2151	0.0000
2	98.01	7369.9920	2.3780E-06

Table E-12 Red kite mortality estimates

Mean activity in wind farm at rotor height	0.0006	hr ⁻¹
Total Combined rotor swept volume	204871	m ³
Bird occupancy	1.5750	hrs/season
Bird occupancy of rotor swept volume	4.0653	bird-sec
No. of transits through rotors	26.7351	per season
Estimated collisions	2.3779	per season
Estimated collisions after correction for operation	2.0212	per season
Estimated collisions after avoidance factor	0.0404	per season
Equivalent to 1 bird every	24.7381	seasons

E.5 Snipe

Non-Breeding Season 2014/2015

Table E-13 Snipe flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHaHr ⁻¹)
1	0.00	5244.7052	0.0000
2	1029.75	7984.1580	2.1623E-05

Table E-14 Snipe mortality estimates

Mean activity in wind farm at rotor height	0.0054	hr ⁻¹
Total Combined rotor swept volume	161083	m ³
Bird occupancy	11.1772	hrs/season
Bird occupancy of rotor swept volume	22.6830	bird-sec
No. of transits through rotors	270.3583	per season
Estimated collisions	15.4249	per season
Estimated collisions after correction for operation	13.1111	per season
Estimated collisions after avoidance factor	0.2622	per season
Equivalent to 1 bird every	3.8136	seasons