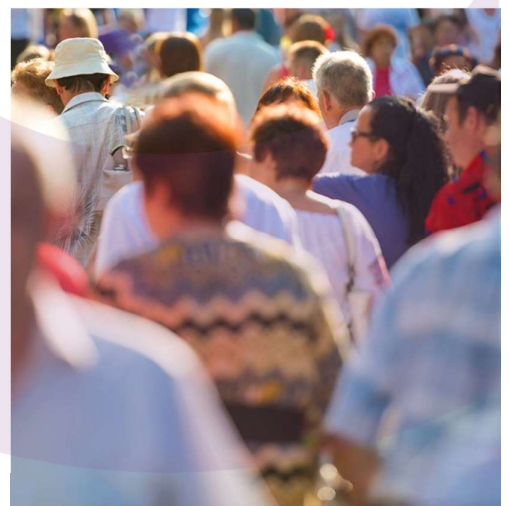
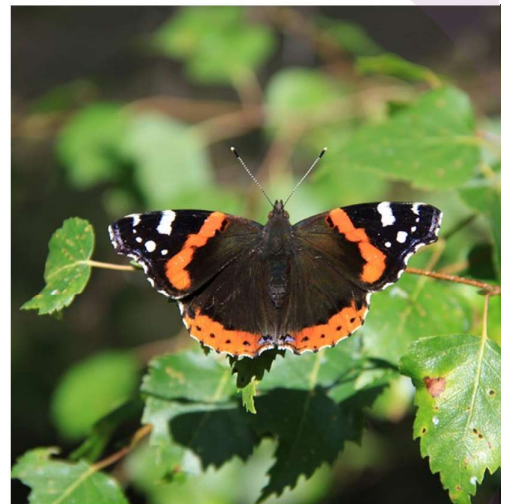




E.ON Climate and Renewables

## Lorg Wind Farm

Baseline Ornithology Report Non-Breeding Season 2018/19



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### Document revisions

No.	Details	Date
01	First Draft	15/08/2019
02	Final	06/12/2019

## Executive summary

### Purpose of this report

- This report documents the methods and results of the wintering bird surveys undertaken between September 2018 and March 2019 at the site of the proposed Lorg Wind Farm in Dumfries and Galloway;
- The Site is located 13 kilometres to the north-west of Moniaive, straddling Dumfries and Galloway and East Ayrshire and is bisected by the Water of Ken. The Site forms a small river valley surrounded by steep hills dominated by white moor managed for upland sheep and cattle grazing and is bordered by similar habitats to those found on Site as well as several commercial forestry plantations;
- A single internationally designated site for birds is located within 20km of the Site. The Muirkirk and North Lowther Uplands Special Protection Area (SPA), approximately 13km to the north-east is designated for breeding hen harrier, short-eared owl, golden plover, merlin and peregrine; and overwintering hen harrier. Hen harrier and peregrine have both been recorded on the Site;
- Survey work during the 2018/19 winter season comprised of vantage point (VP) surveys, at four VP locations with 42 hours observation per VP;
- During the VP surveys a total of 26 flights of seven target species were recorded (pink-footed goose, black grouse, goshawk, hen harrier, red kite, dunlin and peregrine), of which 24 flights were recorded at 15-150m height; and
- In addition, there were incidental records of five target species: greylag goose, pink-footed goose, goshawk, red kite and peregrine.



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# 1. Introduction

## 1.1 About this Document

Wood E&IS UK (Wood) was commissioned by E.ON Climate & Renewables (EC&R) to undertake bird surveys during the 2018/19 non-breeding season (September 2018 to March 2019 inclusive) for a proposed wind farm development at Lorg, Dumfries and Galloway, hereafter referred to as 'the Site'. This report describes the methods and results of the surveys, which were designed to be suitable to update the baseline breeding and wintering bird information for the Site. This work supplements breeding bird surveys that were undertaken at the Site by Wood in 2018 and AMEC in 2013 and 2014, with non-breeding bird surveys carried out during the 2010/11, 2012/13 and 2013/14 seasons. Additionally, there were breeding bird surveys undertaken at the Site by Natural Power in 2012.

## 1.2 Site Description

The Site is located around Lorg Farmhouse within Dumfries and Galloway and is located approximately 12 kilometres north east of Carsphairn and 13 kilometres south of New Cumnock. A small part of the site extends into East Ayrshire. The Site and survey areas are illustrated in **Figure 1.1**. The Site is bisected by the Water of Ken with steep grass-dominated hillsides on either side of the river. Lorg Farmhouse and associated outbuildings are located in the centre of the Site in the valley bottom. The area around this unoccupied dwelling is surrounded by dry stone walls and a small area of deciduous scrub. The Site is surrounded on three sides by commercial forestry plantations and open grassland areas similar to those on Site are present to the west. Afton Reservoir is located approximately 1.5km to the north-west.

## 1.3 Background and Scope

The key issues relating to birds and wind farms are as follows:

- The effects of direct habitat loss due to land take by wind turbine bases, tracks and ancillary structures;
- The effects of disturbance and displacement of birds from the proximity of the wind turbines. Such disturbance may occur as a consequence of construction work, or due to the presence of the wind farm close to nest sites or feeding areas or on habitual flight routes; and
- The effects of collision with rotating turbine blades (i.e. killing or injury of birds), which is of particular relevance for sites located in areas with high raptor activity or which support large concentrations of waterfowl.

With regards to the first issue, total land take by wind farm infrastructure generally represents a small proportion of a site. Therefore, the permanent loss of nesting and foraging habitat for birds tends to be small and will generally have little effect on bird populations. At most wind farm sites, it is the latter two issues, collision risk and displacement, which may potentially be more significant.

A range of guidance documents have been produced relating to the assessment of bird/wind farm interactions and the following publications and guidelines in particular have been influential in determining the scope of the works at the Site:

- Scottish Natural Heritage [SNH] (2017). *Recommended bird survey methods to inform impact assessment of onshore wind farms*. SNH, Battleby; and

- SNH (2018). *Assessing significance of impacts from onshore wind farms on birds outwith designated areas*. SNH, Battleby.

SNH (2017) guidance recommends that field surveys should be focussed on 'target species' which will generally be limited to those which are afforded a higher level of legislative protection; though some species may also be considered as such, as a result of their behaviour, which makes them more likely to be subject to impact from wind farms. There are three overarching species lists from which target species are generally derived<sup>1</sup>:

- Species for which Special Protection Areas (SPA) are designated and those listed under Annex I of the Directive 2009/147/EC on the conservation of wild birds (commonly referred to as the Birds Directive);
- Species listed under Schedule 1 of the Wildlife & Countryside Act 1981 (as amended); and
- Red listed birds of conservation concern (BoCC) (with reference to Eaton *et al.*, 2015).

In addition, consideration should be given to species identified within Local Biodiversity Action Plans (LBAP), though target species should be limited to those likely to be affected by wind farms. As research indicates that most passerine species are not significantly affected by wind farms, many species included on the LBAPs and BoCC are not included as target species. Two LBAPs are considered when selecting target species, Dumfries and Galloway and East Ayrshire as the Site straddles both.

Target species were selected following a data and literature review, and with regard to the results of previous survey work undertaken at the Site.

For the purposes of this report, nomenclature follows that of the International Ornithological Congress (IOC 2018). Scientific names for all species mentioned in the text and tables are included in **Appendix C**.

## 1.4 Desk Study

### Scope

An updated literature search and review were carried out for the 2018/19 Winter Baseline Report in order to gain an insight into the ecology and behaviour of key species that could be affected by the proposed Lorg Wind Farm.

Additional data was obtained through non-breeding and breeding bird surveys at the Site in 2010/11, 2012/13, 2013, 2013/14 and 2014 undertaken by AMEC, and breeding bird surveys undertaken by Natural Power in 2012. All of these are documented in the Environmental Statement (ES) (Amec Foster Wheeler, 2015) for the Consented Development. The desk study is also informed by the breeding season bird surveys carried out for the proposed development by Wood in 2018.

The presence of Special Protection Areas (SPAs) and Ramsar sites within 20km of the Site and ornithological Sites of Special Scientific Interest (SSSIs) within 10km of the Site were determined by accessing the Multi-Agency Geographical Information for the Countryside (MAGIC) website<sup>2</sup>. Details of cited features of designated sites were obtained from the SNH SiteLink website<sup>3</sup>.

Other primary sources of contextual information were:

- ▶ The Birds of Scotland (Forrester *et al.*, 2007);

<sup>1</sup> It may also be appropriate to collect information on non-target species during surveys and desk studies, particularly those of regional conservation concern. However, recording of such species is subsidiary to the recording of target species.

<sup>2</sup> <http://magic.defra.gov.uk/>

<sup>3</sup> <https://sitelink.nature.scot/home>



- ▶ The Scottish Raptor Monitoring Scheme 2016 (Challis *et al.*, 2018); and
- ▶ Literature review to assess bird species connectivity to SPAs (Pendlebury *et al.*, 2011).

## Results

A single internationally designated site (SPA and/or Ramsar) lies within the 20km area of search: the Muirkirk and North Lowther Uplands SPA. There are no SSSIs which list ornithological interest as a reason for notification that lie within 10km of the Site.

**Table 1.1** provides details of statutory ornithological sites within the search area and **Figure 1.2** illustrates the designated ornithological sites within the search area.

Table 1.1 Statutory Ornithological Sites within the Search Area

Site name (Designation)	Distance from Site	Reason for designation	Potential connectivity
Muirkirk and North Lowther Uplands (SPA)	~13km NE	Hen harrier (breeding and non-breeding) Short-eared owl (breeding) Merlin (breeding) Peregrine (breeding) Golden plover (breeding)	Hen Harrier (regularly forages between 2-4kms but up to 10km from nest sites during the breeding season and forages within 6-16kms of communal winter roosts). Short-eared Owl (most foraging flights are recorded within 2km of nest sites, suggesting that the core range is 2kms, but foraging up to 4-5kms away from the nest site has been recorded). Merlin (regularly forages between 4-5kms from the nest during the breeding season, with a maximum recorded distance of 8kms). Peregrine (70% of foraging flights are recorded within 2km of nest sites, suggesting that the core range is 2kms). Golden Plover (forages a maximum of 10.7km away from breeding sites).

Connectivity distances reported from Pendlebury *et al.*, 2011.

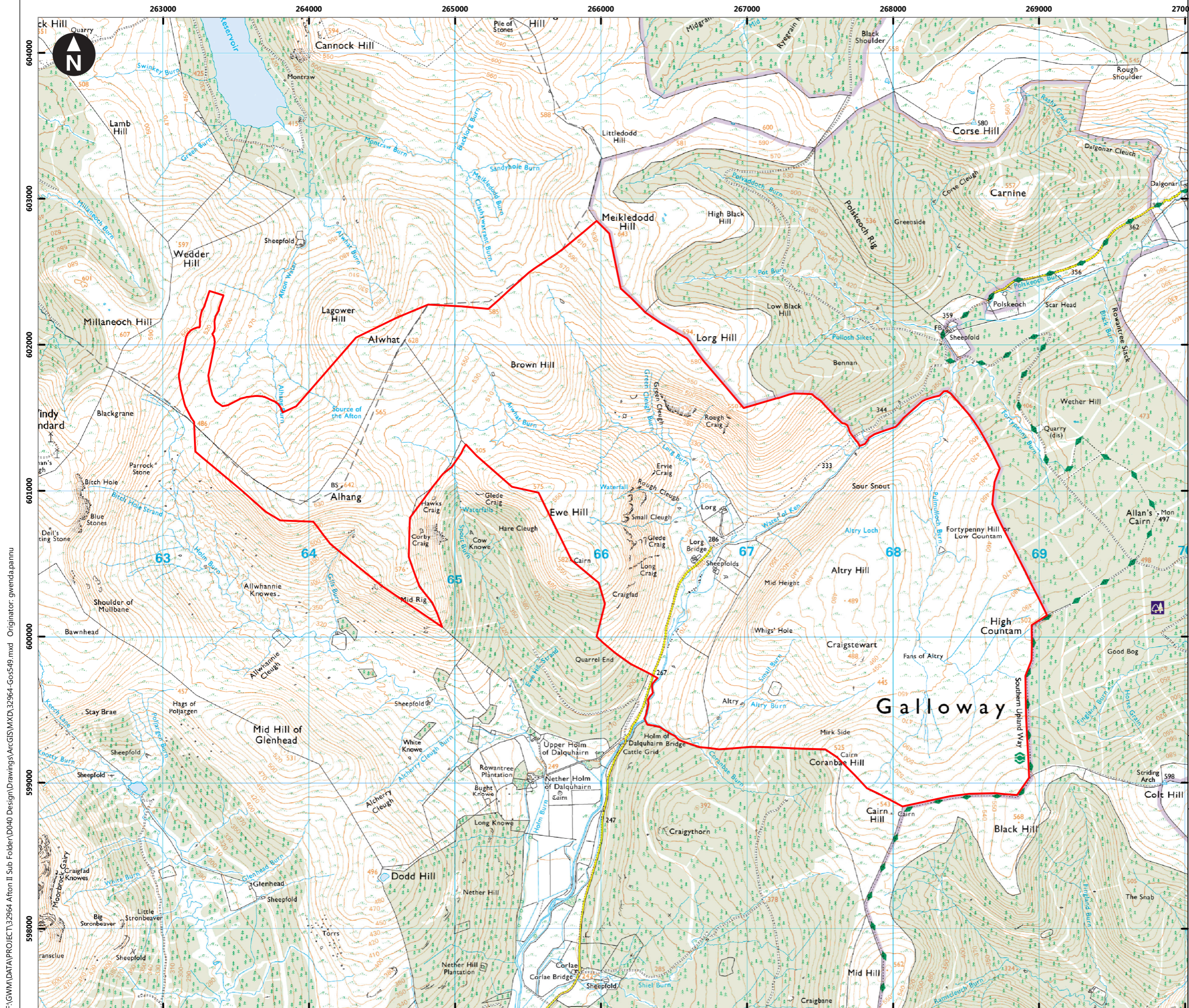
Ornithological survey work at the Site began in the non-breeding season of 2010/11 and subsequently covered two non-breeding seasons (2012/13 and 2013/14) and three breeding seasons (2012, 2013 and 2014); as well as a further breeding season in 2018. Results of these surveys are summarised herein:

- Recorded target species activity was low throughout the survey periods, with key findings being the presence of:
  - ▶ Very low numbers of black grouse; two males were recorded lekking on Site, although the birds were recorded in different locations and in different years;
  - ▶ An active barn owl roost site within the raptor survey area in 2014;
  - ▶ An active peregrine territory within the raptor survey area in 2014;
  - ▶ A merlin and goshawk nesting attempt within the raptor survey area in 2018;
  - ▶ Very low densities of breeding waders within the Site, comprising golden plover, curlew, oystercatcher, snipe and common sandpiper; and
  - ▶ Low target species flight activity levels between 2010 and 2014, with an increased level of red kite activity in the 2018 breeding season.

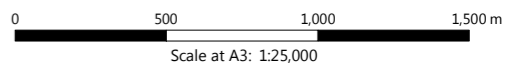
## 1.5 Target Species

The following key species of conservation concern (i.e. 'target species') were identified:

- Relevant SPA qualifying interests: hen harrier, golden plover, short-eared owl, merlin and peregrine;
- Annex I and/or Schedule 1 listed species, including those known to be present in the surrounding area: osprey, goshawk, red kite, dotterel, dunlin and barn owl;
- Waterfowl and Annex I waders on late autumn and early spring passage, including pink-footed goose, whooper swan, other goose and swan species, but excluding feral and introduced breeding species (e.g. Canada goose); and
- Other species of conservation concern such as: black grouse and long-eared owl.



Site boundary



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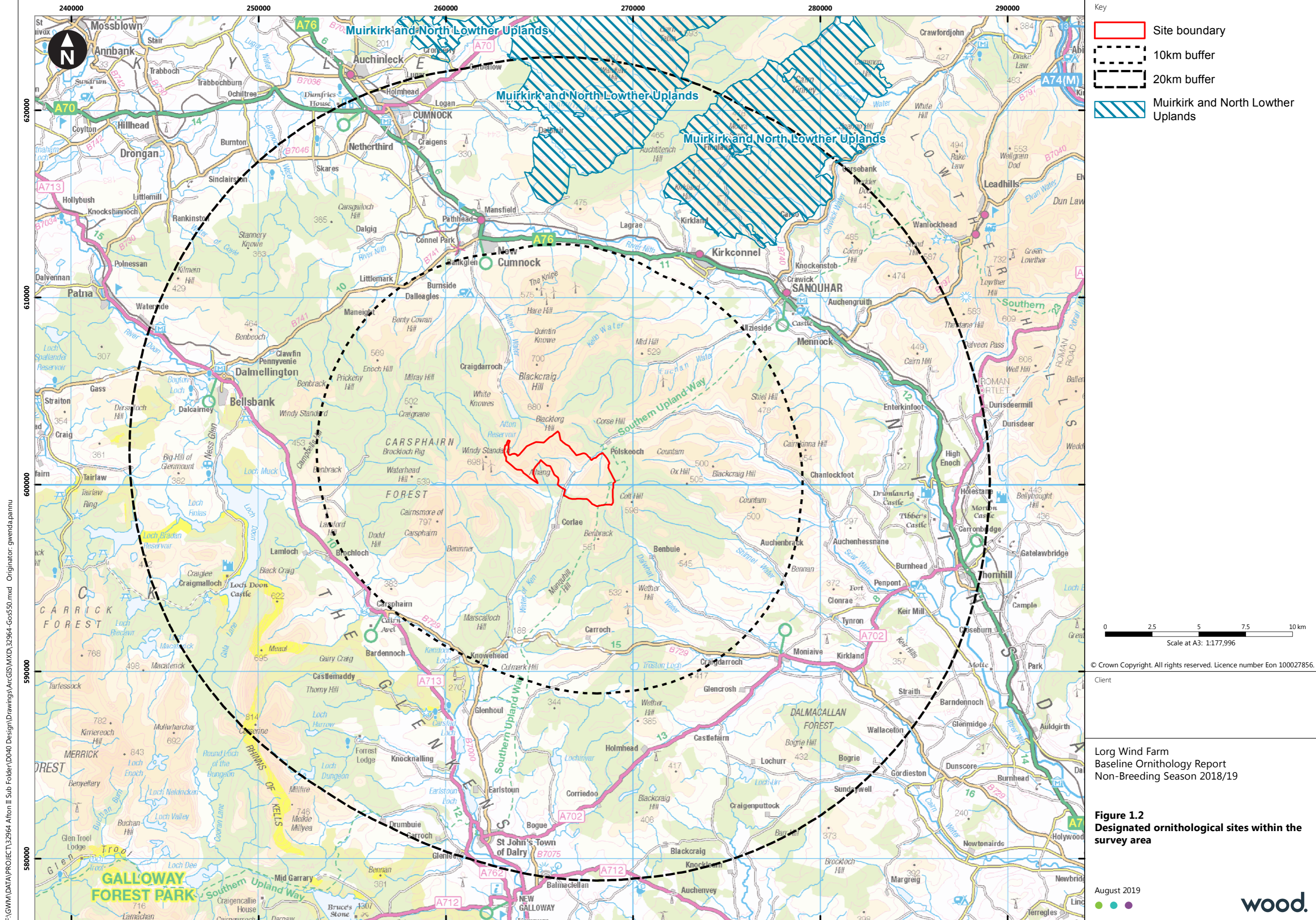
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Non-Breeding Season 2018/19

**Figure 1.1**  
**The Site**

August 2019



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Key

- Site boundary
- 10km buffer
- 20km buffer
- Muirkirk and North Lowther Uplands

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**Figure 1.2**  
Designated ornithological sites within the survey area

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## 2. Survey Methods

### 2.1 Surveyors

All surveys were undertaken by experienced Wood Ornithologists, all of whom have extensive field experience and a detailed understanding of the key methodologies recommended within SNH guidance and experience of monitoring bird activity and distribution at proposed wind farm sites. Surveys were undertaken by James Spencer ACIEEM, Pete Clark ACIEEM, Paul Massey MCIEEM, Paul Rowntree MCIEEM, Neil Rowntree and Damian Bubb.

### 2.2 Vantage Point Surveys

Vantage-point (VP) watches were conducted in accordance with SNH 2017 guidance and undertaken throughout the survey period. This method focuses on identifying flight-paths of target species and allows any regularly used flight lines to be identified, allowing turbine locations to be altered where necessary to reduce collision risk to birds. The data generated can also be used to estimate the theoretical risk of collision with turbines by incorporation into a suitable model.

The SNH guidance is that VPs should be chosen parsimoniously to achieve maximum visibility from the minimum number of locations such that all parts of the survey area are within two kilometres of a VP. Four vantage points were selected (VP locations and view-sheds are shown in **Figure 2.1**) as being enough to survey the turbine layout, the locations of which were:

- VP6 – NS 63310 02387, view bearing 135°;
- VP7 – NS 65429 01955, view bearing 230°;
- VP8 – NS 65591 02003, view bearing 50°; and
- VP9 – NX 67651 99278 – view bearing 65°.

The view-shed illustration in **Figure 2.1** shows a visible area at a height of 15m and above, as a middle height band of 15-150m was used. The VP locations were altered from previous years based on previous experience of the topography and the permission of vehicle access through Afton Wind Farm which facilitated access to the western side of the Site.

Flights were classified using the following three height bands:

- Band 1: <15m;
- Band 2: 15 – 150m; and
- Band 3: >150m.

These differ slightly from the bands used for the 2018 breeding season surveys. This is to account for changes to the proposed turbine heights.

A total of 168 hours of VP observation was undertaken between September 2018 and March 2019: 42 hours from each VP. The methodology to minimise observer disturbance was to allow ten minutes before starting each watch and to remain as inconspicuous as possible (a bivvy bag and camouflaged clothing was used). A 180° arc was scanned alternately by eye and with binoculars until a target species was detected. Flight times of a target species were then recorded with a stopwatch with an audible timer (times were synchronised with other surveyors on Site when undertaking simultaneous watches from separate VPs). Vantage point surveys were spread across the full range of daylight hours targeting diurnal raptors such as hen harrier, merlin,

peregrine and goshawk, geese and swans moving to and from their roosts and feeding sites, as well as crepuscular species such as golden plover, short-eared owl and barn owl. Only flights within the 2km viewshed were recorded, with all other target species flights out-with this zone noted as incidental records.

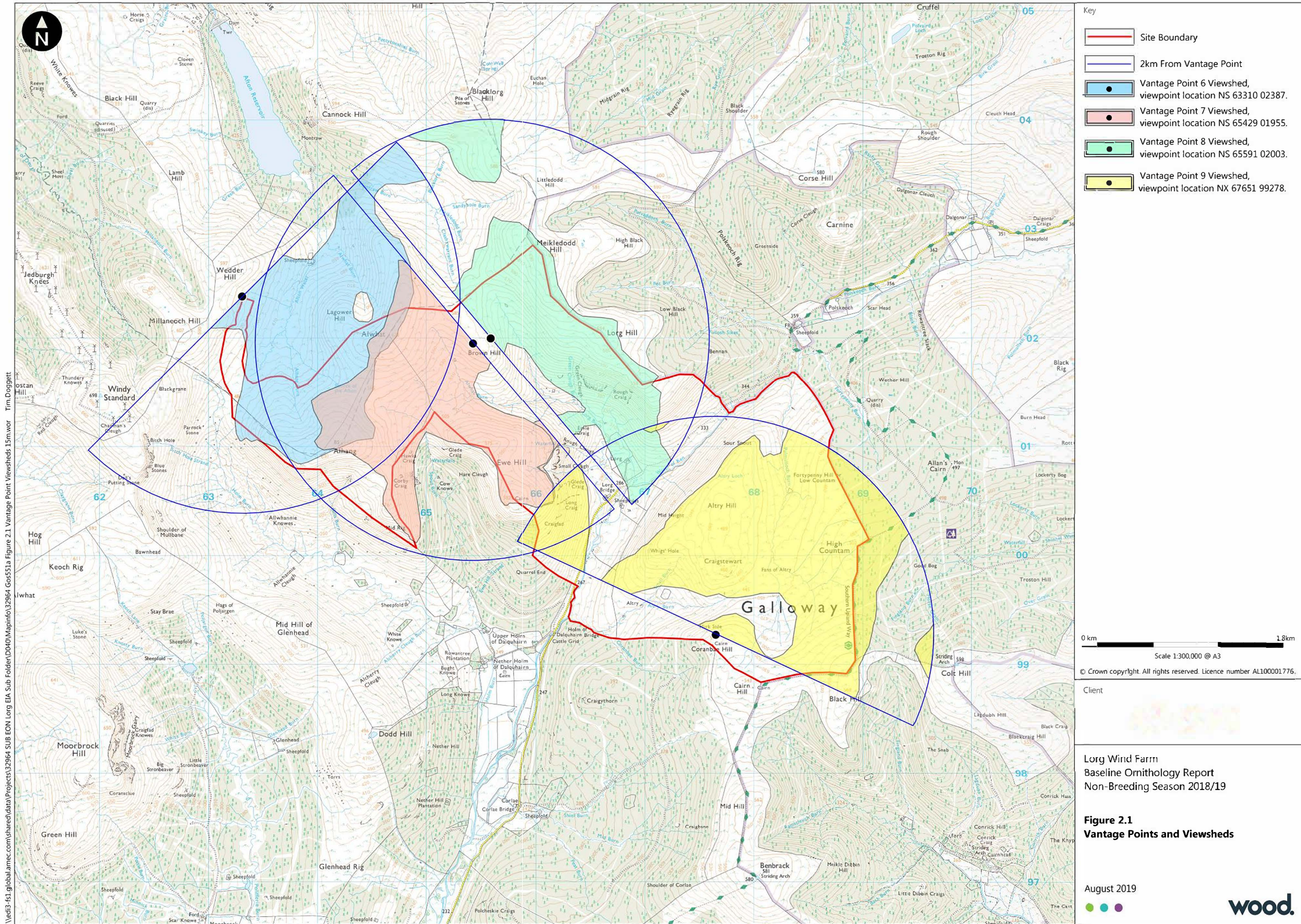
SNH (2017) guidance advises that VP surveys should be undertaken in good visibility and can be undertaken on showery days providing the showers are not too frequent or prolonged. The cloud base should be high enough to allow observation of the collision risk volume. Ideally observations should be undertaken in a range of wind conditions. Watches should be aimed to target heightened activity periods for the target species likely to be present and the survey programme adhered to this, with surveys planned for periods of suitable weather. The dates, times and weather conditions of the VP watches are provided in **Appendix A, Table A.1**.

## 2.3 'Incidental' Records

Birds seen outside of formal survey periods were also recorded (i.e. those observed during walks on and off Site, on walks between VPs and during other breaks in survey work). Detailed notes of activity of highly protected or 'target' species were made, and all flights mapped.

## 2.4 Limitations

Due to the unpredictability of weather conditions, especially pertaining to low levels of cloud or poor visibility, it was not always possible to spread the survey hours out equally from month to month.



\\ed3-fs1.global.amec.com\shared\data\Projects\32964 SUB EON Long EIA Sub Folder\DO40\MapInfo\32964 Gos551a Figure 2.1 Vantage Point Viewsheds 15m.wor Tim.Doggett

## 3. Survey Results

### 3.1 Vantage Point Surveys

The following target species were recorded during VP surveys: pink-footed goose, black grouse, goshawk, hen harrier, red kite, dunlin, and peregrine. Details of target species flights are provided in **Appendix B, Table B.1** and **Table 3.1** below presents a summary of flight activity, including reference to the duration of flight time between 15-150m height.

The flight lines are illustrated in **Figures 3.1a-b** and within the **Confidential Appendix**.

Table 3.1 Summary of Target Species Flight Activity

Species	No. of observations	Month/s of observation	Total flight duration at 15-150m height over the Site (seconds)
<b>Pink-footed goose</b>	3	March 2019	17,781
<b>Black grouse</b>	1	December 2018	0
<b>Goshawk</b>	9	October 2018; January, February and March 2019	393
<b>Hen harrier</b>	3	October 2018 and March 2019	306
<b>Red kite</b>	5	November 2018 and March 2019	371
<b>Dunlin</b>	1	March 2019	0
<b>Peregrine</b>	4	December 2018 and March 2019	558

### Secondary Species

The following secondary species were recorded during the vantage point surveys: goosander, red grouse, buzzard, curlew, kestrel and raven.

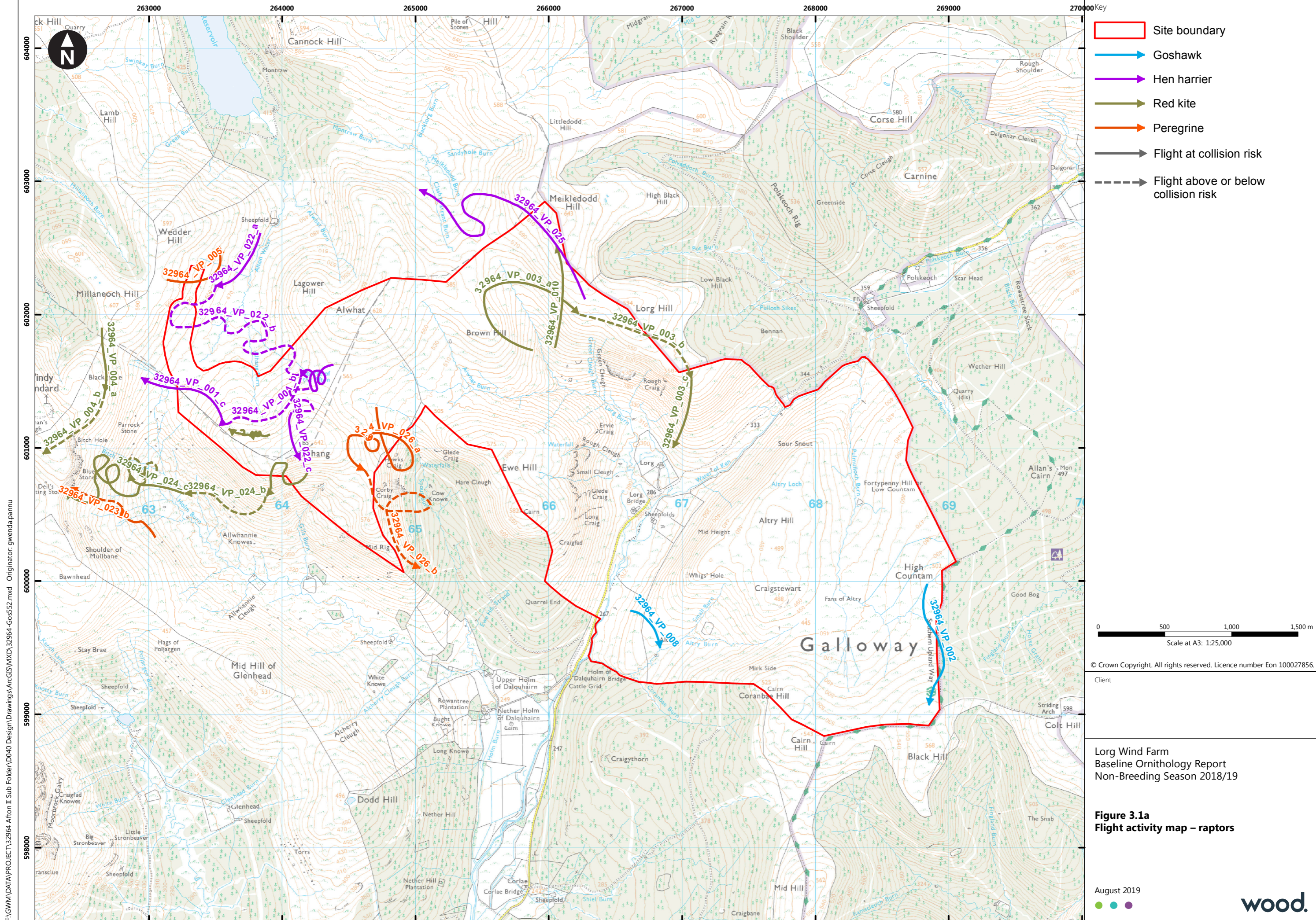
A single goosander was recorded flying along the Water of Ken in December. A single red grouse was heard calling from the head of the Alwhat Burn in December. Buzzards were regularly observed across the Site, frequently flying between 15-150m. There were three records of curlew in late March, with one bird recorded displaying between Brown Hill and Alwhat. There were four records of kestrel across the winter, with sightings generally comprising single birds (both male and female individuals noted). Ravens were regularly recorded across the Site with multiple birds frequently observed (up to six individuals). A single raven nest was recorded on-Site. Notable records also included a single snow bunting, which was recorded flying over Coronbae in early December.

### 3.2 'Incidental' Records

There were thirteen incidental records of target species, comprising greylag goose (one record), pink-footed goose (two), goshawk (six), red kite (three) and peregrine (one). All non-confidential 'incidental' records are illustrated in **Figure 3.2**, with further details provided in **Appendix Table B.2**. All confidential 'incidental records' are illustrated in the Confidential Appendix report and associated figures.







- Site boundary
- Goshawk
- Hen harrier
- Red kite
- Peregrine
- Flight at collision risk
- - - Flight above or below collision risk

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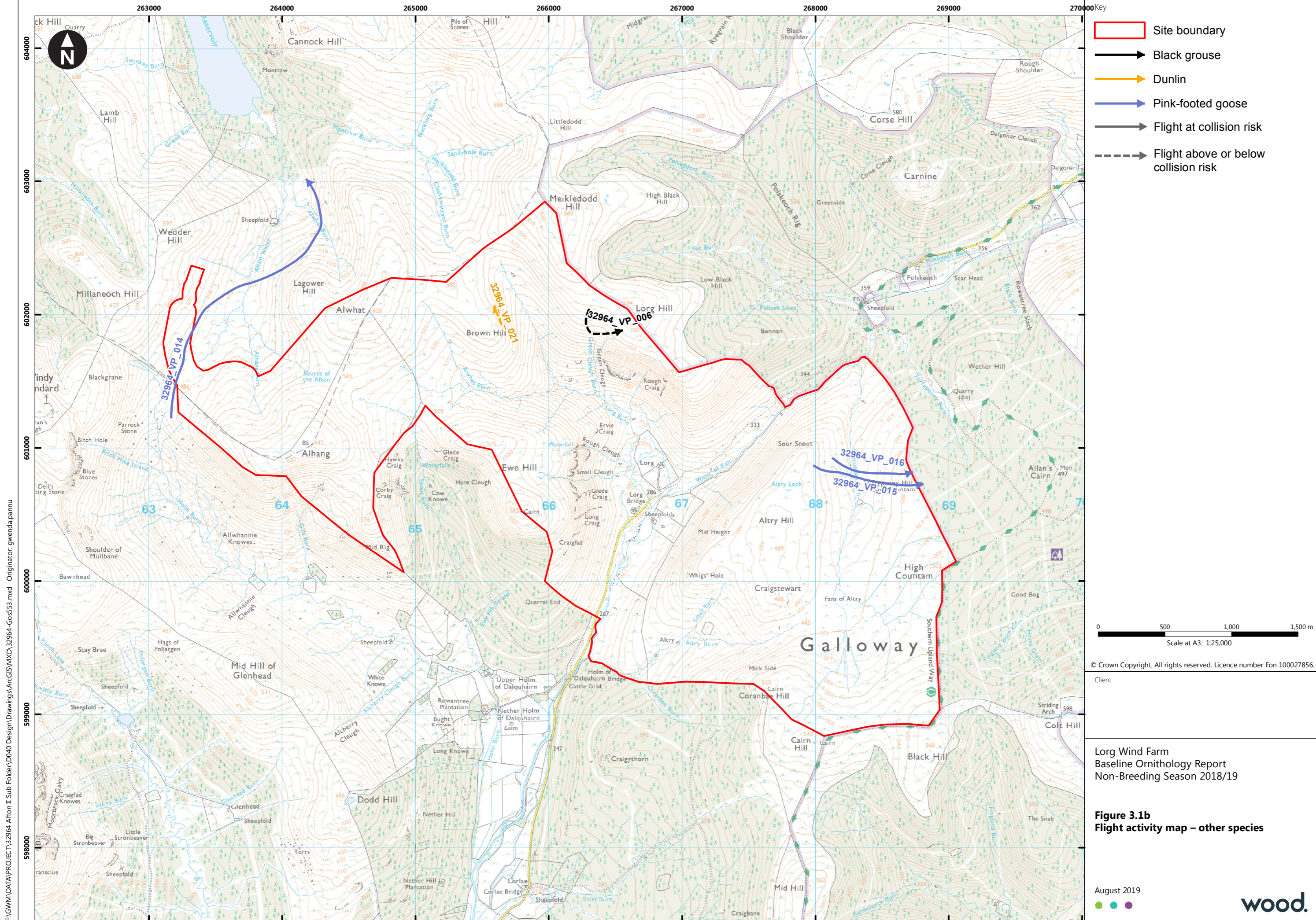
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**Figure 3.1a**  
**Flight activity map – raptors**

August 2019



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- Site boundary
- Black grouse
- Dunlin
- Pink-footed goose
- Flight at collision risk
- - - Flight above or below collision risk

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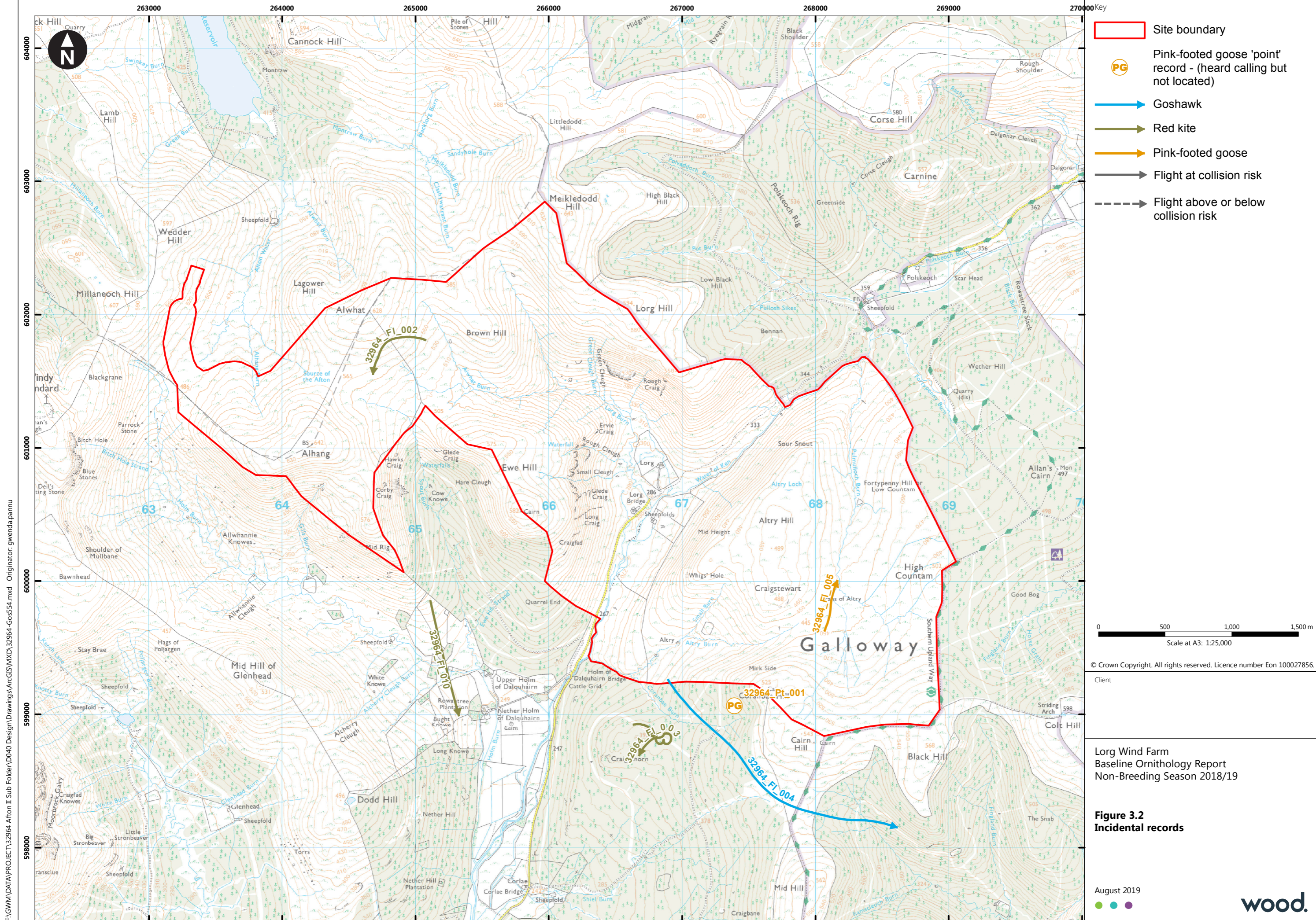
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**Figure 3.1b**  
Flight activity map – other species

August 2019



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- Site boundary
- PG Pink-footed goose 'point' record - (heard calling but not located)
- ➔ Goshawk
- ➔ Red kite
- ➔ Pink-footed goose
- ➔ Flight at collision risk
- - - ➔ Flight above or below collision risk

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**Figure 3.2**  
**Incidental records**

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## 4. Summary

A summary of target species activity and a review of their status is presented herein.

### 4.1 Target Species

#### Greylag Goose

Greylag goose is BoCC amber-listed based upon its non-breeding localisation in the UK (Eaton *et al.*, 2015). The current UK wintering population is estimated at 139,387 birds (Frost *et al.*, 2018) with the Western Southern Uplands and Inner Solway Natural Heritage Zone (NHZ) population estimated at 550 wintering birds (Wilson *et al.*, 2015).

There were no records of greylag goose during the VP surveys, although a greylag goose was heard but not seen on 17 October 2018 as the surveyor walked into VP9.

#### Pink-footed Goose

Pink-footed goose is BoCC amber-listed based upon its non-breeding localisation in the UK (Eaton *et al.*, 2015). The current UK wintering population is estimated at 515,852 birds (Bridges *et al.*, 2018). The Western Southern Uplands and Inner Solway NHZ population is estimated at 34,621 wintering birds (Wilson *et al.*, 2015).

There were three recorded flights of pink-footed goose during the VP surveys, all on 19 March 2019. A flock of 126 birds were recorded from VP6, flying within the 15-150m height band for 96 seconds (totalling 12,096 seconds). Two flocks were observed from VP9, one of 110 birds and another of 225 birds, spending 21 and 15 seconds of flight time within the 15-150m height band, totalling 2,130 and 3,375 seconds respectively. There were also two incidental records of pink-footed goose, with one record of a bird heard calling but not located during VP9 on 04 December and on 19 March 2019 when 60 birds flew over the Fans of Altry as the observer walked in to VP9.

#### Black Grouse

Black Grouse is BoCC red-listed based on its severe breeding population decline (Eaton *et al.*, 2015). This species is also on the Scottish Biodiversity List (SBL). The current UK population is estimated at 5,100 lekking males; 3,344 of which were in Scotland and 800 in South-West Scotland (Musgrove *et al.*, 2013). The Western Southern Uplands and Inner Solway NHZ population is estimated at 121 displaying males (Wilson *et al.*, 2015).

There was a single flight of black grouse recorded during the VP surveys. A male was recorded from VP8 in early December, flying below 15m height.

#### Goshawk

Goshawk is Schedule 1 listed with a UK population estimated to be 542 pairs (Holling *et al.*, 2017). The Scottish population was estimated to be between 144-173 pairs in 2015 (Challis *et al.*, 2018a) with 35 pairs in Dumfries and Galloway. During the 2017 breeding season, of 26 pairs monitored in Dumfries and Galloway, 36 young were fledged, whilst of five pairs monitored in Ayrshire four young were fledged (Challis *et al.*, 2018b).

There were nine records of goshawk from the VP surveys (two flights comprised two individuals) and six incidental records (all refer to flights outwith the respective VP viewsheds). Seven VP survey records and a five incidental records are considered to be confidential and therefore are discussed further in the Confidential Appendix. Both male and female individuals were recorded during the VP surveys, spending a total of 675 seconds within the 15-150m height band. Of this, 393 seconds occurred over the Site.

### Hen Harrier

Hen harrier is an Annex I and Schedule 1 listed species and is a BoCC red list species based on its historical decline in breeding populations (Eaton *et al.*, 2015). Hen harrier is an SBL species and is a designated feature of the Muirkirk and North Lowther Uplands SPA. In 2015, the British population was estimated at 545 breeding pairs (Holling *et al.*, 2017). The Scottish population was estimated at 431 pairs in 2016 (Challis *et al.*, 2018a). The NHZ population was estimated at 18 breeding pairs in 2010 (Wilson *et al.*, 2015). This species is of significant conservation concern due to its historical decline, which has been attributed to extensive illegal persecution, resulting in local extinction of the species from many parts of the UK (Balmer *et al.*, 2013).

There were three records of hen harrier during the VP surveys. Two records were from VP6 comprising an adult female in October and an adult male in March. A ringtail was recorded from VP8 in late March. Hen harriers were recorded in the 15-150m height band for a total of 306 seconds.

### Red Kite

Red Kite is an Annex I and Schedule 1 listed species and is also listed on the SBL. The Scottish population was estimated at a minimum of 273 pairs in 2016 (Challis *et al.*, 2018a). The Western Southern Uplands and Inner Solway NHZ population was estimated at 83 pairs in 2013 (Wilson *et al.*, 2015) and in 2017, 115 of 131 home ranges were occupied by pairs. In 2017, of 67 pairs monitored in Dumfries and Galloway a total of 77 young fledged (Challis *et al.*, 2018b). Red kite has not been confirmed to breed in Ayrshire (Chris Rollie *pers comm*).

A total of five red kite flights were recorded during the VP surveys. Three flights were recorded from VP6; two flights of a single bird in November and one flight of a single adult in March. There was also a single flight of one bird from VP8 in February and also from VP7 in March. Red kite were recorded in the 15-150m height band for a total of 371 seconds.

### Dunlin

Dunlin is listed on the SBL and is also BoCC amber-listed (Eaton *et al.*, 2015). The UK wintering population is estimated at 360,000 individuals and the breeding population at 8,600-10,600 pairs (Musgrove *et al.*, 2013). The Western Southern Uplands and Inner Solway NHZ population is estimated at 36 breeding pairs (Wilson *et al.*, 2015).

Dunlin was recorded once during the VP surveys, with a single bird recorded from VP8 on March 26. No flight time was recorded within the 15-150m height band.

### Peregrine

Peregrine is listed on the Muirkirk and North Lowther Uplands SPA citation, and is an Annex 1, Schedule 1 and SBL listed species. There was an estimated 1,769 breeding pairs in the UK in 2014, with 523 of these pairs in Scotland (Wilson *et al.*, 2018). The Western Southern Uplands and Inner Solway NHZ population is estimated at 34 breeding pairs (Wilson *et al.*, 2015). In 2017: 49 home ranges were checked in Ayrshire, of which 26 sites were occupied by pairs, fledging a minimum of 41 young; and 117 home ranges were checked in Dumfries and Galloway, of which 63 were occupied by pairs, fledging a minimum of 73 young (Challis *et al.*, 2018b). The UK population of peregrine continues to increase, probably because of reduced persecution, abundant prey and increased tolerance of humans (Balmer *et al.*, 2013).

There were four peregrine flights recorded during the VP surveys of which 558 seconds of flight time was recorded at 15-150m height. A single bird was recorded hunting jackdaws from VP6 in November and there were also two records from late March of a probable male recorded from VP6 and VP7. A further flight record is considered to be confidential.





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# Appendix A

## Survey Conditions

Table A.1 Dates, Times and Weather Conditions during the VP Watches

Date	Start	Finish	Length of VP watch (hrs)	Weather conditions (wind using Beaufort scale)
<b>Vantage point 6 – 42 hours</b>				
17/10/18	11:40	14:40	3	Mainly dry (some light rain), Wind F4 W, Cloud Cover 4-7/8, Visibility >3km, Temp 9-8c.
17/10/18	15:10	18:10	3	Dry, Wind F3-2 W, Cloud Cover 4-6/8, Visibility >3km, Temp 9-7c.
20/11/18	08:50	11:50	3	Light showers, Wind F4-5 E, Cloud Cover 7-6/8, Visibility >3km, Temp 1c.
20/11/18	12:20	15:20	3	Light showers, Wind F5-3 E, Cloud Cover 7-8/8, Visibility >3km, Temp 1c.
22/11/18	08:55	11:55	3	Dry, Wind F3-4 SE, Cloud Cover 0-7/8, Visibility >3km, Temp 1-0c.
22/11/18	12:25	15:25	3	Light showers, Wind F2 SE-ESE, Cloud Cover 6-8/8, Visibility >3km to 1-3km, Temp 0-2c.
03/12/18	13:05	16:05	3	Dry, Wind F4 NW, Cloud Cover 3-1/8, Visibility >3km, Temp 1-0c.
10/12/18	12:00	15:00	3	Dry, Wind F3 NW, Cloud Cover 5-7/8, Visibility >3km, Temp 1-2c.
17/01/19	09:25	12:25	3	Dry, Wind F5 NW, Cloud cover 0/8, Visibility >3km, Temp -5c, all day frost, high ground snow.
17/01/19	12:55	15:55	3	Dry, Wind F3 NW, Cloud cover 1-3/8, Visibility >3km, Temp -3c, all day frost, high ground snow.
18/03/19	11:30	14:30	3	Light rain, Wind F4 SW, Cloud Cover 8/8, Visibility 1-3km, Temp 3c, Snow on high ground.
18/03/19	15:00	16:00	1	Light rain, Wind F4 SW, Cloud Cover 8/8, Visibility 1-3km, Temp 3c, Snow on high ground.
19/03/19	08:25	10:25	2	Light rain, Wind F4-5 SW, Cloud Cover 7-8/8, Visibility 1-3km, Temp 3c, Snow on high ground.
26/03/19	09:50	12:50	3	Dry, Wind F4-6 NW, Cloud Cover 7-8/8, Visibility >3km, Temp 5-6c, Snow on high ground.
26/03/19	13:20	16:20	3	Light rain, Wind F6-5 NW, Cloud Cover 8/8, Visibility >3km to 1-3km, Temp 5-4c, Snow on high ground.
<b>Vantage point 7 – 42 hours</b>				
29/09/18	10:15	12:15	2	Dry to drizzle, Wind F5-7 W, Cloud Cover 7-8/8, Visibility >3km to 1-3km, Temp 8-7c.
19/10/18	09:10	10:10	1	Dry, Wind F3 WSW, Cloud Cover 8/8, Visibility 1-3km, Temp 7-9c.
19/11/18	12:50	15:50	3	Light showers, Wind F6-4 E-SE, Cloud Cover 8-3/8, Visibility >3km, Temp 3-1c.
21/11/18	09:20	12:20	3	Light showers, Wind F5-6 SSE, Cloud Cover 8/8, Visibility >3km, Temp 1c.

Date	Start	Finish	Length of VP watch (hrs)	Weather conditions (wind using Beaufort scale)
21/11/18	12:52	15:52	3	Dry, Wind F4 E, Cloud Cover 7/8, Visibility >3km, Temp 3c.
04/12/18	10:05	13:05	3	Mainly dry (drizzle at end), Wind F3-4 SW, Cloud Cover 6-8/8, Visibility 1-3km to >3km, Temp -1c.
04/12/18	13:30	16:30	3	Mainly dry (light rain at start), Wind F2-3 SW, Cloud Cover 7-6/8, Visibility 1-3km, Temp 3c.
10/12/18	11:45	13:15	1.5	Dry, Wind F1-2 NW, Cloud Cover 4-7/8, Visibility >3km, Temp 5c.
02/01/19	12:15	15:15	3	Dry, Wind F2-3 SW, Cloud Cover 1-2/8, Visibility >3km, ground frost, Temp -3c.
27/02/19	11:20	14:20	3	Dry, Wind F2-3 W, Cloud Cover 1/8, Visibility >3km, Temp 8-9c.
27/02/19	14:45	17:45	3	Dry, Wind F2-3 SW, Cloud Cover 0-6/8, Visibility >3km, Temp 5-11c.
04/03/19	13:30	16:30	3	Dry, Wind F5-6 NW, Cloud Cover 4-7/8, Visibility >3km-1-2km, Temp 1c, Snow.
04/03/19	17:00	18:00	1	Dry, Wind F6 NW, Cloud Cover 8/8, Visibility >3km, Temp 1c, Snow.
08/03/19	11:45	14:45	3	Dry, Wind F6-7 NW, Cloud Cover 7/8, Visibility >3km, Temp 1c, Snow.
08/03/19	15:15	18:15	3	Dry, Wind F6-7 NW, Cloud Cover 4-6/8, Visibility >3km, Temp 0-1c, Snow.
26/03/19	10:35	12:35	2	Dry, Wind F6 W, Cloud Cover 8/8, Visibility >3km, Temp 1c, Snow on high ground.
26/03/19	13:00	15:30	2.5	Dry, Wind F6 W, Cloud Cover 8/8, Visibility >3km, Temp 1c, Snow on high ground.
<b>Vantage point 8 – 42 hours</b>				
27/09/18	10:30	12:30	2	Drizzle, Wind F4-6 SW, Cloud Cover 8/8, Visibility >3km to <1km, Temp 14-11c.
19/10/18	09:15	10:15	1	Dry, Wind F5 S, Cloud Cover 7-8/8, Visibility 1-3km, Temp 3c.
19/11/18	12:55	15:55	3	Light showers, Wind F4-3 E, Cloud Cover 7-4/8, Visibility >3km, Temp 7c.
21/11/18	09:22	12:22	3	Light rain, Wind F5-4 E, Cloud Cover 7-8/8, Visibility >3km, Temp 3c.
21/11/18	12:50	15:50	3	Dry, Wind F5-4 SSE, Cloud Cover 8-6/8, Visibility >3km, Temp 1c.
04/12/18	10:00	13:00	3	Dry, Wind F2-3 SW, Cloud Cover 6-7/8, Visibility >3km to 1-3km, Temp 2-3c.
04/12/18	13:35	15:35	2	Mainly dry (drizzle at start), Wind F4 SW, Cloud Cover 8-7/8, Visibility 1-3km, Temp -1c.
10/12/18	13:16	14:46	1.5	Dry, Wind F0-1 NW, Cloud Cover 5-7/8, Visibility >3km, Temp 5c.
02/01/19	12:15	15:15	3	Dry, Wind F2-3 N, Cloud Cover 1-3/8, Visibility >3km, ground frost, Temp -3c.
27/02/19	11:15	14:15	3	Dry, Wind F2 SW, Cloud Cover 0-1/8, Visibility >3km, Temp 9-11c.
27/02/19	14:50	17:50	3	Dry, Wind F1-3 W, Cloud Cover 1-5/8, Visibility >3km, Temp 5-9c.
04/03/19	13:30	16:30	3	Dry, Wind F4-5 NW, Cloud Cover 6-7/8, Visibility >3km, Temp 1c, Snow.

Date	Start	Finish	Length of VP watch (hrs)	Weather conditions (wind using Beaufort scale)
04/03/19	17:00	18:00	1	Dry, Wind F5 NW, Cloud Cover 7-8/8, Visibility >3km, Temp 1c, Snow.
08/03/19	11:45	14:45	3	Some drizzle, Wind F6-7 NW, Cloud Cover 8/8, Visibility >3km, Temp 1c, Snow.
08/03/19	15:15	18:15	3	Some drizzle, Wind F6-7 NW, Cloud Cover 8/8, Visibility >3km, Temp 1c, Snow.
26/03/19	10:30	12:30	2	Dry, Wind F5-6 NW-W, Cloud Cover 8/8, Visibility >3km, Temp 3-2c, Snow on high ground.
26/03/19	13:05	15:35	2.5	Light showers, Wind F5-4 W, Cloud Cover 8/8, Visibility 1-3km, Temp 1-2c, Snow on high ground.
<b>Vantage point 9 – 42 hours</b>				
17/10/18	11:55	14:55	3	Occ. light showers, Wind NW F4-2, Cloud Cover 5-7/8, Visibility >3km, Temp 5-7c.
17/10/18	15:25	18:25	3	Occ. light showers, Wind F2-3 NW, Cloud Cover 6-3/8, Visibility >3km, Temp 7-5c.
20/11/18	08:45	11:45	3	Dry, Wind F4-5 E-NE, Cloud Cover 5-6/8, Visibility >3km, Temp 5c.
20/11/18	12:15	15:15	3	Light showers, Wind F4 NE, Cloud Cover 6-4/8, Visibility >3km, Temp 5c.
22/11/18	08:35	11:35	3	Dry, Wind F3 E, Cloud Cover 0-3/8, Visibility >3km, Temp 2-3c.
22/11/18	12:05	15:05	3	Light showers, Wind F2 E, Cloud Cover 7-8/8, Visibility >3km to 1-3km, Temp 4c.
04/12/18	09:30	12:30	3	Dry, Wind Still to F1 SW, Cloud Cover 4-7/8, Visibility 1-3km to >3km, Temp -3c to 1c.
04/12/18	13:10	16:10	3	Dry, Wind F1 SW, Cloud Cover 7-6/8, Visibility 1-3km to >3km, Temp 1-2c.
17/01/19	09:35	12:35	3	Dry, Wind F5 N, Cloud cover 0/8, Visibility >3km, Temp -5c, ground frost and snow.
17/01/19	13:05	16:05	3	Dry, Wind F4-2 NW, Cloud cover 1-5/8, Visibility >3km, Temp -0c, ground frost and snow.
18/03/19	12:00	15:00	3	Light rain, Wind F2 SW, Cloud Cover 8/8, Visibility 1-3km, Temp 8c.
18/03/19	15:30	16:30	1	Light rain, Wind F2 SW, Cloud Cover 8/8, Visibility 1-3km, Temp 8c.
19/03/19	09:15	10:45	1.5	Dry, Wind F3-4 SW, Cloud Cover 7/8, Visibility 1-3km, Temp 8c.
26/03/19	13:40	16:40	3	Mainly dry (light rain at start), Wind F4 W, Cloud Cover 8/8, Visibility >3km, Temp 5c.
26/03/19	17:10	17:40	0.5	Light rain, Wind F4 W, Cloud Cover 8/8, Visibility >3km, Temp 5c.



# Appendix B

## Survey Results

Table B.1 Vantage Point Survey Results

Flight reference no.	Date	Time	VP	No. of birds	Flight behaviour / age of bird	Time at risk height (15-150m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
<b>Pink-footed goose</b>							
32964_VP_014	19/03/19	08:31	6	126	Calling, slow flight through valley and lost from view to north out of viewshed.	96	12,096
32964_VP_015	19/03/19	10:21	9	110	Appeared out of low cloud.	21	2,310
32964_VP_016	19/03/19	10:24	9	225	Appeared out of low cloud.	15	3,375
<b>Black grouse</b>							
32964_VP_006	04/12/18	14:54	8	1	Male flushed by raven. Lost from view on slope when landed. Still present feeding in sedges at 15:35.	0	0
<b>Goshawk</b>							
32964_VP_002	17/10/18	12:35	9	1	Female.	28	28
32964_VP_008	17/01/19	11:10	9	1	Male.	4	4
<b>Hen harrier</b>							
32964_VP_001_a	17/10/18	14:16	6	1	Adult female.	80	80
32964_VP_001_b	17/10/18	14:16	6	1	Slow flight over valley then out of view.	0	0
32964_VP_001_c	17/10/18	14:16	6	1		55	55
32964_VP_022_a	26/03/19	10:46	6	1	Adult male. Flew out of valley, hunting. A quick flight gaining height over Alhang.	5	5
32964_VP_022_b	26/03/19	10:46	6	1		0	0
32964_VP_022_c	26/03/19	10:46	6	1		6	6
32964_VP_025	26/03/19	11:39	8	1	Ringtail.	160	160
<b>Red kite</b>							
32964_VP_003_a	19/11/18	13:37	8	1		139	139
32964_VP_003_b	19/11/18	13:37	8	1		0	0



Flight reference no.	Date	Time	VP	No. of birds	Flight behaviour / age of bird	Time at risk height (15-150m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
32964_VP_003_c	19/11/18	13:37	8	1		12	12
32964_VP_004_a	22/11/18	09:41	6	1	Lost from view.	31	31
32964_VP_004_b	22/11/18	09:41	6	1		0	0
32964_VP_010	27/02/19	12:30	8	1	Lost from view due to goshawk flight at same time.	49	49
32964_VP_020_a	26/03/19	11:55	7	1	Left viewshed, very high.	30	30
32964_VP_020_b	26/03/19	11:55	7	1		0	0
32964_VP_024_a	26/03/19	11:55	6	1	Adult. Flew high over Alhang ridge, dropped and circled through valley. Lost behind cliff to west.	30	30
32964_VP_024_b	26/03/19	11:55	6	1		0	0
32964_VP_024_c	26/03/19	11:55	6	1		20	20
32964_VP_024_d	26/03/19	11:55	6	1		0	0
32964_VP_024_e	26/03/19	11:55	6	1		60	60
<b>Dunlin</b>							
32964_VP_021	26/03/19	14:26	8	1	Calling, lost from view, low.	0	0
<b>Peregrine</b>							
32964_VP_005	22/11/18	10:45	6	1	Flew over VP chasing jackdaws.	25	25
32964_VP_023_a	26/03/19	11:13	6	1	Probable male. Stationary in wind then stooped behind outcrop to west.	20	20
32964_VP_023_b	26/03/19	11:13	6	1		0	0
32964_VP_026_a	26/03/19	13:09	7	1	Probable male.	30	30
32964_VP_026_b	26/03/19	13:09	7	1		0	0



Table B.2 'Incidental' Records

Unique ID	Date	Notes
<b>Greylag goose</b>		
32964_FI_001	17/10/18	Heard but not seen on access to VP. <i>Not marked on base-map so not digitised.</i>
<b>Pink-footed goose</b>		
32964_FI_005	19/03/19	Brief view of skein heading north during walk-in to VP.
32964_Pt_001	04/12/18	Single bird heard twice behind VP9 but not seen in low cloud (at least >150m flight height).
<b>Goshawk</b>		
32964_FI_004	17/01/19	Remainder of flight 32964_VP_008 outwith view-shed.
<b>Red kite</b>		
32964_FI_002	17/10/18	Flying near Alhang during access to VP.
32964_FI_003	04/12/18	Adult flew over Craigythorn behind VP9 (outwith viewshed) for 24 secs at <15m when lost from view behind trees.
32964_FI_010	26/03/19	Flew along Holm Valley during VP9 (outwith viewshed).





## Appendix C

### Species List

Table C.1 Species Names

IOC Species Name (2018)	Scientific Name	IOC Species Name (2018)	Scientific Name
<b>Canada goose</b>	<i>Branta canadensis</i>	<b>Dotterel</b>	<i>Charadrius morinellus</i>
<b>Greylag goose</b>	<i>Anser anser</i>	<b>Curlew</b>	<i>Numenius arquata</i>
<b>Pink-footed goose</b>	<i>Anser brachyrhynchus</i>	<b>Dunlin</b>	<i>Calidris alpina</i>
<b>Whooper swan</b>	<i>Cygnus cygnus</i>	<b>Snipe</b>	<i>Gallinago gallinago</i>
<b>Goosander</b>	<i>Mergus merganser</i>	<b>Common sandpiper</b>	<i>Actitis hypoleucos</i>
<b>Black grouse</b>	<i>Tetrao tetrix</i>	<b>Barn owl</b>	<i>Tyto alba</i>
<b>Red grouse</b>	<i>Lagopus lagopus</i>	<b>Long-eared owl</b>	<i>Asio otus</i>
<b>Goshawk</b>	<i>Accipiter gentilis</i>	<b>Short-eared owl</b>	<i>Asio flammeus</i>
<b>Hen harrier</b>	<i>Circus cyaneus</i>	<b>Kestrel</b>	<i>Falco tinnunculus</i>
<b>Red kite</b>	<i>Milvus milvus</i>	<b>Merlin</b>	<i>Falco columbarius</i>
<b>Common buzzard</b>	<i>Buteo buteo</i>	<b>Peregrine</b>	<i>Falco peregrinus</i>
<b>Oystercatcher</b>	<i>Haematopus ostralegus</i>	<b>Raven</b>	<i>Corvus corax</i>
<b>Golden Plover</b>	<i>Pluvialis apricaria</i>	<b>Snow bunting</b>	<i>Plectrophenax nivalis</i>

**wood.**

