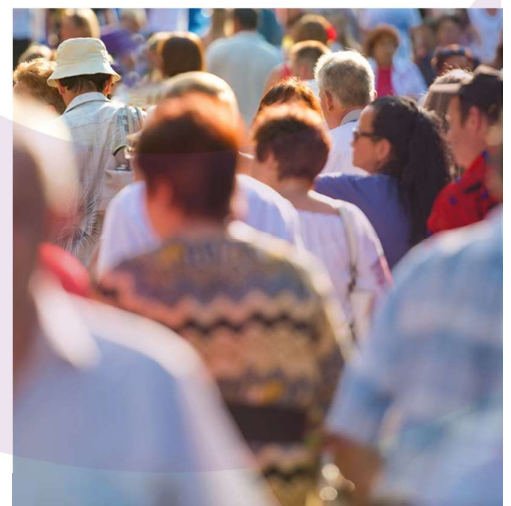
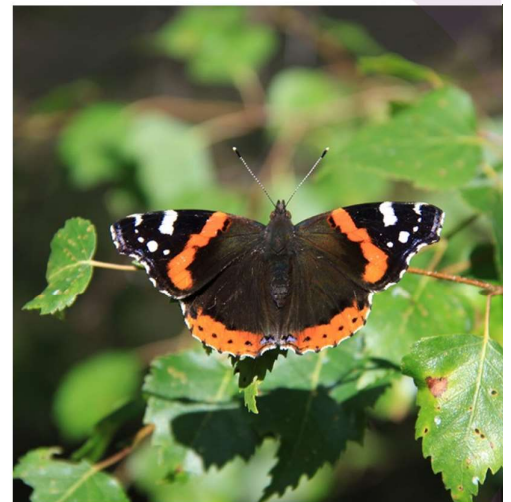




E.ON Climate and Renewables

## Lorg Wind Farm

Baseline Ornithology Report  
Non-Breeding Season 2019/20



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### Document revisions

No.	Details	Date
01	First Draft	29/06/2020
02	Final	01/12/2020

## Executive summary

- This report documents the methods and results of non-breeding bird surveys undertaken between September 2019 and March 2020 inclusive at the site of the proposed Lorg Wind Farm in East Ayrshire and Dumfries and Galloway. Updated bird surveys were carried out in order to support a new variation application;
- 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 golden plover, hen harrier, short-eared owl, merlin and peregrine; and overwintering hen harrier. Hen harrier and peregrine have both been recorded on the Site;
- Survey work during the 2019/20 non-breeding season comprised of vantage point (VP) surveys from four VP locations with 42 hours observation per VP;
- During the VP surveys a total of 50 flights of ten target species were recorded (greylag goose, pink-footed goose, whooper swan, golden plover, golden eagle, goshawk, hen harrier, red kite, merlin and peregrine), of which 42 flights were recorded at 15-150m height; and
- In addition, there were incidental records of three target species: pink-footed goose, red kite and peregrine.

# Contents

<b>1.</b>	<b>Introduction</b>	<b>6</b>
1.1	About this Document	6
1.2	Site Description	6
1.3	Background and Scope	6
1.4	Desk Study	7
1.5	Target Species	7
<b>2.</b>	<b>Survey Methods</b>	<b>9</b>
2.1	Surveyors	9
2.2	Vantage Point Surveys	9
2.3	'Incidental' Records	10
2.4	Limitations	10
<b>3.</b>	<b>Survey Results</b>	<b>11</b>
3.1	Vantage Point Surveys	11
	Secondary Species	11
3.2	'Incidental' Records	11
<b>4.</b>	<b>Summary</b>	<b>13</b>
4.1	Target species	13
	Greylag goose	13
	Pink-footed goose	13
	Whooper swan	13
	Golden plover	13
	Golden eagle	13
	Goshawk	14
	Hen harrier	14
	Red kite	14
	Merlin	15
	Peregrine	15

Table 3.1	Summary of Target Species Flight Activity	11
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Figure 1.1	Site Boundary	After Page 8
Figure 1.2	Designated Ornithological Sites within the Search Area	After Page 8
Figure 2.1	VP Viewshed Analysis	After Page 10
Figure 3.1a	Flight Activity Map – pink-footed goose, greylag goose and whooper swan	After Page 12
Figure 3.1b	Flight Activity Map – golden plover	After Page 12
Figure 3.1c	Flight Activity Map – golden eagle, hen harrier, red kite, merlin and peregrine	After Page 12
Figure 3.2	'Incidental' Records	After Page 12

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References

16

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- Appendix A Survey Conditions
  - Appendix B Survey Results
  - Appendix C Species List



# 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 2019/20 non-breeding season (September 2019 to March 2020 inclusive) for a proposed variation to the consented 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 support an Ecological Impact Assessment for the Site. This work supplements non-breeding bird surveys that were undertaken at the Site by AMEC during the 2010/11, 2012/13 and 2013/14 seasons; and by Wood during 2018/19. Breeding bird surveys were also carried out at the Site by Natural Power in 2012; AMEC in 2013 and 2014; and Wood in 2018 and 2019.

## 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, while open grassland areas similar to those on Site are present to the west. Afton Reservoir is located approximately 1.5 kilometres to the northwest.

## 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 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

Full details of the updated desk study undertaken in autumn 2019 can be found in the Lorg Wind Farm Baseline Ornithology Report – Non-breeding Season 2018/19 and supporting Confidential Appendix (Wood, 2019<sup>2</sup>).

## 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

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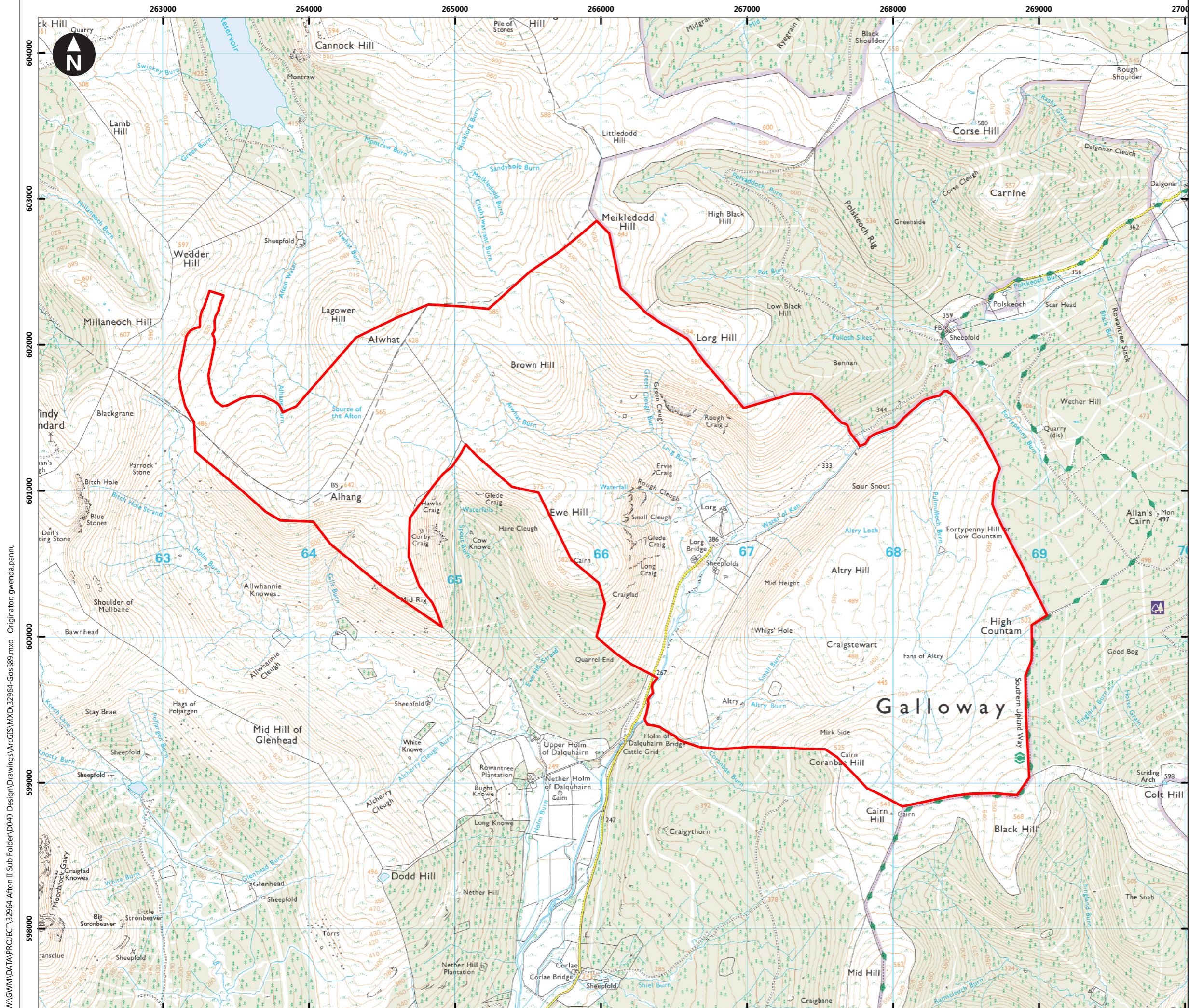
<sup>1</sup> It may also be appropriate to collect information on non-target species during surveys and desk studies, particularly those of regional conservation concern. However, recording of such species is subsidiary to the recording of target species.

<sup>2</sup> Wood. 2019. E.ON Climate & Renewables Lorg Wind Farm Baseline Ornithology Report – Non-breeding Season 2018/19. Doc Ref. 32964-WOOD-XX-XX-RP-OE-0001\_A\_P01.1.

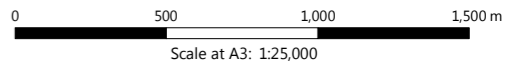
- Other species of conservation concern such as: black grouse and long-eared owl.

Additionally, the following secondary species were identified as potentially occurring: sparrowhawk, buzzard, oystercatcher, lapwing, curlew, snipe, common sandpiper, kestrel and raven.





Site boundary



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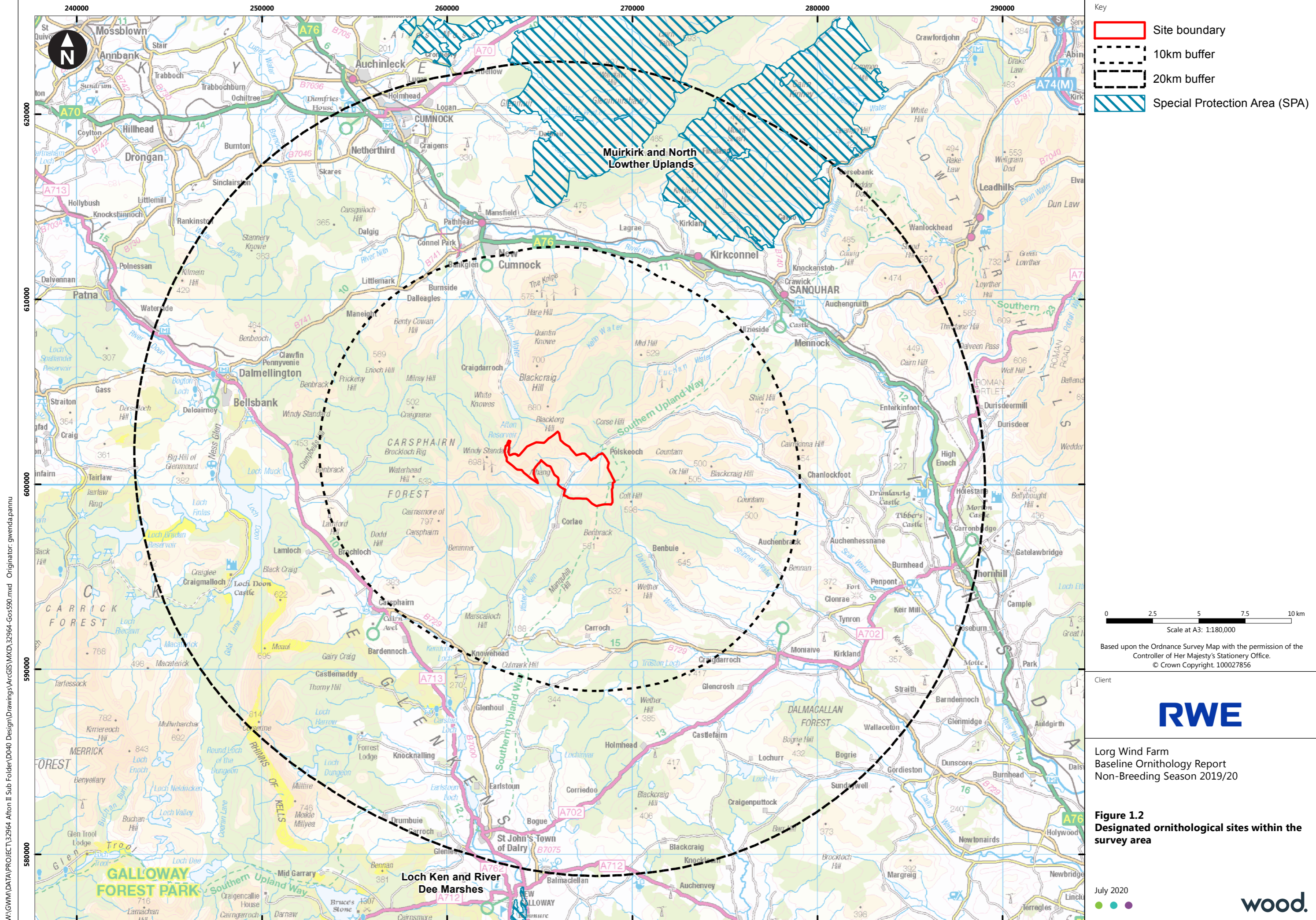
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Baseline Ornithology Report  
Non-Breeding Season 2019/20

**Figure 1.1**  
Site boundary

July 2020

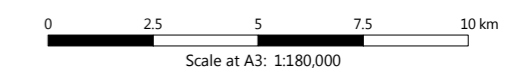


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Key

- Site boundary
- 10km buffer
- 20km buffer
- Special Protection Area (SPA)



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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 Pete Clark MCIEEM, Paul Rowntree MCIEEM, Neil Rowntree, Duncan Priddle MCIEEM and Euan Ferguson.

### 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 viewshed analysis in Figure 2.1 shows the area visible at a height of 15m. Flights were classified using the following three height bands:

- Band 1: <15m;
- Band 2: 15m – 180m; and
- Band 3: >180m.

These differ from the bands used for the 2018 and 2018/19 vantage point surveys. This is to account for changes to the proposed turbine heights.

A total of 168 hours of VP observation was undertaken between September 2019 and March 2020: 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.

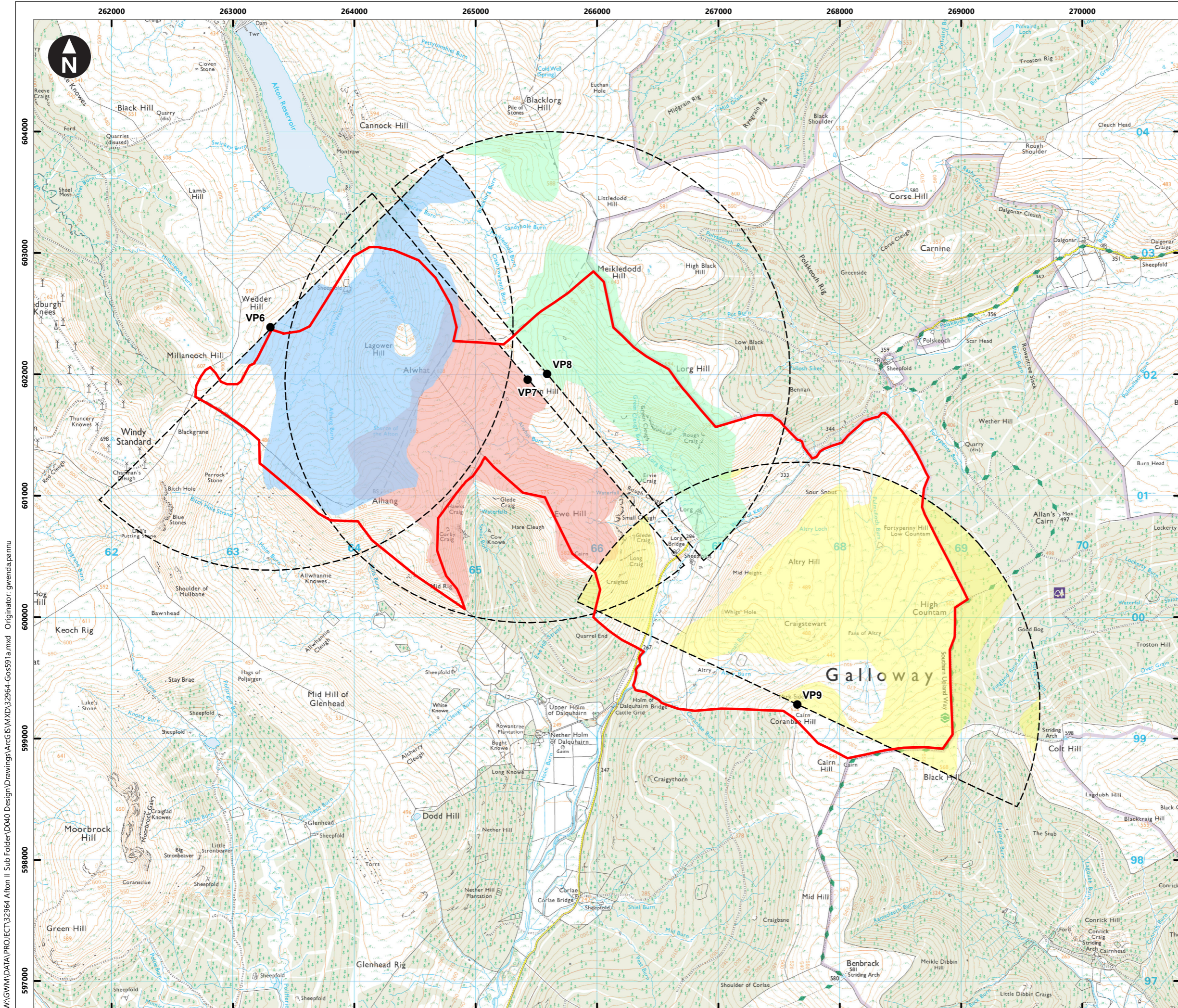
SNH (2017) guidance advises that VP surveys should be undertaken in good visibility and can be carried out on showery days providing the showers are not too frequent or prolonged. The cloud base should be high enough to allow observation of the collision risk height. Ideally observations should be undertaken 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.

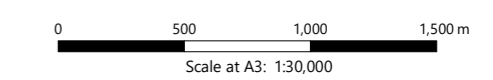
## 2.4 Limitations

There were no limitations recorded during the 2019/20 non-breeding season.



- Key
- Site boundary
  - Vantage point
  - 2km viewing arc
  - Vantage Point 6 Viewshed, viewpoint location NS 63310 02387
  - Vantage Point 7 Viewshed, viewpoint location NS 65429 01955
  - Vantage Point 8 Viewshed, viewpoint location NS 65591 02003
  - Vantage Point 9 Viewshed, viewpoint location NX 67651 99278

Note:  
VA was undertaken at a lower sweep height of 15m and 1.5m height of eye.



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**Figure 2.1**  
**Vantage Point Locations and Viewsheds**

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## 3. Survey Results

### 3.1 Vantage Point Surveys

The following ten target species were recorded during VP surveys: greylag goose, pink-footed goose, whooper swan, golden plover, golden eagle, goshawk, hen harrier, red kite, merlin, 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 15-180m height.

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

Table 3.1 Summary of Target Species Flight Activity

Species	No. of observations	Month/s of observation	Total flight duration at 15-180m height over the Site (seconds)
Greylag goose	3	March 2020	122
Pink-footed goose	1	November 2019	0
Whooper swan	1	March 2020	55
Golden plover	2	September to October 2019	1,000
Golden eagle	2	January to February 2020	640
Goshawk	6	March 2020	980
Hen harrier	5	September 2019 and March 2020	50
Red kite	19	October to December 2019; and March 2020	3,085
Merlin	3	September 2019	0
Peregrine	9	September to October 2019; January and March 2020	216

### Secondary Species

The following secondary species were recorded during the vantage point surveys: snipe, sparrowhawk, buzzard, tawny owl, kestrel and raven.

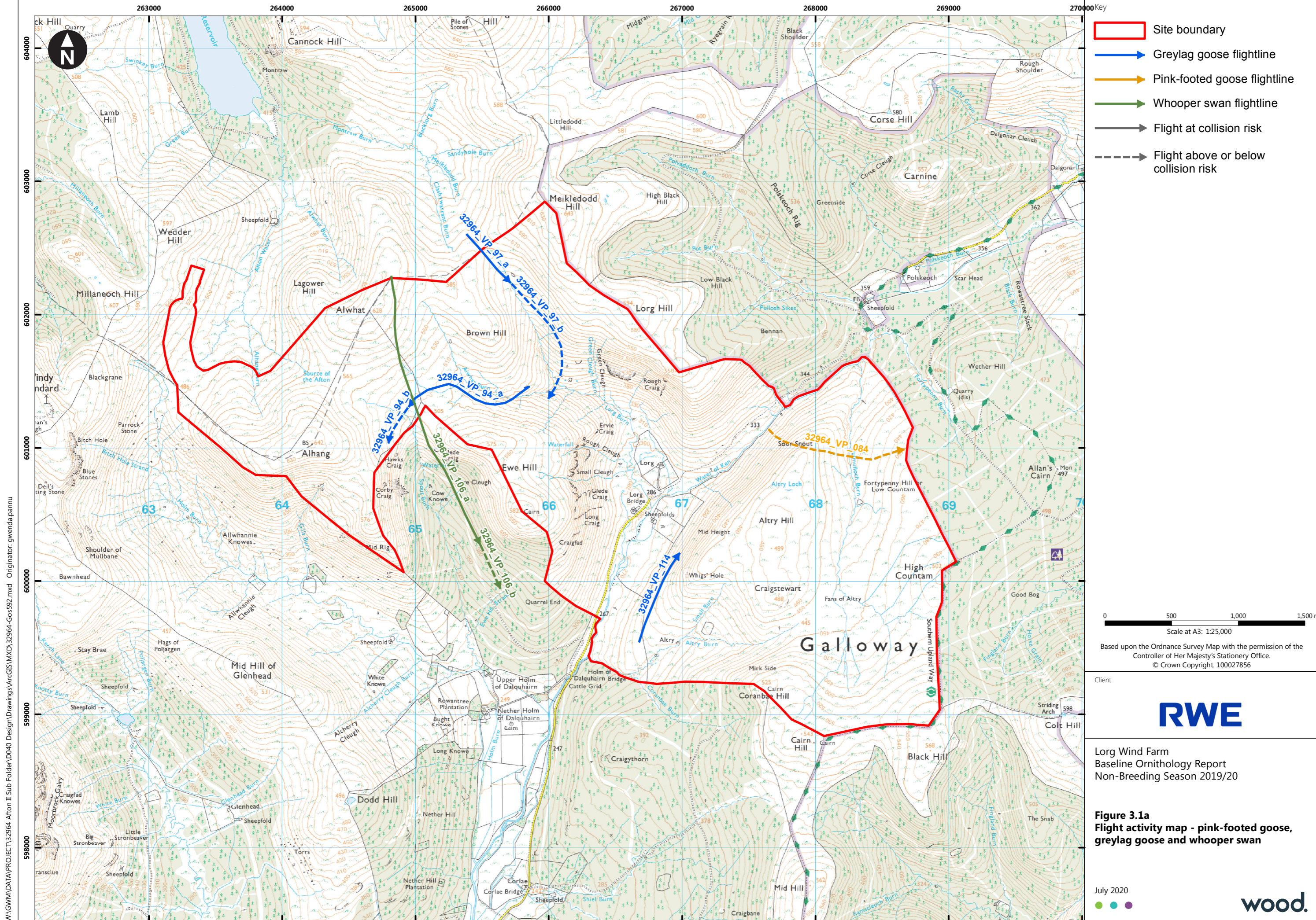
There was a single snipe record from VP9 in early October. There were three records of sparrowhawk across the non-breeding season. Buzzards were regularly observed across the Site (68% of VP surveys). There was a single record of tawny owl on 17 March, with the bird heard calling from VP9. There were seven records of kestrel across the winter, with sightings generally comprising single birds. Ravens were regularly recorded across the Site (90% of all VP surveys) with multiple birds frequently observed, while a single active raven nest was recorded on-Site during March.

Notable records also included a flock of 90 snow buntings around Brown Hill and Lorg Hill in early March.

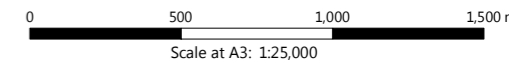
### 3.2 'Incidental' Records

There were five incidental records of target species (not including continuation of mapped flights extending beyond VP viewsheds), comprising; pink-footed goose (a single flock of 90 birds), red kite (two records) and

peregrine (two records). All 'incidental' records are presented in **Appendix Table B.2** and illustrated in **Figure 3.2**. Confidential incidental records are presented within the **Confidential Appendix**.



- Site boundary
- Greylag goose flightline
- Pink-footed goose flightline
- Whooper swan flightline
- Flight at collision risk
- - - → Flight above or below collision risk



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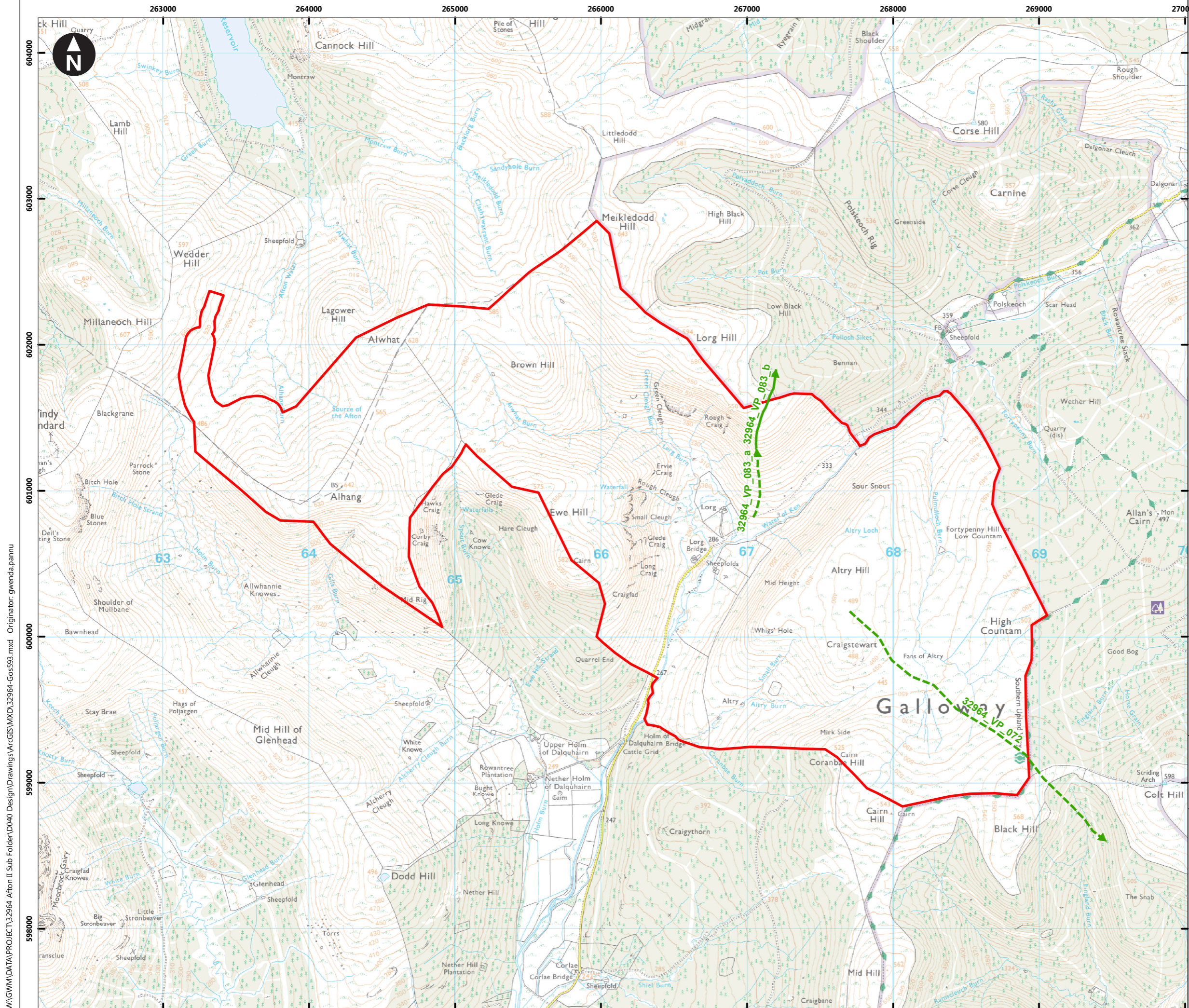
**Figure 3.1a**  
**Flight activity map - pink-footed goose, greylag goose and whooper swan**

July 2020

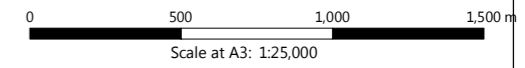


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- Site boundary
- Golden plover flightline
- Flight at collision risk
- Flight above or below collision risk



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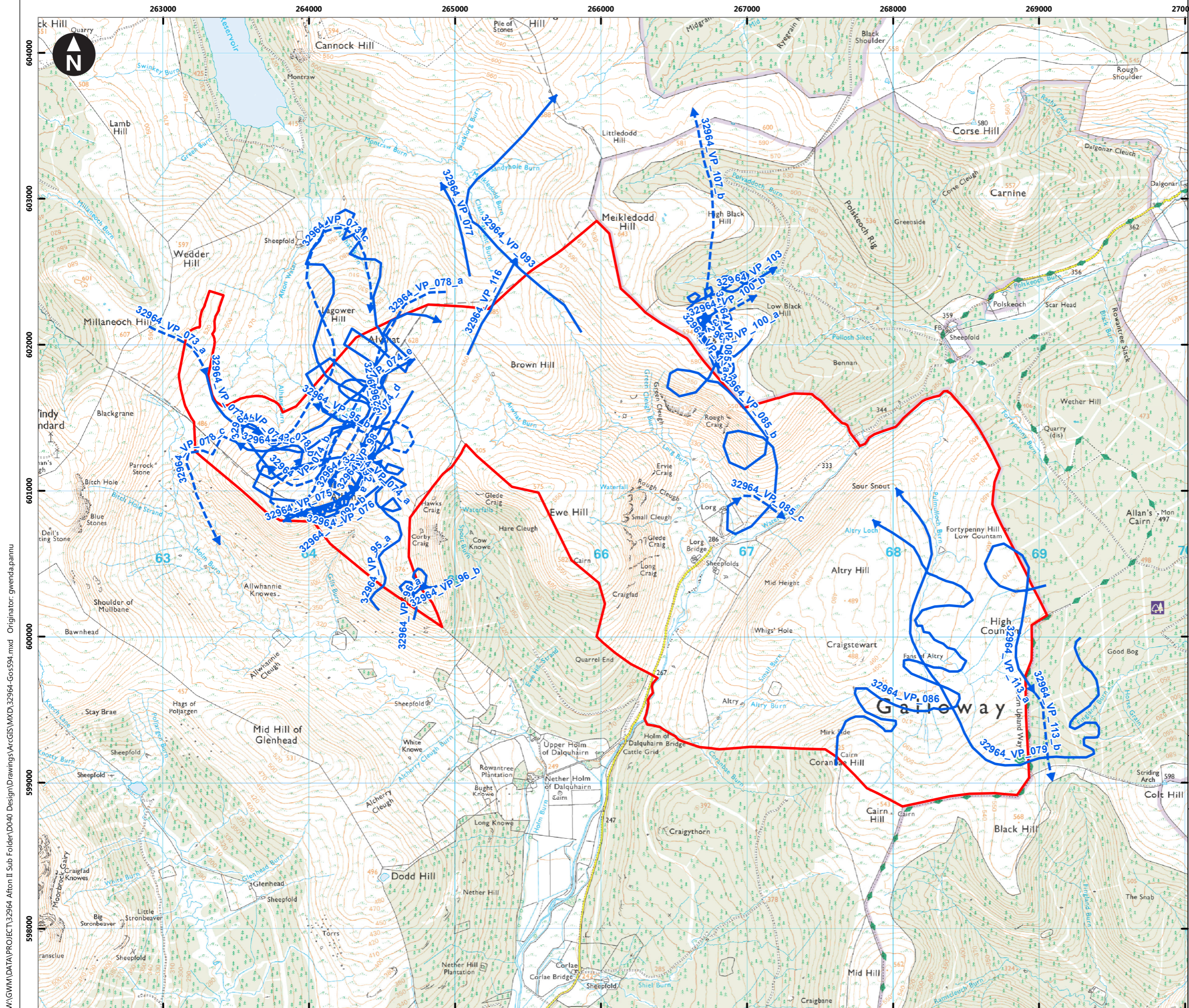
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**Fig 3.1b**  
Flight activity map - golden plover

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- Site boundary
- Red kite flightline
- Flight at collision risk
- - - Flight above or below collision risk

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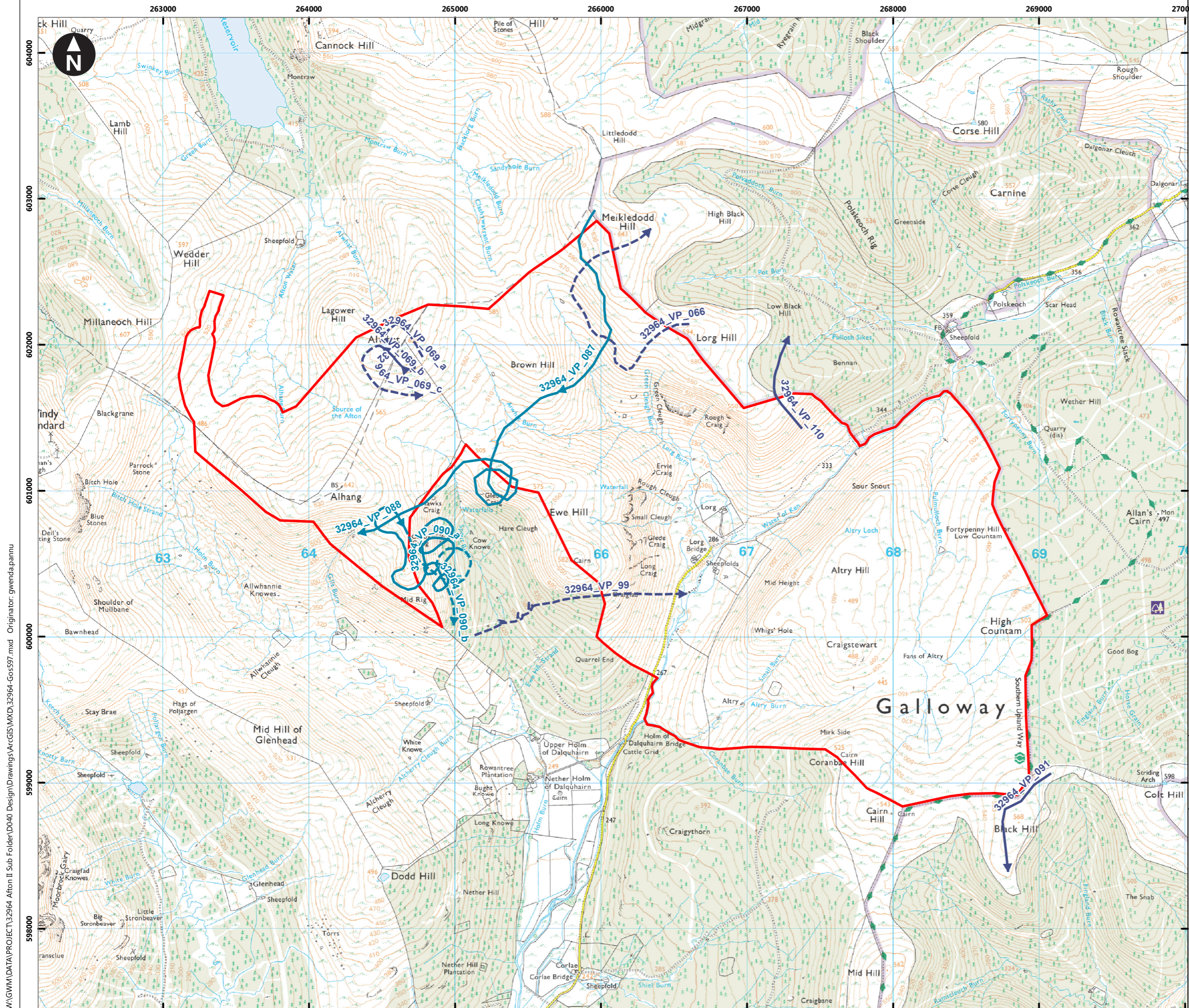
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**Figure 3.1c**  
Flight activity map - red kite

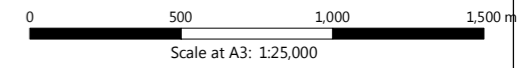
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- Key**
- Site boundary
  - Golden eagle flightline
  - Hen harrier flightline
  - Flight at collision risk
  - - - → Flight above or below collision risk



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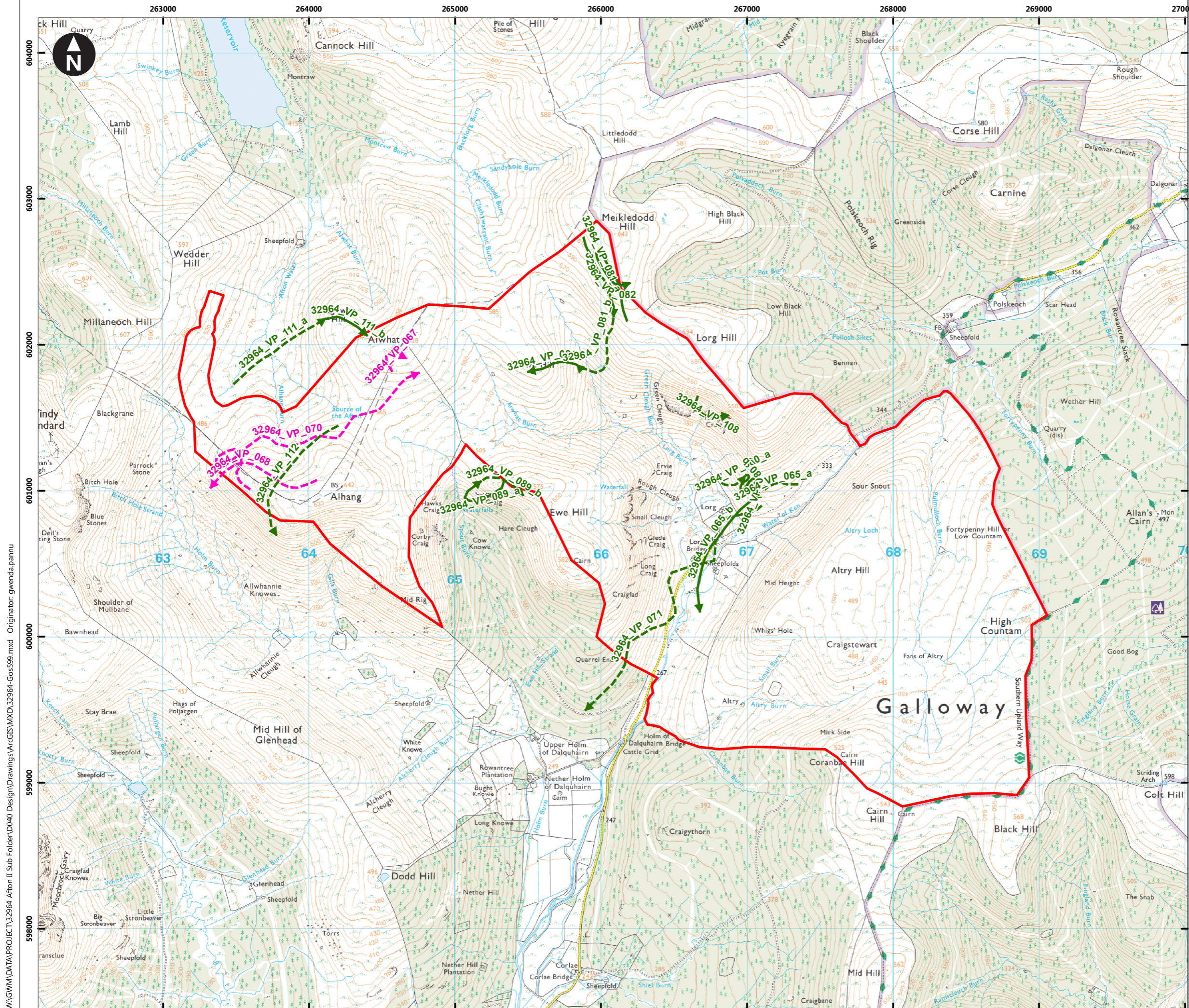
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**Figure 3.1d**  
Flight activity map - golden eagle and hen harrier

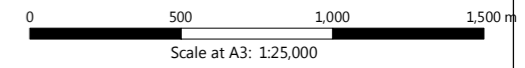
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- Site boundary
- Merlin flightline
- Peregrine flightline
- Flight at collision risk
- - - Flight above or below collision risk



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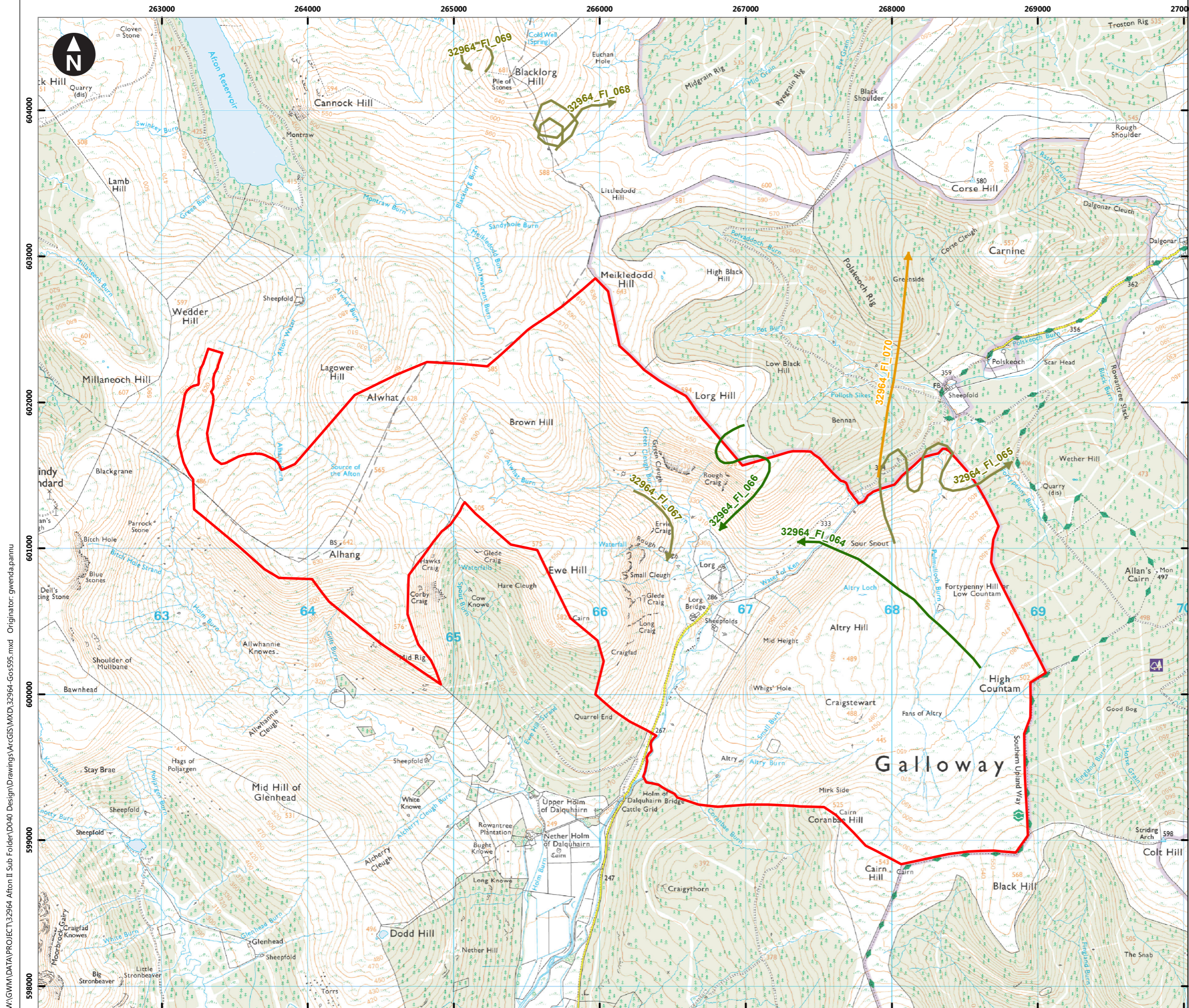
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**Figure 3.1e**  
**Flight activity map - merlin and peregrine**

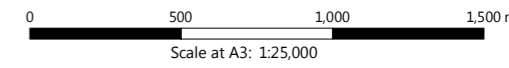
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- Key**
- Site boundary
  - Red kite flightline
  - Peregrine flightline
  - Pink-footed goose flightline



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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 230,000 birds (Woodward *et al.*, 2020).

There were three records of greylag goose during the VP surveys, totalling five birds. All flights were recorded in March 2020. A total of 122 seconds of flight time was recorded at 15-180m height during the VP watches.

#### 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 440,891 birds (Brides *et al.*, 2019). The Western Southern Uplands and Inner Solway NHZ population is estimated at 34,621 wintering birds (Wilson *et al.*, 2015).

There was one flight of pink-footed geese recorded during the VP surveys, a skein of 24 birds was recorded from VP9 on 15 November 2019. No flight time was recorded at 15-180m height.

There was one incidental record of pink-footed goose, a skein of 90 birds observed outwith the viewshed of VP9 on 05 March 2019.

#### Whooper swan

Whooper swan is an Annex I and Schedule 1 listed species and 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 19,500 birds (Woodward *et al.*, 2020), whilst a Scottish population was estimated at 3,784 (Hall *et al.*, 2016). The NHZ population is estimated at 33 wintering birds (Wilson *et al.*, 2015). Whooper swan is also listed on the Scottish Biodiversity List (SBL).

There was one whooper swan flight (of a single bird) recorded during the VP surveys on 05 March 2020 from VP7. A total of 55 seconds of flight time was recorded within the 15-180m height.

#### Golden plover

Golden plover is a qualifying feature of the Muirkirk and North Lowther Uplands SPA and is an Annex I and SBL listed species. The UK wintering population is estimated at 410,000 individuals (Woodward *et al.*, 2020).

There were two records of golden plover during the VP watches, a flock of seven birds on 19 September 2019 and a flock of 50 birds on 23 October 2019. A total of 1,000 seconds of flight time was recorded at 15-180m height during the non-breeding season.

#### Golden eagle

Golden eagle is an Annex I and Schedule 1 listed species and is also on the SBL. The Scottish population was estimated at 508 pairs in 2015 (Hayhow *et al.*, 2017). Western Southern Uplands and Inner Solway NHZ

population was estimated at two pairs in 2013 (Wilson *et al.*, 2015). Of the 316 home ranges known by the Scottish Raptor Monitoring Scheme in 2018, 213 breeding attempts were monitored in Scotland, although no known breeding pairs were located in Dumfries or Ayrshire (Challis *et al.*, 2019). The South of Scotland Golden Eagle Project (SSGEP) released three juvenile golden eagles in the Borders region in 2018 and 2019 (although only four birds remain).

There were two records of two different golden eagles during the VP surveys. On 27 January 2020 a single bird was recorded from VP8 and VP7. This bird, 'Emily' or C121, is a satellite-tagged female that was released by the South of Scotland Golden Eagle Project (SSGEP) in 2019 (Cat Barlow *pers comm*). On 05 February 2020 a second-calendar year bird was recorded from VP7 (Cat Barlow confirmed this bird was not one of the satellite-tagged SSGEP released birds). A total of 640 seconds of flight time was recorded at 15-180m height.

### Goshawk

Goshawk is Schedule 1 listed. The UK population is estimated to be 619 pairs (Holling *et al.*, 2019) and the Scottish population is estimated to be 135 pairs. The Western Southern Uplands and Inner Solway NHZ population is estimated at 31 pairs (Wilson *et al.*, 2015). In 2018, out of 135 known territories in the country, 79 pairs were monitored under the Scottish Raptor Monitoring Scheme (Challis *et al.*, 2019). Of the 22 pairs in Dumfries and Galloway and seven in Ayrshire, 23 pairs were monitored in these two areas; 34 young were fledged, with all but one chick coming from Dumfries and Galloway.

Full details of goshawk activity can be found within the **Confidential Appendix**.

### 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 qualifying feature of the Muirkirk and North Lowther Uplands SPA. In 2016, the UK population was estimated at 545 breeding pairs (Woodward *et al.*, 2020). In 2018, out of 605 home ranges known by the Scottish Raptor Monitoring Scheme, 230 breeding attempts were recorded in the country (Challis *et al.*, 2019). Pairs occupied 12 home ranges in Dumfries and Galloway and two in Ayrshire, with 14 young fledged in Dumfries and three fledged in Ayrshire from the 13 nests that were monitored. The Western Southern Uplands and Inner Solway 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 five records of hen harrier during VP surveys, with two flights recorded in September 2019 and three flights in March 2020. All records were of males, with a minimum of two individuals recorded, two of second calendar year birds and three of adults. A total of 50 seconds of flight time was recorded at 15-180m height.

### Red kite

Red kite is an Annex I and Schedule 1 listed species and is also listed on the SBL. The Western Southern Uplands and Inner Solway NHZ population was estimated at 83 pairs in 2013 (Wilson *et al.*, 2015). In 2018, there were 605 known home ranges within Scotland, with 205 breeding attempts (out of a minimum of 266 pairs) monitored by the Scottish Raptor Monitoring Scheme (Challis *et al.*, 2019). Of 92 pairs monitored in Dumfries and Galloway a minimum of 101 young were fledged. Red kite has not been confirmed to breed in Ayrshire (Chris Rollie *pers comm*).

A total of 19 red kite flights were recorded during VP surveys, with birds recorded between October and December 2019 and also in March 2020. A total of 3,085 seconds of flight time was recorded at 15-180m height.

There were also two incidental records of red kite during the 2019/20 non-breeding season, both of single birds. On 13 November a bird was recorded in-flight over Ewe Hill as the surveyor left a VP survey. On 04 March, a bird was recorded circling over Blacklorg Hill during a VP survey (outwith the viewshed).

### Merlin

Merlin is a qualifying feature of the Muirkirk and North Lowther Uplands SPA, and is an Annex I, Schedule 1 and SBL listed species. It is also a BoCC red list species based on its historical decline in breeding populations (Eaton *et al.*, 2015). The British population was estimated at 1,160 pairs (Ewing *et al.*, 2011 in Holling *et al.*, 2019). The Scottish population was estimated at 733 pairs in 2008 (Ewing *et al.*, 2011), with eight pairs occupying home ranges in Dumfries and Galloway and none in Ayrshire in 2018 (Challis *et al.*, 2019). A minimum of one fledged merlin was recorded from this region from the six monitored pairs.

There were three flights of merlin recorded during VP surveys. All records relate to the same bird on 19 September 2019, recorded from VP6. No flight time was recorded within the 15-180m height.

### Peregrine

Peregrine is a qualifying feature of the Muirkirk and North Lowther Uplands SPA, and is an Annex I, Schedule 1 and SBL listed species. There were 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 2018, 46 home ranges were checked in Ayrshire, of which 23 sites were occupied by pairs, fledging a minimum of 32 young, while 112 home ranges were checked in Dumfries and Galloway, of which 62 were occupied by pairs, fledging a minimum of 85 young (Challis *et al.*, 2019). 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 nine peregrine flights recorded during VP surveys, totalling 216 seconds of flight time was at 15-180m height. The species was recorded during surveys in September and October 2019 and January and March 2020.



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# Appendix A

## Survey Conditions

Table A.1 Dates, times and weather conditions of the VP watches

Date	Start	Finish	Length of VP watch	Weather conditions
<b>Vantage Point 6</b>				
19/09/19	08:30	11:30	3	Dry, Still to Wind F2 NW, Cloud Cover 4-2/8, Visibility >3km, Temp 10-14c
19/09/19	12:00	15:00	3	Dry, Wind F1-2 NW, Cloud Cover 1/8, Visibility >3km, Temp 14-17c
02/10/19	10:30	13:30	3	Dry, Wind F2-3 NW, Cloud Cover 1/8, Visibility >3km, Temp 3-6c
02/10/19	14:00	17:00	3	Dry, Wind F2 NW, Cloud Cover 1-2/8, Visibility >3km, Temp 6-4c
15/11/19	08:30	11:30	3	Dry, Wind F4 NNE, Cloud Cover 6-8/8, Visibility >3km, Temp -1 to 0c
15/11/19	12:00	13:30	1.5	Drizzle, Wind F4 NE, Cloud Cover 8/8, Visibility <1km to 1-3km, Temp 1c
09/12/19	09:30	12:30	3	Dry, Wind F3 NW, Cloud Cover 1-2/8, Visibility >3km, Temp 3c
09/12/19	13:00	15:30	2.5	Dry, Wind F3-1 NW-W, Cloud Cover 1-4/8, Visibility >3km, Temp 3-1c
05/03/20	08:45	11:45	3	Dry, Wind F1 S, Cloud Cover 1-6/8, Visibility >3km, Temp -1c to 0c
05/03/20	12:15	15:15	3	Snow showers, Still to Wind F1 S-NW, Cloud Cover 6-8/8, Visibility >3km, Temp 0c
16/03/20	10:00	13:00	3	Dry, Wind F5-6 SW, Cloud Cover 6-7/8, Visibility 1-3km to >3km, Temp 2-4c
16/03/20	13:30	16:00	2.5	Light showers to heavy rain, Wind F6-7 SW, Cloud Cover 8/8, <1km to >3km, Temp 2-4c
17/03/20	07:30	10:30	3	Dry, Wind F4-6 SW, Cloud Cover 6-7/8, Visibility >3km, Temp 3-4c
17/03/20	11:00	12:30	1.5	Light to heavy rain, Wind F5-6 SW, Cloud Cover 8/8, Visibility 1-3km to >3km, Temp 4-5c
18/03/20	09:00	12:00	3	Dry, Wind F3 NW, Cloud Cover 8/8, Visibility >3km, Temp 0-1c
18/03/20	12:30	13:30	1	Dry, Wind F3 NW, Cloud Cover 5-8/8, Visibility >3km, Temp 1-2c
<b>Total hours</b>			<b>42</b>	
<b>Vantage Point 7</b>				
18/09/19	07:50	10:50	3	Dry, Wind F3 NW, Cloud Cover 7-8/8, Visibility >3km, Temp 4-6c
18/09/19	11:20	14:20	3	Dry, Wind F2-4 NW, Cloud Cover 3-8/8, Visibility >3km, Temp 6-14c
23/10/19	13:20	16:20	3	Dry, Wind F5-7 S-W, Cloud Cover 7-8/8, Visibility >3km, Temp 7-6c
23/10/19	09:50	12:50	3	Dry, Wind F6 SSW, Cloud Cover 8/8, Visibility 1->3km, Temp 7c
14/11/19	12:45	15:45	3	Dry, Wind F6 N, Cloud Cover 1/8, Visibility >3km, Temp -1c to 0c
14/11/19	09:15	12:15	3	Dry, Wind F4 NNE, Cloud Cover 0-1/8, Visibility >3km, Temp -4 to -1c



Date	Start	Finish	Length of VP watch	Weather conditions
27/01/20	13:10	16:10	3	Dry, Wind F5 SW, Cloud Cover 3-5/8, Visibility >3km, Temp -2c
05/02/20	10:20	13:20	3	Dry, Wind F3-5 NE, Cloud Cover 4-8/8, Visibility >3km, Temp 2c
05/02/20	13:50	16:50	3	Dry, Wind F4-5 W, Cloud Cover 3-8/8, Visibility >3km, Temp 1c
04/03/20	10:30	13:30	3	Light snow showers, Wind F3-4 S, Cloud Cover 4-8/8, Visibility 1-3km to >3km, Temp 0-1c
04/03/20	14:05	17:05	2.5	Light rain showers, Wind F1-2 S, Cloud Cover 5-8/8, Visibility <1km to >3km, Temp 0-1c
05/03/20	10:15	13:15	3	Dry, Still to Wind F1 Variable, Cloud Cover 5-7/8, Visibility >3km, Temp -2c to 3c
05/03/20	13:45	16:45	3	Dry, Wind F1-2 N, Cloud Cover 6/8, Visibility >3km, Temp 1-4c
16/03/20	10:30	13:00	2.5	Dry, Wind F6 SW-W, Cloud Cover 6-7/8, Visibility >3km, Temp 3c
17/03/20	09:00	10:00	1	Dry, Wind F6 SW-WNW, Cloud Cover 5-8/8, Visibility >3km, Temp 3c
<b>Total hours</b>			<b>42</b>	
<b>Vantage Point 8</b>				
18/09/19	07:50	10:50	3	Dry, Wind F3 NW, Cloud Cover 7-8/8, Visibility >3km, Temp 4-6c
18/09/19	11:20	14:20	3	Dry, Wind F2-4 NW, Cloud Cover 3-8/8, Visibility >3km, Temp 6-14c
23/10/19	09:50	12:50	3	Dry, Wind F5-7 S-SW, Cloud Cover 7-8/8, Visibility >3km, Temp 6-7c
23/10/19	13:20	16:20	3	Dry, Wind F6 WSW-SSW, Cloud Cover 8/8, Visibility 1->3km, Temp 7c
14/11/19	09:15	12:15	3	Dry, Wind F6 NW, Cloud Cover 1/8, Visibility >3km, Temp -1 to -2c
14/11/19	12:45	15:45	3	Dry, Wind F5 NNE-N, Cloud Cover 1/8, Visibility >3km, Temp 0c to -1c
27/01/20	13:15	16:15	3	Dry, Wind F4-5 SW, Cloud Cover 2-8/8, Visibility >3km, Temp. 0c to -2c
05/02/20	13:50	16:50	3	Dry, Wind F2-3 NE, Cloud Cover 5-8/8, Visibility >3km, Temp 2c
05/02/20	10:20	13:30	3	Dry, Wind F4-5 NW, Cloud Cover 7-8/8, Visibility >3km, Temp 1c
04/03/20	10:30	13:30	3	Light showers, Wind F2 S, Cloud Cover 5-7/8, Visibility >3km, Temp 1-2c
04/03/20	14:00	17:20	2.5	Dry, wind F2-3 S, Cloud Cover 4-8/8, Visibility <1km to >3km, Temp 1-2c
05/03/20	10:15	13:15	3	Dry, Wind F1 N, Cloud Cover 4-5/8, Visibility >3km, Temp 2-5c
05/03/20	13:45	16:45	3	Light showers, Wind F1-2 W-NW, Cloud Cover 7/8, Visibility >3km, Temp -1c to 2c
16/03/20	13:30	16:00	2.5	Light showers-heavy rain, Wind F6-7 SW, Cloud Cover 8/8, 1-3km to >3km, Temp 2-3c
17/03/20	07:45	08:45	1	Dry, Wind F4-5 SW, Cloud Cover 5-6/8, Visibility >3km, Temp 3c
18/09/19	07:50	10:50	3	Dry, Wind F3 NW, Cloud Cover 7-8/8, Visibility >3km, Temp 4-6c
18/09/19	11:20	14:20	3	Dry, Wind F2-4 NW, Cloud Cover 3-8/8, Visibility >3km, Temp 6-14c
<b>Total hours</b>			<b>42</b>	



Date	Start	Finish	Length of VP watch	Weather conditions
<b>Vantage Point 9</b>				
19/09/19	07:25	11:05	3	Dry, Wind F2 SW, Cloud Cover 1-8/8, Visibility >3km, Temp 7-10c
19/09/19	11:25	14:35	3	Dry, Wind F2 SW, Cloud Cover 1-2/8, Visibility >3km, Temp 11-15c
02/10/19	10:50	13:50	3	Dry, Wind F4-5 NW, Cloud Cover 1/8, Visibility >3km, Temp 4-5c
02/10/19	14:20	17:20	3	Dry, Wind F4 NW, Cloud Cover 1-2/8, Visibility >3km, Temp 6-5c
15/11/19	09:00	12:00	3	Light drizzle, Wind F6 N, Cloud Cover 8/8, Visibility >3km, Temp -1c to 0c
15/11/19	12:30	14:30	2	Light drizzle, Wind F6 N, Cloud Cover 7-8/8, Visibility 1-3km to >3km, Temp 1c
09/12/19	10:05	13:05	3	Dry, Wind F5-4 NW, Cloud Cover 0/8, Visibility >3km, Temp 0-1c
09/12/19	13:35	15:35	2	Dry, Wind F4-3 NW, Cloud Cover 0-5/8, Visibility >3km, Temp 1-0c
04/03/20	10:30	13:45	3	Sleet showers, Wind F2 S, Cloud Cover 4-8/8, Visibility 1-3km to >3km, Temp 1c
04/03/20	14:00	17:20	3	Sleet showers, Wind F1-2 S, Cloud cover 5-8/8, Visibility 1-3km to >3km, Temp 1c
16/03/20	11:00	14:00	3	Dry, Wind F6 SW, Cloud cover 4-7/8, Visibility >3km, Temp 4-5c
16/03/20	14:30	16:30	2	Light showers to heavy rain, Wind F6 SW, Cloud cover 8/8, 1-3km to >3km, Temp 3-4c
17/03/20	07:45	10:45	3	Dry, Wind F4-6 SW, Cloud cover 5-7/8, Visibility >3km, Temp 5c
17/03/20	11:15	12:45	1.5	Light to heavy rain, Wind F6 SW, Cloud Cover 8/8, Visibility 1-3km to >3km, Temp 5-6c
18/03/20	08:40	11:40	3	Dry, Wind F5-6 SW-W, Cloud Cover 7-8/8, Visibility >3km, Temp 3c
18/03/20	12:10	13:40	1.5	Dry, Wind F6 W, Cloud Cover 6-8/8, Visibility >3km, Temp 3c
<b>Total hours</b>			<b>42</b>	

# 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 (15-180m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
<b>Greylag goose</b>							
32964_VP_094_a	04/03/2020	10:34	7	2	Calling. Lost from view low in valley.	35	70
32964_VP_094_b	04/03/2020	10:34	7	2		0	0
32964_VP_097_a	04/03/2020	10:36	8	2	Calling. Left viewshed.	20	40
32964_VP_097_b	04/03/2020	10:36	8	2		0	0
32964_VP_114	18/03/2020	08:42	9	1	Lost from view in valley.	12	12
<b>Pink-footed goose</b>							
32964_VP_084	15/11/2019	11:53	9	24	Flying into strong northerly wind. Left viewshed.	0	0
<b>Whooper swan</b>							
32964_VP_106_a	05/03/2020	15:29	7	1	Left viewshed.	55	55
32964_VP_106_b	05/03/2020	15:29	7	1		0	0
<b>Golden plover</b>							
32964_VP_072	19/09/2019	12:50	9	7	Calling. Lost from view over hill.	0	0
32964_VP_083_a	23/10/2019	11:39	8	50	Lost from view behind Lorg Hill.	0	0
32964_VP_083_b	23/10/2019	11:39	8	50		20	1,000
<b>Golden eagle</b>							
32964_VP_087	27/01/2020	16:01	8	1	Immature bird mobbed by two raven. 2CY satellite tagged female (Emily from SSGERP). Creamy tail and white wing bars.	120	120
32964_VP_088	27/01/2020	16:04	7	1	Same bird as VP_087. Mobbed by two raven and single peregrine. Lost from view behind ridge between Mid Rig and Alhang.	210	210
32964_VP_090_a	05/02/2020	14:14	7	1	Likely 2CY. Mobbed by buzzard whilst circling above Spout Burn and crags. Lost from view in	310	310



Flight reference no.	Date	Time	VP	No. of birds	Flight behaviour / age of bird	Time at risk height (15-180m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
					clouds. Untagged bird, different individual to that recorded on 27 January 2020.		
32964_VP_090_b	05/02/2020	14:14	7	1		0	0
<b>Hen harrier</b>							
32964_VP_066	18/09/2019	14:14	8	1	Second calendar year male. Lost from view over Meikle Dodd.	0	0
32964_VP_069_a	19/09/2019	12:43	6	1	Second calendar year male (possibly same bird as VP_066). Lost from view behind summit of Alwhat.	0	0
32964_VP_069_b	19/09/2019	12:43	6	1		5	5
32964_VP_069_c	19/09/2019	12:43	6	1		0	0
32964_VP_091	04/03/2020	12:02	9	1	Adult male. Left viewshed.	20	20
32964_VP_066	05/03/2020	14:14	7	1	Adult male. Left viewshed.	0	0
32964_VP_069_a	05/03/2020	12:43	8	1	Adult male. Mobbed male goshawk.	25	25
<b>Red kite</b>							
32964_VP_073_a	02/10/2019	13:14	6	1	Adult. Lost from view up Alwhat Burn.	0	0
32964_VP_073_b	02/10/2019	13:14	6	1		20	20
32964_VP_073_c	02/10/2019	13:14	6	1		0	0
32964_VP_074_a	02/10/2019	14:02	6	1	Adult, foraging near second adult (VP_074). Lost from view over Alwhat.	30	30
32964_VP_074_b	02/10/2019	14:02	6	1		0	0
32964_VP_074_c	02/10/2019	14:02	6	1		30	30
32964_VP_074_d	02/10/2019	14:02	6	1		0	0
32964_VP_074_e	02/10/2019	14:02	6	1		45	45
32964_VP_075	02/10/2019	14:02	6	1	Adult lost from view as tracking VP_074.	20	20
32964_VP_076	02/10/2019	14:25	6	1	Same bird as VP_074. Foraging within area for 34 minutes in total. Further 1620 seconds at band A.	420	420
32964_VP_077	02/10/2019	14:52	6	1	Brief view of a second individual but unable to monitor as following VP_076.	10	10
32964_VP_078_a	02/10/2019	15:37	6	2	Two birds lost from view over Holm Burn.	0	0

Flight reference no.	Date	Time	VP	No. of birds	Flight behaviour / age of bird	Time at risk height (15-180m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
32964_VP_078_b	02/10/2019	15:37	6	2		40	80
32964_VP_078_c	02/10/2019	15:37	6	2		0	0
32964_VP_079	02/10/2019	12:13	9	1	Very slow flight holding in wind, drifted through viewshed, mobbed by kestrel. Continued outside of viewshed for 4 mins. Lost from view to east.	660	660
32964_VP_085_a	14/11/2019	12:50	8	1	Left viewshed.	0	0
32964_VP_085_b	14/11/2019	12:50	8	1		45	45
32964_VP_085_c	14/11/2019	12:50	8	1		0	0
32964_VP_086	09/12/2019	12:49	9	1	Adult. Lost from view behind Altry Hill.	200	200
32964_VP_092_a	05/03/2020	11:32	6	1	Left viewshed.	120	120
32964_VP_092_b	05/03/2020	11:32	6	1		0	0
32964_VP_092_c	05/03/2020	11:32	6	1		120	120
32964_VP_093	05/03/2020	13:55	6	1	Left viewshed.	80	80
32964_VP_095_a	04/03/2020	12:45	7	1	Soaring flight. Lost from view high into low clouds.	200	200
32964_VP_095_b	04/03/2020	12:45	7	1		0	0
32964_VP_096_a	04/03/2020	12:46	7	1	Soaring flight, then dived out of view into valley.	110	110
32964_VP_096_b	04/03/2020	12:46	7	1		0	0
32964_VP_098	05/03/2020	11:32	7	1	Left viewshed.	180	180
32964_VP_100_a	05/03/2020	11:25	8	1	Slow soaring flight. Lost from view high.	210	210
32964_VP_100_b	05/03/2020	11:25	8	1		0	0
32964_VP_103	05/03/2020	11:53	8	1	Soaring flight. Lost from view to northeast.	130	130
32964_VP_107_a	05/03/2020	13:51	8	1	Left viewshed.	240	240
32964_VP_107_b	05/03/2020	13:51	8	1		0	0
32964_VP_113_a	17/03/2020	11:21	9	1	Lost from view behind Black Hill.	120	120
32964_VP_113_b	17/03/2020	11:21	9	1		0	0
32964_VP_116	18/03/2020	13:08	6	1	Only briefly in viewshed. Headed northeast.	15	15

Flight reference no.	Date	Time	VP	No. of birds	Flight behaviour / age of bird	Time at risk height (15-180m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
<b>Merlin</b>							
32964_VP_067	19/09/2019	09:24	6	1	Juvenile/female mobbed by raven over Alwhat.	0	0
32964_VP_068	19/09/2019	12:01	6	1	Juvenile/female, flushed by passing kestrel, flew directly and dropped out of view.	0	0
32964_VP_070	19/09/2019	14:52	6	1	Juvenile/female (possibly same bird as VP_068) hunting. Landed briefly on fencepost before being lost from view over Alwhat.	0	0
<b>Peregrine</b>							
32964_VP_065_a	18/09/2019	13:51	8	1	Juvenile. Probable male (on size). Stooped into Water of Ken valley and lost from view.	0	0
32964_VP_065_b	18/09/2019	13:51	8	1		10	10
32964_VP_071	19/09/2019	10:04	9	1	Probable female.	0	0
32964_VP_080_a	02/10/2019	14:21	9	1	Flew high over Lorg farm, dropping into slow glide, hanging, then rapid stoop out of view.	60	60
32964_VP_080_b	02/10/2019	14:21	9	1		50	50
32964_VP_081_a	23/10/2019	09:56	8	1	Drifted across valley and then picked up speed in dive over Brown Hill.	30	30
32964_VP_081_b	23/10/2019	09:56	8	1		0	0
32964_VP_081_c	23/10/2019	09:56	8	1		15	15
32964_VP_082	23/10/2019	10:17	8	1	Lost from view over ridge.	16	16
32964_VP_089_a	27/01/2020	16:07	7	1	Male mobbed golden eagle then climbed and lost from view (as recording flight of golden eagle).	20	20
32964_VP_089_b	27/01/2020	16:07	7	1		0	0
32964_VP_108	05/03/2020	14:04	8	1	Probable male. Landed and mobbed by female sparrowhawk.	0	0
32964_VP_111_a	16/03/2020	10:01	6	1	Female. Lost behind hill.	0	0
32964_VP_111_b	16/03/2020	10:01	6	1		15	15
32964_VP_112	16/03/2020	11:03	6	1	Female. Lost behind hill.	0	0



Table B.2 'Incidental' Records

Unique ID	Date	Count	Notes
<b>Pink-footed goose</b>			
32964_FL_070	05/03/20	90	Flight outwith VP8 viewshed at 13:51. Flew northeast on Coronbae side of Water of Ken.
<b>Red kite</b>			
32964_FL_065	02/10/19	1	<i>Continuation of flight VP_079 outwith viewshed. Bird mobbed by kestrel.</i>
32964_FL_067	13/11/19	1	Recorded during walk-off site. Bird lost from view in low cloud near Ewe Hill.
32964_FL_068	05/03/20	1	<i>Continuation of VP_093. Lost from view to northeast.</i>
32964_FL_069	04/03/20	1	Flight outwith viewshed at 12:57. Circling over northern slopes of Blacklorg Hill.
<b>Peregrine</b>			
32964_FL_064	18/09/19	1	<i>Flight outwith viewshed. Start of VP_065_a.</i>
32964_FL_066	02/10/19	1	<i>Flight outwith viewshed. Start of VP_080_a.</i>

The start and continuation of flight lines mapped during VPs that fall outside of the viewshed are recorded in the table in *italics*.

## Appendix C

### Species List

Table C.3 Species Names

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

**wood.**

