

TECHNICAL APPENDIX 7.3: Balgray Wind Farm Wintering Bird Surveys 2021-22



Report to Fred Olsen Renewables Ltd

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BALGRAY WIND FARM: WINTERING BIRD SURVEYS 2021-22

Introduction

1. This report describes the wintering bird survey work carried out for a proposed wind farm at Balgray, Dumfries and Galloway. It provides a wintering season's baseline data on the bird populations, activity and flight paths within the vicinity of the wind farm site, to inform subsequent ornithological impact assessment.
2. The surveys have been designed with reference to current NatureScot survey guidance on bird surveys for wind farms (SNH 2017). The surveys were undertaken by Stuart Piner and Tom Lowe, both highly experienced bird surveyors.

Study Area

3. The site is located about 7 km north-east of Lockerbie in Dumfries and Galloway. The wintering bird survey areas were chosen to include all areas within the possible zone of ornithological influence of the wind farm (Figure 1). This included the wind farm site, plus a 500 m buffer for the main winter walkover surveys (the core survey area, following NatureScot guidance, SNH 2017) and a 2 km buffer for the wider wintering waterfowl surveys (the wider survey area), where access/viewing was possible and where there was potentially suitable habitat (Figure 1). The main core survey area covered a total area of 15.1 km² and the wider survey area 44.3 km². It comprised predominantly upland moorland habitat, currently used mainly for grazing sheep, surrounded by commercial conifer plantation and agriculturally improved grassland.

Wintering Bird Survey Methods

4. The aim of the autumn/winter field survey work was to obtain data on the ornithological importance of the wind farm site and its surrounds at that time of year, and on the flight lines of key target species. It included walkover surveys of the site and vantage point surveys of bird flight activity.

Autumn/Winter Walkover Surveys

5. Walkover mapping surveys of the wintering birds within the site and a 500 m buffer took place in accordance with NatureScot guidance (SNH 2017). The survey focused on key target species which included all EU Birds Directive Annex 1 species, Wildlife & Countryside Act (1981) Schedule 1 species and Red-listed birds of Conservation Concern (Stanbury *et al.* 2021), as per NatureScot (SNH 2017).
6. As well as counting and mapping each species, the behaviour of each flock was also recorded, e.g. feeding/roosting. The surveys included work at dawn and dusk to check the area specifically for roosting hen harriers and other important raptors. A total of 14 surveys were undertaken at approximately fortnightly intervals between September 2021 and March 2022.

Goose Feeding Distribution Surveys

7. Additional surveys were undertaken twice-monthly of all possible habitats that could be used by wintering waterfowl (including pink-footed geese, greylag geese and whooper swans) as feeding/roosting sites were within 2 km of the site (to give contextual information about where goose feeding flocks were located and provide further information on possible linkage to SPAs). The site lies within the potential SPA connectivity distance from the Castle Loch SPA (for which pink-footed geese are a qualifying feature) and within a known goose feeding area (Mitchell 2012, SNH 2013),

Vantage Point Surveys

8. Vantage Point surveys were carried out to determine bird flight activity within the wind farm site to assess collision risk. The surveys quantified the bird numbers that could potentially be at risk of collision (including roost flight observations at dawn/dusk). All flight lines of target species were mapped, and the flight height of each flock recorded. Target species were the same as those set out above for the walkover surveys.
9. The specific aim of the VP surveys was to collect data on key target species flight activity to enable estimates of:
 - The time spent flying over the survey area
 - The relative use made of different parts of the survey area
 - The proportion of flying time spent at different elevations above the ground.
10. Two vantage points were used to cover the wind farm site. The computer-generated viewsheds (using Global Mapper v21) are shown in Figure 1. For each VP, a basic 36 hours' VP surveys during the autumn/winter from each VP were carried out (as set out in NatureScot guidance, SNH 2017), spread evenly across the winter season. As the site lies within the potential SPA connectivity distance from the Castle Loch SPA (for which pink-footed geese are a qualifying feature) and within a known goose feeding area (Mitchell 2012, SNH 2013), an additional six hours' VP for each VP was carried out in September-November and February-March to provide extra survey effort in the main goose migration season.
11. All key target species flights (and any other species of specific nature conservation interest) were recorded, irrespective of their distance from the vantage point. Observations were carried out throughout daylight hours but not in periods of severely reduced visibility (<3 km).
12. During the VP surveys, all key target species flights were mapped and cross-referenced to a standard recording form using a numbering system, and the flight height of each recorded. Heights were estimated as accurately as possible using available reference structures and recorded as a raw estimate rather than being summarised to height classes. Below 10 m estimates were made to 1 m, between 10 and 20 m to 2 m, between 20 m and 50 m to 5 m, and above 50 m to 10 m. When birds were observed over an extended period, estimates of flight height were recorded every 30 seconds. The activity during each flight was also recorded. Particular attention was paid to any observations of birds at rotor height.

Wintering Bird Survey 2021-22 Results

Autumn/Winter Walkover Survey Results

13. The bird populations found within the survey area during each of the monthly walkover surveys are summarised in Table 1. The Table shows the peak numbers recorded during each month, and the overall peak counts. Overall, only low numbers of birds were recorded using the site during these surveys, though the larger lochs did support a range of wintering waterfowl.

Table 1. Autumn/winter bird populations recorded in the Balgray survey area during the September 2021 - March 2022 walkover surveys (monthly peak counts).

Species	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Peak 2021-22
Mute Swan	9	9	9	7	11	9	9	11
Whooper Swan	0	0	4	6	3	3	0	6
Pink-footed Goose*	0	0	6	25	36	0	0	36
Greylag Goose	0	0	0	0	1	0	0	1
Canada Goose	0	0	0	0	0	0	4	4
Wigeon	0	0	1	2	1	0	0	2
Teal	4	13	39	30	45	60	12	60
Mallard	6	37	15	25	35	23	10	37
Tufted Duck	9	3	0	0	0	1	5	9
Goldeneye	0	0	1	1	0	0	0	1
Little Grebe	2	3	0	0	0	1	2	3
Cormorant	0	0	0	0	0	0	2	2
Grey Heron	0	0	1	1	1	1	2	2
Red Kite	0	5	3	5	7	13	1	13
Hen Harrier	0	0	0	0	1	0	0	1
Goshawk	0	0	0	0	0	1	0	1
Sparrowhawk	0	0	1	0	0	0	1	1
Buzzard	7	11	7	11	8	9	16	16
Kestrel	2	2	2	4	1	0	0	4
Coot	1	0	0	0	0	0	0	1
Lapwing	0	13	0	0	0	0	2	13
Jack Snipe	0	0	1	0	0	0	0	1
Snipe	3	14	1	7	3	3	8	14
Woodcock	0	0	0	0	0	1	0	1
Green Sandpiper	0	2	0	0	0	0	0	2
Lesser Black-backed Gull	0	0	0	0	0	3	2	3

Species	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Peak 2021-22
Great Black-backed Gull	0	0	0	0	0	0	2	2
Short-eared Owl	1	0	0	0	0	2	0	2
Raven	0	0	0	0	0	0	1	1
Common Crossbill	0	0	0	0	6	0	0	6

* Pink-footed goose records were all of over-flying migrant flocks.

Autumn/Winter Wider Area Goose Feeding Distribution Survey Results

14. The bird populations found within the survey area during each of the fortnightly goose distribution surveys are summarised in Table 2. The Table shows the peak numbers recorded during each month, and the overall peak counts. The only records of geese during the surveys were of two flocks (one of 45 birds, the other of 51) over-flying on 4/10/21. There were no records of any geese feeding within the survey area.

Table 2. Autumn/winter bird populations recorded in the wider (2 km buffer) Balgray survey area during the September 2021 - March 2022 goose feeding distribution surveys (monthly peak counts).

Species	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Peak 2021-22
Mute Swan	0	0	0	0	0	0	2	2
Pink-footed Goose*	0	96	0	0	0	0	0	96
Mallard	0	0	0	24	22	0	4	24
Goosander	0	0	0	0	0	2	0	2
Grey Heron	0	0	3	0	0	4	2	4
Red Kite	7	10	14	13	23	13	1	23
Goshawk	0	1	0	0	0	1	0	1
Sparrowhawk	0	0	0	0	1	1	0	1
Buzzard	14	11	19	12	25	25	9	25
Kestrel	0	2	2	1	0	0	1	2
Oystercatcher	0	0	0	0	0	2	0	2
Curlew	0	0	0	0	0	0	1	1
Lesser Black-backed Gull	47	14	0	0	0	0	9	47
Herring Gull	0	0	0	0	0	0	6	6
Great Black-backed Gull	0	2	0	0	0	0	2	2
Common Crossbill	2	0	0	0	0	0	0	2

* Pink-footed goose records were all of over-flying migrant flocks.

Vantage Point Survey Results: Autumn/Winter 2019-20

15. The rates of bird flight movement observed across the survey area during the vantage point surveys are summarised in Table 3. This gives the flight rate per hour recorded in each month and the total number of flights recorded. Flight rates over the survey area were generally low, though the site was regularly used by wintering red kites. There were also occasional records of several other key raptors (red kite, hen harrier, goshawk, golden eagle, merlin, peregrine and short-eared owl), and occasional larger flocks of pink-footed geese.
16. Table 3 also gives the percentage of flights of each species that were recorded at rotor height (taking rotor height conservatively as between 21 m and 200 m above ground level).

Table 3. Bird flight rates recorded over the Balgray survey area during the September 2021 - March 2022 vantage point surveys. N = 72 hours total observation from each of the two VPs.

Species	Flight rate (birds/hour)							Total number of birds overflying	% flights at rotor height
	Sep	Oct	Nov	Dec	Jan	Feb	Mar		
Mute Swan	-	-	-	-	0.5	0.1	0.1	25	0%
Pink-footed Goose	0.0	63.3	0.0	1.4	0.4	0.4	1.5	3237	54%
Canada Goose	-	0.1	-	-	-	-	-	7	50%
Mallard	0.2	-	-	-	-	-	0.1	17	17%
Goosander	-	0.1	-	-	-	-	-	4	0%
Cormorant	-	0.1	-	-	-	-	-	6	0%
Grey Heron	-	-	-	-	-	-	-	7	40%
Red Kite	0.6	0.6	2.1	1.2	1.5	1.9	0.2	323	85%
Hen Harrier	0.1	0.1	-	-	-	0.1	0.1	21	29%
Goshawk	0.1	0.1	0.1	-	-	0.1	-	16	44%
Sparrowhawk	0.1	0.1	-	-	-	-	-	7	57%
Buzzard	1.0	1.0	0.9	0.8	0.6	1.7	1.8	336	61%
Golden Eagle	-	-	-	0.2	-	-	-	5	40%
Osprey	-	-	-	-	-	-	-	1	100%
Kestrel	0.7	0.7	0.5	0.3	0.4	0.1	-	112	48%
Merlin	0.1	-	-	-	-	-	-	4	50%
Peregrine	-	-	-	-	-	-	-	3	100%
Oystercatcher	-	-	-	-	-	-	-	1	0%
Golden Plover	0.1	0.6	-	-	-	-	0.6	61	33%
Lapwing	0.5	-	-	-	-	-	-	27	50%
Snipe	0.1	-	-	-	-	-	0.1	14	50%
Woodcock	-	-	-	-	-	-	-	2	0%
Redshank	-	-	-	-	-	-	-	1	100%
Lesser Black-backed Gull	0.1	0.1	-	-	-	-	1.4	84	77%
Herring Gull	-	-	-	-	0.3	-	-	11	75%
Great Black-backed Gull	-	-	-	0.3	-	0.1	-	14	86%
Short-eared Owl	-	-	-	-	-	0.1	-	7	20%

Conservation Evaluation of Wintering Bird Populations

17. The conservation value of the wintering bird populations was determined using the criteria specified in Table 4 (from Percival 2007) and is summarised in Table 5. This includes the criteria adopted by NatureScot in Guidelines for Selection of Biological SSSIs (Drewitt *et al.* 2020), using 1% of the resource to define international and national importance (Frost *et al.* 2021). An additional category of regional importance was assigned for species approaching the threshold for national importance and those for which the survey area held a notable concentration in a county context. A further category of 'local importance' was used for species that did not reach regional importance but were still of some ecological value. This included all species on the red or amber lists of the 'Birds of Conservation Concern' (Stanbury *et al.* 2021) that did not reach national or regional importance at the development site. National (GB) and International wintering waterfowl baseline populations have been taken from the most recently published population figures (Frost *et al.* 2021) from the national Wetland Birds Survey and other species from Woodward *et al.* (2020). In addition, listing on Annex 1 of the EU Birds Directive, Schedule 1 of the Wildlife and Countryside Act 1981, UK BAP priority species and Scottish BAP species were all considered in the evaluation process.

Table 4. Definition of terms relating to the sensitivity of the ornithological receptors at the site.

Conservation Value	Definition
VERY HIGH	Cited interest of SPAs, SACs and SSSIs. Cited means mentioned in the citation text for the site as a species for which the site is designated (SPAs/SACs) or notified (SSSIs).
HIGH	Other species that contribute to the integrity of an SPA or SSSI. A local population of more than 1% of the national population of a species. EU Birds Directive Annex 1, EU Habitats Directive priority habitat/species and/or W&C Act Schedule 1 species. Ecologically sensitive species, e.g. large birds of prey or rare birds (<300 breeding pairs in the UK).
MEDIUM	Regionally important population of a species, either because of population size or distributional context. UK BAP priority species (if not covered above).
LOW	Any other species of conservation interest, e.g. species listed on the Birds of Conservation Concern not covered above. Scottish BAP species (if not covered above).
NEGLIGIBLE	Green-listed species (Stanbury <i>et al.</i> 2021) of favourable conservation status

18. The conservation value of the wintering bird populations observed in the Balgray survey area during the wintering bird surveys has been summarised in Table 5 below. This included one very high sensitivity species (pink-footed goose – the birds seen could be ecologically linked to the Castle Loch SPA), 13 high sensitivity species (whooper swan, goldeneye, osprey, red kite, golden eagle, hen harrier, goshawk, peregrine, merlin, golden plover, green sandpiper, short-eared owl and common crossbill) that are EU Birds Directive Annex 1/Wildlife and Countryside Act Schedule 1 species, three medium sensitivity species (UK BAP priority/red listed species of conservation concern; lapwing, curlew and herring gull), and 12 low sensitivity species.

Table 5. Conservation evaluation of the wintering bird populations in the Balgray survey area, September 2021 – March 2022.

Species	Peak count (core)	Peak count (wider)	EU Birds Dir Ann 1	W and C Act Sch 1	Red [R]/Amber [A] List	UK BAP priority sp	Scottish BAP sp	Conservation Value
Mute Swan	11	2						Negligible
Whooper Swan	6	0	✓	✓	A		✓	High
<i>Pink-footed Goose</i>	36	96			A			Very high
Greylag Goose	1	0			A			Low
Canada Goose	4	0						Negligible
Wigeon	2	0			A			Low
Teal	60	0			A			Low
Mallard	37	24			A			Low
Tufted Duck	9	0						Negligible
Goldeneye	1	0		✓	R			High
Goosander	0	2						Negligible
Little Grebe	3	0						Negligible
Cormorant	2	0						Negligible
Grey Heron	2	4						Negligible
<i>Osprey</i>	1	0	✓	✓	A		✓	High
Red Kite	13	23	✓	✓			✓	High
Hen Harrier	1	0	✓	✓	R		✓	High
<i>Golden Eagle</i>	1	0	✓	✓			✓	High
Goshawk	1	1		✓				High
Sparrowhawk	1	1			A			Low
Buzzard	16	25						Negligible
<i>Peregrine</i>	2	0	✓	✓			✓	High
<i>Merlin</i>	1	0	✓	✓	R		✓	High
Kestrel	4	2			A		✓	Low
Coot	1	0						Negligible
Oystercatcher	0	2			A			Low
<i>Golden Plover</i>	20	0	✓				✓	High
Lapwing	13	0			R	✓	✓	Medium
Jack Snipe	1	0						Negligible
Snipe	14	0			A			Low
Curlew	0	1			R	✓	✓	Medium
Woodcock	1	0			R		✓	Low
<i>Redshank</i>	1	0			A			Low
Green Sandpiper	2	0		✓	A		✓	High
Lesser Black-backed Gull	3	47			A			Low
Herring Gull	0	6			R	✓	✓	Medium
Great Black-backed Gull	2	2			A			Low
Short-eared Owl	2	0	✓		A		✓	High
Raven	1	0						Negligible
Common Crossbill	6	2		✓				High

Note: species in italics seen over-flying only.

19. The key autumn/wintering birds recorded were as follows:

- **Pink-footed Goose** – a total of 3,237 flights were observed during the VP surveys, but 96% of those occurred during 6-8 October 2021. Apart from this brief period of activity, the only other records were of small numbers of migrant flocks over-

flying the survey area. Their flight lines are shown in Figure 2. There were no records of any feeding flocks within the survey area. There was no evidence of any clear link to the Castle Loch SPA, with flights occurring in all directions across the site. As the wind farm site is clearly not within an important goose feeding area, the only impact of the development on this species would be collision risk, which, given the numbers observed, would be unlikely to be significant.

- **Other wintering wildfowl** – the core walkover survey area was used by a range of other wintering waterfowl species but only in low (locally important) numbers. This included **whooper swan, wigeon, mallard, teal** and **goldeneye**. Most records were from Hallhills Loch in the northern part of the site, with a smaller number of records from the smaller loch just outside the south-eastern corner of the site.
- **Red Kite** – this species was observed regularly hunting and over-flying the site, with a total of 323 flights recorded (Figure 3). The site is clearly important for this species at this time of year.
- **Golden Eagle** – a total of five flights of this species were observed during the VP surveys, all of the same juvenile bird and all between 10-16 December 2021 (Figure 4). It is likely, given the location of the site, that this was a bird from the South Scotland Golden Eagle Project release scheme. Given the habitat present and the fact that it did not stay in the area, this would suggest that this area is not important for this species.
- **Hen harrier** – this species was regularly seen hunting over the site through the winter, with 21 flights in total (see Figure 5), though no evidence was found of any night roost in the survey area, and most flights seen were below rotor height (so collision risk would be low).
- **Goshawk** – this species was observed regularly during the winter VP surveys, with 16 flights in total (Figure 6), but was seen mostly over the forestry rather than the open ground of the site itself.
- **Other scarce raptors and owls** – osprey, peregrine, merlin and short-eared owl were all recorded during the winter surveys, but only infrequently in low numbers (Figure 7). There was no indication that the survey area was important to any of these species at this time of year.

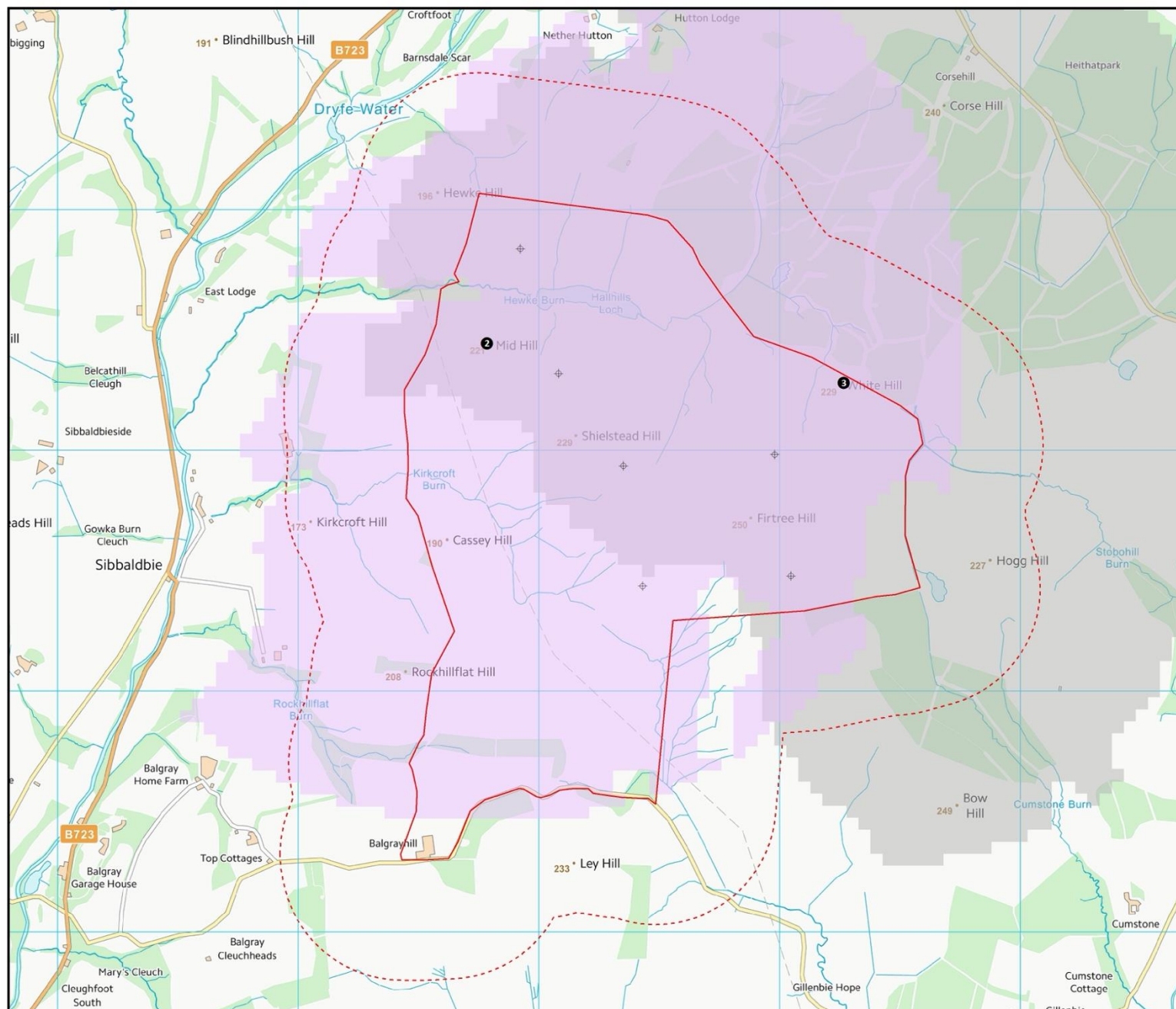
Conclusions

20. The 2021-22 wintering bird surveys found a range of wintering bird populations of conservation importance but generally (apart from red kite) only low numbers within/in proximity to the wind farm site in numerical terms and/or in the context of their regional (NHZ) populations.
21. Pink-footed geese had been initially considered a potentially important species in the area given the proximity to the Castle Loch SPA (within its SPA connectivity range, SNH 2017) and the potential feeding habitat (agricultural grassland and arable land) around the site. However, the goose feeding distribution surveys did not record any pink-footed geese at all feeding within 2km of the site. There were some flocks seen over-flying the site, though most of these were seen during a short period in early October and there was no evidence of any clear link to the Castle Loch SPA.

22. Red kites were seen in regionally important numbers using the site and were recorded regularly during all surveys. Flight activity overall was considerably higher than recorded in the previous summer (Percival *et al.* 2021). Given their use of the site, further analysis was undertaken to more clearly define the areas of importance to inform the site design. Figure 8 shows a heatmap of red kite flight density across the VP survey area. The main area of activity was on the south-western edge of the wind farm site, over the slopes of Shielstead Hill, to the south of Hallhills Loch.
23. Other raptor species, including golden eagle, hen harrier, goshawk, osprey, peregrine, merlin and short-eared owl, were recorded in lower numbers and less frequently.

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Balgray Proposed Wind Farm

FIGURE 1

Core Winter Walkover and VP Survey Areas

KEY:

- Site Boundary
- Core 500m buffer survey area
- Proposed turbines
- Vantage points
- VP2 viewshed
- VP3 viewshed



Contains Ordnance Survey OpenData
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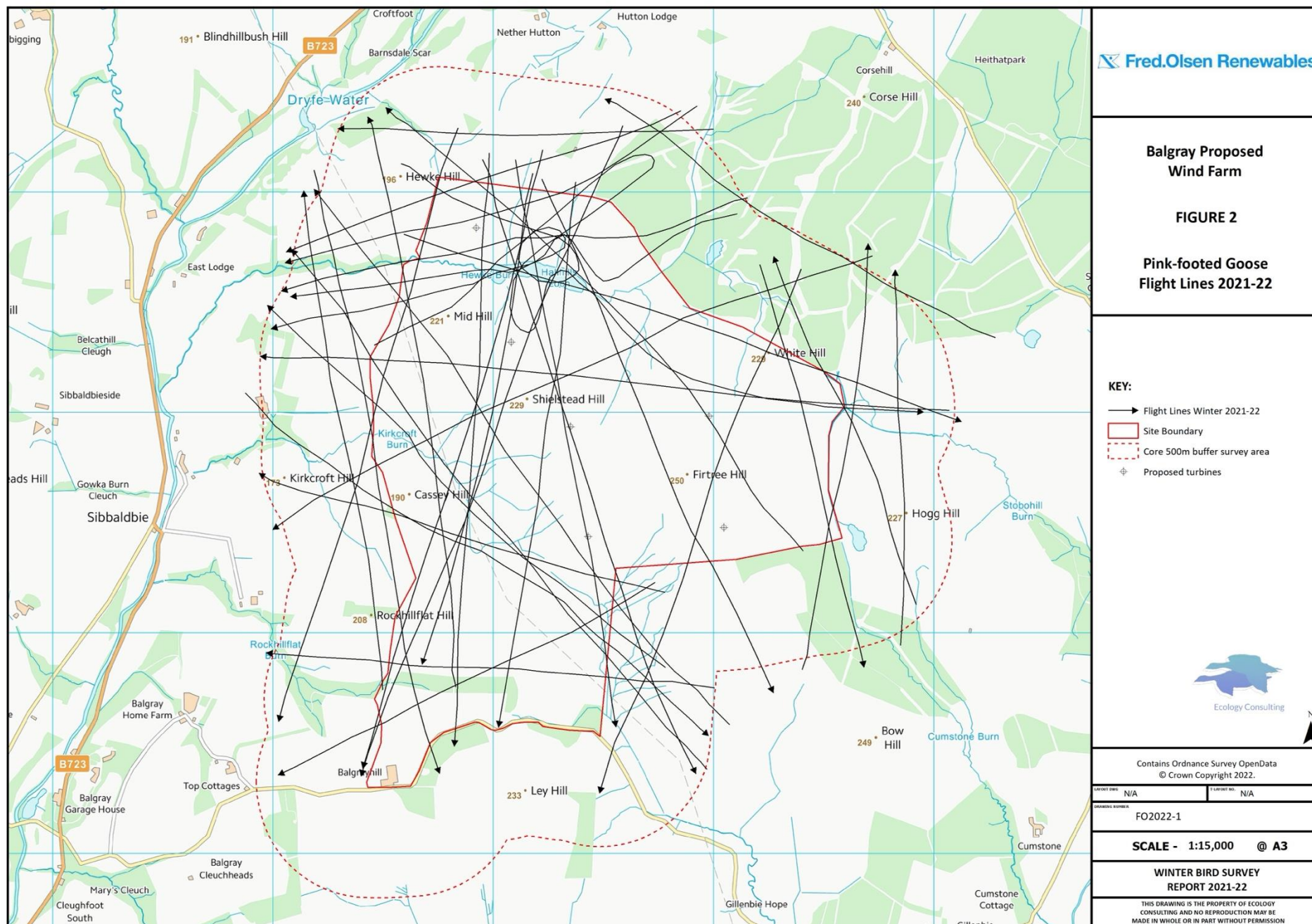
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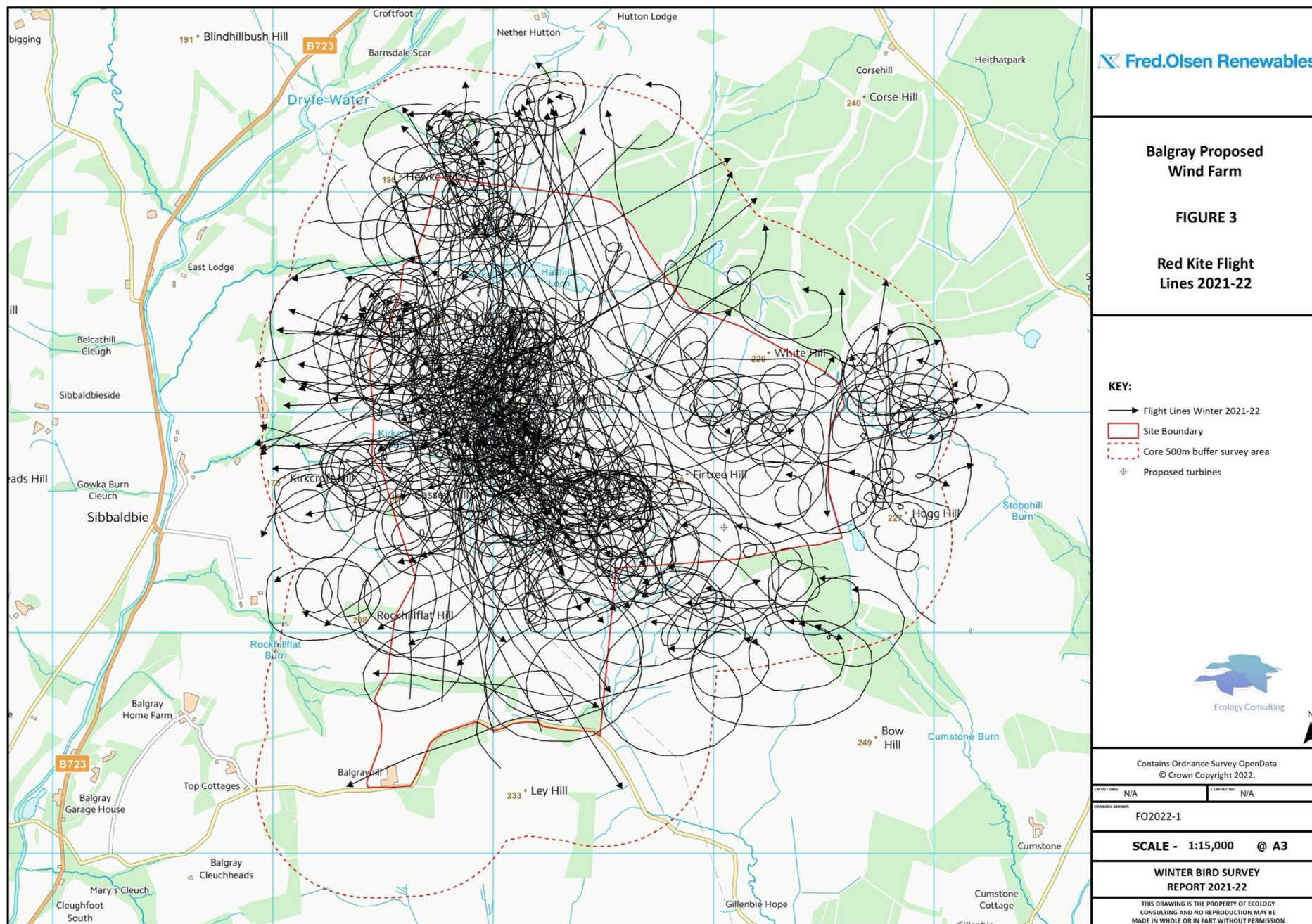
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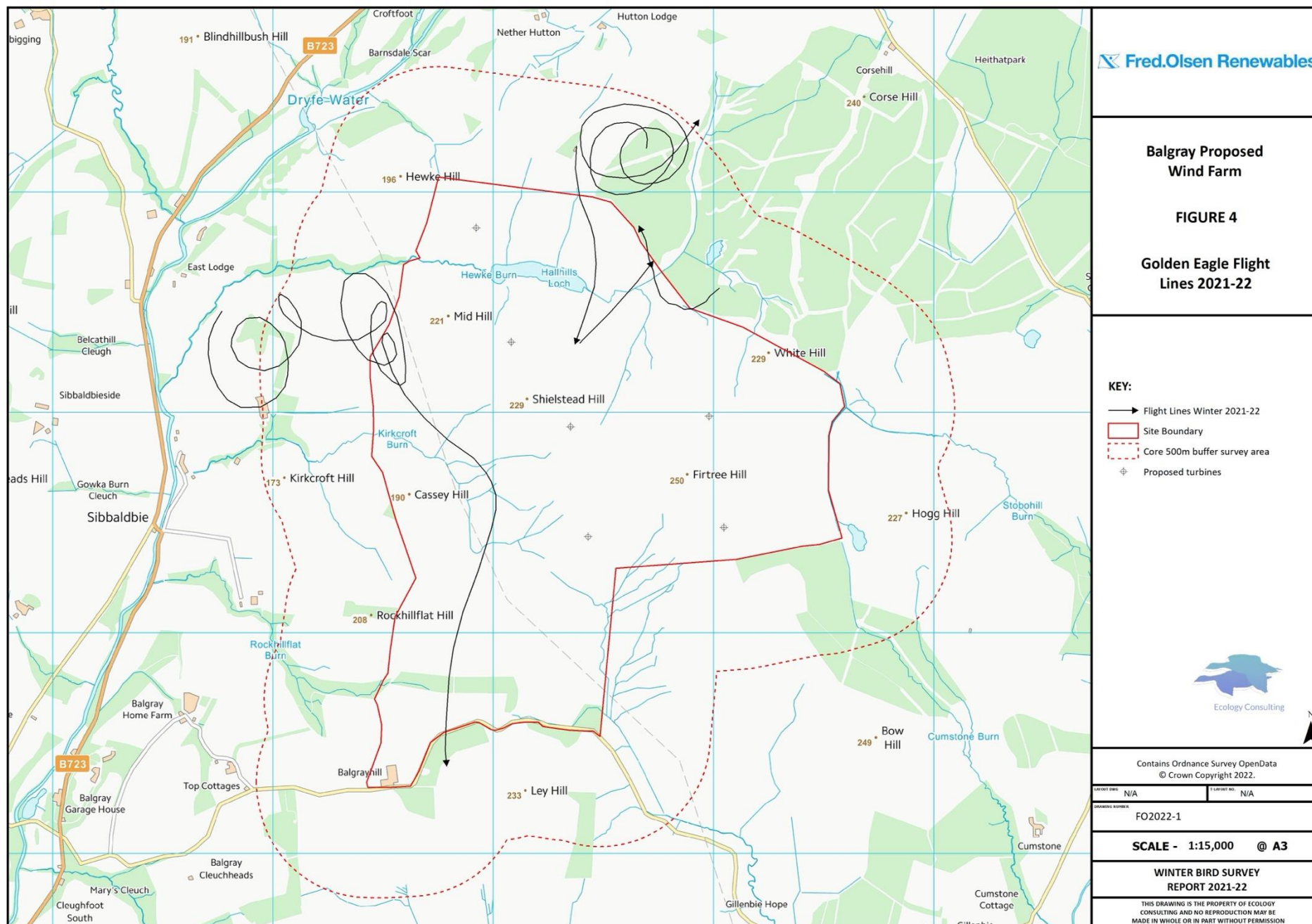
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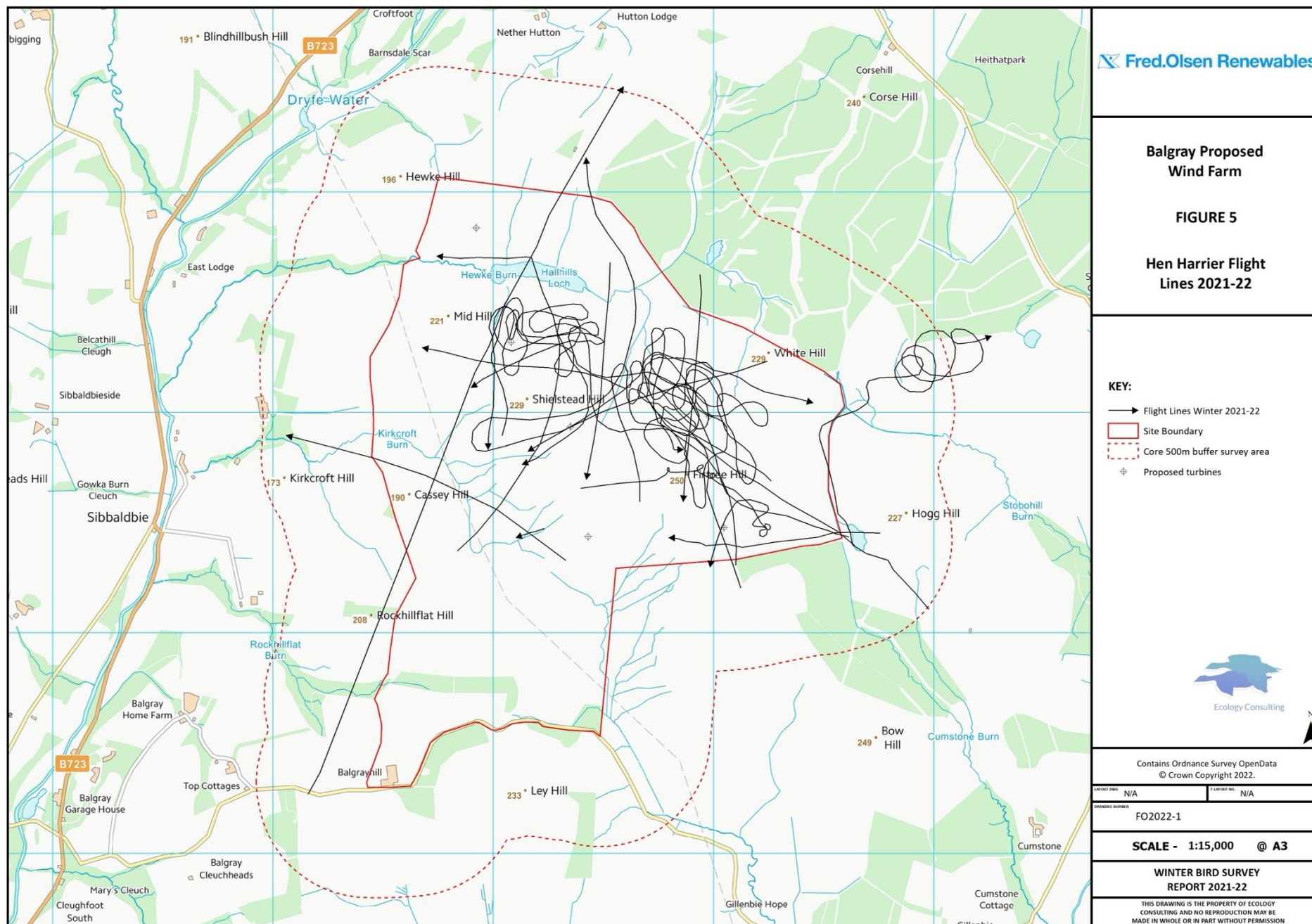
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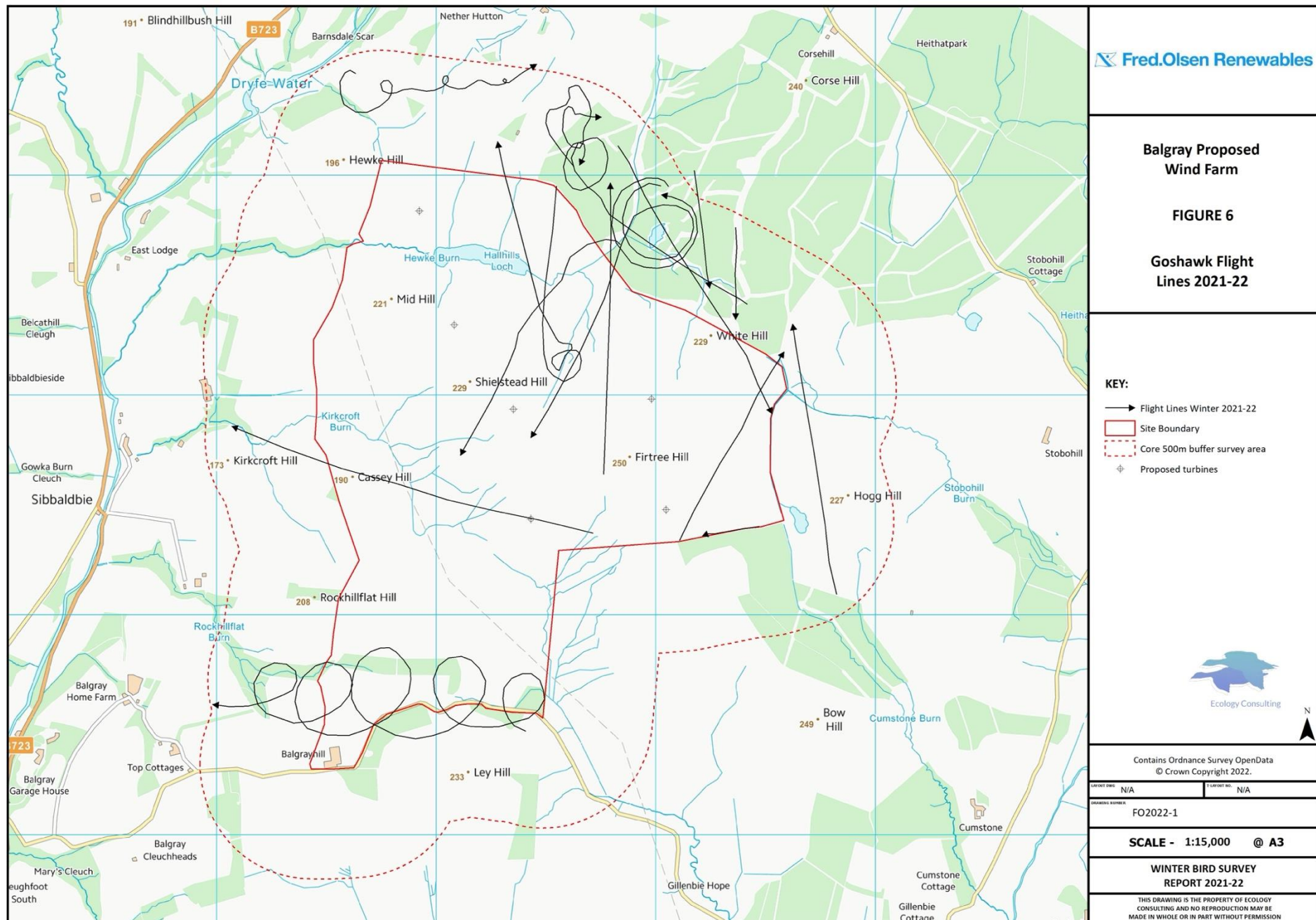
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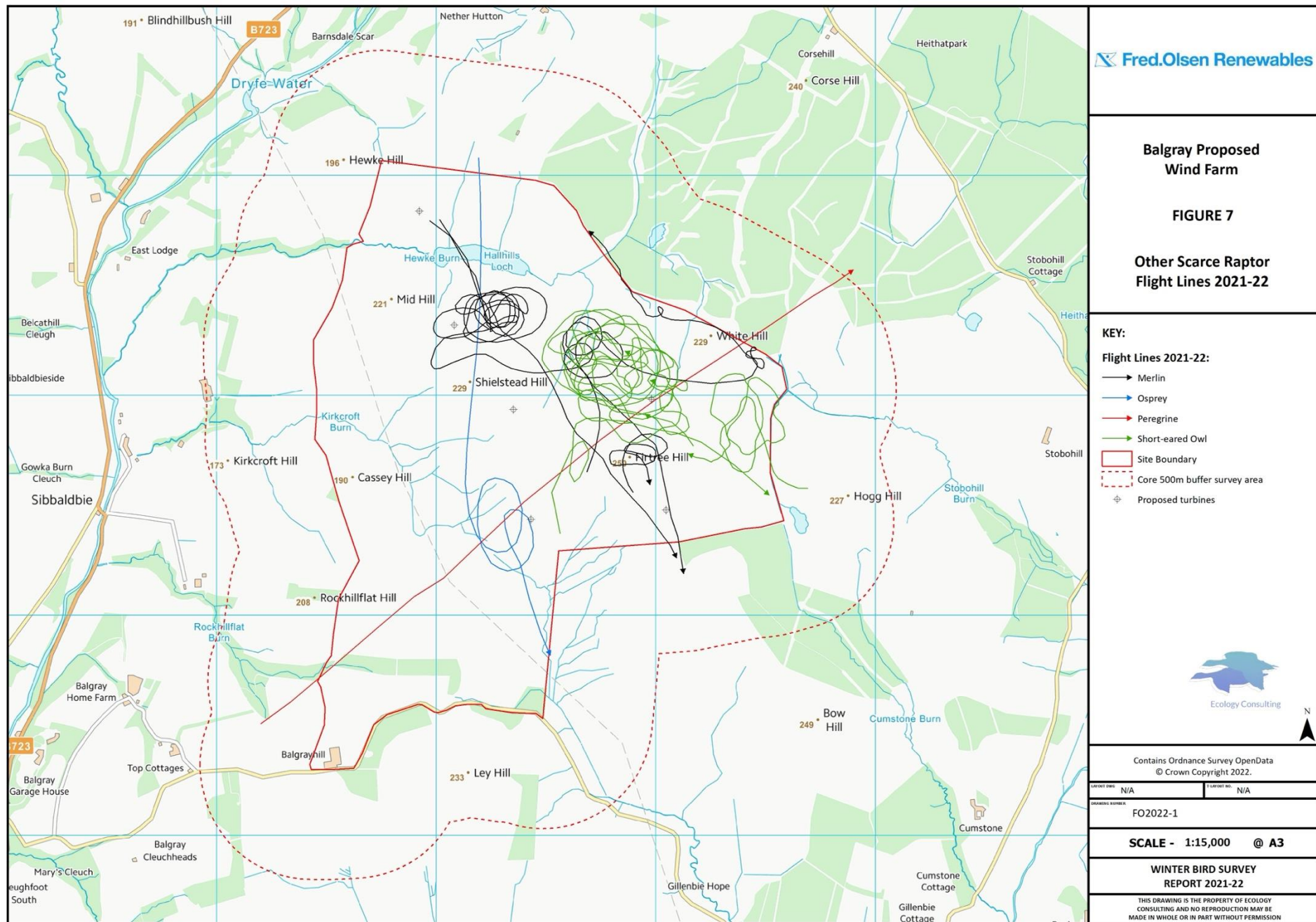


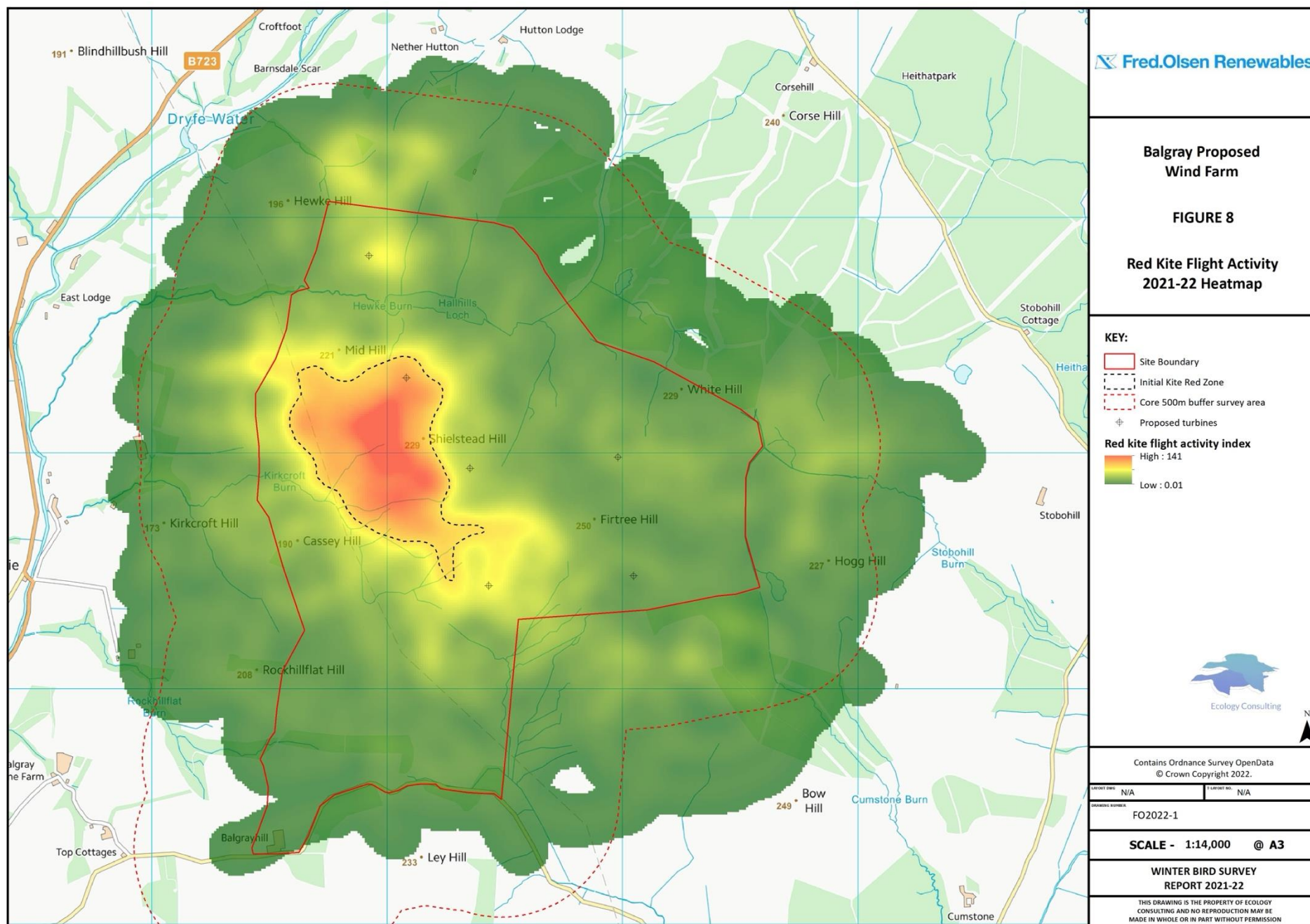












APPENDIX 1. VANTAGE POINT SURVEY DATA

Survey Information

Date	Vantage Point No	Start time	Finish time	Weather
07/09/2021	3	09:30	12:30	8/8 cloud, 0-1 variable wind, ok - very good visibility, 15 to 18C
07/09/2021	3	13:00	16:00	4-0/8 cloud, 0-2 SE wind, excellent vis, 18 to 22C
07/09/2021	2	16:50	19:50	0/8 cloud, 1-2 SE - SE wind, excellent vis
08/09/2021	2	06:00	09:00	4-6/8 cloud, 2 variable wind, excellent vis
08/09/2021	2	09:30	12:30	4-2/8 cloud, 1-3 SSE wind, excellent vis, 18 to 24C
21/09/2021	3	16:30	19:30	8/8 cloud, 3 SSW - WSW wind, very good vis
22/09/2021	3	06:30	09:30	6-8/8 cloud, 4 SW wind, very good vis, 13 to 14C
22/09/2021	2	10:00	13:00	8/8 cloud, 4 SW wind, very good vis
06/10/2021	3	06:55	09:55	0-2/8 cloud, 2-1 variable wind, excellent vis, 2 to 6C
06/10/2021	3	10:25	13:25	0/8 cloud, 1-2 variable wind, excellent vis
06/10/2021	3	13:55	16:55	5-3/8 cloud, 2-3 SSW - SSE wind, excellent vis
06/10/2021	2	17:25	18:55	8/8 cloud, 4 SSE wind, excellent vis
07/10/2021	2	14:00	15:30	8/8 cloud, 4 SSW wind, ok - poor vis, light rain
08/10/2021	2	07:00	10:00	8/8 cloud, 4 SSW wind, very good vis
08/10/2021	2	10:30	13:30	8/8 cloud, 4 SSW wind, very good vis
14/10/2021	3	07:10	10:10	8/8 cloud, 4 SW wind, very good vis
14/10/2021	2	13:30	16:30	8/8 cloud, 4-5 SW - WSW wind, very good vis, brief periods of drizzle
15/10/2021	2	07:10	07:40	0/8 cloud, 0 wind, excellent vis, ground frost
02/11/2021	3	06:45	09:45	3-8/8 cloud, 1 variable wind, ok - excellent vis, 1 to 4C
02/11/2021	3	10:15	13:15	3-6/8 cloud, 2-3 variable wind, excellent vis, 6 to 10C
03/11/2021	2	06:45	09:45	4/8 cloud, 1-2 NW wind, excellent vis, 2 to 5C, ground frost in sheltered areas
03/11/2021	2	10:15	13:15	4-6/8 cloud, 2-3 N wind, excellent vis, 8C
16/11/2021	3	10:00	13:00	8/8 cloud, 3-4 SW wind, very good vis
16/11/2021	3	13:30	16:30	8/8 cloud, 3-4 SW wind, very good vis
18/11/2021	2	10:00	13:00	8/8 cloud, 4 S wind, very good vis, light rain showers
18/11/2021	2	13:30	16:30	8/8 cloud, 3-5 SW wind, very good vis, brief light showers
04/12/2021	2	07:50	10:50	5-8/8 cloud, 3 NW wind, good - very good vis, light rain at dawn
10/12/2021	2	14:00	16:00	2/8 cloud, 2-3 SW wind, excellent vis
16/12/2021	3	08:30	11:30	8/8 cloud, 2-3 S wind, ok - very good vis
16/12/2021	3	13:00	16:00	3-7/8 cloud, 1-3 S-SW wind, very good vis
17/12/2021	2	11:45	12:45	2-6/8 cloud, 1 NNW wind, very good vis
04/01/2022	2	08:10	10:10	0/8 cloud, 3-4 NW wind, excellent vis, ground frost
04/01/2022	2	12:40	14:10	0/8 cloud, 4 NW wind, excellent vis
05/01/2022	3	08:00	11:00	0/8 cloud, 1-2 NW wind, excellent vis, ground frost
05/01/2022	3	11:30	14:30	0/8 cloud, 1-3 NW wind, excellent vis, ground frost
05/01/2022	2	15:00	16:30	0/8 cloud, 3 NW wind, excellent vis, ground frost
17/01/2022	2	11:10	12:10	0/8 cloud, 3 SW wind, excellent vis
01/02/2022	2	07:30	10:30	6-8/8 cloud, 5 WNW wind, very good vis
01/02/2022	3	11:15	14:15	4-7/8 cloud, 5 NW wind, very good vis
01/02/2022	2	14:50	17:20	6-7/8 cloud, 5 NW wind, very good vis
02/02/2022	2	10:10	13:10	8/8 cloud, 4 W wind, very good vis
02/02/2022	2	14:00	14:30	8/8 cloud, 4 W wind, very good vis
21/02/2022	3	06:50	09:50	2-6/8 cloud, 5-6 NW wind, excellent vis
21/02/2022	3	11:00	14:00	2-4/8 cloud, 4-5 NW wind, excellent vis
21/02/2022	3	14:30	17:30	2-4/8 cloud, 2-4 NW wind, excellent vis
22/02/2022	2	13:40	16:40	4-7/8 cloud, 4-5 W wind, very good vis, brief showers
02/03/2022	2	07:40	09:10	7-8/8 cloud, 5 ESE wind, very good vis
03/03/2022	2	06:30	08:00	8/8 cloud, 3 SE wind, ok - good vis, light rain
03/03/2022	3	08:40	10:40	8/8 cloud, 2-3 SE wind, good - ok vis, fine then light rain
10/03/2022	2	12:45	15:45	8/8 cloud, 4 S wind, very good vis, brief light rain shower
10/03/2022	2	16:15	18:15	5-8/8 cloud, 4 S wind, very good vis, light rain showers
15/03/2022	3	06:00	09:00	8/8 cloud, 3-4 SSW wind, good - very good vis
15/03/2022	2	09:45	12:45	8/8 cloud, 3-4 SSW wind, very good vis
15/03/2022	2	13:15	14:15	6-8/8 cloud, 4 SSW wind, very good vis
16/03/2022	3	10:50	13:50	8/8 cloud, 2-3 NNW, very good vis, light rain on and off
16/03/2022	3	14:20	17:20	7-8/8 cloud, 1-2 NW wind, very good vis
16/03/2022	3	17:50	18:50	6-8/8 cloud, 1-2 NW wind, very good vis

Key Species Data

VP	Date	Time	Species	Count	Direction of flight	Flight height (m)	Activity	Time bird observed (sec)	Notes
3	07/09/21	09:32	L	1	S	50		85	
3	07/09/21	10:28	KT	1		45		140	
3	07/09/21	11:24	KT	1		100		150	
3	07/09/21	12:04	OP	1	S	75	mobbed	130	mobbed by KT
3	07/09/21	12:06	KT	1		75	mob	50	mobbed OP
3	07/09/21	12:11	GI	1	circle	65		60	
3	07/09/21	13:13	KT	6		165		960	
3	07/09/21	13:22	KT	2		23		360	
3	07/09/21	13:31	KT	4		33		1860	lip to 4 birds on view during period
3	07/09/21	13:51	KT	6		103		720	
2	07/09/21	17:46	KT	1		250		480	
2	08/09/21	06:54	RK	1	NNE	30		70	redshank, landed on loch
2	08/09/21	07:40	KT	1	ENE	43		420	flew from trees
2	08/09/21	08:42	PE	1	NE	105		160	1cy
2	08/09/21	12:07	GI	1	circle W	225		300	
3	21/09/21	16:41	GP	4	S	55		100	
3	21/09/21	17:29	HH	1		8	hunt	540	juv
3	21/09/21	17:31	ML	1		26	hunt/mob	420	arrived with bird 6 and mobbed HH before heading SE
3	21/09/21	17:31	ML	1		26	hunt/mob	660	arrived with bird 5 then hunting MP after mobbing HH
3	21/09/21	17:51	ML	1	N	16	hunt	540	one of 5 or 6 returned
3	21/09/21	18:10	HH	1	N	6	hunt	330	same as 4
3	21/09/21	18:20	HH	1		6	hunt	210	same as 4 + 9
3	21/09/21	18:21	ML	1		8	mob	90	mobbed HH
3	21/09/21	19:01	GI	1	NE	6		50	adult flew between woods
3	22/09/21	08:01	L	12	WNW	10		50	
3	22/09/21	08:17	HH	1	N	6	hunt	540	
3	22/09/21	08:28	KT	1	WNW	18		30	adult male
3	22/09/21	08:31	KT	2	circle W	45		660	landed
3	22/09/21	08:39	HH	1	NNW	8	hunt	420	
3	22/09/21	08:52	KT	1	SE	20		420	
3	22/09/21	09:00	L	12		40		140	until VP end
3	22/09/21	09:24	KT	1	NNE	30		180	
3	06/10/21	07:43	GP	1	SE	70		40	direct, rapid flight
3	06/10/21	07:50	PG	20					flew N at 300+ to west of site
3	06/10/21	08:18	PG	97	SSE	300		280	
3	06/10/21	08:42	PG	174	SSE	300		180	
3	06/10/21	08:50	PG	39	SSE	300		150	
3	06/10/21	08:51	PG	30	SSW	300		180	
3	06/10/21	08:54	PG	38	SSE	250		150	
3	06/10/21	09:06	PG	110	SSE	300		180	
3	06/10/21	09:16	PG	45	NNW	165		150	
3	06/10/21	09:20	PG	50					
3	06/10/21	09:28	PG	58					
3	06/10/21	09:35	PG	60	NW	225		390	
3	06/10/21	09:51	PG	65					
3	06/10/21	09:54	PG	48	SSE	300		180	
3	06/10/21	11:12	KT	2	circle NNE	50		270	
3	06/10/21	11:20	KT	1	circle E	55		840	
3	06/10/21	11:53	KT	1	circle E	45		540	
3	06/10/21	11:54	KT	1		50		90	
3	06/10/21	12:46	KT	1		40		110	
3	06/10/21	13:55	KT	2		35		270	from VP start
3	06/10/21	15:10	KT	1		100		210	
3	06/10/21	15:50	KT	1	SE	15		70	
3	06/10/21	16:10	KT	2		200		1200	
3	06/10/21	16:44	PG	58	S	300		360	
3	06/10/21	16:49	KT	2		150		360	until VP end
2	06/10/21	18:17	PG	40					flew ESE to south of site at 200m
2	06/10/21	18:31	GP	20	NNW	15		75	landed
2	07/10/21	14:28	GP	6	SW	11		70	
2	07/10/21	14:32	PG	1	SSW	75		360	
2	08/10/21	07:13	PG	7	ENE	45		420	
2	08/10/21	07:21	PG	3	SE	40		160	
2	08/10/21	07:50	PG	1	SSW	175		300	
2	08/10/21	07:50	PG	3	SSW	65		180	
2	08/10/21	07:53	PG	1	SW	70		150	
2	08/10/21	08:00	KT	1	SE	45		360	
2	08/10/21	08:11	PG	80	NNE	300		300	
2	08/10/21	08:19	PG	6	WSW	45		150	
2	08/10/21	08:28	PG	32	W	150		130	
2	08/10/21	08:32	PG	22	SW	200		240	
2	08/10/21	08:33	PG	57	NW	225		420	
2	08/10/21	08:34	PG	160	NNE	300		300	
2	08/10/21	08:37	PG	21	W	200		150	

VP	Date	Time	Species	Count	Direction of flight	Flight height (m)	Activity	Time bird observed (sec)	Notes
2	08/10/21	08:48	PG	20	WNW	300		360	
2	08/10/21	08:48	PG	3	WNW	300		360	
2	08/10/21	09:00	PG	60					flew W to S of site at 300+m
2	08/10/21	09:10	PG	44					flew W to N of site at 200m
2	08/10/21	09:10	PG	85	NNW	200		180	
2	08/10/21	09:12	PG	40					flew W to N of site at 250m
2	08/10/21	09:18	PG	20	NNW	200		240	
2	08/10/21	09:20	PG	37	SW	175		300	
2	08/10/21	09:27	PG	46	NW	175		240	
2	08/10/21	09:32	PG	230					flew WNW to N of site at 300+m
2	08/10/21	09:40	PG	13	WSW	190		240	
2	08/10/21	09:50	PG	90					flew N to E of site at 300+m
2	08/10/21	09:52	PG	300					flew SW to SE of site at 300+m
2	08/10/21	09:55	PG	18	SW	150		240	
2	08/10/21	09:56	PG	60	W	300		150	
2	08/10/21	09:56	PG	225	WNW	300		300	
2	08/10/21	09:57	PG	115	NW	240		300	
2	08/10/21	10:36	PG	35					flew WSW to S of site at 300+m
2	08/10/21	10:37	PG	67	WNW	160		360	
2	08/10/21	11:07	PG	39	NW	140		360	
2	08/10/21	11:17	KT	2		21		1980	
2	08/10/21	11:22	PG	40					flew W to S of site at 300+m
2	08/10/21	11:31	KT	1	circle NE	200		270	
2	08/10/21	11:59	KT	1	E	16		660	
2	08/10/21	12:10	PG	25					flew WNW to south of site at 300+m
2	08/10/21	12:26	KT	1	SW	30		70	
2	08/10/21	12:42	KT	1	SW	38		130	
2	08/10/21	13:15	PG	105	N	275		180	
2	08/10/21	13:20	PG	60					flew W to N of site at 300m
2	08/10/21	13:26	HH	1	WSW	2		20	adult male landed
3	14/10/21	09:02	HH	1	W	20		140	female/1cy male, dropped from view
3	14/10/21	09:04	KT	1	SE	20		25	height difficult to judge here, better from VP2
3	14/10/21	09:24	KT	1	ESE	75		210	
3	14/10/21	09:31	KT	1		50		360	
3	14/10/21	09:54	KT	1		40		420	
2	14/10/21	14:17	KT	1	WNW	35		70	
2	14/10/21	14:37	KT	1		28		420	arrived with 4
2	14/10/21	14:37	KT	1	NW	48		90	arrived with 3
2	14/10/21	15:09	KT	1	WNW	23	hunt	720	
2	14/10/21	15:13	GI	1	circle	26		190	female originally with 9
2	14/10/21	15:13	GI	1		40		210	male originally with 7
2	14/10/21	15:38	KT	1	NW	35		140	
2	14/10/21	15:53	GI	1	NW	33		205	female
2	15/10/21	07:31	HH	2	NE	90	left roost	360	ad male and sub ad male, unusually high when not display
2	15/10/21	07:37	GI	1		16	hunt	65	adult female
3	02/11/21	10:42	KT	1	ESE	38		190	
3	02/11/21	10:53	HH	1	NW	21	hunt	390	female
3	02/11/21	11:03	KT	1	circle NW	60		120	
3	02/11/21	11:08	KT	1		45		95	
3	02/11/21	11:31	HH	1	NNW	13	hunt	270	sub ad male, mobbed by GI
3	02/11/21	11:33	GI	1	S	15	mob	90	1cy, mobbed HH
3	02/11/21	11:44	KT	1		65		65	
3	02/11/21	11:50	KT	2	circle	33		210	
3	02/11/21	12:29	PG	1	ESE	165		210	
3	02/11/21	13:07	KT	1		30		210	
2	03/11/21	10:36	KT	1	circle	45		480	
2	03/11/21	10:45	KT	1	circle ESE	40		180	same bird as 7
2	03/11/21	11:06	KT	1	circle	120		420	
2	03/11/21	11:07	KT	1	NNW	95		180	
2	03/11/21	11:22	KT	1	NE	23		80	
2	03/11/21	11:49	GI	1	N	11		45	juv, flew to wood
2	03/11/21	12:29	KT	1	SSE	60		420	
2	03/11/21	13:10	KT	4		115		300	until VP end
3	16/11/21	10:00	KT	2		40		2100	from VP start
3	16/11/21	10:00	KT	1	circle	23		780	from VP start
3	16/11/21	10:00	KT	2		15	hunt	2100	from VP start
3	16/11/21	10:35	KT	8		21		1680	
3	16/11/21	11:16	KT	2	SSE	35		150	
3	16/11/21	11:29	KT	2		25		420	
3	16/11/21	11:57	KT	2		70		1980	
3	16/11/21	12:06	KT	1		20		90	
3	16/11/21	12:23	KT	1		50		240	drifted E out of buffer
3	16/11/21	12:24	KT	2		21		1260	
3	16/11/21	13:30	KT	2		35		1120	
3	16/11/21	14:18	KT	1	SE	23		35	

VP	Date	Time	Species	Count	Direction of flight	Flight height (m)	Activity	Time bird observed (sec)	Notes
3	16/11/21	15:30	KT	1		18		360	
3	16/11/21	15:37	KT	1	NW	30		300	same bird as 15:30 at 1
3	16/11/21	15:45	KT	1	circle S	33		720	
3	16/11/21	16:11	KT	1	circle	38		360	
2	18/11/21	10:03	PE	2	SSW	40		240	
2	18/11/21	10:04	KT	4		23		300	
2	18/11/21	10:09	KT	4	circle E	26		1140	same birds as 3
2	18/11/21	10:28	KT	1	SW	45		660	
2	18/11/21	10:40	KT	1		45		900	
2	18/11/21	10:42	KT	1	ESE	30		300	
2	18/11/21	10:52	KT	1		35		540	
2	18/11/21	10:57	KT	1	NNE	100		110	
2	18/11/21	11:00	KT	4		28		600	
2	18/11/21	11:10	KT	8		100		150	
2	18/11/21	11:15	KT	1	NW	50		90	
2	18/11/21	11:16	KT	2		65		1260	
2	18/11/21	11:32	KT	2		75		120	
2	18/11/21	11:46	KT	1		95		210	
2	18/11/21	12:06	KT	1	E	30		360	
2	18/11/21	12:10	KT	8		85		1740	
2	18/11/21	12:37	KT	1	E	30		210	
2	18/11/21	13:34	KT	1	N	40		540	
2	18/11/21	13:49	KT	3	circle E	31		4380	
2	18/11/21	14:28	KT	1	circle E	31		2040	joined 3 still in flight on flight 2
2	18/11/21	14:44	GI	1	SE	18		80	female, dropped from view
2	18/11/21	14:54	KT	2		75		360	
2	18/11/21	15:34	KT	1	SW	15		50	landed
2	18/11/21	15:36	KT	1		75		90	
2	18/11/21	15:37	KT	1	NNW	25		180	flew from ground
2	18/11/21	15:56	KT	1		30		1140	
2	18/11/21	16:00	KT	1		18		180	dropped into wood
2	04/12/21	09:05	KT	1	circling EN	40		300	
2	04/12/21	09:38	KT	1	NW	60		90	
2	04/12/21	09:41	KT	1	ENE	16		660	
2	04/12/21	09:44	KT	1	E	41		960	
2	04/12/21	10:28	KT	1	NE	115		150	
2	10/12/21	13:37	EA	1	circling	113		660	juv Golden Eagle circling with KT + BZ (photographed)
2	10/12/21	14:00	KT	1	NW	35		100	
2	10/12/21	14:11	KT	1	circling	95		660	
2	10/12/21	14:50	KT	1	NE	55		140	
2	10/12/21	14:56	KT	1	NNW	35		110	
2	10/12/21	15:30	KT	1	NW	28		420	
2	10/12/21	15:39	KT	1	NNW	40		300	
3	16/12/21	08:42	EA	1	SW	16	left roost	35	juv, same bird seen last week, appeared to fly from trees
3	16/12/21	08:48	PG	32	NW	125		120	
3	16/12/21	08:52	KT	2	SSE	25		270	
3	16/12/21	09:34	EA	1	S	4		70	same as above, landed, mobbed by RN
3	16/12/21	09:41	KT	1		25		150	
3	16/12/21	09:43	EA	1	NE	5		20	
3	16/12/21	09:54	GI	1	WSW	7		10	flew along wood and landed in tree (adult)
3	16/12/21	10:49	KT	1		26		360	
3	16/12/21	10:51	EA	1		40		200	juv, circled up from trees
3	16/12/21	11:08	PG	1	SE	175		180	
3	16/12/21	11:14	KT	3		28		960	until VP end
3	16/12/21	13:24	KT	2	E	26		840	
3	16/12/21	13:41	KT	1		30		1140	
3	16/12/21	14:33	KT	2	ENE	25		70	
3	16/12/21	14:39	KT	1		23		50	
3	16/12/21	15:01	KT	1	WNW	13		210	landed
3	16/12/21	15:21	KT	1	NW	30		150	flew from ground
3	16/12/21	15:37	KT	1	NE	50		70	
2	17/12/21	12:25	KT	1	WSW	25		70	
2	04/01/22	08:19	KT	4	ESE	60	left roost	630	
2	04/01/22	08:53	KT	1		60		120	
2	04/01/22	09:38	KT	1	NNE	20		210	
2	04/01/22	10:01	KT	1	NNW	8		210	
2	04/01/22	12:40	KT	2		20		190	from VP start
2	04/01/22	12:48	KT	1		90		100	
2	04/01/22	13:07	KT	1	SW	15		240	joined 17
2	04/01/22	13:42	KT	1	WNW	26		360	
3	05/01/22	08:26	KT	4	E	125	left roost	540	
3	05/01/22	08:27	KT	1	SSE	83	left roost	450	
3	05/01/22	08:30	KT	1		25	left roost	90	
3	05/01/22	08:30	KT	2		55	left roost	40	
3	05/01/22	09:28	PG	10	S				
3	05/01/22	12:06	KT	1	SSE	10		130	
3	05/01/22	12:10	KT	2	NW	31		360	
3	05/01/22	12:53	KT	1		80		1020	

VP	Date	Time	Species	Count	Direction of flight	Flight height (m)	Activity	Time bird observed (sec)	Notes
3	05/01/22	13:35	KT	1	ESE	31		720	
3	05/01/22	13:36	KT	1		125		540	
3	05/01/22	13:49	KT	6		41		2040	
3	05/01/22	14:11	KT	2		235		600	
2	17/01/22	11:19	KT	1	ENE	32		330	
2	17/01/22	11:50	KT	1	NW	8	hunt	1200	until VP end
2	17/01/22	12:08	KT	1		80		120	until VP end
2	01/02/22	07:41	KT	4		25	hunt	2280	
2	01/02/22	07:45	KT	1	SE	45		120	
2	01/02/22	08:25	GI	1	SSE	20		25	adult
2	01/02/22	08:34	KT	5		105		2700	
2	01/02/22	08:39	KT	1	NE	25	hunt	420	
2	01/02/22	09:03	KT	1	NNE	16		270	
2	01/02/22	09:12	KT	1		115		300	
2	01/02/22	09:19	KT	1		23		270	
2	01/02/22	09:31	KT	1		21		1260	
2	01/02/22	09:39	KT	1	WNW	35		90	
2	01/02/22	09:45	KT	2		75		780	
2	01/02/22	10:02	KT	1		45		660	
3	01/02/22	12:11	KT	1	WNW	40		20	
3	01/02/22	12:44	HH	1	S	2		125	adult male
3	01/02/22	12:55	KT	1		55		720	
3	01/02/22	13:01	KT	1	WNW	50		160	
2	01/02/22	15:41	HH	2	NW	65		390	both males
2	01/02/22	15:46	KT	2	NNW	28		150	
2	01/02/22	15:50	KT	1	SW	28		100	
2	01/02/22	16:42	KT	1	NW	50		240	
2	02/02/22	10:10	KT	1		45		540	
2	02/02/22	10:23	KT	1	SE	26	hunt	660	
2	02/02/22	10:33	KT	2		40		150	
2	02/02/22	10:34	KT	3	NNE	21		2040	
2	02/02/22	10:39	KT	1		45		210	
2	02/02/22	10:44	KT	4		50		540	
2	02/02/22	11:17	KT	2		21		2280	
2	02/02/22	11:44	KT	1	SE	18		300	
2	02/02/22	12:01	KT	1		15		1800	
2	02/02/22	12:08	KT	2		45		150	
2	02/02/22	12:08	KT	1	ESE	25		3720	until VP end
2	02/02/22	12:14	SE	1	NNW	50		95	mobbed by 6 KT
2	02/02/22	12:14	KT	6		51		1440	mobbed SE then layered
2	02/02/22	12:25	HH	1	WSW	8		480	male
2	02/02/22	12:46	KT	2		41		1440	until VP end
2	02/02/22	12:47	KT	2	WSW	125		150	
2	02/02/22	12:59	KT	2		45		150	
2	02/02/22	13:03	HH	1	NNE	21	hunt	190	male
2	02/02/22	14:00	KT	2		60		1200	
2	02/02/22	14:03	KT	9		35		1620	until VP end
2	02/02/22	14:15	KT	2		60		180	
2	02/02/22	14:21	KT	1		125		50	
2	02/02/22	14:24	KT	1		21		360	until VP end
2	02/02/22	14:24	KT	1		30		130	
2	02/02/22	14:27	KT	1		15		180	until VP end
3	21/02/22	08:18	KT	1		60		50	
3	21/02/22	09:13	KT	1		30		40	
3	21/02/22	09:36	KT	1		50		65	
3	21/02/22	12:28	KT	1	WNW	35		150	
3	21/02/22	12:32	GI	1	NNW	18		70	female
3	21/02/22	12:40	GI	1	WNW	25		75	same as 11
3	21/02/22	13:20	KT	1	NW	25		540	with BZ
3	21/02/22	15:00	KT	1	SSW	11		270	
3	21/02/22	15:15	KT	2		15		540	
3	21/02/22	15:16	KT	1	circle N	30		600	
3	21/02/22	15:21	SE	2		13		480	landed
3	21/02/22	15:29	KT	2		85		900	
3	21/02/22	15:31	KT	1	WNW	40		30	
3	21/02/22	15:37	KT	1	WNW	40		30	
3	21/02/22	16:46	SE	2		6	hunt	2640	landing occasionally for brief periods until VP end
3	21/02/22	17:10	PG	20	SSW	300		220	
2	22/02/22	14:24	KT	1	NW	50		190	
2	22/02/22	14:53	KT	1	W	33		360	
2	22/02/22	15:36	KT	1	WNW	33		540	
2	02/03/22	08:35	KT	1	S	10		35	
2	02/03/22	08:51	KT	1		35		900	
2	10/03/22	12:48	KT	1	circle NW	20		540	
2	10/03/22	12:57	KT	2		26	hunt	3720	

VP	Date	Time	Species	Count	Direction of flight	Flight height (m)	Activity	Time bird observed (sec)	Notes
2	10/03/22	16:21	GI	1	S	23		30	adult
3	15/03/22	07:20	PG	15					
3	15/03/22	08:16	L	2		10	display	2400	
2	15/03/22	10:40	PG	55					flew west to south of site then north just outside west buffer
2	15/03/22	11:14	GI	1	WNW	55		120	adult
2	15/03/22	13:41	HH	2	NW	5	hunt	540	male and female
2	15/03/22	14:01	KT	2	circle ENE	65		210	
3	16/03/22	11:31	KT	1	N	2		65	
3	16/03/22	12:35	KT	1		11		300	
3	16/03/22	12:40	KT	1		125		210	
3	16/03/22	16:44	HH	2		10	hunt	2160	male and female flushed SE, until VP end
3	16/03/22	16:45	SE	1		10	hunt	2100	mobbed HH pair then hunting until VP end
3	16/03/22	17:57	HH	1	S	23		55	female
3	16/03/22	18:05	SE	1		5	hunt	660	
3	16/03/22	18:13	GP	15		13		960	
3	16/03/22	18:39	GP	15		13		150	same flock as above