

Appendix 9.1: Ornithology Technical Report

Appendix 9.1: Ornithology Technical Report

Introduction

- 1.1. This report details the ornithological survey work undertaken at the site of the proposed Kilgallioch Windfarm Extension (hereafter referred to as the 'proposed Development') by Natural Research (Projects) Ltd (NRP) between April 2018 and August 2019. Surveys covering two breeding seasons and one non-breeding seasons have been completed.
- 1.2. The objectives of the study were to:
 - ◆ Map the distribution of breeding birds, including scarce breeding species listed in Annex 1 of the EU Birds Directive (2009/147/EEC) on the Conservation of Wild Birds 1979 (the Birds Directive) or Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)(WCA).
 - ◆ Quantify the level of bird flight activity by breeding, wintering and foraging birds of potential conservation importance; and
 - ◆ Record the presence and abundance of other birds of conservation importance (those listed on the Scottish Biodiversity List (SBL) or on the Red List of Birds of Conservation Concern (BoCC) (Eaton *et al.*, 2015) throughout the year.
- 1.3. This report is supported by the EIA Report **Confidential Annex**.

Desk Study

- 1.4. The site is not statutorily designated at international or national levels for ornithological interests. The nearest Special Protection Area (SPA) is the Glen App and Galloway Moors SPA (approximately 7.5 km west at its nearest point) which is designated for breeding hen harrier.
- 1.5. Consultation was made with Scottish Natural Heritage (SNH), Royal Society for the Protection of Birds (RSPB), Dumfries & Galloway Raptor Study Group (D&GRSG) for information to inform surveys, along with considering the survey results from previous work on the area for the operational Kilgallioch Wind Farm.

Study Areas and Survey Periods

- 1.6. The proposed Development is an extension to the Operational Kilgallioch Windfarm which has been operational since 2018. The study area is situated in an area of open rough moorland enclosed by commercial forestry with a maximum elevation of 227 m AOD. The Operational Kilgallioch Windfarm borders the site to the west and the existing Balmurrie, Artfield and Airies Windfarms are south and south east of the site. The majority of the other surrounding areas consist of commercial forestry, rough grazing land and some small waterbodies and water courses.

- 1.7. Surveys were devised following the SNH Guidance on recommended survey methods (SNH, 2017).
- 1.8. Surveys relevant to the proposed Development commenced in April 2018 and ended in August 2019. This provides data for two bird breeding periods and one non-breeding period.
- 1.9. Some birds range over large areas and are therefore potentially vulnerable to the effects of windfarm developments a considerable distance away. Hence, the Study Area was defined with reference to the proposed Development and encompasses a series of buffers of up to 2 km radius; with buffer size dependent on the sensitivity of key species to potential effects associated with windfarm development (**Figure 9.1**). The various survey areas, which make up the Study Area, are defined as follows:
 - 'Site' refers to the area enclosed by the proposed Development's red-line boundary;
 - 'breeding bird survey area' and 'winter walkover survey area' refers to the Site plus an additional 500 m wide strip around the Site;
 - 'flight activity assessment area' or 'FA' refers to a polygon around the outermost turbines plus an additional 500 m strip around the polygon;
 - 'black grouse survey area' refers to the Site plus an additional 1.5 km wide strip; and
 - 'raptor/owl survey area' refers to the Site plus an additional 1-2 km wide strip depending on the focal species and presence of contiguous suitable habitat outside of the Site.

Field Survey Methods

- 1.10. The field surveyors were A. Ash (AA), B. Dunlop (BJD), D. Maloney (DM), R. Stakim (RAS), H. Thurgate (HCT) and N. Thurgate (NT). Field surveyors received training prior to and during survey work. Training included the various survey methods, techniques to minimise fieldworker effects on bird detection, and the classification of bird behaviour. Training was provided irrespective of surveyors' previous experience. Emphasis was placed on the importance of carrying out surveys in a systematic and standardised way to enable direct comparison of data from different survey periods and sites.

Flight Activity

- 1.11. Information on bird flight activity was collected during timed watches from strategic Generic Vantage Points (GVPs) using the methods described by Band *et al.* (2007). GVPs were selected through a mix of GIS analysis and field trials, with the aim of maximising ground visibility within 500 m of the proposed turbine locations using the minimum number of vantage points. Viewsheds from each VP are derived using a 20 m vertical cut-off (**Figures 9.2a, 9.2b & 9.2c**).
- 1.12. Four Generic Vantage Points (GVPs) have been used during VP survey effort, with a further two used at the very start of surveys. The surveys were initially conducted from GVP 1, 4 and 7 (**Figure 9.2a**) however the location of GVP4 was moved due to health and safety reasons in early May 2018, and so GVP 1, 2 and 3 were used until August 2018 (**Figure 9.2b**). GVP2 was then deemed potentially too close to the possible hen harrier roost location therefore was replaced by GVP5 in September 2018 (**Figure 9.2c**).

1.13. In order to select flights for potential inclusion in a Collision Risk Model (CRM) (Band *et al.*, 2007), flight activity data were extracted and reported in respect of a 500 m buffer around a polygon formed by the outermost turbine locations of the proposed Development. This area is termed the Flight Activity Assessment Area (FA) (**Figure 9.1**).

1.14. The FA measures 589.3 hectares (ha). For the FA the area observed from at least one GVP (i.e. the cumulative visible area) measures between 549.1 and 578.3 ha, providing a spatial coverage between 93 and 98 % at 20 m above ground level with a 2 km horizontal cut-off. (**Table 1**).

Table 1. Details of Generic Vantage Point locations and visible areas.						
Dates utilised	GVP	Grid Reference	Total area visible (ha)	Area visible within FA (ha)	Cumulative visible area (ha)	Coverage (%)
April & May 2018	1	NX 25236 68739	616.0	46.3	549.1	93
	4*	NX 24116 71104	613.2	491.9		
	7*	NX 24210 69801	590.0	110.9		
	Total		1819.2	649.1		
May 2018 to August 2018	1	NX 25236 68739	616.0	46.3	560.7	95
	2*	NX 23942 70006	547.0	294.2		
	3*	NX 22226 70213	595.6	298.9		
	Total		1758.6	639.4		
September 2018 to August 2019	1	NX 25236 68739	616.0	46.3	578.3	98
	3	NX 22226 70213	595.6	298.9		
	5	NX 25126 70084	536.4	407.3		
	Total		1748.0	752.5		

*Initial surveys in April 2018 and very start of May only were undertaken at different locations which were then superseded by other locations for the remainder of the surveys, due to health & safety concerns for accessing the initial GVP4. The visible areas and coverage of the survey area were very similar for both pairings and hence were a direct replacement for survey effort calculations.

1.15. Observers at GVPs positioned themselves to minimise their effects on bird behaviour. A viewing arc not exceeding 180° was scanned. Watches were undertaken during daylight hours by a single observer in a wide range of weather conditions, mainly in conditions of good ground visibility (>2 km) and when the cloud base was higher than most elevated parts of the survey area.

1.16. A minimum of 36 hours of observation has been completed from each GVP for each period of each year (April to August classed as the breeding period (**Tables 2 & 4**) and September to March classed as the non-breeding period (**Table 3**)). Thus, in total 327 hours of observation has been undertaken with 219 hours during the breeding season and 108 hours in the non-breeding season.

1.17. During surveys in April and the beginning of May 2018 when the GVP locations were first set up, watches were undertaken at a different location for two of the GVPs. These were then superseded by another location for the remainder of the surveys. This was due in the main to health and safety

concerns for accessing the initial GVP4. The visible areas and coverage of the survey area were very similar for both pairings and hence were a direct replacement for survey effort calculations.

1.18. When possible observations were stratified across three daylight periods (termed 'early', 'middle' and 'late') to allow for diurnal variation in activity rates. The timing of watches within each period was adjusted each month in accordance with sunrise and sunset times (**Annex 1.1 & 1.2**). A wide range of weather conditions were sampled including rain and snow showers, cloud cover from 0 to 100 % and wind speeds up to Beaufort Force 8 (**Annex 1.3**).

Table 2. Summary of monthly GVP effort in the breeding season with early, middle and late stratification in 2018 (data are hours of observation).							
GVP	Daylight Period	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Total
1	E	1.50	1.00		1.50		4.00
	M	10.50	5.75	3.00	4.50	4.50	28.25
	L		2.25	3.00		1.50	6.75
Total		12.00	9.00	6.00	6.00	6.00	39.00
2	E		1.00		1.50		2.50
	M		6.25	3.00	4.50	4.50	18.25
	L		1.75		3.00	1.50	6.25
Total			9.00	3.00	9.00	6.00	27.00
3	E						
	M		6.75	3.00	3.50	4.5	17.75
	L		2.25	3.00	2.50	1.5	9.25
Total			9.00	6.00	6.00	6.00	27.00
4*	E						
	M	6.00	3.00				9.00
	L						
Total		6.00	3.00				9.00
7*	E						
	M	6.00	3.00				9.00
	L						
Total		6.00	3.00				9.00

*GVPs 4 & 7 were used initially in April and start of May were then replaced by GVPs 2 & 3 for the remainder of the survey period, therefore add 9.00 to the effort for GVP2 & GVP3 each

Table 3. Summary of monthly GVP effort in the non-breeding season; with early, middle and late stratification in 2018/2019 (data are hours of observation).

GVP	Daylight Period	2018			2019			Total
		Sep	Nov	Dec	Jan	Feb	Mar	
1	E	1.5		1.0		1.0		3.5
	M	4.5	5.0	5.75	5.0	5.0	3.5	28.5
	L		1.0	0.25	1.0		1.5	4.0
Total		6.0	6.0	7.0	6.0	6.0	5.0	36.0
3	E			1.0		1.0		2.0
	M	4.5	5.0	5.75	5.0	5.0	4.0	29.25
	L	1.5	1.0	0.25	1.0		1.0	4.75
Total		6.0	6.0	7.0	6.0	6.0	5.0	36.0
5	E			0.75	0.25	1.0		2.0
	M	4.5	6.0	4.09	4.75	5.0	4.5	28.84
	L	1.5		1.16	1.0		1.5	5.16
Total		6.0	6.0	6.0	6.0	6.0	6.0	36.0

Table 4. Summary of monthly GVP effort in the breeding season; with early, middle and late stratification in 2019 (data are hours of observation).

GVP	Daylight Period	Apr	May	Jun	Jul	Aug	Total
1	E	1.50		1.50		1.50	4.50
	M	7.50	7.50	4.50	4.50	4.50	28.50
	L		1.50		1.50		3.00
Total		9.00	9.00	6.00	6.00	6.00	36.00
3	E	1.50		1.50		1.50	4.50
	M	7.50	10.50	1.50	4.50	4.50	28.50
	L		1.50		1.50		3.00
Total		9.00	12.00	3.00	6.00	6.00	36.00
5	E	1.50		1.50		1.50	4.50
	M	7.50	7.50	4.50	4.00	4.50	28.00
	L		1.50		2.00		3.50
Total		9.00	9.00	6.00	6.00	6.00	36.00

1.19. During each watch three hierarchical recording methods were used, as follows:

- Focal bird sampling – timed. The viewing arc was scanned constantly until a *Target A species*¹ was detected in flight. Once detected, the bird was followed until it ceased flying or was lost from view, with the duration of the flight recorded to the nearest second. The route followed by the bird was plotted in the field onto a 1:25,000 scale map, with the direction of flight indicated regardless of whether or not the bird was within the survey area. The bird's flying elevation above the ground was estimated at the point of detection and at 15 second intervals thereafter, using a countdown timer with an audible alarm. Flying elevation was classified as less than 10 m, 10 m to 30 m, 30 m to 50 m, 50 m to 100 m, 100 m to 200 m and greater than 200 m. Where simultaneous flight activity by a number of birds was observed and it was not possible to plot individual flight lines, areas of flight activity were plotted on the field maps.
- Focal bird sampling – untimed. The same scanning procedure as described above was used. However flights of *Target B species*² were not timed, instead the flight path was mapped and flying elevation was recorded at the start and when it changed during the recorded bout. Where a flock was observed a central flight line representative of the route was estimated.
- Activity Summaries. At the end of each five minute period flight activity within the survey area by species of lesser conservation importance (*Target C species*)³ was summarised. The number of birds recorded in any one period was the minimum number of individuals that could account for the activity observed. The height, direction and number of individuals involved in notable bird movements (e.g. gull flights) were recorded.

1.20. Data were entered in the field onto recording sheets and later transferred to Microsoft Excel spreadsheets. Maps of flight activity by Target Species were compiled for each watch. Each flying bout was numbered and cross-referenced to the relevant flight path on the map.

Scarce Breeding Birds

- 1.21. Priority was given to detecting the species considered most likely to breed in the area: hen harrier (*Circus cyaneus*), short-eared owl (*Asio flammeus*), merlin (*Falco columbarius*) goshawk (*Accipiter gentilis*) and barn owl (*Tyto alba*). To avoid disturbance the Dumfries & Galloway Raptor Study Group was consulted on any potential raptors breeding in the area.
- 1.22. In addition to the survey effort on GVP watches and the breeding birds of open ground, 55.92 hours were spent searching for evidence of scarce breeding birds (including barn owl) (Table 5).
- 1.23. Surveys were undertaken within suitable habitat which was located within: the 2 km survey boundary for hen harrier, merlin and short-eared owl; and the 1 km survey boundary for goshawk and barn owl (Figure 9.1). The survey area was curtailed in 2018 by lack of access to some areas of the 2 km buffer, so observations were carried out from suitable vantage points where available, however all areas were accessed in 2019.

¹ *Target A species* were drawn from those listed in Annex 1 of the Birds Directive and Schedule 1 of the WCA. See Annex 1.6 for a full list.

² *Target B species* were migratory birds of conservation importance, in this instance geese and certain waders. See Annex 1.6 for a full list.

³ See Annex 1.6

Hen harrier

- 1.24. Survey methods in Hardey *et al.* (2013) were followed, with emphasis given to any stands of tall heather.

Merlin

- 1.25. Survey methods in Hardey *et al.* (2013) were followed, with emphasis given to any stands of tall heather, boulders, hummocks, bushes and trees including old crows nests (which could be re-used by merlin) were checked for signs of occupation (e.g. plucked prey, moulted feathers, pellets and faeces).

Short-eared owl

- 1.26. Survey methods in Hardey *et al.* (2013) were followed. Emphasis was given to stands of tall heather.

Goshawk

- 1.27. Survey methods in Hardey *et al.* (2013) were followed. Emphasis was given to stands of mature conifers, particularly stands of European larch (*Larix decidua*).

Barn owl

- 1.28. Suitable nest and roost locations were searched for signs of occupancy.

Table 5. Details of Scarce Breeding Bird surveys, 2018 and 2019.										
Date	Obs	Start	Finish	Duration	Weather					
					Cloud 10ths	Cloud base (m)	Wind Direction	Wind Force	Precip*	Visibility (km)
29/04/2018	BJD	0545	0645	1.00	0	-	nil	0	nil	5
29/04/2018	DM	0605	0700	0.92	2	2000	E	1	nil	3
29/04/2018	BJD	1655	1725	0.50	10	3000	NW	2	nil	5
30/04/2018	BJD	0530	0630	1.00	0	-	W	1	nil	5
30/04/2018	BJD	0545	0645	1.00	0	-	NNW	1	nil	3
30/04/2018	DM	1425	1535	2.17	2	2000	N	1	nil	3
01/05/2018	BJD	1315	1515	2.00	6	1500	S	2	nil	3
18/05/2018	HCT	1745	1800	0.25	5	3000	SE	3	nil	20
07/08/2018	RAS	1630	1700	0.50	8	900	SW	3	nil	5
12/02/2019	RAS	0855	0910	0.25	10	300	SW	5	nil	3
27/02/2019	RAS	0930	1230	3.00	10	300	S	2	CLF	1
26/03/2019	RAS	0840	1040	2.00	10	900	WSW	3	nil	5
28/03/2019	RAS	1400	1500	1.00	5	900	SSW	3	nil	5
10/04/2019	RAS	0600	0800	2.00	1	900	nil	0	nil	5

Table 5. Details of Scarce Breeding Bird surveys, 2018 and 2019.										
Date	Obs	Start	Finish	Duration	Weather					
					Cloud 10ths	Cloud base (m)	Wind Direction	Wind Force	Precip*	Visibility (km)
10/04/2019	RAS	0800	1130	3.50	2	900	E	3	nil	5
11/04/2019	RAS	0600	0700	1.00	9	500	SE	2	nil	3
11/04/2019	RAS	1000	1400	4.00	10	900	SE	4	nil	5
12/04/2019	RAS	1000	1200	2.00	3	900	SE	4	nil	5
23/04/2019	RAS	0855	1000	1.08	9	900	E	3	nil	4
23/04/2019	RAS	1200	1215	0.25	10	900	ESE	4	nil	4
08/05/2019	RAS	0615	0745	1.50	10	500	E	2	nil	3
08/05/2019	RAS	0745	1415	6.50	10	600	E	5	ILR	5
15/05/2019	RAS	0600	0800	2.00	4	1000	SE	3	nil	5
15/05/2019	RAS	0800	1030	2.50	3	1000	SE	4	nil	5
31/05/2019	RAS	1450	1820	3.50	10	300	SW	4	nil	3
25/06/2019	RAS	1000	1430	4.50	10	800	SE	3	nil	5
30/07/2019	RAS	1530	1830	3.00	9	900	NE	3	nil	5
31/07/2019	RAS	1430	1730	3.00	7	800	NW	4	nil	5

* Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog

Black Grouse

- 1.29. Methods followed those in Gilbert *et al.* (1998). Areas of suitable habitat within a 1.5 km survey boundary (**Figure 9.1**) were visited to search for signs of occupation (droppings, feathers) and to locate and count any displaying (lekking) males. Spring visits were made within two hours of dawn from mid-April in dry, calm weather with good visibility. Surveyors listened and scanned carefully for lekking males. In total 10.50 hours were spent searching for black grouse (**Table 6**).

Table 6. Details of black grouse lek surveys, 2018 and 2019.										
Date	Obs	Start	Finish	Duration	Weather					
					Cloud 10ths	Cloud base (m)	Wind direction	Wind force	Precip*	Visibility (km)
29/04/2018	BJD	0545	0645	1.00	0	-	nil	0	nil	5
29/04/2018	DM	0605	0700	0.92	2	2000	E	1	nil	3
30/04/2018	BJD	0530	0630	1.00	0	-	W	1	nil	5
30/04/2018	DM	0545	0645	1.00	0	-	NNW	1	nil	3
10/04/2019	RAS	0600	0800	2.00	1	900	nil	0	nil	5
11/04/2019	RAS	0600	0700	1.00	9	500	SE	2	nil	3

Table 6. Details of black grouse lek surveys, 2018 and 2019.

Date	Obs	Start	Finish	Duration	Weather					
					Cloud 10ths	Cloud base (m)	Wind direction	Wind force	Precip*	Visibility (km)
08/05/2019	RAS	0615	0745	1.50	10	500	E	2	nil	3
15/05/2019	RAS	0600	0800	2.00	4	1000	SE	3	nil	5

*Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog

Breeding Birds of Open Ground

- 1.30. Surveys were completed using a four visit Brown & Shepherd (1993) method for upland waders. These visits were completed between late-April and early July in 2018 within a 500 m survey boundary of the proposed turbines (**Figure 9.1**). Selected bird species were surveyed, namely those included on Annex 1 of the Birds Directive, Schedule 1 of the WCA, Red-listed BoCC and those listed on the UK and local BAPs together with selected other species (see **Annex 1.7** for a full list).
- 1.31. Surveys were completed four times between April and July to allow for differences in detection rate between early and late breeding species. Fieldwork was not undertaken in conditions considered likely to affect bird detection, for example, strong winds (greater the Beaufort Force 5), persistent precipitation, poor visibility (less than 300 m) or in unusually hot or cold temperatures. Surveys were undertaken for a total of 69.5 hours. (**Table 7**).
- 1.32. The survey aimed to cover the ground systematically with a constant search effort. All points within the survey areas were approached closely typically to within 100 m. Patches of scrub, isolated trees, rocky outcrops and streams were investigated closely and surveyors paused at regular intervals to scan and listen for calling and singing birds. Careful attention was given to recording behaviour indicative of breeding with care taken to avoid counting the same individual more than once.
- 1.33. The location and activity of birds were mapped onto enlarged 1:25000 scale OS maps using standard BTO codes (Marchant 1983). The position of each bird was mapped at the point of first detection and flight lines recorded. At the end of each visit, a summary map was compiled showing the locations of each identified territory or breeding pair. The following evidence was considered diagnostic of breeding: song, courtship or territorial display; territorial dispute; nest building and hole excavation; agitated behaviour by adult bird(s) indicative of the presence of a nearby nest or young (e.g. repetitive alarm calling, distraction display); adult(s) carrying food; presence of newly fledged young; adult(s) removing faecal sac.
- 1.34. Where a number of breeding individuals were present and it was not possible to determine the exact number of breeding pairs, a method was devised to allow the number of discrete territories to be estimated. Registrations of individual birds were deemed to represent discrete breeding territories / pairs if the distance between them was more than 250 m (500 m for curlew, 200 m for small passerines). Whilst it is recognised that these distances are arbitrary and the territory size varies both inter- and intra- specifically, this approach produces a standardised index of abundance based on the distance that members of a breeding pair are likely to move during the survey period. In cases where two individuals were considered to constitute a pair of birds, the location of the pair was placed centrally by convention.

- 1.35. Population estimates were derived by comparing the summary maps for the four survey visits. Again a method was devised whereby discrete territories could be estimated. Territories plotted during each visit were considered to be separate from one another if they were located more than 1000 m apart (500 m for snipe, common sandpiper and skylark, 300 m for other small passerines). These distances were chosen to reflect the distances birds could plausibly move between survey dates. The locations of territories mapped in more than one survey period were plotted centrally.

Table 7. Details of breeding birds of open ground surveys, 2018.

Date	Obs	Start	Finish	Duration	Visit	Weather					
						Cloud 10ths	Cloud base (m)	Wind dir	Wind force	Precip*	Vis (km)
29/04/2018	BJD	0700	1000	3.00	1	0	-	nil	0	nil	5
29/04/2018	DM	0735	1030	2.92	1	1	2000	E	2	nil	3
30/04/2018	BJD	0630	0905	2.58	1	0	-	N	2	nil	5
30/04/2018	BJD	1540	1640	1.00	1	0	-	N	2	nil	5
01/05/2018	DM	1005	1245	2.67	1	6	1500	S	2	nil	3
01/05/2018	NT	1005	1305	3.00	1	6	1500	S	2	nil	3
01/05/2018	BJD	1015	1315	3.00	1	6	1500	S	2	nil	3
18/05/2018	HCT	1515	1745	2.50	2	5	3000	SE	3	nil	20
18/05/2018	NT	1630	1815	1.75	2	3	3000	SE	3	nil	20
19/05/2018	HCT	0800	1825	10.42	2	8	3000	SE	3	nil	2
19/05/2018	NT	0900	1115	2.25	2	8	3000	SE	3	nil	2
19/05/2018	NT	1600	1715	1.25	2	10	3000	SE	4	nil	2
08/06/2018	HCT	1900	2200	3.00	3	4	3000	SSW	2	nil	30
09/06/2018	HCT	1000	1945	9.75	3	5	2000	S	2	nil	30
10/06/2018	HCT	0830	1245	4.25	3	6	2000	S	2	nil	30
06/07/2018	HCT	1535	2005	4.50	4	7	2000	NW	2	nil	30
07/07/2018	HCT	0915	1400	4.75	4	6	2000	SW	2	nil	30
07/07/2018	HCT	1830	2200	3.50	4	7	2000	NW	2	nil	30
08/07/2018	HCT	0930	1300	3.50	4	6	2000	NNW	2	nil	30

* Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog

Autumn / Winter Walkover Surveys

- 1.36. Walkover surveys were undertaken between September 2018 and March 2019. Surveys were designed to record any important assemblages of migrant and wintering birds on the site and within a 500 m survey boundary (**Figure 9.1**).
- 1.37. Survey routes meandered to encompass as much ground as practical, in particular features of potential ornithological interest such as streams, marshes and trees. Where practicable surveyors used a

different route to maximise the eventual spatial coverage of the site, and paused to scan for birds. Walkover surveys totalling 21.75 hours were undertaken and a range of weather conditions sampled, although wind speeds of over Beaufort Force 5 were avoided to improve aural detection of species (Table 8).

- 1.38. For Target A species the time each individual was first detected was recorded along with details of age, sex and behaviour (if possible). These details were cross-referenced to a map where the location and flight route (if applicable) were plotted. For all other species the number of individuals was recorded and locations where they were first detected plotted on the map.

Date	Obs	Start	Finish	Duration	Weather					
					Cloud 10ths	Cloud base (m)	Wind Direction	Wind Force	Precip*	Visibility (km)
18/09/2018	RAS	1130	1430	3.00	8	600	SW	4	nil	5
28/09/2018	RAS	0715	0730	0.25	1	900	N	1	nil	5
28/09/2018	RAS	1030	1115	0.75	7	900	NW	3	nil	5
24/10/2018	RAS	0915	1315	4.00	9	600	WNW	5	ILR	5
22/11/2018	RAS	1015	1415	4.00	3	800	E	3	nil	5
20/12/2018	RAS	0725	0755	0.50	10	200	WSW	2	ILR	0.1
20/12/2018	RAS	1000	1020	0.33	10	400	SW	4	nil	5
20/12/2018	RAS	1220	1230	0.17	9	400	SW	4	ILR	5
28/01/2019	RAS	1000	1400	4.00	4	800	W	1	nil	5
27/02/2019	RAS	1230	1615	3.75	5	900	S	2	CLF	3
26/03/2019	RAS	1400	1500	1.00	10	800	W	4	nil	5

* Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog

Hen harrier winter roost survey

- 1.39. Additional survey effort during the winter months in suitable habitat and over areas where historically hen harrier have roosted. Watches of approximately 2 hours were carried out during the period around dusk for birds arriving to roost and around dawn for birds leaving. These were complemented by walkovers of the roost area searching for signs of roosts (flattened vegetation, pellets, droppings etc) during the day.
- 1.40. A total of 18.5 hours of dawn and dusk watches were completed in October 2018 to February 2019 (Table 9). Walkovers included searches of areas for signs of roosting by hen harriers were completed on 18 September 2018; 24 October 2018; 22 November 2018; 20 December 2018 and 28 January 2019 (Table 10).

Date	Obs	Period of day	Start	Finish	Duration	Weather					
						Cloud 10ths	Cloud base (m)	Wind Direction	Wind Force	Precip *	Visibility (km)
24/10/2018	RAS	Dawn	0715	0915	2.00	10	400	WNW	4	nil	0.1 to 3
24/10/2018	RAS	Dusk	1630	1830	2.00	10	400	WNW	5	ILR	3 to 2
22/11/2018	RAS	Dawn	0735	1935	2.00	0	-	E	1	nil	1 to 5
22/11/2018	RAS	Dusk	1415	1615	2.00	9	800	E	2	nil	5 to 2
20/12/2018	RAS	Dawn	0800	1000	2.00	10	300	WSW	3	nil	0.1 to 2
21/12/2018	RAS	Dusk	1430	1630	2.00	10	500	SW	3	nil	5 to 1
28/01/2019	RAS	Dawn	0800	1000	2.00	5	700	NW	1	nil	2 to 5
28/01/2019	RAS	Dusk	1515	1645	1.50	9	700	SW	3	nil	5 to 1
27/02/2019	RAS	Dawn	0655	1855	2.00	0	-	SSE	1	ILF	1 to 2
27/02/2019	RAS	Dusk	1615	1715	1.00	10	200	SW	2	CHF	0.5 to 0.2

* Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog

Date	Obs	Duration
18/09/2018	RAS	Checked area on east and found location C
24/10/2018	RAS	Checked area of location C (nil results) and through rest of Site including area of location B (nil results), found location A
22/11/2018	RAS	Checked near A (nil results), found location B (after saw birds in vicinity during dawn watch)
20/12/2018	RAS	Checked area C, nil results
28/01/2019	RAS	Checked area A, nil results

Field Survey Results

Wildfowl

Occurrence and status

- 1.41. Whooper swan (*Cygnus cygnus*), greylag goose (*Anser anser*) and pink-footed goose (*Anser brachyrhynchus*) were recorded during the survey period. Whooper swan is found on Annex 1 of the Birds Directive whilst greylag goose and pink-footed goose are regular winter migratory species and as such are afforded protection under the Birds Directive. The greylag geese that are resident in this area are from the British population with Icelandic birds passing through on migration (**Tables 12 & 15; Figures 9.3 & 9.5**).

Abundance and distribution

- 1.42. During all surveys two sightings of whooper swan involving six individuals (two flocks of three birds) were recorded. Both flocks were on the Eldrig Loch, and occurred in November and December 2018 (**Figure 9.5**).
- 1.43. Three greylag goose flights were recorded during all surveys. The flocks consisted of two, three and four individuals and flights were observed in January, February and March 2019 (**Figure 9.3 & 9.5**).
- 1.44. Two flights of pink-footed goose were recorded; a flock of 90 in October 2018 and a flock of 190 in April 2019 (**Figure 9.3 & 9.5**).

Flight activity recorded during GVP watches within the FA 500 m buffer – September to April

- 1.45. Two greylag goose flights, involving a total of seven birds, flew at least partially through the FA at collision risk height, i.e. between 30-100 m above ground level (a.g.l). (**Table 12; Figure 9.3**).
- 1.46. One pink-footed goose flight passed within the 500 m buffer used for collision modelling (FA) involving 90 birds; all flying above collision risk height, i.e. greater than 200 m a.g.l (**Table 12; Figure 9.3**).

Raptors and Owls

Occurrence and status

- 1.47. Sightings of goshawk (*Accipiter gentilis*), hen harrier (*Circus cyaneus*), merlin (*Falco columbarius*), peregrine (*Falco peregrinus*), red kite (*Milvus milvus*), short-eared owl (*Asio flammeus*) and barn owl (*Tyto alba*) were recorded during the survey period. All these species except goshawk and barn owl are listed on Annex 1 of the Birds Directive and all except short-eared owl are listed on Schedule 1 of the WCA. Hen harrier and merlin are also listed as red on the BoCC (**Tables 11, 13a, 15 & 16; Figures 9.4a, 9.4b & 9.5**).

Abundance and distribution

- 1.48. Goshawk was recorded as probably breeding beyond the 2 km survey buffer during 2019.
- 1.49. In 2018 and 2019 one barn owl nest site was found and birds were present, however there was no evidence that breeding occurred in either year (**Confidential Annex: Figure 1**).

- 1.50. There was no evidence that any of the other species recorded had bred within the survey buffers.
- 1.51. Three areas containing hen harrier winter roost locations were identified (A, B and C), of which two (A and B) were used regularly by two individuals and up to four individuals through the winter. These were in very similar areas to those identified during the surveys for the Operational Kilgallioch Windfarm, and lie within the 500 m buffer of the proposed turbine locations, the closest is approximately 215 m from the nearest turbine location (**Confidential Annex: Figure 2**). **Table 15 and Table 16**.

- 1.52. Hen harrier was recorded mostly during the non-breeding season, and was observed in August to December 2018, January to March 2019. Sixteen flights were seen from GVPs (**Figure 9.4a & 9.4b**). Of these, 13 sightings were sexed, 12 as adult male and one as a female, the other three flights were by one immature bird. Eight flights were recorded during the course of winter roost surveys (**Confidential Annex: Figure 2**).

- 1.53. Merlin was seen on four occasions during the study period, all during the non-breeding season. Two flights were seen from GVP watches and two flights were seen during the course of other surveys (**Figure 9.4b & 9.5**).

- 1.54. Peregrine was seen on three occasions; once in May 2018 and two flight by the same bird in August 2019. All flights were recorded from GVPs; however only two flights passed within the FA (**Figure 9.4a**).

- 1.55. Goshawk was recorded in February, March, April and May. In total, seven flights were seen from GVPs, however only one passed within the FA. A male and an immature female were seen (**Figure 9.4a, 9.4b & 9.5**).

- 1.56. Red kite was seen on three occasions during the study period, in May 2018, May 2019 and June 2019. All three flights were recorded from GVPs; however only two flights passed within the FA (**Figure 9.4a**).

- 1.57. Short-eared owl was seen in flight on three occasions, once in August 2018 and twice in September 2018. Two flights by the same juvenile bird were seen from a GVP (**Figure 9.4b & 9.5**).

Flight Activity from GVPs within the FA 500 m buffer – Breeding Season (April to August)

Hen harrier

- 1.58. During flight activity surveys seven flights by hen harrier were recorded within the FA for a total duration of 453 seconds, all of which was spent below collision risk height, i.e. less than 30 m a.g.l (**Table 13a, Figure 9.4a**).

Peregrine

- 1.59. During flight activity surveys two flights by peregrine was recorded within the FA for a total duration of 52 seconds; of which 37 seconds was spent at collision risk height, i.e. between 30 and 200 m a.g.l (**Table 13a, Figure 9.4a**).

Goshawk

- 1.60. During flight activity surveys one flight by goshawk was recorded within the FA for a total duration of 4 seconds, all of which was spent below collision risk height (**Table 13a, Figure 9.4a**).

Red kite

- 1.61. During flight activity surveys two flights by red kite were recorded within the FA for a total duration of 151 seconds, of which 75 seconds was spent at collision risk height (**Table 13a, Figure 9.4a**).

Flight Activity from GVPs within the FA 500 m buffer – Non-Breeding Season (September to March)

Hen harrier

- 1.62. During flight activity surveys nine flights by hen harrier were recorded within the FA for a total duration of 1178 seconds, of which 96 seconds (8 %) was spent at collision risk height (**Table 13a, Figure 9.4b**).

Merlin

- 1.63. During flight activity surveys one flight by merlin was recorded within the FA for a total duration of 32 seconds, all of which was spent below collision risk height (**Table 13a, Figure 9.4b**).

Short-eared owl

- 1.64. During flight activity surveys two flights by short-eared owl were recorded within the FA for a total duration of 194 seconds, all of which was spent below collision risk height (**Table 13a, Figure 9.4b**).

Black grouse

Occurrence and Status

- 1.65. This species was not recorded during any surveys.

Waders

Occurrence and Status

- 1.66. Sightings of golden plover (*Pluvialis apricaria*), snipe (*Gallinago gallinago*), jack snipe (*Lymnocyptes minimus*) and woodcock (*Scolopax rusticola*) were recorded. Golden plover is listed on Annex 1 of the Birds Directive and woodcock is a Red-listed Bird of Conservation Concern (**Tables 11, 13b & 15; Figures 9.3, 9.5 and 9.6**).

Abundance and Distribution

- 1.67. No confirmed territories were recorded of any wader species breeding within the 500 m buffer of the turbines, two probable snipe territories were identified (**Figure 9.6**).
- 1.68. Golden plover was recorded during January, February, April, September, October, November and December. Twenty five flights involving a total of 772 birds (flock sizes ranged from 2 to 200) were recorded from GVPs. Of these 24 flights were within the FA (**Figure 9.3 & 9.5**).
- 1.69. Snipe was recorded during January, February, April, June, September and December, one jack snipe was recorded in January and woodcock was recorded during January, February and December.

Flight Activity from GVPs within the FA 500 m buffer – Non-breeding season (September to April)

- 1.70. Twenty four golden plover flights involving 769 birds (flocks of 2 to 200 individuals) passed at least partially through the FA, 14 of these (554 birds) were at collision risk height (**Table 13b, Figure 9.3**).

Other Species of Interest

- 1.71. Red grouse (*Lagopus lagopus*), common gull (*Larus canus*), cuckoo (*Cuculus canorus*), skylark (*Alauda arvensis*), reed bunting (*Emberiza schoeniclus*) and grasshopper warbler (*Locustella naevia*) were among the other species recorded (**Table 11, 14 & 15, Figure 9.6**). Cuckoo, skylark and grasshopper warbler are red listed BoCC and along with red grouse and reed bunting are also SBL species. A small colony (around 6 to 8 pairs) of common gulls nests on the island in Eldrig Loch.
- 1.72. Buzzard (*Buteo buteo*) raven (*Corvus corax*) and kestrel (*Falco tinnunculus*) were the species recorded most often during the GVP watches (**Table 11**).

References

- Band, W., Madders, M. & Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at windfarms. In de Lucas, M, Janss, G. and Ferrer, M. (eds) *Birds and Wind Power*. Lynx Edicions, Barcelona.
- Brown, A.F. and Shepherd, K.B. (1993). A method for censusing upland breeding waders. *Bird study* 40(3) pp189-195.
- Eaton, M.A., Aebischer, N.J., Brown, A.F., Hearn, R.D., Lock, L., Musgrove, A.J., Noble, D.G., Stroud, D.A. and Gregory, R.D. (2015) *Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man*. *British Birds* 108 pp 708-746.
- Gilbert, G., Gibbons, D.W. and Evans, J. (1998). *Bird monitoring methods*. RSPB Sandy, Bedfordshire.
- Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. and Thompson, D. (2013). *Raptors, a field guide to survey and monitoring*. The Stationery Office, Edinburgh.
- Marchant, J.H. (1983). *BTO Common Birds Census Instructions*. British Trust for Ornithology, Thetford.
- SNH (2017). *Guidance: Recommended bird survey methods to inform impact assessment of onshore wind farms*. SNH Battleby, UK

Tables 11 – 16

Table 11. Species recorded during Generic Vantage Point observations of flight activity, April 2018 to August 2019.		
Species	Total number of 5-minute periods observed	Encounter rate* (%)
Buzzard	125	3.186
Raven	105	2.676
Kestrel	74	1.886
Golden plover	32	0.815
Hen harrier	27	0.688
Cuckoo	7	0.178
Goshawk	7	0.178
Red kite	6	0.153
Sparrowhawk	4	0.102
Starling	4	0.102
Peregrine	3	0.076
Snipe	3	0.076
Short-eared owl	3	0.076
Merlin	3	0.076
Greylag goose	3	0.076
Woodcock	2	0.051
Lesser black-backed gull	1	0.025
Lapwing	1	0.025
Herring gull	1	0.025
Pink-footed goose	1	0.025
Fieldfare	1	0.025
Redwing	1	0.025
Cormorant	1	0.025

*The number of 5-min recording periods in which each species was encountered during watches from the GVPs (n=327) is shown (327x12=3,924).

Table 12. Wildfowl flights recorded within VP viewsheds and clipped to 500 m survey buffer. Part, or all, of these flights at a height of 30 – 200 m agl places them at risk of a collision with the turbine blades (shaded columns).											
Species	Season	GVP	No of flights	No of birds	Total fly time (s)	Height class					
						0-10m	10-30m	30-50m	50-100m	100-200m	>200 m
Greylag goose	Sep-Mar	1	1	3				*			
		5	1	4			*		*		
	Total		2	7			*	*	*		
Total			2	7			*	*	*		
Pink-footed goose	Sep-Mar	5	1	90						*	
	Total		1	90						*	
Total			1	90						*	

Table 13a. Flight durations recorded within VP viewsheds and clipped to 500 m survey buffer. Part, or all, of these flights at a height of 30 – 200 m agl places them at risk of a collision with the turbine blades (shaded columns).

Species	Season	GVP	Flight id	No of birds	Total fly time (s)	Height class					
						<10m	10-30m	30-50m	50-100m	100-200m	>200m
Goshawk	Apr-Aug	5	KILX_190729_004_B001	1	4	4					
		Total		1	4	4					
	Total				1	4	4				
Total				1	4	4					
Hen harrier	Apr-Aug	1	KILX_180807_001_B001	1	5	5					
		Total		1	5	5					
		3	KILX_180816_001_B001	1	68	68					
			KILX_180816_001_B002	1	10	10					
			KILX_180816_001_B003	1	157	63	94				
			KILX_180816_002_B001	1	95	95					
			KILX_180816_002_B002	1	38	38					
	KILX_180816_002_B003	1	81	81							
	Total		6	448	354	94					
	Total				7	453	359	94			
	Sep-Mar	1	KILX_181005_002_B001	1	75	75					
			KILX_181025_001_B002	1	7	7					
			KILX_181106_001_B001	1	45	45					
		Total		3	127	127					
		5	KILX_180918_003_B001	1	177	112	48	17			
			KILX_181115_003_B001	1	195	195					
			KILX_190328_002_B001	1	264	264					
KILX_190328_002_B002			1	25	25						
KILX_190328_002_B003	1		151	151							
KILX_190328_003_B001	1	239		160	79						
Total		6	1051	747	208	96					
Total				9	1178	874	208	96			
Total				16	1631	1233	302	96			
Merlin	Sep-Mar	5	KILX_180928_003_B002	1	32	16	16				
		Total		1	32	16	16				
	Total				1	32	16	16			
Total				1	32	16	16				
Peregrine	Apr-Aug	1	KILX_190815_001_B002	1	28		15	13			
		Total		1	28		15	13			
		7	KILX_180502_001_B001	1	24			24			
	Total		1	24			24				
Total				2	52		15	37			
Total				2	52		15	37			
Red kite	Apr-Aug	2	KILX_180519_001_B001	1	75				30	45	
		Total		1	75				30	45	
		5	KILX_190517_003_B001	1	76	76					
	Total		1	76	76						

Table 13a. Flight durations recorded within VP viewsheds and clipped to 500 m survey buffer. Part, or all, of these flights at a height of 30 – 200 m agl places them at risk of a collision with the turbine blades (shaded columns).

Species	Season	GVP	Flight id	No of birds	Total fly time (s)	Height class					
						<10m	10-30m	30-50m	50-100m	100-200m	>200m
	Total			2	151	76			30	45	
Total				2	151	76			30	45	
Short-eared owl	Sep-Mar	5	KILX_180918_003_B002	1	163	163					
			KILX_180918_003_B003	1	31	31					
	Total		2	194	194						
	Total			2	194	194					
Total				2	194	194					

Table 13b. Flights recorded within VP viewsheds and clipped to 500 m survey buffer. Part, or all, of these flights at a height of 30 – 200 m agl places them at risk of a collision with the turbine blades (shaded columns).

Species	Season	GVP	Flight Id	No of birds	Height class					
					<10m	10-30m	30-50m	50-100m	100-200m	>200m
Golden plover	Apr-Aug	5	KILX_190423_003_B001	13	*			*		
		Total		13	*			*		
	Total			13	*			*		
Golden plover	Sep-Mar	1	KILX_181005_001_B001	7	*	*				
			KILX_181005_001_B002	7	*	*				
			KILX_181025_001_B001	21	*			*		
			KILX_181025_001_B003	30	*		*			
			KILX_181106_001_B002	16	*	*				
			KILX_181106_001_B003	5	*	*				
			KILX_181106_002_B001	5	*	*				
			KILX_181106_002_B002	38	*	*				
			KILX_190109_001_B001	2	*			*		
	Total		131	*	*	*	*			
	3	KILX_190107_002_B001	200	*			*			
		KILX_190107_002_B002	100		*	*				
		KILX_190107_002_B003	100			*	*			
		KILX_190204_001_B001	2	*	*					
	Total		402	*	*	*	*			
	5	KILX_180928_003_B001	2			*	*			
		KILX_181024_001_B001	7			*	*			
KILX_181220_003_B001		9				*	*			
KILX_181220_003_B002		7			*	*				
KILX_190213_003_B001		5		*	*					
KILX_190213_003_B002		18		*		*				
KILX_190213_003_B003		14	*				*			
KILX_190213_003_B004		60				*	*			
KILX_190213_003_B005		53			*	*				
KILX_190213_003_B006	48				*	*				
Total		223	*	*	*	*	*			
Total				756						
Total				769	*	*	*	*	*	

Table 14. Territory abundance of selected species recorded during the survey for breeding birds of open ground within the 500 m buffer, 2018.

Species	Count of Territories	
	Confirmed	Probable
Red grouse		1
Common gull	8	
Snipe		2
Cuckoo	1	
Skylark	43	
Song thrush	1	
Grasshopper warbler	3	
Reed bunting	11	

Table 15. Winter walked transect results, 2018/19.

Date	Species	Number	Age/Sex	Behaviour	Signs	Comments
18/09/2018	Reed bunting	1				
18/09/2018	Kestrel	1	Immature male	Hunt/feed		
18/09/2018	Golden plover	7		Flying		Flight at <10 - 10-30m
18/09/2018	Kestrel	1		Hunt/feed		
18/09/2018	Hen harrier	0			Roost/Feathers, Faeces	
18/09/2018	Short-eared owl	0			Roost/Feathers, Faeces, Pellets	
28/09/2018	Mallard	12	M/F			On loch
28/09/2018	Reed bunting	1				
28/09/2018	Hen harrier	1	Adult male	Perch		
28/09/2018	Reed bunting	1				
28/09/2018	Reed bunting	1				
28/09/2018	Starling	13		Flying		
28/09/2018	Linnet	5				
28/09/2018	Barn owl	1	Adult	Perch	Feathers, Faeces, Pellets	Flushed from perch. Nest box
28/09/2018	Snipe	1		Flying		Flight at <10m
24/10/2018	Mallard	30	M/F	Loafing		On loch
24/10/2018	Teal	40	M/F	Loafing		On loch
24/10/2018	Golden plover	20		Roosting		
24/10/2018	Golden plover	1		Roosting	Feathers,	

Table 15. Winter walked transect results, 2018/19.

Date	Species	Number	Age/Sex	Behaviour	Signs	Comments
					Faeces	
24/10/2018	Hen harrier	0			Roost/ Faeces, Pellets	min 9 beds = 12 pellets
24/10/2018	Golden plover	21		Roosting	Feathers, Faeces	
24/10/2018	Short-eared owl	0		Perch	Faeces, Pellets	pellets x 2
24/10/2018	Golden plover	4		Roosting	Feathers, Faeces	
22/11/2018	Hen harrier	1	Adult male	Hunt/feed		
22/11/2018	Hen harrier	0			Roost/ Faeces, Pellets	4 beds = 5 pellets
22/11/2018	Hen harrier	0			Roost/ Faeces, Pellets	1 bed = 2 pellets
20/12/2018	Barn owl	1	Adult	Hunt/feed		Flushed
20/12/2018	Woodcock	1		Flying		Flushed
20/12/2018	Woodcock	1		Flying		Flushed
20/12/2018	Snipe	2		Flying		Flushed
20/12/2018	Golden plover	1		Flying		Heard only
20/12/2018	Woodcock	1		Flying		
20/12/2018	Whooper swan	3	Adult	Feeding		On loch
20/12/2018	Mallard	8	M/F	Feeding		On loch
20/12/2018	Teal	4		Feeding		On loch
20/12/2018	Goldeneye	1	Female	Feeding		On loch
28/01/2019	Reed bunting	1				
28/01/2019	Woodcock	1				
28/01/2019	Starling	70				
28/01/2019	Jack snipe	1				
28/01/2019	Stonechat	2	M/F			
27/02/2019	Woodcock	1				Flushed
27/02/2019	Snipe	1				Flushed
27/02/2019	Mallard	2	MF	Loafing		On loch
27/02/2019	Teal	3	2M+F	Loafing		On loch
27/02/2019	Raven	2	Adult	Territorial		
27/02/2019	Snipe	1				
27/02/2019	Buzzard	1		Hunt/feed		Flight at 50-100m

Table 16. Hen harrier winter roost survey results, 2018/19.				
Date	Number	Age/Sex	Time first seen	Additional info
22/11/2018	1	Adult male	0755	Leaving roost (Location not seen, however, flight from vicinity of B), flew to perch on ground, left area at 0912.
	1	Adult male	0835	Leaving roost (Location not seen, however, flight from vicinity of A and B), flew to perch on ground, left area at 0912.
20/12/2018	1	Adult male	0859	Leaving roost A
28/01/2019	1	Adult male	0814	Leaving roost A, flew to perch, left area 0902
	1	Immature male	0922	Leaving roost area A
All other watches (Table 9) Nil result				

Annexes

Annex 1.1 Recording Periods used in Diurnal Stratification of Watches

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Early GVPs finish by / Middle GVPs begin from	0930	0900	0830*	0830	0745	0730	0800	0830	0900	0930**	0900	0930
Middle GVPs finish by / Late GVPs begin from	1500	1600	1630*	1800	1900	1900	1900	1830	1730	1630**	1500	1430
	GMT	GMT	GMT	BST	BST	BST	BST	BST	BST	BST	GMT	GMT

*This time is GMT, when the clocks changed time was kept in line with this, within the month.

** This time is BST, when the clocks changed time was kept in line with this, within the month.

Annex 1.2 Generic Vantage Point Survey Information

***Watch ID relates to Appendix 1.3 Weather Details**

Date	Obs	GVP	Start	End	Duration	Watch ID*
29/04/2018	BJD	1	1010	1310	3.00	KILX_180429_003
29/04/2018	DM	7	1035	1335	3.00	KILX_180429_001
29/04/2018	BJD	1	1340	1640	3.00	KILX_180429_004
29/04/2018	DM	7	1405	1705	3.00	KILX_180429_002
30/04/2018	DM	1	0705	1005	3.00	KILX_180430_003
30/04/2018	BJD	4	0910	1210	3.00	KILX_180430_001
30/04/2018	DM	1	1045	1345	3.00	KILX_180430_004
30/04/2018	BJD	4	1240	1540	3.00	KILX_180430_002
01/05/2018	DM	4	1250	1550	3.00	KILX_180501_001
02/05/2018	DM	7	1105	1405	3.00	KILX_180502_001
18/05/2018	NT	2	0630	0930	3.00	KILX_180518_002
18/05/2018	HCT	2	1750	2050	3.00	KILX_180518_003
18/05/2018	NT	1	1815	2115	3.00	KILX_180518_001
19/05/2018	NT	2	1215	1515	3.00	KILX_180519_001
20/05/2018	HCT	1	0630	0930	3.00	KILX_180520_001
20/05/2018	NT	3	0730	1030	3.00	KILX_180520_003
20/05/2018	HCT	1	0930	1230	3.00	KILX_180520_002
20/05/2018	NT	3	1030	1130	1.00	KILX_180520_004
20/05/2018	NT	3	1615	1815	2.00	KILX_180520_005
20/05/2018	NT	3	1815	2115	3.00	KILX_180520_006
08/06/2018	NT	1	1900	2200	3.00	KILX_180608_001
09/06/2018	NT	1	1100	1400	3.00	KILX_180609_001
09/06/2018	NT	2	1500	1800	3.00	KILX_180609_002
10/06/2018	NT	3	0930	1230	3.00	KILX_180610_001
10/06/2018	NT	3	1900	2200	3.00	KILX_180610_002

Date	Obs	GVP	Start	End	Duration	Watch ID*
06/07/2018	NT	2	1600	1900	3.00	KILX_180706_001
07/07/2018	NT	1	1030	1330	3.00	KILX_180707_001
07/07/2018	NT	3	1830	2130	3.00	KILX_180707_002
08/07/2018	NT	3	0930	1230	3.00	KILX_180708_001
09/07/2018	NT	2	1930	2230	3.00	KILX_180709_001
10/07/2018	NT	2	0630	0930	3.00	KILX_180710_001
12/07/2018	NT	1	0630	0930	3.00	KILX_180712_001
06/08/2018	RAS	3	1115	1415	3.00	KILX_180806_003
06/08/2018	RAS	1	1630	1800	1.50	KILX_180806_001
06/08/2018	RAS	1	1830	2000	1.50	KILX_180806_002
07/08/2018	RAS	1	1330	1630	3.00	KILX_180807_001
07/08/2018	RAS	2	1700	1830	1.50	KILX_180807_002
07/08/2018	RAS	2	1830	2000	1.50	KILX_180807_003
16/08/2018	RAS	2	1230	1530	3.00	KILX_180816_003
16/08/2018	RAS	3	1700	1830	1.50	KILX_180816_001
16/08/2018	RAS	3	1830	2000	1.50	KILX_180816_002
17/09/2018	RAS	1	0730	0900	1.50	KILX_180917_001
17/09/2018	RAS	1	0900	1030	1.50	KILX_180917_002
17/09/2018	RAS	3	1145	1445	3.00	KILX_180917_003
18/09/2018	RAS	3	0730	0900	1.50	KILX_180918_001
18/09/2018	RAS	3	0900	1030	1.50	KILX_180918_002
18/09/2018	RAS	5	1430	1730	3.00	KILX_180918_003
28/09/2018	RAS	5	0730	0900	1.50	KILX_180928_002
28/09/2018	RAS	5	0900	1030	1.50	KILX_180928_003
28/09/2018	RAS	1	1115	1415	3.00	KILX_180928_001

Date	Obs	GVP	Start	End	Duration	Watch ID*
05/10/2018	AA	1	1215	1345	1.50	KILX_181005_001
05/10/2018	AA	5	1405	1705	3.00	KILX_181005_003
05/10/2018	AA	1	1725	1855	1.50	KILX_181005_002
23/10/2018	RAS	3	1500	1630	1.50	KILX_181023_001
23/10/2018	RAS	3	1630	1800	1.50	KILX_181023_002
24/10/2018	RAS	5	1315	1615	3.00	KILX_181024_001
25/10/2018	RAS	3	1100	1400	3.00	KILX_181025_003
25/10/2018	RAS	1	1500	1630	1.50	KILX_181025_001
25/10/2018	RAS	1	1630	1800	1.50	KILX_181025_002
01/11/2018	RAS	3	0800	0900	1.00	KILX_181101_001
01/11/2018	RAS	3	0900	1030	1.50	KILX_181101_002
01/11/2018	RAS	5	1145	1415	2.50	KILX_181101_003
06/11/2018	RAS	1	0800	0900	1.00	KILX_181106_001
06/11/2018	RAS	1	0900	1030	1.50	KILX_181106_002
06/11/2018	RAS	3	1130	1400	2.50	KILX_181106_003
15/11/2018	RAS	5	0800	0900	1.00	KILX_181115_002
15/11/2018	RAS	5	0900	1030	1.50	KILX_181115_003
15/11/2018	RAS	1	1100	1330	2.50	KILX_181115_001
11/12/2018	RAS	1	1030	1230	2.00	KILX_181211_001
20/12/2018	RAS	5	1020	1220	2.00	KILX_181220_003
20/12/2018	RAS	3	1330	1430	1.00	KILX_181220_001
20/12/2018	RAS	3	1430	1530	1.00	KILX_181220_002
21/12/2018	RAS	1	1100	1400	3.00	KILX_181221_001
07/01/2019	RAS	3	1100	1400	3.00	KILX_190107_002
07/01/2019	RAS	1	1500	1600	1.00	KILX_190107_001
08/01/2019	RAS	5	0845	1145	3.00	KILX_190108_003
08/01/2019	RAS	3	1300	1500	2.00	KILX_190108_001
08/01/2019	RAS	3	1500	1600	1.00	KILX_190108_002

Date	Obs	GVP	Start	End	Duration	Watch ID*
09/01/2019	RAS	1	1035	1235	2.00	KILX_190109_001
09/01/2019	RAS	5	1300	1500	2.00	KILX_190109_002
09/01/2019	RAS	5	1500	1600	1.00	KILX_190109_003
04/02/2019	RAS	3	0800	0900	1.00	KILX_190204_001
04/02/2019	RAS	3	0900	1030	1.50	KILX_190204_002
04/02/2019	RAS	5	1145	1415	2.50	KILX_190204_003
12/02/2019	RAS	1	0800	0900	1.00	KILX_190212_001
12/02/2019	RAS	1	0900	1030	1.50	KILX_190212_002
12/02/2019	RAS	3	1135	1405	2.50	KILX_190212_003
13/02/2019	RAS	5	0800	0900	1.00	KILX_190213_002
13/02/2019	RAS	5	0900	1030	1.50	KILX_190213_003
13/02/2019	RAS	1	1100	1330	2.50	KILX_190213_001
26/03/2019	RAS	5	1100	1400	3.00	KILX_190326_003
26/03/2019	RAS	1	1500	1630	1.50	KILX_190326_001
26/03/2019	RAS	1	1630	1800	1.50	KILX_190326_002
27/03/2019	RAS	1	1100	1400	3.00	KILX_190327_001
27/03/2019	RAS	3	1500	1630	1.50	KILX_190327_002
27/03/2019	RAS	3	1630	1800	1.50	KILX_190327_003
28/03/2019	RAS	3	1050	1350	3.00	KILX_190328_001
28/03/2019	RAS	5	1500	1630	1.50	KILX_190328_002
28/03/2019	RAS	5	1630	1800	1.50	KILX_190328_003
10/04/2019	RAS	3	1230	1530	3.00	KILX_190410_001
11/04/2019	RAS	3	0700	0830	1.50	KILX_190411_001
11/04/2019	RAS	3	0830	1000	1.50	KILX_190411_002
12/04/2019	RAS	3	1300	1600	3.00	KILX_190412_001
23/04/2019	RAS	5	0700	0830	1.50	KILX_190423_002
23/04/2019	RAS	5	0830	1000	1.50	KILX_190423_003
23/04/2019	RAS	1	1030	1330	3.00	KILX_190423_001

Date	Obs	GVP	Start	End	Duration	Watch ID*
24/04/2019	RAS	1	0700	0830	1.50	KILX_190424_001
24/04/2019	RAS	1	0830	1000	1.50	KILX_190424_002
24/04/2019	RAS	5	1030	1330	3.00	KILX_190424_003
30/04/2019	RAS	1	0905	1205	3.00	KILX_190430_001
30/04/2019	RAS	5	1230	1530	3.00	KILX_190430_002
15/05/2019	RAS	1	1030	1330	3.00	KILX_190515_001
16/05/2019	RAS	1	1410	1710	3.00	KILX_190516_001
16/05/2019	RAS	5	1730	1900	1.50	KILX_190516_002
16/05/2019	RAS	5	1900	2030	1.50	KILX_190516_003
17/05/2019	RAS	1	1730	1900	1.50	KILX_190517_001
17/05/2019	RAS	1	1900	2030	1.50	KILX_190517_002
17/05/2019	RAS	5	1410	1710	3.00	KILX_190517_003
21/05/2019	RAS	3	1400	1700	3.00	KILX_190521_001
21/05/2019	RAS	3	1730	1900	1.50	KILX_190521_002
21/05/2019	RAS	3	1900	2030	1.50	KILX_190521_003
28/05/2019	RAS	3	0845	1145	3.00	KILX_190528_001
28/05/2019	RAS	5	1300	1600	3.00	KILX_190528_002
31/05/2019	RAS	3	1150	1450	3.00	KILX_190531_001
04/06/2019	RAS	1	0600	0730	1.50	KILX_190604_001
04/06/2019	RAS	1	0730	0900	1.50	KILX_190604_002
04/06/2019	RAS	5	0930	1230	3.00	KILX_190604_003
24/06/2019	RAS	1	0930	1230	3.00	KILX_190624_001
24/06/2019	RAS	5	0600	0730	1.50	KILX_190624_002
24/06/2019	RAS	5	0730	0900	1.50	KILX_190624_003
25/06/2019	RAS	3	0600	0730	1.50	KILX_190625_001
25/06/2019	RAS	3	0730	0900	1.50	KILX_190625_002
19/07/2019	RAS	1	1415	1715	3.00	KILX_190719_001
29/07/2019	RAS	5	1300	1600	3.00	KILX_190729_003

Date	Obs	GVP	Start	End	Duration	Watch ID*
29/07/2019	RAS	5	1600	1700	1.00	KILX_190729_004
29/07/2019	RAS	1	1730	1900	1.50	KILX_190729_001
29/07/2019	RAS	1	1900	2030	1.50	KILX_190729_002
30/07/2019	RAS	3	1130	1430	3.00	KILX_190730_001
30/07/2019	RAS	5	1830	2030	2.00	KILX_190730_002
31/07/2019	RAS	3	1730	1900	1.50	KILX_190731_001
31/07/2019	RAS	3	1900	2030	1.50	KILX_190731_002
13/08/2019	RAS	3	0700	0830	1.50	KILX_190813_001
13/08/2019	RAS	3	0830	1000	1.50	KILX_190813_002
13/08/2019	RAS	5	1115	1415	3.00	KILX_190813_003
14/08/2019	RAS	1	0700	0830	1.50	KILX_190814_001
14/08/2019	RAS	1	0830	1000	1.50	KILX_190814_002
14/08/2019	RAS	3	1100	1400	3.00	KILX_190814_003
15/08/2019	RAS	5	0700	0830	1.50	KILX_190815_002
15/08/2019	RAS	5	0830	1000	1.50	KILX_190815_003
15/08/2019	RAS	1	1030	1330	3.00	KILX_190815_001

Annex 1.3 Weather details for Watches

*Precipitation Codes: Continuous / Intermittent + Light / Heavy + Rain / Snow / Hail / Fog

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_180429_001	0	4	3000	ESE	2	nil	3
KILX_180429_001	1	5	2000	NE	1	nil	3
KILX_180429_001	2	6	2000	NE	1	nil	3
KILX_180429_001	3	8	2000	NE	1	nil	3
KILX_180429_002	0	8	2000	NNE	2	nil	3
KILX_180429_002	1	8	1500	N	1	ILR	3
KILX_180429_002	2	9	1000	SSW	1	IHR	2
KILX_180429_002	3	9	1000	W	1	nil	3
KILX_180429_003	0	0	3000	E	2	nil	5
KILX_180429_003	1	2	3000	E	2	nil	5
KILX_180429_003	2	6	3000	E	3	nil	5
KILX_180429_003	3	8	3000	E	2	nil	5
KILX_180429_004	0	10	3000	E	1	nil	5
KILX_180429_004	1	10	3000	W	3	IHR	3
KILX_180429_004	2	10	2000	N	3	IHR	3
KILX_180429_004	3	10	2000	NW	3	nil	3
KILX_180430_001	0	0	-	N	1	nil	5
KILX_180430_001	1	0	-	N	3	nil	5
KILX_180430_001	2	0	-	NW	3	nil	5
KILX_180430_001	3	0	-	NW	2	nil	5
KILX_180430_002	0	1	3000	NW	1	nil	5
KILX_180430_002	1	1	3000	NW	2	nil	5
KILX_180430_002	2	0	-	N	3	nil	5
KILX_180430_002	3	0	--	N	3	nil	5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_180430_003	0	0	-	NNW	1	nil	3
KILX_180430_003	1	0	-	NNW	2	nil	3
KILX_180430_003	2	0	-	NNW	1	nil	3
KILX_180430_003	3	1	2000	N	1	nil	3
KILX_180430_004	0	2	2000	N	2	nil	3
KILX_180430_004	1	3	2000	N	1	nil	3
KILX_180430_004	2	3	2000	N	1	nil	3
KILX_180430_004	3	2	2000	N	1	nil	3
KILX_180501_001	0	10	1500	S	2	ILR	2
KILX_180501_001	1	10	1500	SSW	2	CLR	2
KILX_180501_001	2	10	1000	SSW	3	CLR	2
KILX_180501_001	3	10	1000	SSW	3	CHR	2
KILX_180502_001	0	6	1500	WNW	2	nil	4
KILX_180502_001	1	7	1400	W	3	nil	4
KILX_180502_001	2	7	1400	W	2	nil	4
KILX_180502_001	3	8	1500	W	2	nil	4
KILX_180518_001	0	2	3000	SE	3	nil	20
KILX_180518_001	1	2	3000	SE	2	nil	20
KILX_180518_001	2	2	3000	SE	2	nil	20
KILX_180518_001	3	2	3000	SE	1	nil	20
KILX_180518_002	0	1	3000	SE	2	nil	20
KILX_180518_002	1	1	3000	SE	3	nil	20
KILX_180518_002	2	1	3000	SE	3	nil	20
KILX_180518_002	3	1	3000	SE	1	nil	20
KILX_180518_003	0	4	2000	WSW	2	nil	20
KILX_180518_003	1	4	2000	WSW	2	nil	20
KILX_180518_003	2	1	2000	WSW	1	nil	20
KILX_180518_003	3	1	2000	WSW	1	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_180519_001	0	6	3000	SE	3	nil	20
KILX_180519_001	1	8	3000	SE	4	nil	20
KILX_180519_001	2	8	3000	SE	4	nil	20
KILX_180519_001	3	8	3000	SE	5	nil	20
KILX_180520_001	0	9	2000	SSW	3	nil	20
KILX_180520_001	1	9	2000	SSW	3	nil	20
KILX_180520_001	2	9	2000	S	3	nil	20
KILX_180520_001	3	10	2000	S	3	nil	20
KILX_180520_002	0	10	2000	S	3	nil	20
KILX_180520_002	1	9	2000	S	3	nil	20
KILX_180520_002	2	9	2000	SSW	4	nil	20
KILX_180520_002	3	9	2000	S	4	nil	20
KILX_180520_003	0	9	2000	S	3	nil	20
KILX_180520_003	1	10	2000	S	4	nil	20
KILX_180520_003	2	9	2000	S	4	nil	20
KILX_180520_003	3	9	2000	S	4	ILR	20
KILX_180520_004	0	9	2000	S	4	ILR	20
KILX_180520_004	1	10	2000	S	4	nil	20
KILX_180520_005	0	10	2000	S	4	nil	20
KILX_180520_005	1	10	2000	S	4	nil	20
KILX_180520_005	2	9	2000	S	5	nil	20
KILX_180520_006	0	9	2000	S	5	nil	20
KILX_180520_006	1	9	2000	S	4	nil	20
KILX_180520_006	2	9	2000	S	4	nil	20
KILX_180520_006	3	8	2000	S	4	nil	20
KILX_180608_001	0	4	3000	W	2	nil	20
KILX_180608_001	1	4	3000	W	1	nil	20
KILX_180608_001	2	6	3000	nil	0	nil	20

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_180608_001	3	6	3000	nil	0	nil	20
KILX_180609_001	0	5	3000	S	1	nil	20
KILX_180609_001	1	7	3000	S	2	nil	20
KILX_180609_001	2	6	3000	S	2	nil	20
KILX_180609_001	3	4	3000	S	2	nil	20
KILX_180609_002	0	4	3000	SW	2	nil	20
KILX_180609_002	1	4	3000	SW	2	nil	20
KILX_180609_002	2	4	3000	SW	2	nil	20
KILX_180609_002	3	4	3000	SW	2	nil	20
KILX_180610_001	0	6	3000	N	2	nil	20
KILX_180610_001	1	6	3000	N	2	nil	20
KILX_180610_001	2	5	3000	N	2	nil	20
KILX_180610_001	3	4	3000	N	2	nil	20
KILX_180610_002	0	8	3000	N	2	nil	20
KILX_180610_002	1	8	3000	N	2	nil	20
KILX_180610_002	2	8	3000	N	2	nil	20
KILX_180610_002	3	4	3000	N	2	nil	20
KILX_180706_001	0	7	3000	W	2	nil	2
KILX_180706_001	1	5	3000	NW	2	nil	2
KILX_180706_001	2	5	3000	NW	2	nil	2
KILX_180706_001	3	3	3000	NW	1	nil	2
KILX_180707_001	0	4	3000	S	2	nil	2
KILX_180707_001	1	6	3000	S	2	nil	2
KILX_180707_001	2	7	3000	S	2	nil	2
KILX_180707_001	3	7	3000	S	2	nil	2
KILX_180707_002	0	8	3000	W	2	nil	2
KILX_180707_002	1	9	3000	W	2	nil	2
KILX_180707_002	2	9	3000	W	2	nil	2

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_180707_002	3	9	3000	W	2	nil	2
KILX_180708_001	0	9	3000	NW	2	nil	2
KILX_180708_001	1	9	3000	NW	2	nil	2
KILX_180708_001	2	8	3000	NW	2	nil	2
KILX_180708_001	3	6	3000	NW	2	nil	2
KILX_180709_001	0	1	3000	N	3	nil	2
KILX_180709_001	1	1	3000	N	3	nil	2
KILX_180709_001	2	0	-	N	2	nil	2
KILX_180709_001	3	0	-	N	2	nil	2
KILX_180710_001	0	9	3000	NE	1	nil	2
KILX_180710_001	1	8	3000	NE	1	nil	2
KILX_180710_001	2	8	3000	NE	1	nil	2
KILX_180710_001	3	7	3000	NE	1	nil	2
KILX_180712_001	0	4	3000	NW	1	nil	2
KILX_180712_001	1	5	3000	NW	1	nil	2
KILX_180712_001	2	4	3000	NW	1	nil	2
KILX_180712_001	3	4	3000	NW	1	nil	2
KILX_180806_001	0	10	400	SW	3	nil	4
KILX_180806_001	1	10	300	SW	3	ILR	3
KILX_180806_002	0	10	200	SW	3	ILR	2
KILX_180806_002	1	10	200	SW	2	ILR	1
KILX_180806_003	0	10	200	SW	3	nil	3
KILX_180806_003	1	10	200	SW	3	nil	3
KILX_180806_003	2	10	300	SW	3	nil	3
KILX_180806_003	3	10	300	SW	3	nil	4
KILX_180807_001	0	8	900	SW	4	nil	5
KILX_180807_001	1	9	900	SW	4	nil	5
KILX_180807_001	2	9	900	SW	4	nil	5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_180807_001	3	9	900	SW	4	nil	5
KILX_180807_002	0	8	900	SW	3	nil	5
KILX_180807_002	1	8	900	SW	3	nil	5
KILX_180807_003	0	9	900	SW	3	nil	5
KILX_180807_003	1	8	900	S	3	nil	5
KILX_180816_001	0	5	700	WSW	3	nil	5
KILX_180816_001	1	8	500	W	3	ILR	4
KILX_180816_002	0	8	600	W	3	nil	5
KILX_180816_002	1	5	700	WNW	3	nil	5
KILX_180816_003	0	9	800	WSW	4	nil	5
KILX_180816_003	1	9	500	SW	4	IHR	4
KILX_180816_003	2	8	700	SW	4	nil	5
KILX_180816_003	3	7	800	SW	4	nil	5
KILX_180917_001	0	9	700	S	2	ILF	2
KILX_180917_001	1	10	700	S	2	ILF	3
KILX_180917_002	0	9	700	S	3	nil	3
KILX_180917_002	1	10	600	S	4	nil	4
KILX_180917_003	0	10	600	SSW	4	nil	5
KILX_180917_003	1	10	600	SSW	4	nil	5
KILX_180917_003	2	10	400	SSW	3	CLR	1
KILX_180917_003	3	10	200	S	4	CLF	1
KILX_180918_001	0	10	200	S	2	CLR	1
KILX_180918_001	1	10	300	S	2	ILR	2
KILX_180918_002	0	10	300	S	2	CLF	1
KILX_180918_002	1	10	300	W	3	CLF	1
KILX_180918_003	0	9	600	SW	4	nil	5
KILX_180918_003	1	10	600	SW	4	nil	5
KILX_180918_003	2	9	600	SW	5	nil	5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_180918_003	3	10	300	SW	4	IHR	5
KILX_180928_001	0	7	900	NW	3	nil	5
KILX_180928_001	1	6	900	NW	3	nil	5
KILX_180928_001	2	7	900	NW	4	nil	5
KILX_180928_001	3	7	900	NW	4	nil	5
KILX_180928_002	0	1	900	N	1	nil	5
KILX_180928_002	1	2	900	N	1	nil	5
KILX_180928_003	0	3	600	NW	1	nil	5
KILX_180928_003	1	4	600	NW	1	nil	5
KILX_181005_001	0	3	1000	NW	3	nil	20
KILX_181005_001	1	4	1000	NW	3	nil	20
KILX_181005_002	0	7	1000	NW	3	nil	20
KILX_181005_002	1	7	1000	NW	3	nil	20
KILX_181005_003	0	4	1000	NW	4	nil	20
KILX_181005_003	1	4	1000	NW	4	nil	20
KILX_181005_003	2	6	1000	NW	4	nil	20
KILX_181005_003	3	6	1000	NW	4	nil	20
KILX_181023_001	0	10	200	W	5	ILR	2
KILX_181023_001	1	10	200	W	4	ILR	2
KILX_181023_002	0	10	200	W	3	ILR	1
KILX_181023_002	1	10	200	W	3	CLR	1
KILX_181024_001	0	10	500	WNW	5	ILR	5
KILX_181024_001	1	10	500	WNW	5	nil	5
KILX_181024_001	2	9	500	WNW	5	ILR	5
KILX_181024_001	3	10	400	WNW	5	ILR	4
KILX_181025_001	0	10	400	WNW	3	ILR	5
KILX_181025_001	1	10	600	WNW	3	nil	5
KILX_181025_002	0	9	600	WNW	3	nil	5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_181025_002	1	10	400	WNW	4	ILR	4
KILX_181025_003	0	10	300	WNW	4	CLR	2
KILX_181025_003	1	10	300	WNW	4	ILR	2
KILX_181025_003	2	10	400	WNW	4	nil	3
KILX_181025_003	3	9	400	WNW	4	nil	5
KILX_181101_001	0	3	600	nil	0	nil	5
KILX_181101_001	1	3	700	W	1	nil	5
KILX_181101_002	0	3	700	W	1	nil	5
KILX_181101_002	1	4	700	W	2	nil	5
KILX_181101_003	0	4	600	WSW	3	nil	5
KILX_181101_003	1	6	600	WSW	3	nil	5
KILX_181101_003	2	7	600	W	4	nil	5
KILX_181106_001	0	10	200	SE	5	CLF	1
KILX_181106_001	1	10	200	SE	5	CLF	1
KILX_181106_002	0	10	200	SE	5	CLF	2
KILX_181106_002	1	10	200	SE	5	CLF	2
KILX_181106_003	0	10	300	SE	5	nil	2
KILX_181106_003	1	10	300	SE	5	nil	3
KILX_181106_003	2	10	300	SE	5	nil	3
KILX_181115_001	0	9	400	SE	6	nil	4
KILX_181115_001	1	10	300	SE	6	nil	4
KILX_181115_001	2	10	400	SE	6	nil	3
KILX_181115_002	0	10	400	SE	5	ILR	2
KILX_181115_002	1	10	400	SE	5	ILR	2
KILX_181115_003	0	10	400	SE	5	nil	3
KILX_181115_003	1	10	400	SE	5	nil	3
KILX_181211_001	0	10	100	SE	3	CLF	0.5
KILX_181211_001	1	10	100	SE	3	CLF	0.5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_181211_001	2	10	100	SE	3	CLF	0.5
KILX_181220_001	0	10	400	SW	4	ILR	4
KILX_181220_001	1	10	400	SW	4	nil	5
KILX_181220_002	0	9	400	SW	3	nil	5
KILX_181220_002	1	8	400	SW	3	nil	5
KILX_181220_002	2	7	500	SW	2	nil	5
KILX_181220_003	0	10	400	SW	4	nil	5
KILX_181220_003	1	9	400	SW	4	nil	5
KILX_181220_003	2	9	400	SW	4	nil	5
KILX_181221_001	0	10	400	SW	3	nil	5
KILX_181221_001	1	9	400	SW	4	nil	5
KILX_181221_001	2	10	400	SW	3	nil	5
KILX_181221_001	3	10	500	SW	3	nil	5
KILX_190107_001	0	8	600	WNW	5	ILR	4
KILX_190107_001	1	8	600	WNW	6	nil	4
KILX_190107_002	0	10	300	WSW	5	IHR	2
KILX_190107_002	1	8	500	W	5	nil	5
KILX_190107_002	2	6	600	W	5	nil	5
KILX_190107_002	3	5	700	W	6	nil	5
KILX_190108_001	0	5	800	NW	4	nil	5
KILX_190108_001	1	4	800	NW	4	nil	5
KILX_190108_001	2	4	800	NW	4	nil	5
KILX_190108_002	0	3	800	NW	4	nil	5
KILX_190108_002	1	4	800	NW	4	nil	5
KILX_190108_003	0	5	600	NW	3	nil	4
KILX_190108_003	1	6	600	NW	4	nil	5
KILX_190108_003	2	5	700	NW	4	nil	5
KILX_190108_003	3	4	800	NW	4	nil	5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_190109_001	0	3	1000	nil	0	nil	5
KILX_190109_001	1	2	1000	SW	2	nil	5
KILX_190109_001	2	3	1000	SW	3	nil	5
KILX_190109_002	0	3	1000	SW	3	nil	5
KILX_190109_002	1	4	900	SW	2	nil	5
KILX_190109_002	2	7	900	SW	1	nil	5
KILX_190109_003	0	8	800	nil	0	nil	5
KILX_190109_003	1	9	800	S	1	nil	5
KILX_190204_001	0	8	600	NW	4	nil	3
KILX_190204_001	1	7	600	NW	4	nil	5
KILX_190204_002	0	7	600	NW	4	nil	5
KILX_190204_002	1	6	700	NW	5	nil	5
KILX_190204_003	0	6	700	WNW	4	nil	5
KILX_190204_003	1	7	700	WNW	4	ILR	5
KILX_190204_003	2	7	700	WNW	4	nil	5
KILX_190212_001	0	10	300	SW	5	nil	2
KILX_190212_001	1	10	300	SW	5	nil	3
KILX_190212_002	0	9	300	SSW	4	nil	4
KILX_190212_002	1	9	400	SSW	4	nil	5
KILX_190212_003	0	10	400	SSW	4	nil	5
KILX_190212_003	1	10	400	SSW	4	nil	4
KILX_190212_003	2	10	400	SSW	4	nil	5
KILX_190213_001	0	10	300	SSW	4	ILF	3
KILX_190213_001	1	10	400	SSW	4	ILF	3
KILX_190213_001	2	10	400	SSW	5	ILF	3
KILX_190213_002	0	10	300	SW	4	ILF	1
KILX_190213_002	1	10	300	SW	4	ILF	2
KILX_190213_003	0	10	300	SW	4	ILF	2

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_190213_003	1	10	300	SW	4	ILF	2
KILX_190326_001	0	10	800	W	4	nil	5
KILX_190326_001	1	10	800	W	3	nil	5
KILX_190326_002	0	10	700	W	3	nil	5
KILX_190326_002	1	10	700	WNW	3	nil	5
KILX_190326_003	0	10	900	WSW	4	nil	5
KILX_190326_003	1	10	900	W	4	nil	5
KILX_190326_003	2	10	900	W	4	nil	5
KILX_190326_003	3	10	800	W	4	nil	5
KILX_190327_001	0	9	700	W	3	nil	5
KILX_190327_001	1	9	800	W	3	nil	5
KILX_190327_001	2	8	900	W	3	nil	5
KILX_190327_001	3	7	900	W	3	nil	5
KILX_190327_002	0	8	900	WNW	3	nil	5
KILX_190327_002	1	8	900	WNW	3	nil	5
KILX_190327_003	0	8	800	WNW	3	nil	5
KILX_190327_003	1	6	700	WNW	3	nil	5
KILX_190328_001	0	8	900	W	3	nil	5
KILX_190328_001	1	7	900	SW	3	nil	5
KILX_190328_001	2	5	900	SW	3	nil	5
KILX_190328_001	3	5	900	SW	3	nil	5
KILX_190328_002	0	5	900	SSW	4	nil	5
KILX_190328_002	1	8	700	SSW	4	nil	3
KILX_190328_003	0	8	600	SSW	4	nil	3
KILX_190328_003	1	9	300	SSW	3	nil	3
KILX_190410_001	0	2	900	SE	3	nil	5
KILX_190410_001	1	2	900	SE	3	nil	5
KILX_190410_001	2	3	900	ESE	3	nil	5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_190410_001	3	3	900	E	3	nil	5
KILX_190411_001	0	8	600	SE	3	nil	4
KILX_190411_001	1	9	700	SE	3	nil	4
KILX_190411_002	0	10	700	SE	3	nil	4
KILX_190411_002	1	10	800	SE	4	nil	5
KILX_190412_001	0	3	900	SE	4	nil	5
KILX_190412_001	1	3	900	SE	5	nil	5
KILX_190412_001	2	2	900	SE	5	nil	5
KILX_190412_001	3	4	900	SE	5	nil	5
KILX_190423_001	0	9	900	E	3	nil	4
KILX_190423_001	1	10	900	ESE	4	nil	4
KILX_190423_001	2	10	900	ESE	4	nil	4
KILX_190423_001	3	9	900	ESE	4	nil	4
KILX_190423_002	0	8	900	E	2	nil	4
KILX_190423_002	1	7	900	E	3	nil	4
KILX_190423_003	0	9	900	E	3	nil	4
KILX_190423_003	1	9	900	E	3	nil	4
KILX_190424_001	0	6	800	E	4	nil	4
KILX_190424_001	1	6	800	E	5	nil	4
KILX_190424_002	0	6	800	E	5	nil	4
KILX_190424_002	1	5	900	E	5	nil	4
KILX_190430_001	0	10	500	SSE	3	CLR	3
KILX_190430_001	1	10	500	SSE	3	ILR	3
KILX_190430_001	2	10	300	SSE	3	CLR	2
KILX_190430_001	3	10	300	SSE	3	CLR	2
KILX_190430_002	0	10	400	SSE	3	CLR	3
KILX_190430_002	1	10	400	SSE	3	CLR	3
KILX_190430_002	2	10	400	SSE	3	CLR	3

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_190430_002	3	10	400	SSE	3	CLR	3
KILX_190515_001	0	3	1000	SE	4	nil	5
KILX_190515_001	1	3	1000	SE	5	nil	5
KILX_190515_001	2	4	1000	SE	5	nil	5
KILX_190515_001	3	4	1000	SE	5	nil	5
KILX_190516_001	0	3	900	SE	5	nil	5
KILX_190516_001	1	3	900	SE	5	nil	5
KILX_190516_001	2	3	900	SE	5	nil	5
KILX_190516_001	3	4	900	SE	4	nil	5
KILX_190516_002	0	4	900	SE	4	nil	5
KILX_190516_002	1	6	900	SE	4	nil	5
KILX_190516_003	0	7	900	SE	4	nil	5
KILX_190516_003	1	7	900	SE	3	nil	5
KILX_190517_001	0	9	900	E	3	nil	5
KILX_190517_001	1	8	900	E	4	nil	5
KILX_190517_002	0	8	900	E	4	nil	5
KILX_190517_002	1	7	900	E	3	nil	5
KILX_190517_003	0	7	900	NE	2	nil	5
KILX_190517_003	1	7	900	NE	3	nil	5
KILX_190517_003	2	9	900	N	4	nil	5
KILX_190517_003	3	8	900	N	3	nil	5
KILX_190521_001	0	5	900	NW	4	nil	5
KILX_190521_001	1	4	900	NW	4	nil	5
KILX_190521_001	2	3	900	NW	4	nil	5
KILX_190521_001	3	2	900	NW	4	nil	5
KILX_190521_002	0	2	900	NW	4	nil	5
KILX_190521_002	1	2	900	NW	4	nil	5
KILX_190521_003	0	1	900	NW	4	nil	5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_190521_003	1	2	900	NW	3	nil	5
KILX_190528_001	0	5	800	NW	3	nil	5
KILX_190528_001	1	4	800	NW	3	nil	5
KILX_190528_001	2	4	900	NW	3	nil	5
KILX_190528_001	3	4	900	NW	4	nil	5
KILX_190528_002	0	4	900	NW	5	nil	5
KILX_190528_002	1	4	900	NW	5	nil	5
KILX_190528_002	2	3	900	NW	4	nil	5
KILX_190528_002	3	2	900	WNW	4	nil	5
KILX_190531_001	0	10	300	SW	4	CLR	1
KILX_190531_001	1	10	300	SW	4	CLR	1
KILX_190531_001	2	10	200	S	4	nil	2
KILX_190531_001	3	10	200	SSW	5	nil	2
KILX_190604_001	0	4	1000	N	0	CLF	0.2
KILX_190604_001	1	5	1000	SE	2	CLF	0.2
KILX_190604_002	0	8	300	SSE	3	ILF	2
KILX_190604_002	1	7	400	S	3	nil	5
KILX_190604_003	0	8	900	SE	3	nil	5
KILX_190604_003	1	9	900	SE	3	nil	5
KILX_190604_003	2	10	800	SE	3	ILR	5
KILX_190604_003	3	10	500	SE	3	ILR	3
KILX_190624_001	0	8	700	E	3	nil	5
KILX_190624_001	1	10	600	E	3	nil	5
KILX_190624_001	2	10	600	E	3	nil	5
KILX_190624_001	3	10	600	ESE	2	nil	5
KILX_190624_002	0	10	700	ENE	2	nil	5
KILX_190624_002	1	10	700	ENE	2	nil	5
KILX_190624_003	0	10	700	ENE	2	nil	5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_190624_003	1	8	700	E	3	nil	5
KILX_190625_001	0	9	300	NNE	1	CLF	2
KILX_190625_001	1	10	200	NNE	1	CLF	1
KILX_190625_002	0	10	400	NE	1	nil	3
KILX_190625_002	1	10	400	E	2	nil	4
KILX_190719_001	0	10	300	SE	3	CLR	2
KILX_190719_001	1	10	300	SE	3	CLR	2
KILX_190719_001	2	10	300	SE	3	ILR	2
KILX_190719_001	3	10	300	SE	3	CLR	1
KILX_190729_001	0	6	800	SSW	3	nil	5
KILX_190729_001	1	4	800	SSW	3	nil	5
KILX_190729_002	0	3	800	SSW	3	nil	5
KILX_190729_002	1	3	800	SW	3	nil	5
KILX_190729_003	0	10	400	SW	3	nil	3
KILX_190729_003	1	10	400	SW	3	nil	4
KILX_190729_003	2	10	500	SSW	4	nil	4
KILX_190729_003	3	9	500	SSW	3	nil	5
KILX_190729_004	0	9	500	SSW	3	nil	5
KILX_190729_004	1	7	700	SSW	4	nil	5
KILX_190730_001	0	10	900	nil	0	nil	5
KILX_190730_001	1	10	900	S	1	ILR	5
KILX_190730_001	2	10	900	N	3	IHR	4
KILX_190730_001	3	10	900	NE	3	nil	5
KILX_190730_002	0	10	900	NE	3	nil	5
KILX_190730_002	1	8	900	NE	4	nil	5
KILX_190730_002	2	10	500	NE	4	CHR	2
KILX_190731_001	0	9	800	NW	4	nil	5
KILX_190731_001	1	9	800	NW	4	ILR	5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precip	Visibility (km)
KILX_190731_002	0	8	800	NW	4	nil	5
KILX_190731_002	1	10	700	NW	4	nil	5
KILX_190813_001	0	4	500	W	2	nil	5
KILX_190813_001	1	5	600	W	2	nil	5
KILX_190813_002	0	8	600	W	3	nil	5
KILX_190813_002	1	8	500	W	3	nil	5
KILX_190813_003	0	8	700	WSW	4	nil	5
KILX_190813_003	1	7	900	WSW	4	nil	5
KILX_190813_003	2	7	900	W	4	nil	5
KILX_190813_003	3	6	900	W	4	nil	5
KILX_190814_001	0	10	300	SE	3	CLR	2
KILX_190814_001	1	10	300	SE	3	CLR	1
KILX_190814_002	0	10	300	SE	3	CLR	2
KILX_190814_002	1	10	400	SE	3	CLR	2
KILX_190814_003	0	10	300	SE	3	CLR	2
KILX_190814_003	1	10	300	SE	3	CLR	1
KILX_190814_003	2	10	200	SE	3	CLR	1
KILX_190814_003	3	10	300	SE	3	ILR	1
KILX_190815_001	0	4	800	NW	6	nil	5
KILX_190815_001	1	6	800	NW	6	nil	5
KILX_190815_001	2	7	900	NW	6	nil	5
KILX_190815_001	3	7	900	NW	5	nil	5
KILX_190815_002	0	9	500	NW	6	ILR	4
KILX_190815_002	1	9	500	NW	6	ILR	4
KILX_190815_003	0	8	600	NW	5	nil	5
KILX_190815_003	1	6	700	NW	5	nil	5

Annex 1.4 Hen Harrier Roost Survey Information

*Watch ID relates to Appendix 1.5 Weather Details

Date	Obs	Dusk/Dawn	Start	End	Duration	Watch ID*
24/10/2018	RAS	Dawn	0715	0915	2.00	KILX_181024_002
24/10/2018	RAS	Dusk	1630	1830	2.00	KILX_181024_003
22/11/2018	RAS	Dawn	0735	0935	2.00	KILX_181122_001
22/11/2018	RAS	Dusk	1415	1615	2.00	KILX_181122_002
20/12/2018	RAS	Dawn	0800	1000	2.00	KILX_181220_004
21/12/2018	RAS	Dusk	1430	1630	2.00	KILX_181221_002
28/01/2019	RAS	Dawn	0800	1000	2.00	KILX_190128_001
28/01/2019	RAS	Dusk	1515	1645	1.50	KILX_190128_002
27/02/2019	RAS	Dawn	0655	0855	2.00	KILX_190227_001
27/02/2019	RAS	Dusk	1615	1715	1.00	KILX_190227_002

Annex 1.5 Weather details for HH Roost watches

*Precipitation Codes: Continuous / Intermittent + Light / Heavy + Rain / Snow / Hail / Fog

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precipitation	Visibility (km)
KILX_181024_002	0	10	400	WNW	4	nil	0.1
KILX_181024_002	1	10	400	WNW	5	nil	1
KILX_181024_002	2	10	400	WNW	4	ILR	3
KILX_181024_003	0	10	400	WNW	5	ILR	3
KILX_181024_003	1	10	400	WNW	5	ILR	3
KILX_181024_003	2	10	400	WNW	5	ILR	2

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind Direction	Wind Force	Precipitation	Visibility (km)
KILX_181122_001	0	0	-	E	1	nil	1
KILX_181122_001	1	0	-	E	1	nil	5
KILX_181122_001	2	0	-	E	3	nil	5
KILX_181122_002	0	7	800	E	2	nil	5
KILX_181122_002	1	9	800	E	2	nil	5
KILX_181122_002	2	10	600	E	2	nil	2
KILX_181220_004	0	10	200	WSW	2	nil	0.1
KILX_181220_004	1	10	300	WSW	3	nil	1
KILX_181220_004	2	10	400	WSW	4	CLR	2
KILX_181221_002	0	9	500	SW	3	nil	5
KILX_181221_002	1	10	500	SW	3	nil	4
KILX_181221_002	2	10	500	SW	2	nil	1
KILX_190128_001	0	4	700	NW	1	nil	2
KILX_190128_001	1	5	700	NW	1	nil	5
KILX_190128_001	2	6	700	NW	2	nil	5
KILX_190128_002	0	8	800	SW	3	nil	5
KILX_190128_002	1	9	700	SW	3	nil	5
KILX_190128_002	2	10	400	SW	3	CLR	1
KILX_190227_001	0	2	900	SSE	1	ILF	1
KILX_190227_001	1	0	9999	nil	0	ILF	1
KILX_190227_001	2	0	9999	S	1	ILF	2
KILX_190227_002	0	10	200	SW	2	CHF	0.5
KILX_190227_002	1	10	200	SW	2	CHF	0.2

Annex 1.6 Flight Activity Survey Species Lists and BTO Codes

List A		List B		List C	
Species	BTO Code	Species	BTO Code	Species	BTO Code
Diver spp.	RH/BV	Greylag goose	GJ	Cormorant	CA
Common scoter	CX	Barnacle goose	BY	Heron	H.
White-tailed eagle	WE	White-fronted goose	EW(Euro)/NW(Grd)	Kestrel	K.
Golden eagle	EA	Pink-footed goose	PG	Buzzard	BZ
Hen harrier	HH	Brent goose	DB(Dark)/PB(Pale)	Sparrowhawk	SH
Goshawk	GI	Bean goose	BE	Red grouse	RG
Red kite	KT	Golden plover	GP	Grey partridge	P.
Osprey	OP	Dunlin	DN	Lapwing	L.
Merlin	ML	Greenshank	GK	Redshank	RK
Peregrine	PE	Whimbrel	WM	Common sandpiper	CS
Hobby	HY	Curlew	CU	Oystercatcher	OC
Barn owl	BO	Wood sandpiper	OD	Snipe	SN
Short-eared owl	SE	Tern spp.	AE/CN	Woodcock	WK
Black grouse	BK	Arctic Skua	AC	Herring gull	HG
Capercaillie	CP	Great Skua	NX	Cuckoo	CK
Nightjar	NJ			Ring ouzel	RZ
Chough	CF			Raven	RN
Whooper swan	WS				
Rare raptors	HZ/MR/RF/YF				

Annex 1.7 Other Survey Species Lists and BTO Codes

List A		List C	
Species	BTO Code	Species	BTO Code
Diver sp.	RH/BV	Cormorant	CA
Common scoter	CX	Heron	H.
White tailed eagle	WE	Kestrel	K.
Golden eagle	EA	Buzzard	BZ
Hen harrier	HH	Sparrowhawk	SH
Goshawk	GI	Red grouse	RG
Red kite	KT	Grey partridge	P.
Osprey	OP	Lapwing	L.
Merlin	ML	Redshank	RK
Peregrine	PE	Common sandpiper	CS
Hobby	HY	Oystercatcher	OC
Barn owl	BO	Snipe	SN
Short-eared owl	SE	Woodcock	WK
Black grouse	BK	Herring gull	HG
Capercaillie	CP	Cuckoo	CK
Nightjar	NJ	Skylark	S.
Chough	CF	Tree pipit	TP
Whooper swan	WS	Dunnock	D.
Rare raptors	HZ/MR/RF/YF	Ring ouzel	RZ
List B		Song thrush	ST
Species	BTO Code	Grasshopper warbler	GH
Greylag goose	GJ	Wood warbler	WO
Barnacle goose	BY	Spotted flycatcher	SF
White-front. goose	EW(Euro)/NW(Grid)	Marsh/Willow tit	MT/WT
Pink-footed goose	PG	Crested tit	CI
Brent goose	DB(Dark)/PB(Pale)	Starling	SG
Bean goose	BE	House/Tree sparrow	HS/TS
Golden plover	GP	Linnet	LI
Dunlin	DN	Twite	TW
Greenshank	GK	Lesser redpoll	LR
Whimbrel	WM	Crossbill/ Scottish c'bill	CR/CY
Curlew	CU	Bullfinch	BF
Wood sandpiper	OD	Hawfinch	HF
Tern spp.	AE/CN	Yellowhammer	Y.
Skua spp.	AC/NX	Reed bunting	RB
Colonial spp. nests	H./Gull spp.	Corn bunting	CB
		Raven	RN
		Other wildfowl spp.	MS/MA/GD/T.

