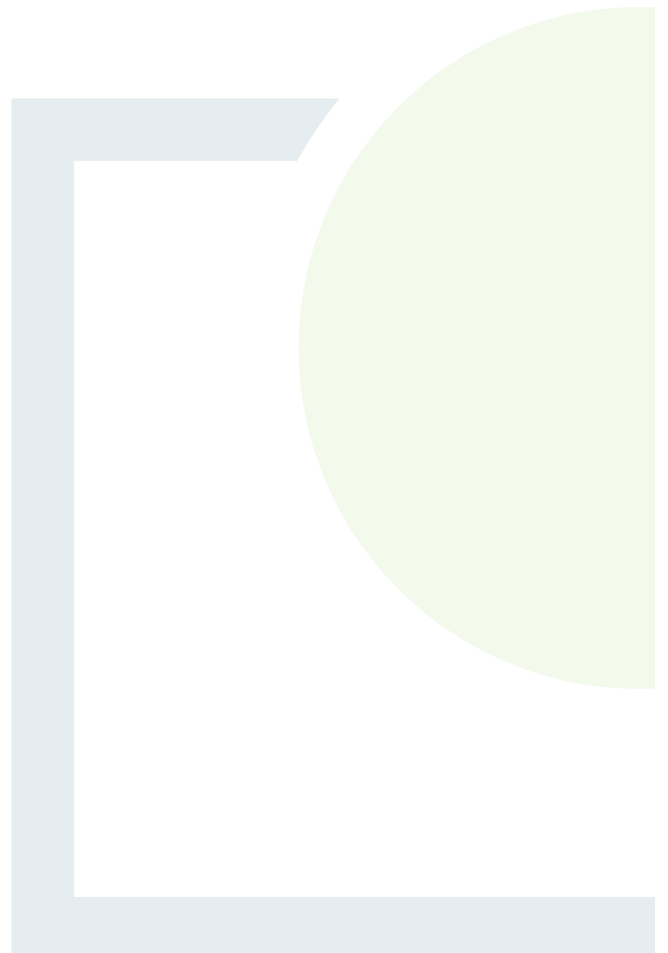




CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE & PLANNING

APPENDIX 8

Biodiversity



8.14 APPENDICES

Appendix 8-A: Avifauna Survey Data

Appendix-A: Avifauna Survey Data

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Table 1: Sightings of HH breeding season March 2016 – September 2016

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
7	10/03/2016	10:30	16:30	Male	11:17	NF4	S+F	0	360		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: WNW Temp (°C): 8.5
7	10/03/2016	10:30	16:30	Male	13:11	GO	S+F	3	0		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: WNW Temp (°C): 8.5
3	11/03/2016	09:50	12:50	Female	11:02	NF4	H	3	0		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 9.5
8	16/03/2016	09:00	15:00	Female	13:22	G+GO	H	180	25		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: E Temp (°C): 7
8	16/03/2016	09:00	15:00	Male	13:50	F	F	0	10		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: E Temp (°C): 7
2	18/03/2016	10:30	13:30	Male	12:55	NF2	D	10	0		Rain: None Cloud: 0/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: ESE Temp (°C): 9
2	18/03/2016	10:30	13:30	Female	12:55	NF2	D	25	10		Rain: None Cloud: 0/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: ESE Temp (°C): 9
2	18/03/2016	10:30	13:30	Male	13:00	NF2	H	60			Rain: None Cloud: 0/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: ESE Temp (°C): 9
12	21/03/2016	09:20	15:20	Male	13:18	RG+DE	H	18	0		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: W Temp (°C): 5
12	21/03/2016	09:20	15:20	Male	15:10	DE	F	170	110		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: W Temp (°C): 5
30	27/03/2016	12:20	16:20	Male	13:28	G	H	25	0		Rain: Heavy Showers Cloud: 6/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 6
27	28/03/2016	10:15	13:15	Male	10:50	NF3	D+F	0	120		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: SW Temp (°C): 6.5
27	28/03/2016	10:15	13:15	Female	10:50	NF3	F	0	120		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: SW Temp (°C): 6.5
2	05/04/2016	10:00	13:00	Female	12:40	CF+F	S+C	0	140		Rain: Light Cloud: 5/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: SE Temp (°C): 8
2	05/04/2016	15:50	18:50	Male	18:38	NF2	H	33	0		Rain: Light Cloud: 5/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: SE Temp (°C):
3	06/04/2016	10:15	16:15	Male	10:40	NF3	S	0	5		Rain: Heavy Showers Cloud: 2/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: NW Temp (°C): 4.5

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
3	06/04/2016	10:15	16:15		11:36	NF2	H	15	0		Rain: Heavy Showers Cloud: 2/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: NW Temp (°C):
3	06/04/2016	10:15	16:15	Female	13:14	NF2	H	3	0		Rain: Heavy Showers Cloud: 2/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: NW Temp (°C):
7	11/04/2016	10:20	16:20	Male	12:20	G+CF+F	S+D+F	0	360		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: E Temp (°C): 8
7	11/04/2016	10:20	16:20	Male	14:50	G+DE+CF+F	C+D+F	0	300		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: E Temp (°C): 8
15	12/04/2016	12:50	18:50	Male	13:57	G	F	0	15		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 4
15	12/04/2016	12:50	18:50	Female	14:46	G+DE	H	100	0		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 4
15	12/04/2016	12:50	18:50	Male	15:58	G	H	60	0		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 4
15	12/04/2016	12:50	18:50	Male	16:40	G	H	60	0		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 4
15	12/04/2016	12:50	18:50	Male	16:46	G	F	28	0		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 4
31	14/04/2016	09:30	15:30	Male	09:35	NF4	F	0	7		Rain: None Cloud: 2/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 2
31	14/04/2016	09:30	15:30	Female	11:43	CF	F	0	5		Rain: None Cloud: 2/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 2
31	14/04/2016	09:30	15:30	Female	14:42	NF4	S+F	5	105		Rain: None Cloud: 2/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 2
30	14/04/2016	15:45	18:45	Female	15:43	NF4	S+C	0	25		Rain: Heavy Showers Cloud: 5/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 5
30	14/04/2016	15:45	18:45	Male	15:50	NF4	D+F	0	390		Rain: Heavy Showers Cloud: 5/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 5
30	14/04/2016	15:45	18:45	Female	15:50	NF4	D+F	0	360		Rain: Heavy Showers Cloud: 5/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 5
30	14/04/2016	15:45	18:45	Female	17:15	G+NF4	H+F	0	135		Rain: Heavy Showers Cloud: 5/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 5
23	16/04/2016	14:00	17:00	Male	14:00	NF3	F	10	0		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: W Temp (°C): 8

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
23	16/04/2016	14:00	17:00	Female	15:55	DE+NF1	H	3	0		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: W Temp (°C): 8
12	19/04/2016	09:30	15:30	Male	12:40	G+HB+DE	S+H+F	70	290		Rain: None Cloud: 2/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: var Temp (°C): 2
12	19/04/2016	09:30	15:30	Male	13:16	G+RG+DE	H+F	210	0		Rain: None Cloud: 2/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: var Temp (°C): 2
12	19/04/2016	09:30	15:30	Male	13:50	G+RG+HB+DE	H	330	0		Rain: None Cloud: 2/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: var Temp (°C): 2
12	19/04/2016	09:30	15:30	Male	14:50	RG+HB+DE	H	150	300		Rain: None Cloud: 2/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: var Temp (°C): 2
12	19/04/2016	09:30	15:30	Male	15:05	G+HB+DE	S+H+F	130	150		Rain: None Cloud: 2/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: var Temp (°C): 2
30	20/04/2016	12:30	15:30	Male	12:40	NF2+F	F	0	75		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: E Temp (°C): 1
32	23/04/2016	10:00	16:00	Male	12:00	G+DE	H	34	0		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: N Temp (°C): 1
32	23/04/2016	10:00	16:00	Male	14:39	G+DE	H	35	0		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: N Temp (°C): 1
17	24/04/2016	12:35	15:35	Female	12:40	G+NF4+F	D+H+F	40	30		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 8
17	24/04/2016	12:35	15:35	Male	12:40	F	D	30	30		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 8
5	24/04/2016	15:45	18:45	Male	17:26	G+DE	H	55	0		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 8
9	25/04/2016	12:45	18:45		14:31	NF3	H	25	0		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 7
27	26/04/2016	09:00	15:00	Female	12:24	F	F	0	15		Rain: None Cloud: 3/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 3
2	03/05/2016	09:15	15:35	Female	10:15	NF3+NF4	F	5	0		Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 11.5
2	03/05/2016	09:15	15:35	Female	10:24	NF3+NF4	F	0	35		Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 13.5
2	03/05/2016	09:15	15:35	Male	10:25	NF3+NF4	F	5	0		Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 10

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
2	03/05/2016	09:15	15:35	Male	10:31	NF3+NF4	F	0	7		Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 15
2	03/05/2016	09:15	15:35	Male	11:33	NF3+NF4	H	120	0		Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 15
2	03/05/2016	09:15	15:35	Female	12:04	NF3+NF4	F	0	12		Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 14
2	03/05/2016	09:15	15:35	Female	12:45	NF3+NF4	S+F	0	340		Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 16.5
2	03/05/2016	09:15	15:35	Female	13:14	NF3+NF4	C+F	0	215		Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 13.5
2	03/05/2016	09:15	15:35	Female	13:39	NF3+NF4	C+F	4	10		Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 15.5
3	09/05/2016	10:30	16:30	Male	11:31	F	F	2	0		Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 15
3	09/05/2016	10:30	16:30	Male	14:21	F	F	0	5		Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 10
34	11/05/2016	09:25	12:25	Female	10:43	G+F	F	0	20		Rain: None Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: calm Temp (°C): 18.5
21	19/05/2016	10:00	12:30	Male	11:05	DE	H+F	95	0		Rain: Cloud: 8/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: W Temp (°C): 14.5
15	20/05/2016	09:00	12:00	Male	09:10	RG	H+F	145	0		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
15	20/05/2016	09:00	12:00	Female	11:05	RG	H	10	0		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 16
15	21/05/2016	07:00	10:00	Male	09:05	G+RG+F	H	295	0		Rain: Misty Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 16
15	21/05/2016	07:00	10:00	Male	09:45	G+RG	H+F+FP	25	0		Rain: Misty Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 15.5
30	21/05/2016	13:20	16:20	Male	14:30	NF4	D+F+FP	210	0		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: W Temp (°C): 15.5
30	21/05/2016	13:20	16:20	Female	14:32	NF4	F	0	15		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: W Temp (°C): 15.5
31	24/05/2016	11:25	14:25	Male	12:17	F	F	0	2		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: S Temp (°C): 13

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
32	25/05/2016	09:30	15:30	Female	12:03	G+HB+DE+F	F	150	10		Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: NE Temp (°C): 18.5
32	25/05/2016	09:30	15:30	Male	12:35	G+DE	H+F	20	0		Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: NE Temp (°C): 18.5
11	28/05/2016	15:50	18:50	Male	12:00	G+DE	H	5	0		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: E Temp (°C): 18.5
21	01/06/2016	08:20	14:20	Female	08:42	G	F	2	0		Rain: None Cloud: 4/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: W Temp (°C): 9
30	04/06/2016	08:30	14:30	Male	08:47	G	F	2	0		Rain: None Cloud: 0/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SE Temp (°C): 15.5
30	04/06/2016	08:30	14:30	Male	10:36	G	F	3	0		Rain: None Cloud: 0/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SE Temp (°C): 15.5
15	07/06/2016	10:00	16:00	Male	15:42	G+RG	H	15	0		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: S Temp (°C): 16
3	08/06/2016	12:00	15:00	Female	13:52	DE+NF3	H	0	6		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: SE Temp (°C): 21.5
5	16/06/2016	10:00	13:00	Male	10:40	NF3	H	30	0		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 12
5	18/06/2016	10:00	13:00	Female	10:50	DE+NF3	H+F+P	130	110		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 13.5
5	18/06/2016	10:00	13:00	Male	12:15	DE	F+P	30	0		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 13.5
7	18/06/2016	13:10	16:10	Male+ Female	13:30	NF4	F+FP	0	29		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 18
7	18/06/2016	13:10	16:10	Female	14:36	NF4	F	0	14		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 18
17	21/06/2016	08:15	14:15	Male	11:59	NF3	D	0	30		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 13.5
17	21/06/2016	08:15	14:15	Female	13:25	NF3	F	0	5		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 13.5
31	21/06/2016	15:00	18:00		15:52	F	H+F	0	130		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: SW Temp (°C): 13.5
14b	24/06/2016	12:15	15:15	Male	12:57	G+RG+NF3	H	135	0		Rain: Light Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 14

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
14b	24/06/2016	12:15	15:15	Male	13:04	NF4	H	0	20		Rain: Light Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 14
14b	24/06/2016	12:15	15:15	Male	13:09	NF4	F	0	60		Rain: Light Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 14
32	27/06/2016	07:15	13:15	Male	08:47	G+GO	F	23	0		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SW Temp (°C): 14/8
34a	27/06/2016	13:30	16:30	Female	13:54	G+F	H+F	35	0		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SW Temp (°C): 17.5
34a	27/06/2016	13:30	16:30	Male	15:00	DE	F	12	0		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SW Temp (°C): 17.5
5	04/07/2016	10:30	16:30	Male	16:02	DE	H+F+P	60	0		Rain: Misty Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: SW Temp (°C): 15
3	06/07/2016	15:40	18:40	Female	15:58	HB+NF2	F	70	0		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: SW Temp (°C): 14.5
3	06/07/2016	15:40	18:40	Female	16:11	HB+NF2	H	5	0		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: SW Temp (°C): 14.5
17	07/07/2016	09:30	12:30	Female	10:13	G+DE+F	D+H	140	0		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: SW Temp (°C): 15
15	07/07/2016	12:35	15:35	Male	14:37	F	F	7	0		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 17.5
9	30/07/2016	10:50	13:50	Female	12:52	G+F	H	85	20		Rain: None Cloud: 6/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: NW Temp (°C): 15.5
23	05/08/2016	09:30	15:30	Male	15:03	G+RG+DE+NF3	H	203	0		Rain: None Cloud: 7/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 15
2	08/08/2016	15:15	18:15	Immature	15:15	NF3+F	H+F	0	90		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F4 Wind Direction: W Temp (°C): 18.5
17	13/08/2016	12:40	15:40	Female	15:00	G+F	F	3	0		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 17
32	31/08/2016	09:20	15:20	Immature	09:53	RG+HB	H	0	95		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: 3 Wind Direction: SSW Temp (°C): 14
12	27/09/2016	11:10	17:10	Female	12:40	G+F	F	10	26		Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
12	27/09/2016	11:10	17:10	Juvenile	12:40	G+F	F	10	8		Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
12	27/09/2016	11:10	17:10	Female	14:20	F	F		12		Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
12	27/09/2016	11:10	17:10	Female	14:55	F	F		11		Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
12	27/09/2016	11:10	17:10	Female	15:55	F	F		25		Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
17	14/09/2016	10:30	13:30	Female	10:33	RG+F	H+F	145			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 15
17	14/09/2016	10:30	13:30	Female	10:34	F	F	4			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 15
17	14/09/2016	10:30	13:30	Female	10:36	F	H	0	136		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 15
17	14/09/2016	10:30	13:30	Female	10:58	F	H	0	42		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 15
17	14/09/2016	10:30	13:30	Female	11:38	F	H	0	69		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 15
31	25/09/2016	10:45	13:45	Female	11:03	F	F	4	128		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	10:45	13:45	Female	11:04	CF+F	H	0	17		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	10:45	13:45	Female	11:06	F	H	0	12		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	10:45	13:45	Female	12:15	F	F	0	89		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	14:15	17:15	Female	17:09	F	F	0	8		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
15	20/09/2016	10:15	13:15	Male	11:56	G	H		143		Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
32	27/09/2016	11:30	17:30	Juvenile	15:04	G+RG+HB+CF	H+P	160	0		Rain: None Cloud: 3/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 12

Table 2: Sightings of HH Non-breeding season October 2016 – February 2017

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
23	10/10/2016	09:35	15:35	Male	13:17	G	H+F	43			Rain: None Cloud: 6/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: E Temp (°C): 11
3	11/10/2016	09:30	15:30	Female	10:45	HB+NF2+NF3	H+F	127	128		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: E Temp (°C): 8
12	11/10/2016	16:30	19:30	Female	18:25	G	F	6			Rain: None Cloud: 4/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: SE Temp (°C): 12
2	12/10/2016	14:30	19:30	Male	18:43	NF2	F	8			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: E Temp (°C): 13
2	12/10/2016	14:30	19:30	Male	19:06	NF2	F	6			Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: E Temp (°C): 8
14a	13/10/2016	11:00	14:00	Female	13:35	F	S+F	48			Rain: None Cloud: 3/8 Visibility (km): 16 Wind Speed: F1 Wind Direction: NE Temp (°C): 11
34	27/10/2016	10:00	16:00	Male	12:15	RG	H	36			Rain: None Cloud: 7/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
8	15/11/2016	14:35	17:05	Immature Female	16:10	RG	F	5			Rain: None Cloud: 5/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: W Temp (°C): 13
3	19/11/2016	10:05	14:40	Female	13:09	HB+NF2	F	65			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 0
31	22/11/2016	09:00	15:00	Female	14:50	CF	H	60	0		Rain: None Cloud: 1/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: NW Temp (°C): 5
34	29/11/2016	09:25	15:25	Female	10:48	G	F	8	0		Rain: None Cloud: 0/8 Visibility (km): >20 Wind Speed: F1 Wind Direction: E Temp (°C): 4
23	09/12/2016	15:45	16:45	Female	16:03	CF+F	F	0	5		Rain: None Cloud: 6/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: SE Temp (°C): 11
17	13/12/2016	11:00	17:00	Male	13:54	RG	H	16	0		Rain: Light Cloud: 8/8 Visibility (km): <1 Wind Speed: F1 Wind Direction: SE Temp (°C): 7
2	14/12/2016	09:15	15:15	Male	09:40	NF3	F	43			Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 7
34	16/12/2016	08:45	14:45	Male	14:24	RG+HB+DE	H	35	0		Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: N Temp (°C): 6

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
32	17/12/2016	10:30	16:30	Male	11:52	G	H	11	0		Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 5
15	18/12/2016	08:40	14:40	Female	09:14	G+RG+F	H	25	0		Rain: None Cloud: 3/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 2
7	19/12/2016	09:00	15:30	Female	10:11	HB+NF4	F	18			Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	09:00	15:30	Female	10:12	HB+NF4+F	F	6	7		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	09:00	15:30	Male	14:11	G+HB	H	29	0		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
8	05/01/2017	10:00	16:00	Male	11:34	G	F	36			Rain: None Cloud: 8/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SE Temp (°C): 6
23	08/01/2017	11:30	17:30	Male	15:44	G+CF+F	H	360			Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: S Temp (°C): 10
23	08/01/2017	11:30	17:30	Female	15:59	NF2+NF3	F		13		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: S Temp (°C): 10
34	19/01/2017	09:50	15:50	Male	13:27	HB+DE	H	64			Rain: None Cloud: 3/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: E Temp (°C): 5
32	20/01/2017	09:15	15:15	Female	14:07	G+HB+DE	H	89			Rain: None Cloud: 1/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: E Temp (°C): 4
32	20/01/2017	09:15	15:15	Male	15:00	G+HB+DE	C+H+F	124			Rain: None Cloud: 1/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: E Temp (°C): 4
27a	20/01/2017	08:30	13:00	Male	12:16	RG	H	305			Rain: None Cloud: 0/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: E Temp (°C): 9
2	25/01/2017	13:15	17:15	Female	16:58	HB+NF3	F		6		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: SE Temp (°C): 9
15	26/01/2017	09:30	15:30	Male	15:00	G+F	F		10		Rain: Heavy Showers Cloud: 8/8 Visibility (km): 8 Wind Speed: F3 Wind Direction: S Temp (°C): 7
7	27/01/2017	09:00	15:00	Female	12:45	G	F		15		Rain: None Cloud: 4/8 Visibility (km): 16 Wind Speed: F1 Wind Direction: W Temp (°C): 8
18	27/01/2017	13:30	15:30	Male	13:50	G+RG	H	99	16		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 8

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
7	08/02/2017	09:45	12:45	Male	09:55	G+F	H	22	0		Rain: None Cloud: 2/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SE Temp (°C): 9
15	09/02/2017	13:00	16:00	Male	13:29	RG+F	F	39	0		Rain: Occasional showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 6
2	14/02/2017	11:00	15:30	Male	14:59	HB+NF2	F+P	2172	0		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: S Temp (°C): 10
3	18/02/2017	11:00	14:00	Male	11:00	HB+NF2	F+P	5			Rain: None Cloud: 6/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: SW Temp (°C): 10
34	24/02/2017	08:15	14:15	Male	09:49	G+HB+DE	H	35	0		Rain: Light Cloud: 7/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 3
12	27/02/2017	09:30	12:30	Male	10:32	RG+F	H	47	0		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 6
11	28/02/2017	09:00	15:00	Male	11:30	G	F		10		Rain: Light Cloud: 4/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: NW Temp (°C):

Table 3: Sightings of HH breeding season March 2017 – September 2017 (Note: Change in VP names from July onwards)

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
18	06/03/2017	15:00	18:00	Female	16:59	DE	F	0	3		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 6
11	08/03/2017	09:40	15:40	Male	11:30	G+RG	F	100			Rain: None Cloud: 8/8 Visibility (km): 16 Wind Speed: F1 Wind Direction: SW Temp (°C): 8
21	12/03/2017	09:30	12:30	Female	10:48	G	H	217	0		Rain: Light Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 8
21	12/03/2017	09:30	12:30	Female	11:01	RG+NF3	H+P	78	12		Rain: Light Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 8
21	12/03/2017	09:30	12:30	Female	11:18	RG+NF3	F	15	9		Rain: Light Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 8
21	12/03/2017	09:30	12:30	Male	11:19	RG+NF3	H	265			Rain: Light Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 8
21	12/03/2017	14:20	17:20	Male	16:00	NF3+NF4	F	7	16		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 11
34	15/03/2017	11:30	14:30	Female	11:31	G+NF4	F	0	73		Rain: Misty Cloud: 7/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: S Temp (°C): 13
17	18/03/2017	11:20	14:20	Male	11:35	G+NF4	H+F	79	112		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 14
17	18/03/2017	15:10	18:10	Female	15:36	G	C+F		112		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 14
30	19/03/2017	10:00	13:00	Male	12:33	G	F	73	8		Rain: Misty Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 11
3	20/03/2017	07:30	10:30	Male	08:12	NF4	F	12			Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: W Temp (°C): 7
15	20/03/2017	10:00	16:00	Male	12:40	G+F	D		128		Rain: Light Cloud: 8/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SW Temp (°C): 6
23	20/03/2017	15:30	18:30	Male	16:12	G	F	3	0		Rain: Light Cloud: 5/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 8
23	20/03/2017	15:30	18:30	Male	16:18	CF+NF4	F	31	5		Rain: Light Cloud: 5/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 8
2	21/03/2017	11:30	14:30	Male	11:50	NF4	C+F		108		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
2	21/03/2017	11:30	14:30	Female	12:30	NF4	F	0	147		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
2	04/04/2017	09:00	12:00	Male	09:31	NF3	F	0	22		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 8
2	04/04/2017	09:00	12:00	Female	09:46	NF3	F	0	60		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 8
3	04/04/2017	12:00	15:00	Male	12:02	DE+NF3	F	0	40		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 10
3	04/04/2017	12:00	15:00	Male	12:49	HB+NF3	H	0	106		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 10
3	04/04/2017	12:00	15:00	Male	12:54	HB+NF3	F	0	92		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 10
3	04/04/2017	12:00	15:00	Male	13:50	NF3	F	0	189		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 10
3	04/04/2017	12:00	15:00	Female	14:04	NF4	F	0	42		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 10
23	04/04/2017	15:15	18:15	Male	15:56	NF1+NF3	F	9			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 10
18	05/04/2017	15:10	18:10	Male	16:18	G+RG	H	74	10		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 10
21	05/04/2017	09:05	15:05	Female	12:37	G+RG+DE	H	781	34		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 8
18	08/04/2017	10:00	13:00	Female	12:17	F	C+F	0			Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
27	08/04/2017	13:05	16:05	Male/Female	13:20	F	F		18		Rain: None Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 14
27	08/04/2017	13:05	16:05	Male/Female	13:23	F	F		21		Rain: None Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 14
27	08/04/2017	13:05	16:05	Female	14:09	F	F		8		Rain: None Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 14
5	10/04/2017	08:40	14:40	Male	12:13	NF3+F	H	2			Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 7
5	10/04/2017	08:40	14:40	Male/Female	12:20	G+NF3+F	F	135			Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 7

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
5	10/04/2017	08:40	14:40	Male	13:15	G+NF2+NF3	H	140			Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 7
5	10/04/2017	08:40	14:40	Female	13:18	G+NF2+NF3	F	7	62		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 7
7	10/04/2017	14:45	17:45	Female	14:45	HB+DE+NF3	F	0	31		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
7	10/04/2017	14:45	17:45	Male	15:06	HB+DE+NF3	F		285		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
7	10/04/2017	14:45	17:45	Male	16:28	NF3	H+F		4		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
7	10/04/2017	14:45	17:45	Male	17:16	DE+NF3	F	0	45		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
2	11/04/2017	13:20	16:20	Female	14:30	NF4	H+F	0	195		Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: N Temp (°C): 11
3	11/04/2017	09:50	12:50	Male	10:24	NF3+F	F	33	0		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: N Temp (°C): 8
3	11/04/2017	09:50	12:50	Male	11:29	NF3+F	F		10		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: N Temp (°C): 8
3	11/04/2017	09:50	12:50	Female	12:10	DE+NF3	H		4		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: N Temp (°C): 8
9	12/04/2017	13:00	16:00	Male	13:07	G+F	H	24	0		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 11
15	14/04/2017	09:00	12:00	Male	09:58	G+F	F	0	104		Rain: Heavy Showers Cloud: 6/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
15	14/04/2017	09:00	12:00	Female	09:58	G+F	F	0	104		Rain: Heavy Showers Cloud: 6/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
15	14/04/2017	09:00	12:00	Male	10:05	G+F	F	32			Rain: Heavy Showers Cloud: 6/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
15	14/04/2017	09:00	12:00	Female	10:05	F	F	32			Rain: Heavy Showers Cloud: 6/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
15	14/04/2017	09:00	12:00	Male	10:08	G+F	F	540	0		Rain: Heavy Showers Cloud: 6/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
15	14/04/2017	09:00	12:00	Female	10:08	G+F	F	540			Rain: Heavy Showers Cloud: 6/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
15	14/04/2017	09:00	12:00	Male	10:44	F	F		25		Rain: Heavy Showers Cloud: 6/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
15	14/04/2017	09:00	12:00	Female	10:55	G+F	S+F		806		Rain: Heavy Showers Cloud: 6/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
23	14/04/2017	15:30	18:30	Male	17:00	G+NF1	H	73			Rain: Misty Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: W Temp (°C): 10
12	15/04/2017	11:30	17:30	Male	12:20	G+DE	H	113			Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 9
32	20/04/2017	10:00	16:00	Male	14:32	G+RG+HB	H	78			Rain: None Cloud: 3/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: W Temp (°C): 12
31	24/04/2017	10:00	16:00	Male	14:05	CF	F	6	0		Rain: Light Cloud: 1/8 Visibility (km): 20 Wind Speed: F2 Wind Direction: N Temp (°C): 9
17	25/04/2017	10:00	16:00	Male	15:34	F	F		37		Rain: None Cloud: 3/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 9
23	05/05/2017	10:00	16:00	Male	13:23	NF1+NF3	H+F	16	35		Rain: Misty Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: W Temp (°C): 10
11	06/05/2017	09:00	15:00	Male	11:15	RG+F	H+F	125	70		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NE Temp (°C): 9
11	06/05/2017	09:00	15:00	Male	11:20	G+RG	H	35	0		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NE Temp (°C): 9
3	08/05/2017	11:15	14:15	Female	12:27	NF3	F	40	25		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: E Temp (°C): 14
5	09/05/2017	12:30	15:30	Male	15:00	NF1+NF2	H+P	660			Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: E Temp (°C): 13
12	09/05/2017	09:00	12:00	Male	09:52	G+RG+F	H+F	0	20		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: E Temp (°C): 13
12	09/05/2017	09:00	12:00	Male	10:10	G+RG+DE+F	H+F	280	215		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: E Temp (°C): 13
12	09/05/2017	09:00	12:00	Male	10:30	G+RG+DE+F	H+F		80		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: E Temp (°C): 13
12	09/05/2017	09:00	12:00	Male	10:52	G+RG+DE+F	H+F	0	300		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: E Temp (°C): 13
12	09/05/2017	09:00	12:00	Male	12:10	G	H+F	450	120		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: E Temp (°C): 13

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
5	12/05/2017	08:30	11:30	Male	08:46	HB+NF2	H+F	60	150		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
5	12/05/2017	08:30	11:30	Male	10:59	RG+NF2	H+F		180		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
5	12/05/2017	08:30	11:30	Male	11:04	RG+NF2	H+F		116		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
7	18/05/2017	09:00	15:00	Male	10:05	G+NF2	H+F	120	0		Rain: Light Cloud: 5/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 10
7	18/05/2017	09:00	15:00	Female	11:24	NF2	H+F	2			Rain: Light Cloud: 5/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 10
7	18/05/2017	09:00	15:00	Male	13:35	F	H+F	3			Rain: Light Cloud: 5/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 10
3	25/05/2017	15:30	18:30	Male	17:05	HB+DE+NF3	F+P	5			Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 17
9	26/05/2017	09:51	15:51	Male	13:32	HB+F	S	180			Rain: None Cloud: 7/8 Visibility (km): 20 Wind Speed: F2 Wind Direction: SE Temp (°C): 18
9	26/05/2017	09:51	15:51	Male	14:33	G+F	H	40	22		Rain: None Cloud: 7/8 Visibility (km): 20 Wind Speed: F2 Wind Direction: SE Temp (°C): 18
9	26/05/2017	09:51	15:51	Male	14:47	CF	H	15			Rain: None Cloud: 7/8 Visibility (km): 20 Wind Speed: F2 Wind Direction: SE Temp (°C): 18
14a	26/05/2017	15:55	18:55	Male		G	F	20	0		Rain: Light Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: SE Temp (°C): 16
21	27/05/2017	11:00	17:00	Male	11:50	RG+NF3	F	14	7		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: W Temp (°C): 13
15	29/05/2017	11:18	17:18	Male	13:15	RG+NF2	F+FP		120		No information available
15	29/05/2017	11:18	17:18	Female	13:17	NF2	F+FP	20			No information available
15	29/05/2017	11:18	17:18	Male	14:16	RG	H	265			No information available
15	29/05/2017	11:18	17:18	Male	14:37	RG	F		180		No information available
15	29/05/2017	11:18	17:18	Male	14:48	RG+DE+F	F		25		No information available
15	29/05/2017	11:18	17:18	Male	16:30	G+DE+F	H+P	480			No information available
15	29/05/2017	11:18	17:18	Male	17:06	G	H	40			No information available
15	29/05/2017	11:18	17:18	Female	17:12	NF3	F	30			No information available
17	29/05/2017	08:05	11:05	Male	09:15	G+F	H	30			Rain: None Cloud: 8/8 Visibility (km): 20 Wind Speed: F1 Wind Direction: NW Temp (°C): 13

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
35	29/05/2017	11:41	17:41	Male	09:15	F	F		40		Rain: None Cloud: 7/8 Visibility (km): >20 Wind Speed: F1 Wind Direction: W Temp (°C): 15
35	29/05/2017	11:41	17:41	Male	13:57	DE+F	H		35	55	Rain: None Cloud: 7/8 Visibility (km): >20 Wind Speed: F1 Wind Direction: W Temp (°C): 15
35	29/05/2017	11:41	17:41	Male	15:08	DE+F	H		3180	120	Rain: None Cloud: 7/8 Visibility (km): >20 Wind Speed: F1 Wind Direction: W Temp (°C): 15
30	30/05/2017	11:02	17:02	Male	11:42	G+NF3	F		33		Rain: Single shower Cloud: Visibility (km): 20 Wind Speed: F1 Wind Direction: NW Temp (°C): 15
31	30/05/2017	11:15	17:15	Male	14:05	CF	H		50		Rain: Cloud: 7/8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SE Temp (°C): 15
31	30/05/2017	11:15	17:15	Male	15:54	G+CF	H		600		Rain: Cloud: 7/8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SE Temp (°C): 15
8	08/06/2017	10:45	16:45	Male	14:40	G	H		24		Rain: Light Cloud: 7/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
15	09/06/2017	08:30	11:30	Male	10:12	G+RG	H		41		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 18
15	09/06/2017	08:30	11:30	Male	10:13	G+F	H		77		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 18
15	09/06/2017			Male	11:38	RG	H		34		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 18
15	09/06/2017	12:00	15:00	Male	13:02	G+RG	H+F		53		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 18
15	09/06/2017	12:00	15:00	Male	13:08	F	H		31		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 18
15	09/06/2017	12:00	15:00	Male	13:16	G+F	H+F		25		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 18
15	09/06/2017	12:00	15:00	Male	15:00	RG+F	F		25		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 18
18	13/06/2017	08:45	14:45	Male	09:45	F	H			8	Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
18	13/06/2017	08:45	14:45	Male	12:30	G+RG+DE	H		715	5	Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
34	21/06/2017	08:30	14:30	Male	12:06	G+HB+DE	H		14		Rain: None Cloud: 6/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: SW Temp (°C): 18

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
31	23/06/2017	10:00	16:00	Male	15:53	RG+DE+NF3+NF4	H+F	180			Rain: Misty Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 16
31	23/06/2017	10:00	16:00	Male	15:55	RG+DE+F	D+H+F	103	103		Rain: Misty Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 16
23	28/06/2017	11:15	17:15	Female	12:37	G+DE+NF1		135			Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 15
23	28/06/2017	11:15	17:15	Female	12:43	G+DE+NF1		165			Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 15
3	01/07/2017	10:45	16:45	Male	14:34	RG+DE+NF3		175	20		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
15	07/07/2017	12:00	15:00	Male	12:27	RG+F	C+H+F	49	49		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: W Temp (°C): 18
15	07/07/2017	12:00	15:00	Male	13:39	F	F	10			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: W Temp (°C): 18
15	07/07/2017	15:30	18:30	Male	15:34	F	F	25			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: W Temp (°C): 18
15	07/07/2017	15:30	18:30	Male	16:27	G+RG	H	52			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: W Temp (°C): 18
15	07/07/2017	15:30	18:30	Male	16:31	F	F	16	16		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: W Temp (°C): 18
13	17/07/2017	09:30	15:30	Female	14:45	NF3+NF4+2nd F3	C+H+F	80	181		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: N Temp (°C): 15
14	17/07/2017	15:15	16:30	Female	15:20	HB	F+P	4			Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: N Temp (°C): 16
11	18/07/2017	09:30	15:30	Female	10:26	NF4	H+F	148			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 15
11	18/07/2017	09:30	15:30	Female	13:56	NF3+NF4	F	7			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 15
11	18/07/2017	09:30	15:30	Female	15:29	NF3+NF4	H+F	179	15		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 15
10	21/07/2017	09:00	15:00	Female	10:40	CF+NF4	H+F	28			Rain: none Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
10	21/07/2017	09:00	15:00	Female	10:51	RG+GO+CF+NF3+NF4+F	H+F	48			Rain: none Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 10

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
10	21/07/2017	09:00	15:00	Male	14:51	RG+CF	H+F	38			Rain: none Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
4	24/07/2017	08:45	14:45	Male	11:10	G	H+F	24			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 15
4	24/07/2017	08:45	14:45	Male	11:18	G	D+H	37			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 15
4	24/07/2017	08:45	14:45	Male	11:44	G+RG+GO+NF4	H+F	64			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 15
4	24/07/2017	08:45	14:45	Female	12:38	G+RG	H+F	43			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 15
4	24/07/2017	08:45	14:45	Female	13:56	G+NF4	F	11			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 15
5	25/07/2017	11:35	17:35	Female	12:09	G+CF+NF4	C	30			Rain: Dry Cloud: 7/8 Visibility (km): 30 Wind Speed: F1 Wind Direction: SE Temp (°C): 18
5	25/07/2017	11:35	17:35	Female	12:50	NF4	C	15			Rain: Dry Cloud: 7/8 Visibility (km): 30 Wind Speed: F1 Wind Direction: SE Temp (°C): 18
9	25/07/2017	08:21	11:21	Female	11:20	G	F	20			Rain: Dry Cloud: 7/8 Visibility (km): 30 Wind Speed: F1 Wind Direction: SE Temp (°C): 18
9	26/07/2017	08:01	11:01	Female	11:21	NF4	C	35			Rain: Single shower Cloud: 5/8 Visibility (km): 30 Wind Speed: F3 Wind Direction: W Temp (°C): 15
12	26/07/2017	16:00	17:00	Female	16:18	NF3+NF4	F	10			Rain: Occasional showers Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: W Temp (°C): 16
14	26/07/2017	12:15	15:30	Male	13:20	HB	H+F	173			Rain: none Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: W Temp (°C): 16
12	27/07/2017	11:30	16:30	Male	14:05	NF3+NF4	H+F	34			Rain: none Cloud: 6/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: W Temp (°C): 15
7	31/07/2017	08:55	14:55	Female	13:27	CO+NF4	F	10			Rain: Heavy Showers X 3 Cloud: 7/8 Visibility (km): 30 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
7	13/08/2017	11:00	17:00	Male	15:28	G+NF3+NF4	H+F+P	563			Rain: Heavy Showers Cloud: 2/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 17
1	15/08/2017	08:50	14:00	Female	10:00	HB+NF2	H	10			Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 13
4	18/08/2017	11:00	17:00	Female	12:02	NF4	C	7			Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SW Temp (°C): 13

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
5	20/08/2017	14:15	17:15	Immature	14:32	G+NF4	C+F	1080			Rain: Occasional showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SW Temp (°C): 17
5	20/08/2017	14:15	17:15	Immature	15:05	G+NF4	F	20			Rain: Occasional showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SW Temp (°C): 17
5	20/08/2017	14:15	17:15	Immature	15:36	G+NF4	F	15			Rain: Occasional showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SW Temp (°C): 17
5	20/08/2017	14:15	17:15	Immature	15:50	G+NF4	F	73			Rain: Occasional showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SW Temp (°C): 17
5	20/08/2017	14:15	17:15	Immature	16:43	G+NF4	F	74			Rain: Occasional showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SW Temp (°C): 17
5	20/08/2017	14:15	17:15	Immature	16:45	G	F	66			Rain: Occasional showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SW Temp (°C): 17
10	25/08/2017	10:15	16:15	Female	12:35	RG+NF4	C+F		130		Rain: Dry Cloud: 5/8 Visibility (km): 30 Wind Speed: F1 Wind Direction: W Temp (°C): 15°
6	29/08/2017	11:51	17:51	Female	11:57	RG+2nd F3+F	F	260	15		Rain: Single shower Cloud: 6/8 Visibility (km): 30 Wind Speed: F1 Wind Direction: W Temp (°C): 15°
11	02/09/2017	09:20	10:20	Ringtail	09:25	NF3+2nd F1/F2+F	H	7	7		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: S Temp (°C): 12
10	15/09/2017	10:10	16:10	Female	15:05		F+P	1560	0		Rain: None Cloud: 5/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: N Temp (°C): 10
10	15/09/2017	10:10	16:10	Female	15:26		F	60	0		Rain: None Cloud: 5/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: N Temp (°C): 10

Table 4: Sightings of HH non-breeding season October 2017 – February 2018

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)		Weather
								<30	30-170 >170	
14	24/10/2017	10:00	13:00	Male	11:14	HB+NF3	H	29		Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F5 Wind Direction: SW Temp (°C): 13
14	24/10/2017	10:00	13:00	Male	11:21	HB+NF3	H	16		Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F6 Wind Direction: SW Temp (°C): 13
14	24/10/2017	10:00	13:00	Female	11:33	HB+NF3	F+P	67		Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F8 Wind Direction: SW Temp (°C): 13
14	24/10/2017	10:00	13:00	Male	11:55	HB	H+F	57		Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F9 Wind Direction: SW Temp (°C): 13
Roost	25/10/2017	06:15	08:45	Male	07:55	2nd F3	F	10		Rain: Dry Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 8
Roost	25/10/2017	06:15	08:45	Female	07:55	2nd F3	F	10		Rain: Dry Cloud: 4/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: NW Temp (°C): 8
14	26/10/2017	10:00	13:00	Male	11:15	HB	H	15		Rain: Dry Cloud: 4/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: NW Temp (°C): 8
2	02/11/2017	09:00	15:00	Male	09:11	RG+2nd F1/F2	H	64		Rain: Dry Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NE Temp (°C): 9
2	02/11/2017	09:00	15:00	Male	09:12	RG+2nd F1/F2	H	23		Rain: Dry Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NE Temp (°C): 9
1	03/11/2017	09:00	15:00	Female	09:00	2nd F3	F	12		Rain: Dry Cloud: 6/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NE Temp (°C): 7
1	03/11/2017	09:00	15:00	Male	09:04	HB+NF2	F	4		Rain: Dry Cloud: 6/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NE Temp (°C): 7
8	04/11/2017	09:40	13:10	Female	11:51	G+RG	H	5		Rain: Single shower Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 7
3	20/11/2017	10:55	16:55	Female	12:35	G+NF4	F	56		Rain: Misty Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
3	20/11/2017	10:55	16:55	Male	14:20	G	F	20		Rain: Misty Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
13	24/11/2017	11:00	17:00	Male	16:05	CF+F	F	7		Rain: Heavy Showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 3

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
2	02/12/2017	10:00	16:00	Male	12:03	G	H	15			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 4
13	08/12/2017	11:00	17:00	Ringtail	14:19	CF+2nd F1/F2	H	27			Rain: Single shower Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: N Temp (°C): 4
5	14/12/2017	11:00	17:00	Male	15:06	G+F	H+F	70	19		Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 3
1	04/01/2018	10:30	16:30	Male	16:10	HB+NF2	H+F	26			Rain: none Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 6
N/A	17/01/2018			Male	16:00	G	H	25			Casual Sighting
10	18/01/2018	15:55	16:55	Ringtail	13:30	G	F	17			Rain: Heavy Showers Cloud: 7/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: W Temp (°C): 4
1	18/01/2018	06:56	09:20	Male	08:57	G	F	8			Rain: Light Cloud: 3/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: W Temp (°C): 1
2	22/01/2018	13:20	15:20	Male	14:00	HB+DE+GO	H+P	88			Rain: none Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 9
2	22/01/2018	13:20	15:20	Male	14:12	HB+DE+GO	H+P	18			Rain: none Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 9
4	23/01/2018	09:30	15:50	Male	10:00	F	F	58			Rain: Misty Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: W Temp (°C): 5
4	25/01/2018	16:30	17:30	Male	16:43	G	H	38			Rain: None Cloud: 7/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: W Temp (°C): 8
2	26/01/2018	11:15	15:15	Male	15:28	G+RG+DE+GO	H	97			Rain: none Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 7
7	06/02/2018	13:30	16:30	Male	13:58	G	H	2			Rain: Dry Cloud: 4/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 3
7	06/02/2018	13:30	16:30	Female	14:20	2nd F1/F2+F	H+F	70	23		Rain: Dry Cloud: 4/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 3
7	07/02/2018	09:30	12:30	Male	11:11	G+RG+NF2+2nd F1/F2+2nd F3	H+F	330			Rain: Light Cloud: 4/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 1
2	09/02/2018	09:45	12:45	Ringtail	09:58	RG+DE+GO+NF4	H	6			Rain: snow showers Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 0

Table 5: Sightings of HH breeding season March 2018 – September 2018

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)		Weather
								<30	30-170 >170	
7	09/03/2018	07:00	13:10	Male	10:50	2nd F1/F2+F	F	37		Rain: none Cloud: 5/8 Visibility (km): 5 Wind Speed: f2 Wind Direction: NE Temp (°C): 1
5	12/03/2018	15:00	18:00	Male	17:35	RG	F	18		Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: f3 Wind Direction: NW Temp (°C): 9
7	03/04/2018	08:10	14:10	Female	09:45	2nd F1/F2	H	4		Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: f2 Wind Direction: S Temp (°C): 7
7	03/04/2018	08:10	14:10	Female	09:47	CF+NF2+2nd F1/F2	H	189		Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: f2 Wind Direction: S Temp (°C): 7
7	03/04/2018	08:10	14:10	Female	12:35	CF+NF2+2nd F1/F2	F+P	683	95	Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: f2 Wind Direction: S Temp (°C): 7
1	03/04/2018	14:25	17:25	Female	14:33	NF4	F	8		Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: f2 Wind Direction: SE Temp (°C): 7
Casual Sighting	11/04/2019	N/A	N/A	Male						
12	13/04/2018	09:30	15:30	Male	12:33	G	F	40		Rain: None Cloud: 3\4 Visibility (km): 5 Wind Speed: F1 Wind Direction: WSW Temp (°C): 12
2	11/05/2018	12:00	18:00	Male/Female	13:46	NF3	F	16		Rain: Light mist clearing Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: S Temp (°C): 8
2	11/05/2018	12:00	18:00	Male	17:16	G	H	26		Rain: Light mist clearing Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: S Temp (°C): 8
5	17/05/2018	09:15	15:15	Male	10:17	RG	H	120		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: SE Temp (°C): 10
5	17/05/2018	09:15	15:15	Male	10:24	RG+F	S+F	20	35	Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SE Temp (°C): 10
5	17/05/2018	09:15	15:15	Male	10:43	RG	H	30		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: SE Temp (°C): 10
5	17/05/2018	09:15	15:15	Male	10:44	G+RG+F	H+F	120	120	Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F5 Wind Direction: SE Temp (°C): 10
5	17/05/2018	09:15	15:15	Male	12:58	RG+F	H+F	20	20	Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F6 Wind Direction: SE Temp (°C): 10

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
12	29/05/2018	10:30	16:30	Male	15:30	RG	F	10			Rain: None Cloud: 0\8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 25
12	29/05/2018	10:30	16:30	Male	15:57	RG	S+C+F		20		Rain: None Cloud: 0\8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 25
12	29/05/2018	10:30	16:30	Male	16:05	RG	F	40	15		Rain: None Cloud: 0\8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 25
12	30/05/2018	16:10	20:10	Male	19:30	RG	H+F	5			Rain: None Cloud: 1\8 Visibility (km): 10 Wind Speed: F1 Wind Direction: N Temp (°C): 20
1	08/06/2018	10:45	13:45	Male	13:00	DE+NF4	C+D+F				Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 19
1	08/06/2018	10:45	13:45	Female	13:00	F	F	3			Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 19
2	08/06/2018	14:15	17:15	Male	15:53	F	F	39			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 21
13	19/06/2018	08:58	14:58	Ringtail	12:13	F	F	17			Rain: misty Cloud: 8/8 Visibility (km): 2 Wind Speed: F4 Wind Direction: S Temp (°C): 13
1	05/07/2018	08:45	14:45	Female	13:30	NF4+F	F	25			Rain: none Cloud: 6/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 14
7	05/07/2018	15:00	17:00	Male	16:22	G+NF1+F	H	115			Rain: none Cloud: 6/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 14
3	13/07/2018	07:00	08:00	Male	07:54	RG	H+F	14			Rain: None Cloud: 3\4 Visibility (km): 20 Wind Speed: F1 Wind Direction: N Temp (°C): 18
4	13/08/2018	11:30	16:30	Female	12:05		H	152			Rain: Dry Cloud: 6/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19

Table 6: Sightings of HH non breeding season October 2018 – February 2019

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)		Weather
								<30	30-170	
4	16/10/2018	13:30	16:30	Male	13:47	G+RG+F		20	40	Rain: Showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
4	16/10/2018	13:30	16:30	Female	15:00	G	F	9		Rain: Showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
11	18/10/2018	09:30	12:30		11:05	HB	F	5		Rain: None Cloud: 1\8 Visibility (km): 24 Wind Speed: F1 Wind Direction: SW Temp (°C): 6
11	15/11/2018	10:00	13:00	Male	11:47	CF	F	5		Rain: Heavy Rain Cloud: 8\8 Visibility (km): 1 Wind Speed: F3 Wind Direction: SW Temp (°C): 11
7	18/11/2018	11:00	14:00	Male	13:40	G+CF	H+F	20		Rain: Frequent Showers Cloud: 8\8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SE Temp (°C): 11
5	04/12/2018	09:00	12:00	Female	10:24	RG	F	69		Rain: None Cloud: 7\8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SE Temp (°C): 1
5	04/12/2018	09:00	12:00	Male	10:46	RG	H+F	24		Rain: None Cloud: 7\8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SE Temp (°C): 1
5	04/12/2018	12:30	15:30	Female	13:20	RG	F	20		Rain: Light Cloud: 8\8 Visibility (km): 10 Wind Speed: F2 Wind Direction: SE Temp (°C): 3
12	04/12/2018	10:00	13:00		11:10	G	F+P	70		Rain: Persistent heavy rain Cloud: 8\8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 5
3	07/12/2018	12:30	15:30		14:57	F	F	0	7	Rain: Showers Cloud: 1\2 Visibility (km): 20 Wind Speed: F1 Wind Direction: W Temp (°C): 5
5	12/12/2018	13:24	16:24	Female	14:56	RG	F	10		Rain: Light Cloud: 1 Visibility (km): 10 Wind Speed: F2 Wind Direction: SE Temp (°C): 7
13	12/12/2018	08:30	11:30	Female	10:10	G	F	8		Rain: None Cloud: 7\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 3
2	14/12/2018	10:00	16:00	Female	15:42	2nd F1/F2+F	F	12		Rain: Occasional showers Cloud: 8\8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 8
1	18/12/2018	10:00	16:00	Female	10:26	HB+NF2	F	18		Rain: Occasional showers Cloud: 6\8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
1	19/12/2018	09:30	15:30	Female	14:48	HB+NF3	H+F	23		Rain: Occasional showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
1	02/01/2019	12:55	15:55	Female	13:09	F	F	12		Rain: Misty Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 7

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
1	02/01/2019	12:55	15:55	Male	15:25	F	F	13			Rain: Misty Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 7
1	02/01/2019	12:55	15:55	Female	15:56	F	F	10			Rain: Misty Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 7
3	21/01/2019	11:15	17:30	Male	14:08	G+CF	F	11			Rain: Heavy Showers Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 3
4	05/02/2019	13:00	16:00	Male	15:22	G+F	F	17			Rain: Misty Cloud: 8/8 Visibility (km): 1 Wind Speed: F4 Wind Direction: SW Temp (°C): 10
4	05/02/2019	13:00	16:00	Male	15:24	G+RG+CF	S+F+P	325			Rain: Misty Cloud: 8/8 Visibility (km): 1 Wind Speed: F4 Wind Direction: SW Temp (°C): 10
5	06/02/2019	08:15	11:15	Female	10:32	RG+F	F	19			Rain: Dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 8

Table 7: Sightings of HH breeding season March 2019 – September 2019

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)		Weather
								<30	30-170 >170	
4	04/03/2019	11:30	17:30		16:02	HB	H	55		Rain: None Cloud: 5/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: W Temp (°C): 4
5	04/03/2019	11:20	14:20	Male	11:46	RG+F	F	55	4	Rain: Dry Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 5
3	21/03/2019	16:30	18:40	Male	17:24	G	H	5		Rain: Misty Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: SW Temp (°C): 11
3	21/03/2019	16:30	18:40	Male	18:07	RG	H	6		Rain: Misty Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: SW Temp (°C): 11
13	01/04/2019	16:00	19:00	Male	16:30	RG	H	25		Rain: None Cloud: 8/8 Visibility (km): 8 Wind Speed: F1 Wind Direction: SW Temp (°C): 8
13	01/04/2019	16:00	19:00	Male	16:35	RG+F	F	26	4	Rain: None Cloud: 8/8 Visibility (km): 8 Wind Speed: F1 Wind Direction: SW Temp (°C): 8
10	08/04/2019	13:00	16:00	Male	13:46	HB+CF+NF3+F	S+D+F	130	620	Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F2 Wind Direction: SE Temp (°C): 10
10	08/04/2019	13:00	16:00	Female	14:04		F	145		Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F2 Wind Direction: SE Temp (°C): 10
11	26/04/2019	09:34	15:34	Male	11:55	CF+NF3	F		112	Rain: Occasional showers Cloud: 8/8 Visibility (km): 8 Wind Speed: F3 Wind Direction: S Temp (°C): 6
11	26/04/2019	09:34	15:34	Male	13:23	CF+F	H+F	30	63	Rain: Occasional showers Cloud: 8/8 Visibility (km): 8 Wind Speed: F4 Wind Direction: S Temp (°C): 6
4	27/04/2019	10:30	16:30	Male	14:47	F	F	0	87	Rain: Dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 6
12	29/04/2019	12:50	18:50	Male	14:50	CF+NF3	D+H	75		Rain: Misty Cloud: 1 Visibility (km): 2 Wind Speed: F3 Wind Direction: S Temp (°C): 10
12	29/04/2019	12:50	18:50	Male	15:12	G+2ndF4	F		210	Rain: Misty Cloud: 1 Visibility (km): 2 Wind Speed: F3 Wind Direction: S Temp (°C): 10
12	29/04/2019	12:50	18:50	Male	15:43	G+2ndF4	F	0		Rain: Misty Cloud: 1 Visibility (km): 2 Wind Speed: F3 Wind Direction: S Temp (°C): 10
12	29/04/2019	12:50	18:50	Male	15:43	G+2ndF4	H	90		Rain: Misty Cloud: 1 Visibility (km): 2 Wind Speed: F3 Wind Direction: S Temp (°C): 10

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)		Weather
								<30	30-170 >170	
12	29/04/2019	12:50	18:50	Male	16:24	NF3+NF4		165		Rain: Misty Cloud: 1 Visibility (km): 2 Wind Speed: F3 Wind Direction: S Temp (°C): 10
9	03/05/2019	08:10	11:10	Male	08:17	G	F	07		Rain: Dry Cloud: 1 Visibility (km): 16 Wind Speed: F2 Wind Direction: NW Temp (°C): 9
9	03/05/2019	08:10	11:10	Male	09:12		C	22		Rain: Dry Cloud: 1 Visibility (km): 16 Wind Speed: F2 Wind Direction: NW Temp (°C): 9
9	03/05/2019	08:10	11:10	Female	10:56		C	258		Rain: Dry Cloud: 1 Visibility (km): 16 Wind Speed: F2 Wind Direction: NW Temp (°C): 9
9	03/05/2019	11:40	14:40	Male/Female	13:34	G	H+F	195		Rain: Dry Cloud: 1 Visibility (km): 16 Wind Speed: F3 Wind Direction: NW Temp (°C): 17
11	05/05/2019	12:00	15:00	Male	13:50	CF+F	F	18		Rain: None Cloud: 8 Visibility (km): 6 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
10	07/05/2019	09:45	15:45	Male	12:01	NF2+NF3	H	74		Rain: Dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: S Temp (°C): 10
10	07/05/2019	09:45	15:45	Male	12:08	F	H	25		Rain: Dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: S Temp (°C): 10
13	15/05/2019	10:15	16:40	Male	13:46	G	F	30		Rain: Dry Cloud: 5 Visibility (km): 14
13	15/05/2019	10:15	16:40	Male	14:28	F	F	52		Rain: Dry Cloud: 5 Visibility (km): 14
5	16/05/2019	09:40	18:45	Male	09:45	G+RG+NF3	H+F	35	9	Rain: dry Cloud: 1 Visibility (km): 3 Wind Speed: F2 Wind Direction: SE Temp (°C): 11
5	16/05/2019	09:40	18:45	Male	10:25	G+RG	H	120		Rain: dry Cloud: 1 Visibility (km): 3 Wind Speed: F2 Wind Direction: SE Temp (°C): 11
5	16/05/2019	09:40	18:45	Female	13:06	NF3+NF4	F	30	6	Rain: dry Cloud: 1 Visibility (km): 3 Wind Speed: F2 Wind Direction: SE Temp (°C): 11
5	16/05/2019	09:40	18:45	Male	13:53	NF4	F	13		Rain: dry Cloud: 1 Visibility (km): 3 Wind Speed: F2 Wind Direction: SE Temp (°C): 11
5	16/05/2019	09:40	18:45	Female	14:02	NF4	F	2		Rain: dry Cloud: 1 Visibility (km): 3 Wind Speed: F2 Wind Direction: SE Temp (°C): 11
4	16/05/2019	10:05	16:30	Male	10:57	F	F		28	Rain: Drizzle Cloud: 7 Visibility (km): 16
4	16/05/2019	10:05	16:30	Male	11:28	F	S	3	22	Rain: Drizzle Cloud: 7 Visibility (km): 16
4	16/05/2019	10:05	16:30	Male	11:30	F	F		15	Rain: Drizzle Cloud: 7 Visibility (km): 16
4	16/05/2019	10:05	16:30	Male	12:06	G	H	25		Rain: Drizzle Cloud: 7 Visibility (km): 16
4	16/05/2019	10:05	16:30	Male	12:30	F	F	36		Rain: Drizzle Cloud: 7 Visibility (km): 16

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
4	16/05/2019	10:05	16:30	Male	15:08	G	F	80			Rain: Dry Cloud: 5 Visibility (km): 16
3	29/05/2019	13:35	16:35	Female	16:15	F	F	4			Rain: Light mist clearing Cloud: 1 Visibility (km): 10 Wind Speed: F4 Wind Direction: W Temp (°C): 15
7	06/06/2019	09:40	15:40	Male	14:42	NF3+F	H+F	70			Rain: dry Cloud: 4 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 15
9	20/06/2019	10:57	13:57	Male	12:04	NF4	F	7			Rain: 0 Cloud: 4/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 15
3	22/06/2019	08:21:00	14:21:00	Male	10:54	RG	H	33			Rain: Dry Cloud: 7/8 Visibility (km): 7 Wind Speed: F2 Wind Direction: SE Temp (°C): 13
3	22/06/2019	08:21:00	14:21:00	Male	11:11	G+F	H	24			Rain: Dry Cloud: 7/8 Visibility (km): 7 Wind Speed: F2 Wind Direction: SE Temp (°C): 13
10	24/06/2019	11:30	14:30	Female	11:43	G+CF	H	16			Rain: dry Cloud: 7 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 17
10	24/06/2019	11:30	14:30	Female	13:22	G+CF	H	10			Rain: dry Cloud: 7 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 17
5	03/07/2019	12:30	16:30	Female	14:12	NF4	F	8			Rain: Dry Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 17
5	03/07/2019	12:30	16:30	Female	14:40	CF+NF4	F+P	5			Rain: Dry Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 17
5	10/07/2019	14:30	16:30	Female	16:22	G	H	13			Rain: Occasional rain Cloud: 1/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
10	10/07/2019	16:35	19:05	Female	18:25	G+GO+F	S+F	645			Rain: Dry Cloud: 1/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 19
11	27/07/2019	13:50	19:50	Male	18:09	CF	F	30			Rain: Dry Cloud: 7/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
4	02/08/2019	13:40	16:40	Male	16:14	G	F	85			Rain: None Cloud: 4 Visibility (km): 15 Wind Speed: F1 Wind Direction: SE Temp (°C): 18
4	02/08/2019	13:40	16:40	Male	16:14	G	F	30			Rain: None Cloud: 4 Visibility (km): 15 Wind Speed: F1 Wind Direction: SE Temp (°C): 18
1	15/08/2019	12:00	18:00	Female/immature	14:39	HB+NF2	H+F	3			Rain: dry Cloud: 5 Visibility (km): 5 Wind Speed: f2 Wind Direction: W Temp (°C): 16
1	16/09/2019	10:10	16:10	Male	13:37	NF2+NF3	H	2	0		Rain: Drizzle Cloud: 1 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 16

Table 8: Sightings of other species breeding season March 2016 – September 2016

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
8	16/03/2016	Kestrel_K.	09:00	15:00		13:56	F	F	0	7		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: E Temp (°C): 7
15	16/03/2016	Kestrel_K.	15:10	18:10		16:00	G	H	135	45		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: E Temp (°C): 12
15	16/03/2016	Kestrel_K.	15:10	18:10		16:06	G	H	0	50		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: E Temp (°C): 12
15	17/03/2016	Kestrel_K.	10:00	13:00		10:34	G	H	160	35		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: E Temp (°C): 5.5
15	17/03/2016	Kestrel_K.	10:00	13:00		12:05	G	H	0	15		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: E Temp (°C): 5.5
15	17/03/2016	Kestrel_K.	10:00	13:00		12:52	G	H	20	325		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: E Temp (°C): 5.5
2	18/03/2016	Buzzard_BZ	10:30	13:30		12:40	NF2	H	0	150		Rain: None Cloud: 0/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: ESE Temp (°C): 9
2	18/03/2016	Buzzard_BZ	10:30	13:30		12:42	NF2	F	0	20		Rain: None Cloud: 0/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: ESE Temp (°C): 9
23	18/03/2016	Kestrel_K.	13:30	16:30		15:50	CF	P	0	0		Rain: None Cloud: 0/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: calm Temp (°C): 10
23	19/03/2016	Sparrowhawk_SH	10:30	13:30	Male+Female	11:00	CF	F		13		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: E Temp (°C): 6.5
12	21/03/2016	Merlin_ML	09:20	15:20	Male	13:06	G	F	8	0		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: W Temp (°C): 5
32	23/03/2016	Sparrowhawk_SH	10:00	14:00	Female	11:45	G	F	10			Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
32	23/03/2016	Sparrowhawk_SH	15:00	17:00	Female	15:00	G	F	6			Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
17	24/03/2016	Sparrowhawk_SH	12:20	15:20	Male	14:33	RG	F+P	20			Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: W Temp (°C): 9.5
31	25/03/2016	Sparrowhawk_SH	11:15	17:17	Female	12:28	RG+CF+NF4	F		25		Rain: Light Cloud: 6/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 9.5
14a	27/03/2016	Kestrel_K.	16:25	19:25		16:25	G	F	0	15		Rain: Heavy Showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 5.5

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
14a	27/03/2016	Kestrel_K.	16:25	19:25		17:00	RG	F	0	10		Rain: Heavy Showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 5.5
30	27/03/2016	Peregrine_PE	12:20	16:20		13:25	G+DE	F	0	30		Rain: Heavy Showers Cloud: 6/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 6
27	28/03/2016	Buzzard_BZ	10:15	13:15		11:50	NF3	S+C+F	0	0		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: SW Temp (°C): 6.5
27	28/03/2016	Buzzard_BZ	10:15	13:15		13:02		F	0	0		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: SW Temp (°C): 6.5
27	28/03/2016	Kestrel_K.	10:15	13:15		12:00	G	H	0	80		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: SW Temp (°C): 6.5
27	28/03/2016	Raven_RN	16:25	19:25		17:50	F	F		10		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: SW Temp (°C): 8
34	30/03/2016	Merlin_ML	09:30	15:30	Female	13:34	RG	F+P	5	5		Rain: Light Cloud: 5/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: NW Temp (°C): 8
3	06/04/2016	Kestrel_K.	10:15	16:15		13:06		H+F	0	5		Rain: Heavy Showers Cloud: 2/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: NW Temp (°C):
8	08/04/2016	Kestrel_K.	08:40	14:40		12:20	G	H	0	25		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: W Temp (°C): 1
8	08/04/2016	Kestrel_K.	08:40	14:40		12:40	F	F	0	10		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: W Temp (°C): 1
8	08/04/2016	Merlin_ML	08:40	14:40	Female	12:48		F+P	10	0		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: W Temp (°C): 1
7	11/04/2016	Buzzard_BZ	10:20	16:20		12:02	F	C	0	5		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: E Temp (°C): 8
7	11/04/2016	Kestrel_K.	10:20	16:20		11:27	F	H	0	10		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: E Temp (°C): 8
7	11/04/2016	Kestrel_K.	10:20	16:20		14:43	G	F	0	320		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: E Temp (°C): 8
7	11/04/2016	Kestrel_K.	10:20	16:20		16:00	G+F	F	0	10		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: E Temp (°C): 8
15	12/04/2016	Kestrel_K.	12:50	18:50		14:54	G	H+F	16	59		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 4
15	12/04/2016	Kestrel_K.	12:50	18:50		16:16	G	H	25	0		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 4
15	12/04/2016	Kestrel_K.	12:50	18:50		16:42	RG+DE+NF4	H	0	80		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 4

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
15	12/04/2016	Kestrel_K.	12:50	18:50		17:27	G	H	5	110		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 4
15	12/04/2016	Kestrel_K.	12:50	18:50		17:35	G	H	0	50		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 4
31	14/04/2016	Kestrel_K.	09:30	15:30		14:18	RG	S+F	0	10		Rain: None Cloud: 2/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 2
31	14/04/2016	Sparrowhawk_SH	09:30	15:30		10:30	CF+F	F		10		Rain: None Cloud: 2/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 2
31	14/04/2016	Sparrowhawk_SH	09:30	15:30	Female	11:18	RG+CF	S+F		35		Rain: None Cloud: 2/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 2
31	14/04/2016	Sparrowhawk_SH	09:30	15:30		11:55	NF4	S+C+F		45		Rain: None Cloud: 2/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 2
30	14/04/2016	White-tailed Eagle_WE	15:45	18:45		15:45	G+NF4	F		12		Rain: Heavy Showers Cloud: 5/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 5
23	16/04/2016	Kestrel_K.	14:00	17:00		14:13	CF	F+P	0	20		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: W Temp (°C): 8
11A	19/04/2016	Buzzard_BZ	16:00	19:00		15:40	F	S+F	0	120		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: E Temp (°C): 4
12	19/04/2016	Kestrel_K.	09:30	15:30		15:00	G	H+F	0	15		Rain: None Cloud: 2/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: var Temp (°C): 2
30	20/04/2016	Kestrel_K.	12:30	15:30		12:35	G	H+F	0	15		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: E Temp (°C): 1
30	20/04/2016	Kestrel_K.	12:30	15:30		12:40	NF2+F	H	0	15		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: E Temp (°C): 1
17	20/04/2016	Kestrel_K.	15:40	18:40		15:45	G+NF4	H	0	25		Rain: None Cloud: 2/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: E Temp (°C): 2
11	21/04/2016	Kestrel_K.	15:10	18:10		15:54	RG	H	0	15		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: N Temp (°C): 8
32	23/04/2016	Kestrel_K.	10:00	16:00		11:43	F	F	3	12		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: N Temp (°C): 1
32	23/04/2016	Kestrel_K.	10:00	16:00		12:13	G	H	0	20		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: N Temp (°C): 1
32	23/04/2016	Kestrel_K.	10:00	16:00		14:17	CF+F	H	0	32		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: N Temp (°C): 1
17	24/04/2016	Kestrel_K.	12:35	15:35		12:55	F	F	0	105		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 8

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
14	24/04/2016	Raven_RN	09:30	12:30		11:18	G+F	F		40		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 8
14	24/04/2016	Raven_RN	09:30	12:30		10:30	F	F		30		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 8
17	24/04/2016	Sparrowhawk_SH	12:35	15:35		12:45	G+F	F		25		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 8
17	24/04/2016	Sparrowhawk_SH	12:35	15:35		13:05	G	F		7		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 8
9	25/04/2016	Kestrel_K.	12:45	18:45		16:50	G+F	F		0	15	Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 7
5	25/04/2016	Raven_RN	08:50	11:50		09:03	F	F		18		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: NW Temp (°C): 8
27	26/04/2016	Kestrel_K.	09:00	15:00		11:00	G	F		0	15	Rain: None Cloud: 3/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 3
27	26/04/2016	Kestrel_K.	09:00	15:00		13:30	G+NF4	F		0	18	Rain: None Cloud: 3/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 3
27	26/04/2016	Kestrel_K.	09:00	15:00		14:07	G+F	H		0	5	Rain: None Cloud: 3/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 3
27	26/04/2016	Raven_RN	09:00	15:00		12:05	NF4+F	F		25		Rain: None Cloud: 3/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 3
27	26/04/2016	Raven_RN	09:00	15:00		14:33	F			30		Rain: None Cloud: 3/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 3
27	26/04/2016	Sparrowhawk_SH	09:00	15:00	Female	14:29	G+NF4	H		22		Rain: None Cloud: 3/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 3
18	30/04/2016	Kestrel_K.	11:00	17:00		13:52	F	H		0	7	Rain: Light Cloud: 8/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 8
18	30/04/2016	Kestrel_K.	11:00	17:00		14:01	NF4	H		0	8	Rain: Light Cloud: 8/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 8
18	30/04/2016	Raven_RN	11:00	17:00		12:57	F	F		20		Rain: Light Cloud: 8/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 8
18	30/04/2016	Raven_RN	11:00	17:00		13:35	F	F		25		Rain: Light Cloud: 8/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 8
18	30/04/2016	Raven_RN	11:00	17:00		13:42	F	F		10		Rain: Light Cloud: 8/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 8
18	30/04/2016	Raven_RN	11:00	17:00		13:55	DE+F	F		15		Rain: Light Cloud: 8/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 8

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
18	30/04/2016	Raven_RN	11:00	17:00		14:22	DE+F	F		10		Rain: Light Cloud: 8/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 8
2	03/05/2016	Sparrowhawk_SH	09:15	15:35	Male	15:20	NF3+NF4	H	7			Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 17
7	08/05/2016	Whimbrel_WM	10:30	17:30		12:50	G+DE+NF4	F		75		Rain: Heavy Showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: SE Temp (°C): 16
23	10/05/2016	Kestrel_K.	11:30	16:30		11:30	CF	F	0	5		Rain: Light Cloud: 4/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: SE Temp (°C): 12.5
27	11/05/2016	Kestrel_K.	12:40	15:40		15:18	G+NF4+F	H+F	10	140		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: calm Temp (°C): 18.5
8	11/05/2016	Kestrel_K.	15:50	18:50		16:20	G	H+F	0	110		Rain: Light Cloud: 7/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: NE Temp (°C): 11.5
12	16/05/2016	Kestrel_K.	09:25	15:25		12:45	G+DE	H+F	0	19		Rain: None Cloud: 8/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: E Temp (°C): 11.5
12	16/05/2016	Kestrel_K.	09:25	15:25		12:56	G+F	H+F	0	205		Rain: None Cloud: 8/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: E Temp (°C): 9.5
21	17/05/2016	Raven_RN	13:45	17:15		17:07	F	F	12	8		Rain: None Cloud: 8/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: E Temp (°C): 13.5
5	18/05/2016	Kestrel_K.	09:25	12:55		11:20	NF3	H+F	0	44		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: NW Temp (°C): 14.5
8	19/05/2016	Kestrel_K.	12:55	15:55		14:55		H+F	0	20		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SW Temp (°C): 14/8
8	19/05/2016	Raven_RN	12:55	15:55		14:17		F		15		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SW Temp (°C): 14/8
30	21/05/2016	Kestrel_K.	13:20	16:20		13:40	NF4	H+F	0	10		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: W Temp (°C): 15.5
17	23/05/2016	Kestrel_K.	09:35	15:35		10:05	G	H	0	20		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: W Temp (°C): 15.5
17	23/05/2016	Raven_RN	09:35	15:35		11:09	F	F		15		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: W Temp (°C): 15.5
31	24/05/2016	Buzzard_BZ	11:25	14:25		11:47	NF4	H+F	0	35		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: S Temp (°C): 12
31	24/05/2016	Buzzard_BZ	11:25	14:25		13:05	F	H+F	0	275		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: S Temp (°C): 18
31	24/05/2016	Kestrel_K.	11:25	14:25		13:07	F	H	0	8		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: S Temp (°C): 18

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
9	24/05/2016	Raven_RN	14:40	17:40		15:03	F	F		8		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SE Temp (°C): 12
9	24/05/2016	Raven_RN	14:40	17:40		15:06	F	F		22		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SE Temp (°C): 12
31	24/05/2016	Raven_RN	11:25	14:25		12:16	F	F		45		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: S Temp (°C): 13.5
31	24/05/2016	Raven_RN	11:25	14:25		12:58	G+F	F		95		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: S Temp (°C): 13
31	24/05/2016	Raven_RN	11:25	14:25		13:41	F	F		55		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: S Temp (°C): 18
32	25/05/2016	Kestrel_K.	09:30	15:30		09:58	DE+F	H		0	96	Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: NE Temp (°C): 15.5
32	25/05/2016	Raven_RN	09:30	15:30		14:03	F	F		39		Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: NE Temp (°C): 18.5
5	28/05/2016	Kestrel_K.	15:15	17:45		15:25	G+DE+NF4	F		0	290	Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: E Temp (°C): 18.5
5	28/05/2016	Kestrel_K.	15:15	17:45		16:14	RG+H	F		0	22	Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: E Temp (°C): 18.5
5	28/05/2016	Kestrel_K.	15:15	17:45		16:45	G+DE+F	F		0	151	Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: E Temp (°C): 18.5
11	28/05/2016	Raven_RN	09:00	15:00		14:36	F	F			195	Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: E Temp (°C): 18.5
23	02/06/2016	Kestrel_K.	08:20	14:20		10:10	NF3	H		0	12	Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: NW Temp (°C): 14.5
3	02/06/2016	Kestrel_K.	14:30	17:30		15:30	NF2	F		0	43	Rain: None Cloud: 2/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: NW Temp (°C): 21.5
3	02/06/2016	Kestrel_K.	14:30	17:30		15:37	NF2	F		0	78	Rain: None Cloud: 2/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: NW Temp (°C): 21.5
30	04/06/2016	Kestrel_K.	08:30	14:30		13:35	G+NF3	S+F		0	46	Rain: None Cloud: 0/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SE Temp (°C): 15.5
30	04/06/2016	Raven_RN	08:30	14:30		10:37	G+DE	F			16	Rain: None Cloud: 0/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SE Temp (°C): 15.5
8	11/06/2016	Kestrel_K.	13:20	16:20		13:40	G+NF3	H		0	14	Rain: None Cloud: 7/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: S Temp (°C): 18.5
8	11/06/2016	Sparrowhawk_SH	13:20	16:20	Female	14:17	G	F			21	Rain: None Cloud: 7/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: S Temp (°C): 18.5

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
14B	14/06/2016	Kestrel_K.	16:00	19:00		16:05	G	F	0	25		Rain: Heavy Showers Cloud: 8/8 Visibility (km): 4 WindSpeed: F3 Wind Direction: NW Temp (°C): 15
5	16/06/2016	Buzzard_BZ	10:00	13:00		09:10	G+NF4	H	0	240		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 12
5	16/06/2016	Kestrel_K.	10:00	13:00		10:21	G	F	0	50		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 12
7	16/06/2016	Kestrel_K.	13:10	16:10		14:25	NF3	H	0	20		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 13
31	21/06/2016	Buzzard_BZ	15:00	18:00		16:20	G+NF1	H	0	325		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: SW Temp (°C): 13.5
17	21/06/2016	Kestrel_K.	08:15	14:15	Female	10:44	F	F	0	30		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 13.5
31	21/06/2016	Kestrel_K.	15:00	18:00		15:40	CF	H	0	12		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: SW Temp (°C): 16
31	21/06/2016	Kestrel_K.	15:00	18:00		15:52	F	F	0	20		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: SW Temp (°C): 13.5
31	21/06/2016	Kestrel_K.	15:00	18:00		15:57	F	H	0	5		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: SW Temp (°C): 13.5
27a	25/06/2016	Buzzard_BZ	09:00	12:00		10:54	F	F	0	210		Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: NW Temp (°C): 12
27a	25/06/2016	Raven_RN	09:00	12:00		12:10	F	F		75		Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: NW Temp (°C): 12
34a	27/06/2016	Kestrel_K.	13:30	16:30		13:53	G+F	F	3	0		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SW Temp (°C): 17.5
34a	27/06/2016	Raven_RN	13:30	16:30		15:54	F	S		40		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SW Temp (°C): 17.5
5	04/07/2016	Kestrel_K.	10:30	16:30		16:10	DE+NF2	F	0	16		Rain: Misty Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: SW Temp (°C): 15
21	05/07/2016	Buzzard_BZ	09:20	15:20		13:59	F	S+F	0	200		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 12.5
21	05/07/2016	Kestrel_K.	09:20	15:20		14:24	G	S+F	0	300		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 12.5
3	06/07/2016	Kestrel_K.	15:40	18:40		18:02	HB+NF2	F+P	0	35		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: SW Temp (°C): 14.5
15	07/07/2016	Buzzard_BZ	12:35	15:35		12:36	G+RG+NF4	S+H	0	18		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 17.5

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
15	07/07/2016	Buzzard_BZ	12:35	15:35		14:26	F	H	0	50		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 17.5
15	07/07/2016	Buzzard_BZ	12:35	15:35		14:42	G+RG	H	0	500		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 17.5
31	07/07/2016	Buzzard_BZ	15:50	18:50		16:14	F	S+H	0	165		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 19.5
15	07/07/2016	Kestrel_K.	12:35	15:35		14:56	G+F	H	0	23		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 17.5
31	07/07/2016	Kestrel_K.	15:50	18:50	Female	17:07	CF+F	S+F	0	44		Rain: None Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 19.5
31	07/07/2016	Kestrel_K.	15:50	18:50	Male	17:30	CF	F	0	12		Rain: None Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 19.5
3	08/07/2016	Kestrel_K.	11:55	14:55		11:50	NF3	H+F	0	190		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 17
31	13/07/2016	Kestrel_K.	13:50	16:50		14:13	CF+F	H+F	0	16		Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: NW Temp (°C): 15
31	13/07/2016	Kestrel_K.	13:50	16:50		14:41	CF+F	F	0	5		Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: NW Temp (°C): 15
31	13/07/2016	Peregrine_PE	13:50	16:50		14:19	CF+F	H+F	0	54		Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: NW Temp (°C): 15
31	13/07/2016	Raven_RN	13:50	16:50		15:05	CF+F	F		15		Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: NW Temp (°C): 15
15	13/07/2016	Sparrowhawk_SH	10:40	13:40		10:52	CF+F	F		7		Rain: Light Cloud: 6/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NW Temp (°C): 15
2	19/07/2016	Kestrel_K.	14:30	17:30		14:35	NF3	H	0	10		Rain: Light Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 20
2	19/07/2016	Kestrel_K.	14:30	17:30		14:40	NF3	H	0	15		Rain: Light Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 20
2	19/07/2016	Kestrel_K.	14:30	17:30		16:20	NF3	H	0	25		Rain: Light Cloud: 4/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 20
12	20/07/2016	Kestrel_K.	09:45	12:45		11:14	RG+F	H	0	5		Rain: None Cloud: 7/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: W Temp (°C): 15
12	20/07/2016	Kestrel_K.	09:45	12:45		11:35	G	H	0	55		Rain: None Cloud: 7/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: W Temp (°C): 15
11	20/07/2016	Kestrel_K.	13:00	16:00		13:00	RG	H	0	45		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 15

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
2	20/07/2016	Kestrel_K.	16:30	19:30		16:41	NF3	H	0	240		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 17.5
2	20/07/2016	Kestrel_K.	16:30	19:30		17:08	NF3	H	0	184		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 17.5
2	20/07/2016	Kestrel_K.	16:30	19:30		17:32	NF3	H	0	20		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 17.5
2	20/07/2016	Kestrel_K.	16:30	19:30		17:47	NF3	H	0	125		Rain: None Cloud: 4/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 17.5
9	23/07/2016	Raven_RN	12:15	16:15		13:19	G			20		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: S Temp (°C): 19
8	23/07/2016	Sparrowhawk_SH	10:10	13:10	Male	12:16	G+F			7		Rain: Misty Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: S Temp (°C): 15
7	25/07/2016	Kestrel_K.	10:00	16:00		11:52	HB+NF1	H	0	47		Rain: Light Cloud: 8/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SW Temp (°C): 14
7	25/07/2016	Kestrel_K.	10:00	16:00		12:51	HB+NF2	H	0	22		Rain: Light Cloud: 8/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SW Temp (°C): 14
7	25/07/2016	Kestrel_K.	10:00	16:00		12:52	HB+NF3	H	0	11		Rain: Light Cloud: 8/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SW Temp (°C): 14
14a	25/07/2016	Kestrel_K.	16:10	19:10		17:50	G+F	H	0	36		Rain: None Cloud: 8/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 17.5
14a	25/07/2016	Kestrel_K.	16:10	19:10		17:59	G+F	H	0	85		Rain: None Cloud: 8/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 17.5
32	28/07/2016	Kestrel_K.	08:00	14:00		11:56	G+F	H	28	139		Rain: Misty Cloud: 7/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: NW Temp (°C): 16.5
34	28/07/2016	Kestrel_K.	14:00	17:40		14:40	G+F	H	12	25		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: NW Temp (°C): 20
2	04/08/2016	Kestrel_K.	09:00	12:00		09:25	NF2	H	0	19		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 15
2	04/08/2016	Kestrel_K.	09:00	12:00		10:28	NF2	H	5	37		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 15
2	04/08/2016	Kestrel_K.	09:00	12:00		10:32	NF2	H+F	0	105		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 15
2	04/08/2016	Kestrel_K.	09:00	12:00		11:24	NF2	H	0	15		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 15
2	04/08/2016	Kestrel_K.	09:00	12:00		11:25	NF2	H	0	70		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 15

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
23	05/08/2016	Kestrel_K.	09:30	15:30		09:25	F	H	0	10		Rain: None Cloud: 7/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 15
23	05/08/2016	Kestrel_K.	09:30	15:30		14:45	CF	H+F	0	71		Rain: None Cloud: 7/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 15
23	05/08/2016	Raven_RN	09:30	15:30		14:16	CF	F		15		Rain: None Cloud: 7/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 15
23	05/08/2016	Raven_RN	09:30	15:30		14:27	CF	F		12		Rain: None Cloud: 7/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SW Temp (°C): 15
21	06/08/2016	Kestrel_K.	09:20	11:50		10:06	G	H	22	0		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 14.5
21	06/08/2016	Kestrel_K.	09:20	11:50		11:45	G	H	10	0		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 14.5
21	07/08/2016	Kestrel_K.	09:30	13:00		11:44	G+NF2	H	0	20		Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 15.5
21	07/08/2016	Kestrel_K.	09:30	13:00		12:15	G	H	0	15		Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 15.5
3	08/08/2016	Kestrel_K.	09:00	15:00		10:34	HB+NF2	H	0	17		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 12.5
2	08/08/2016	Kestrel_K.	15:15	18:15		16:22	NF4+F	F	0	420		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F4 Wind Direction: W Temp (°C): 18.5
2	08/08/2016	Kestrel_K.	15:15	18:15		16:31	NF4+F	F	0	135		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F4 Wind Direction: W Temp (°C): 18.5
3	08/08/2016	Raven_RN	09:00	15:00		12:57	HB+NF2	F		37		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 12.5
3	08/08/2016	Sparrowhawk_SH	09:00	15:00		13:19	HB+NF2	F	9			Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 12.5
12	09/08/2016	Kestrel_K.	10:00	13:00		10:40	NF3+F	H+F	0	53		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 13.5
12	09/08/2016	Kestrel_K.	10:00	13:00		11:10	RG+F	H	0	80		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 13.5
12	09/08/2016	Kestrel_K.	10:00	13:00		12:40	G+DE	H	0	15		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 13.5
12	09/08/2016	Kestrel_K.	10:00	13:00		12:45	G	H	0	30		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 13.5
8	09/08/2016	Kestrel_K.	16:25	19:25		16:40	G	H	0	6		Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: NW Temp (°C): 16.5

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
8	09/08/2016	Kestrel_K.	16:25	19:25		17:06	G	H	0	55		Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: NW Temp (°C): 16.5
8	09/08/2016	Kestrel_K.	16:25	19:25		17:30	G	H	0	35		Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: NW Temp (°C): 16.5
8	09/08/2016	Kestrel_K.	16:25	19:25		17:40	G	H	0	15		Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: NW Temp (°C): 16.5
5	10/08/2016	Kestrel_K.	12:00	15:00		16:54	CF	H	0	10		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 15
12	11/08/2016	Buzzard_BZ	09:30	12:30		11:52	G+F	S+H+F	80	110		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: W Temp (°C): 16.5
12	11/08/2016	Kestrel_K.	09:30	12:30		10:20	G+DE	H	0	27		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: W Temp (°C): 16.5
12	11/08/2016	Kestrel_K.	09:30	12:30		10:22	G+DE	H	0	50		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: W Temp (°C): 16.5
12	11/08/2016	Kestrel_K.	09:30	12:30		10:54	G+DE+F	F	0	65		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: W Temp (°C): 16.5
12	11/08/2016	Kestrel_K.	09:30	12:30		11:03	G	H+F+C	12	66		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: W Temp (°C): 16.5
12	11/08/2016	Kestrel_K.	09:30	12:30		12:17	G+DE	H	0	9		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: W Temp (°C): 16.5
12	11/08/2016	Kestrel_K.	09:30	12:30		12:30	G+DE	H	0	73		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: W Temp (°C): 16.5
9	11/08/2016	Kestrel_K.	15:45	18:45		16:35	G+F	F	0	27		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: W Temp (°C): 18.5
9	11/08/2016	Raven_RN	15:45	18:45		17:56	F	F		15		Rain: None Cloud: 3/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: W Temp (°C): 18.5
15	12/08/2016	Kestrel_K.	10:15	16:15		15:37	G+F	H	0	36		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 14.5
15	12/08/2016	Raven_RN	10:15	16:15		10:42	RG+CF+NF4	F		34		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 14.5
15	12/08/2016	Sparrowhawk_SH	10:15	16:15	Female	14:04	DE+NF1	H+F	12			Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 14.5
30	13/08/2016	Kestrel_K.	09:35	12:35		10:15	G+F		0	11		Rain: None Cloud: 4/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: W Temp (°C): 15.5
17	13/08/2016	Sparrowhawk_SH	12:40	15:40		13:57	G+RG	H	5			Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 17

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
27	18/08/2016	Kestrel_K.	10:30	13:30		11:03	NF4	H+F	0	32		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: W Temp (°C): 14.5
31	20/08/2016	Kestrel_K.	09:20	13:20		09:46	G+CF	H+F	5	75		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: W Temp (°C): 15
31	20/08/2016	Kestrel_K.	09:20	13:20		09:47	CF	H	0	144		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: W Temp (°C): 15
31	20/08/2016	Kestrel_K.	09:20	13:20		13:07	G+CF+NF4	H	0	29		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: W Temp (°C): 15
30	20/08/2016	Kestrel_K.	13:40	16:40		15:19	G+CF+NF4	H	0	28		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: W Temp (°C): 15.5
31	20/08/2016	Raven_RN	09:20	13:20		09:49	F	F		29		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: W Temp (°C): 15
31	20/08/2016	Raven_RN	09:20	13:20		09:54	G+CF+NF4	F		10		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: W Temp (°C): 15
31	20/08/2016	Raven_RN	09:20	13:20		11:54	G+CF+NF4	F		25		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: W Temp (°C): 15
27	22/08/2016	Buzzard_BZ	10:30	13:30		11:50	F	S+F	75	205		Rain: None Cloud: 6/8 Visibility (km): 5+ Wind Speed: F1 Wind Direction: W Temp (°C): 15.5
8	27/08/2016	Raven_RN	15:20	18:20		16:52	G	F		22		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SE Temp (°C): 19.5
8	27/08/2016	Raven_RN	15:20	18:20		17:30	G	F	1080	10		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SE Temp (°C): 19.5
8	27/08/2016	Raven_RN	15:20	18:20		17:48	G	F		25		Rain: None Cloud: 5/8 Visibility (km): 5+ Wind Speed: F3 Wind Direction: SE Temp (°C): 19.5
7	28/08/2016	Kestrel_K.	09:35	15:35		09:45	DE+NF3	F	0	9		Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 15
7	28/08/2016	Kestrel_K.	09:35	15:35		10:26	G	H	250	0		Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 15
7	28/08/2016	Kestrel_K.	09:35	15:35		10:57	G+DE+NF3	F	0	135		Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 15
7	28/08/2016	Kestrel_K.	09:35	15:35		11:32	G+NF3	F	0	120		Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 15
7	28/08/2016	Kestrel_K.	09:35	15:35		11:45	DE+NF3	H	0	35		Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 15
7	28/08/2016	Raven_RN	09:35	15:35		12:40	G	F		150		Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 15

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
7	28/08/2016	Raven_RN	09:35	15:35		14:08	G	F		40		Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 15
7	28/08/2016	Sparrowhawk_SH	09:35	15:35		09:44	DE+NF3	F		12		Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 15
14	29/08/2016	Buzzard_BZ	10:20	16:20		10:54	F	S+F		0	250	Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SE Temp (°C): 17
14	29/08/2016	Raven_RN	10:20	16:20		11:48	G+RG+DE	F		33		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SE Temp (°C): 17
14	29/08/2016	Raven_RN	10:20	16:20		15:08	G+RG+NF4	S+F		57		Rain: None Cloud: 1/8 Visibility (km): 5+ Wind Speed: F2 Wind Direction: SE Temp (°C): 17
34	30/08/2016	Kestrel_K.	10:20	16:20		12:08	G+NF4	H		5	150	Rain: Misty Cloud: 8/8 Visibility (km): 3 Wind Speed: F4 Wind Direction: SSW Temp (°C): 15.5
34	30/08/2016	Kestrel_K.	10:20	16:20		12:45	G+DE+NF4	H		40	420	Rain: Misty Cloud: 8/8 Visibility (km): 3 Wind Speed: F4 Wind Direction: SSW Temp (°C): 15.5
34	30/08/2016	Kestrel_K.	10:20	16:20		12:51	DE	F		18	0	Rain: Misty Cloud: 8/8 Visibility (km): 3 Wind Speed: F4 Wind Direction: SSW Temp (°C): 15.5
34	30/08/2016	Kestrel_K.	10:20	16:20		13:09	G+NF4	H		0	245	Rain: Misty Cloud: 8/8 Visibility (km): 3 Wind Speed: F4 Wind Direction: SSW Temp (°C): 15.5
34	30/08/2016	Kestrel_K.	10:20	16:20		14:24	G	H		0	54	Rain: Misty Cloud: 8/8 Visibility (km): 3 Wind Speed: F4 Wind Direction: SSW Temp (°C): 15.5
34	30/08/2016	Sparrowhawk_SH	10:20	16:20	Female	14:50	G	H		5		Rain: Misty Cloud: 8/8 Visibility (km): 3 Wind Speed: F4 Wind Direction: SSW Temp (°C): 15.5
34	30/08/2016	Sparrowhawk_SH	10:20	16:20	Female	16:00	G	H		4		Rain: Misty Cloud: 8/8 Visibility (km): 3 Wind Speed: F4 Wind Direction: SSW Temp (°C): 15.5
32	31/08/2016	Kestrel_K.	09:20	15:20		09:30	F	P		0	0	Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: 3 Wind Direction: SSW Temp (°C): 14
32	31/08/2016	Kestrel_K.	09:20	15:20		14:40	F	H+F		0	45	Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: 3 Wind Direction: SSW Temp (°C): 14
32	31/08/2016	Sparrowhawk_SH	09:20	15:20		12:05	G	H+F		6		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: 3 Wind Direction: SSW Temp (°C): 14
21	13/09/2016	Kestrel_K.	10:45	16:45		12:16	G	H		35		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 12
21	13/09/2016	Kestrel_K.	10:45	16:45		12:39	G	H		22	0	Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 12
21	13/09/2016	Kestrel_K.	10:45	16:45		12:50	G	H		185		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 12

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
21	13/09/2016	Kestrel_K.	10:45	16:45		13:41	G	H		235		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 12
21	13/09/2016	Kestrel_K.	10:45	16:45		14:44	G	H	87			Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 12
21	13/09/2016	Kestrel_K.	10:45	16:45		15:01	G	H	15	95		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 12
21	13/09/2016	Kestrel_K.	10:45	16:45		15:33	G	H	0	45		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 12
21	13/09/2016	Kestrel_K.	10:45	16:45		15:36	G	H	99			Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 12
21	13/09/2016	Kestrel_K.	10:45	16:45		16:02	G	H		156		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 12
21	13/09/2016	Raven_RN	10:45	16:45		10:46	G	H		8		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 12
21	13/09/2016	Raven_RN	10:45	16:45		16:25	G+F	F		8		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 12
30	14/09/2016	Buzzard_BZ	14:00	17:00		15:40	G	H	0	27		Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
17	14/09/2016	Kestrel_K.	10:30	13:30	Female	12:52	RG	H		80		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 15
30	14/09/2016	Kestrel_K.	14:00	17:00		14:11	G+DE	F		6		Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
30	14/09/2016	Kestrel_K.	14:00	17:00		14:21	G+RG	H		0	70	Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
30	14/09/2016	Kestrel_K.	14:00	17:00		14:35	G+F	F	20	0		Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
30	14/09/2016	Kestrel_K.	14:00	17:00		14:53	RG	H		23		Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
30	14/09/2016	Kestrel_K.	14:00	17:00		15:03	G	H		32		Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
30	14/09/2016	Kestrel_K.	14:00	17:00		15:33	RG	H		24		Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
30	14/09/2016	Kestrel_K.	14:00	17:00		15:35	G+F	F		35		Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
17	14/09/2016	Sparrowhawk_SH	10:30	13:30	Female	12:47	G+DE+F	H+F	20	120		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 15

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
23	16/09/2016	Kestrel_K.	11:00	16:00		11:52	NF3+NF4	H	0	15		Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 13
23	16/09/2016	Kestrel_K.	11:00	16:00		13:55	CF+F	F	0	66		Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 13
23	16/09/2016	Kestrel_K.	11:00	16:00		14:53	DE+CF	F+P	0	22		Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 13
23	16/09/2016	Raven_RN	11:00	16:00		12:26	F	F		20		Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 13
23	16/09/2016	Raven_RN	11:00	16:00		12:34	G+NF4	F		35		Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 13
23	16/09/2016	Sparrowhawk_SH	11:00	16:00	Female	13:55	CF+F	F		10		Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 13
3	17/09/2016	Kestrel_K.	10:00	16:00		13:37	HB+NF1	F+P	0	190		Rain: None Cloud: 3/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
3	17/09/2016	Kestrel_K.	10:00	16:00		13:40	HB+NF1	F		8		Rain: None Cloud: 3/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
3	17/09/2016	Raven_RN	10:00	16:00		14:06	F	F		55		Rain: None Cloud: 3/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
30	19/09/2016	Buzzard_BZ	13:40	16:40		14:10	G	S	30	275		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 17
17	19/09/2016	Kestrel_K.	10:00	13:00		11:04	G	P	0			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 18
17	19/09/2016	Kestrel_K.	10:00	13:00		11:16	F	P	0			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 18
17	19/09/2016	Kestrel_K.	10:00	13:00	Female	11:36	F	F+P	6	0		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 18
30	19/09/2016	Kestrel_K.	13:40	16:40		13:49	G	F+P	12	0		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 17
30	19/09/2016	Kestrel_K.	13:40	16:40	Female	16:02	RG	H		23		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 17
30	19/09/2016	Kestrel_K.	13:40	16:40		16:09	G+RG+F	F	0	35		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 17
7	19/09/2016	Raven_RN	10:20	16:20		10:43	G+F	F		53		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 13
7	19/09/2016	Raven_RN	10:20	16:20		11:10	G+DE+NF4	F		73		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 13

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
7	19/09/2016	Raven_RN	10:20	16:20		12:56	G+DE	F		43		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 13
7	19/09/2016	Raven_RN	10:20	16:20		14:55	G	F	x			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 13
15	20/09/2016	Buzzard_BZ	10:15	13:15		12:06	G+F	S		0	451	Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
15	20/09/2016	Kestrel_K.	10:15	13:15		12:26	RG+F	H		25	450	Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
15	20/09/2016	Kestrel_K.	10:15	13:15		13:01	RG	H+P			12	Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
15	20/09/2016	Kestrel_K.	13:45	16:45		14:10	G	F			27	Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
15	20/09/2016	Kestrel_K.	13:45	16:45		14:16	RG	H		0	182	Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
15	20/09/2016	Kestrel_K.	13:45	16:45		15:00	G	F		5	0	Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
15	20/09/2016	Kestrel_K.	13:45	16:45		15:03	RG	H+P		235		Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
15	20/09/2016	Kestrel_K.	13:45	16:45		15:54	RG	P		400		Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
15	20/09/2016	Kestrel_K.	13:45	16:45		16:30	G	F		0	37	Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
5	20/09/2016	Kestrel_K.	09:40	15:40		10:34	G	F			18	Rain: Light Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 11
15	20/09/2016	Raven_RN	10:15	13:15		12:02	G	F			65	Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
15	20/09/2016	Raven_RN	13:45	16:45		14:12	G	F			77	Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
5	20/09/2016	Raven_RN	09:40	15:40		12:44	G	F			44	Rain: Light Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 11
5	20/09/2016	Raven_RN	09:40	15:40		13:59	G	F			27	Rain: Light Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 11
15	20/09/2016	Sparrowhawk_SH	13:45	16:45		13:50	F	F		20		Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
27	21/09/2016	Raven_RN	16:30	18:30		16:58	F	F			195	Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 13

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
8	22/09/2016	Buzzard_BZ	11:10	17:10		11:50	F	S+F	0	471		Rain: showers Cloud: 5/8 Visibility (km): 19 Wind Speed: F1 Wind Direction: SW Temp (°C): 13
8	22/09/2016	Buzzard_BZ	11:10	17:10		14:10	G+F	S+F		63		Rain: showers Cloud: 5/8 Visibility (km): 19 Wind Speed: F1 Wind Direction: SW Temp (°C): 13
8	22/09/2016	Buzzard_BZ	11:10	17:10		14:50	G+F	S+F		310		Rain: showers Cloud: 5/8 Visibility (km): 19 Wind Speed: F1 Wind Direction: SW Temp (°C): 13
8	22/09/2016	Buzzard_BZ	11:10	17:10		14:50	G+F	S+F		152		Rain: showers Cloud: 5/8 Visibility (km): 19 Wind Speed: F1 Wind Direction: SW Temp (°C): 13
8	22/09/2016	Kestrel_K.	11:10	17:10		11:40	F	F	0	30		Rain: showers Cloud: 5/8 Visibility (km): 19 Wind Speed: F1 Wind Direction: SW Temp (°C): 13
8	22/09/2016	Kestrel_K.	11:10	17:10		11:59	G	H+F	0	30		Rain: showers Cloud: 5/8 Visibility (km): 19 Wind Speed: F1 Wind Direction: SW Temp (°C): 13
8	22/09/2016	Kestrel_K.	11:10	17:10		13:05	G+F	H+F	0	240		Rain: showers Cloud: 5/8 Visibility (km): 19 Wind Speed: F1 Wind Direction: SW Temp (°C): 13
8	22/09/2016	Kestrel_K.	11:10	17:10		14:10	G+RG	H+F	0	5		Rain: showers Cloud: 5/8 Visibility (km): 19 Wind Speed: F1 Wind Direction: SW Temp (°C): 13
8	22/09/2016	Kestrel_K.	11:10	17:10		15:08	F	F	0	13		Rain: showers Cloud: 5/8 Visibility (km): 19 Wind Speed: F1 Wind Direction: SW Temp (°C): 13
2	22/09/2016	Kestrel_K.	08:45	14:45		14:10	NF2+NF3+F	H+F		243		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 9
2	22/09/2016	Kestrel_K.	08:45	14:45		15:28	NF2+NF3+F	H+F	12			Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 9
2	22/09/2016	Kestrel_K.	08:45	14:45		16:11	NF2+NF3	H+F		53		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 9
2	22/09/2016	Raven_RN	08:45	14:45		08:45	NF2+NF3	F		26		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 9
11	23/09/2016	Buzzard_BZ	09:45	15:45		11:50	F	F	9	9		Rain: None Cloud: 8/8 Visibility (km): 17 Wind Speed: F3 Wind Direction: SE Temp (°C): 9
11	23/09/2016	Kestrel_K.	09:45	15:45		10:07	G	H+F	15			Rain: None Cloud: 8/8 Visibility (km): 17 Wind Speed: F3 Wind Direction: SE Temp (°C): 9
11	23/09/2016	Kestrel_K.	09:45	15:45		10:55	F	F	0	5		Rain: None Cloud: 8/8 Visibility (km): 17 Wind Speed: F3 Wind Direction: SE Temp (°C): 9
11	23/09/2016	Kestrel_K.	09:45	15:45		11:00	F	F	13			Rain: None Cloud: 8/8 Visibility (km): 17 Wind Speed: F3 Wind Direction: SE Temp (°C): 9
11	23/09/2016	Kestrel_K.	09:45	15:45		14:07	G+F	H+F	0	20		Rain: None Cloud: 8/8 Visibility (km): 17 Wind Speed: F3 Wind Direction: SE Temp (°C): 9

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
11	23/09/2016	Kestrel_K.	09:45	15:45		14:18	G+F	F		54		Rain: None Cloud: 8/8 Visibility (km): 17 Wind Speed: F3 Wind Direction: SE Temp (°C): 9
11	23/09/2016	Kestrel_K.	09:45	15:45		15:13	G+F	F		30		Rain: None Cloud: 8/8 Visibility (km): 17 Wind Speed: F3 Wind Direction: SE Temp (°C): 9
18	23/09/2016	Kestrel_K.	12:15	17:15		12:45	G+DE	H		15		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 13
18	23/09/2016	Kestrel_K.	12:15	17:15		15:28	G+DE	H		12		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 13
18	23/09/2016	Kestrel_K.	12:15	17:15		15:44	G+DE	H		0	53	Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 13
31	25/09/2016	Buzzard_BZ	14:15	17:15		15:42	F	C+H+F			451	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	10:45	13:45		11:15	CF	F		8		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	10:45	13:45		11:20	CF	F		15		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	10:45	13:45		11:28	CF	F		18		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	10:45	13:45		11:52	F	H		0	26	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	10:45	13:45		12:20	HB+2nd F4	H		31	1200	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	10:45	13:45		12:26	CF	F		12		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	10:45	13:45		12:48	CF+F	F		32	0	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	10:45	13:45		12:54	F	F		0	20	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	10:45	13:45		13:09	CF	F+P		17		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	10:45	13:45		13:17	HB+2nd F4	H			480	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	14:15	17:15		14:53	RG	H			185	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	14:15	17:15		15:15	RG	H+F			10	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
31	25/09/2016	Kestrel_K.	14:15	17:15		15:20	RG	H+F	2	18		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	14:15	17:15		15:55	RG	H+F	0	107		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	14:15	17:15		16:03	F	H+F	0	285		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	14:15	17:15		16:05	RG+F	H	0	105		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	14:15	17:15		16:10	RG	H	0	165		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	14:15	17:15		16:24	RG	H		20		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	14:15	17:15		16:27	HB+2nd F4	F	4			Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	14:15	17:15		16:55	HB+2nd F4	F	0	55		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Kestrel_K.	14:15	17:15		17:04	F	H+F	15	200		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Raven_RN	10:45	13:45		13:42	G+F	F		210		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Raven_RN	14:15	17:15		14:34	F	F		172		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Raven_RN	14:15	17:15		15:08	G+F	C+F		337		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Raven_RN	14:15	17:15		15:33	F	F		35		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Sparrowhawk_SH	10:45	13:45		11:39	F	F		168		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Sparrowhawk_SH	10:45	13:45		12:54	F	F		20		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
31	25/09/2016	Sparrowhawk_SH	14:15	17:15		15:24	CF	F	3			Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
34	26/09/2016	Kestrel_K.	14:25	17:25		15:59	RG+F	H+P	225	105		Rain: Light mist Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 14
34	26/09/2016	Kestrel_K.	14:25	17:25		16:04	RG	H	17			Rain: Light mist Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 14

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
12	27/09/2016	Kestrel_K.	11:10	17:10		13:20	G	H	89	89		Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
12	27/09/2016	Kestrel_K.	11:10	17:10		13:21	G	H	30			Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
12	27/09/2016	Kestrel_K.	11:10	17:10		15:15	G+F	H	0	45		Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
12	27/09/2016	Kestrel_K.	11:10	17:10		15:16	G	H	10	0		Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
12	27/09/2016	Kestrel_K.	11:10	17:10		15:35	RG+F	H	0	27		Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
12	27/09/2016	Kestrel_K.	11:10	17:10		15:35	RG+F	H	0	27		Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
12	27/09/2016	Kestrel_K.	11:10	17:10		15:45	G+RG+F	H+F	0	109		Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
32	27/09/2016	Kestrel_K.	11:30	17:30		13:13	G+NF3	H+F	0	210		Rain: None Cloud: 3/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
32	27/09/2016	Kestrel_K.	11:30	17:30		14:37	G+NF3	H	0	20		Rain: None Cloud: 3/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
34	27/09/2016	Kestrel_K.	08:30	11:30		11:14	G+RG+F	H+P	55	90		Rain: None Cloud: 6/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 11
12	27/09/2016	Raven_RN	11:10	17:10		12:54	G+F	F		217		Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
12	27/09/2016	Raven_RN	11:10	17:10		14:00	G+F	F		56		Rain: None Cloud: 2/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
34	27/09/2016	Sparrowhawk_SH	08:30	11:30		08:49	G+HB	F		13		Rain: None Cloud: 6/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 11
9	28/09/2016	Kestrel_K.	10:00	16:00		11:20	G+F	H+F+P	40	66		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 16
9	28/09/2016	Kestrel_K.	10:00	16:00		13:05	G	H	7	6		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 16
14a	29/09/2016	Kestrel_K.	10:00	16:00		12:56	G+F	F	13	13		Rain: showers Cloud: 7/8 Visibility (km): 16 Wind Speed: F1 Wind Direction: SW Temp (°C): 12

Table 9: Sightings of other species non-breeding season October 2016 – February 2017

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
21	07/10/2016	Kestrel_K.	09:50	15:50		10:55	G	H		10		Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: E Temp (°C): 9
9	10/10/2016	Kestrel_K.	11:20	17:20		14:16	G	H+F		137		Rain: None Cloud: 8/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: E Temp (°C): 12
23	10/10/2016	Kestrel_K.	09:35	15:35		12:07	CF	F		8		Rain: None Cloud: 6/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: E Temp (°C): 11
9	10/10/2016	Raven_RN	11:20	17:20		15:46	F	F		13		Rain: None Cloud: 8/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: E Temp (°C): 12
8	11/10/2016	Buzzard_BZ	10:45	13:45		13:45	F	F		35		Rain: Single shower Cloud: 8/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: SE Temp (°C): 11
12	11/10/2016	Buzzard_BZ	16:30	19:30		17:55	G+F	F		83		Rain: None Cloud: 4/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: SE Temp (°C): 12
3	11/10/2016	Kestrel_K.	09:30	15:30		12:10	HB+NF2	H+F+P		21		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: E Temp (°C): 8
8	11/10/2016	Kestrel_K.	10:45	13:45		11:51	RG	H+F		27		Rain: Single shower Cloud: 8/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: SE Temp (°C): 11
8	11/10/2016	Kestrel_K.	10:45	13:45		13:40	G+F	H+F		0	320	Rain: Single shower Cloud: 8/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: SE Temp (°C): 11
3	11/10/2016	Merlin_ML	09:30	15:30	Female	15:09	HB+NF2	H+P		7	0	Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: E Temp (°C): 8
12	11/10/2016	Raven_RN	16:30	19:30		18:55	G	F		8		Rain: None Cloud: 4/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: SE Temp (°C): 12
8	12/10/2016	Kestrel_K.	16:25	19:25	Female	17:02	G	F		269	0	Rain: None Cloud: 7/8 Visibility (km): 17 Wind Speed: F1 Wind Direction: E Temp (°C): 13
12	12/10/2016	Kestrel_K.	11:00	14:00		11:59	F	H+F		53		Rain: None Cloud: 8/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: E Temp (°C): 11
12	12/10/2016	Kestrel_K.	11:00	14:00		12:40	G+F	F		296		Rain: None Cloud: 8/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: E Temp (°C): 11
12	12/10/2016	Kestrel_K.	11:00	14:00		12:59	G+F	H+F		100	100	Rain: None Cloud: 8/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: E Temp (°C): 11
14a	13/10/2016	Kestrel_K.	11:00	14:00		12:07	F	H+F		0	40	Rain: None Cloud: 3/8 Visibility (km): 16 Wind Speed: F1 Wind Direction: NE Temp (°C): 11

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
7a	13/10/2016	Kestrel_K.	16:00	19:30		16:05	DE+2nd F1/F2	F	8			Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: E Temp (°C): 12
14a	13/10/2016	Raven_RN	11:00	14:00		11:42	F	F	66			Rain: None Cloud: 3/8 Visibility (km): 16 Wind Speed: F1 Wind Direction: NE Temp (°C): 11
14a	13/10/2016	Raven_RN	11:00	14:00		12:20	G+DE	F	33			Rain: None Cloud: 3/8 Visibility (km): 16 Wind Speed: F1 Wind Direction: NE Temp (°C): 11
18	18/10/2016	Kestrel_K.	08:00	13:00		13:00	F+NF4	H	10			Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: E Temp (°C): 8
18	18/10/2016	Raven_RN	08:00	13:00		12:54	G+RG+F	F	50			Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: E Temp (°C): 8
18	18/10/2016	Raven_RN	08:00	13:00		13:30	RG+NF4	F	63			Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: E Temp (°C): 8
27	19/10/2016	Raven_RN	09:00	14:00		10:44	NF4+F	F	61			Rain: None Cloud: 1/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: E Temp (°C): 9
31	20/10/2016	Raven_RN	14:30	19:30		16:50	RG+CF	F+P	3	5		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 11
5	21/10/2016	Raven_RN	11:00	16:00		11:13	G+F	F	11			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 9
5	21/10/2016	Raven_RN	11:00	16:00		11:18	G+F	F		23		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 9
7a	22/10/2016	Kestrel_K.	14:30	17:00		16:50	DE+NF2	H	0	43		Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 13
7a	22/10/2016	Raven_RN	14:30	17:00		15:55	CF+F	F		56		Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 13
30	24/10/2016	Sparrowhawk_SH	12:30	18:30	Female	14:12	G	H+F	27			Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NE Temp (°C): 11
18	25/10/2016	Raven_RN	14:20	15:20		14:25	G	F		13		Rain: None Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: NE Temp (°C): 11
34	27/10/2016	Kestrel_K.	10:00	16:00		10:00	G+RG	F	12	0		Rain: None Cloud: 7/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
34	27/10/2016	Kestrel_K.	10:00	16:00		14:42	G+HB	H		67		Rain: None Cloud: 7/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
34	27/10/2016	Kestrel_K.	10:00	16:00		15:22	G+RG	F	25			Rain: None Cloud: 7/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 12

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
34	27/10/2016	Kestrel_K.	10:00	16:00		15:33	G+RG	H+F	12	310		Rain: None Cloud: 7/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
34	27/10/2016	Raven_RN	10:00	16:00		11:13	G+RG	F	12			Rain: None Cloud: 7/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
31	29/10/2016	Kestrel_K.	15:15	16:15		15:20	F	F	0	12		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: S Temp (°C): 12
18	03/11/2016	Raven_RN	13:30	17:00		14:38	G+F	F		53		Rain: None Cloud: 3/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: N Temp (°C): 9
21	04/11/2016	Kestrel_K.	10:00	13:00		12:37	G+DE	H+F	0	27		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
27	08/11/2016	Buzzard_BZ	14:00	17:00		16:36		F+P	13	14		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: S Temp (°C): 10
27	08/11/2016	Buzzard_BZ	14:00	17:00		16:40		F	0	68		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: S Temp (°C): 10
27	08/11/2016	Raven_RN	14:00	17:00		16:36		F	19	18		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: S Temp (°C): 10
27	08/11/2016	Raven_RN	14:00	17:00		16:40		F		61		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: S Temp (°C): 10
27	08/11/2016	Raven_RN	14:00	17:00		16:49		F		25		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: S Temp (°C): 10
27	08/11/2016	Raven_RN	14:00	17:00		16:50		F		35		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: S Temp (°C): 10
5	09/11/2016	Raven_RN	10:30	16:30		13:35	G+F	F		27		Rain: Heavy Showers Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 8
21	15/11/2016	Kestrel_K.	12:40	15:40		12:45	DE	H	0	335		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 13
21	15/11/2016	Kestrel_K.	12:40	15:40		13:27	G+RG	H+F	0	65		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
21	15/11/2016	Kestrel_K.	12:40	15:40		13:58	G	F+P	85			Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SW Temp (°C): 13
2	22/11/2016	Raven_RN	08:55	14:55		10:06	HB+NF3	F		33		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 1
2	22/11/2016	Raven_RN	08:55	14:55		11:34	F	F		67		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 1

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
7	25/11/2016	Kestrel_K.	12:30	15:30		14:02	G	F+P	0	60		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 3
7	25/11/2016	Kestrel_K.	12:30	15:30		14:06	G	F		68		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 3
34	29/11/2016	Merlin_ML	09:25	15:25						0		Rain: None Cloud: 0/8 Visibility (km): >20 Wind Speed: F1 Wind Direction: E Temp (°C): 4
23	05/12/2016	Kestrel_K.	10:00	15:00		14:27	CF+F	H+F		13		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: SE Temp (°C): 7
27	07/12/2016	Sparrowhawk_SH	13:30	17:00	Male	14:42	G+NF4	F+P	34	33		Rain: Misty Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: SE Temp (°C): 13
9	08/12/2016	Raven_RN	11:00	17:00		11:18	G+F	F		47		Rain: Misty Cloud: 8/8 Visibility (km): <1 Wind Speed: F1 Wind Direction: SE Temp (°C): 9
9	08/12/2016	Raven_RN	11:00	17:00		11:40	G+F	F		21		Rain: Misty Cloud: 8/8 Visibility (km): <1 Wind Speed: F1 Wind Direction: SE Temp (°C): 9
5	12/12/2016	Kestrel_K.	09:30	15:30		10:30	G	F	14	14		Rain: Light Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: SE Temp (°C): 9
30	12/12/2016	Raven_RN	13:50	16:50		15:58	G	F		18		Rain: Light Cloud: 8/8 Visibility (km): 6 Wind Speed: F1 Wind Direction: S Temp (°C): 10
30	12/12/2016	Raven_RN	13:50	16:50		16:05	G	F		17		Rain: Light Cloud: 8/8 Visibility (km): 6 Wind Speed: F1 Wind Direction: S Temp (°C): 10
30	12/12/2016	Raven_RN	13:50	16:50		16:10	G	F		6		Rain: Light Cloud: 8/8 Visibility (km): 6 Wind Speed: F1 Wind Direction: S Temp (°C): 10
17	13/12/2016	Sparrowhawk_SH	11:00	17:00	Female	14:34	RG	F	13			Rain: Light Cloud: 8/8 Visibility (km): <1 Wind Speed: F1 Wind Direction: SE Temp (°C): 7
30	14/12/2016	Raven_RN	10:10	13:10		11:46	G+F	F		58		Rain: None Cloud: 8/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: NW Temp (°C): 7
21	15/12/2016	Peregrine_PE	09:10	12:10		10:02	G+DE	F		74		Rain: None Cloud: 3/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 7
21	15/12/2016	Raven_RN	09:10	12:10		09:38	G+DE	F		56		Rain: None Cloud: 3/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 7
34	16/12/2016	Kestrel_K.	08:45	14:45		13:55	G+DE+F	F		38		Rain: None Cloud: 4/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: N Temp (°C): 6
31	17/12/2016	Buzzard_BZ	08:45	15:20		13:27	HB	F	27	0		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 7

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
31	17/12/2016	Kestrel_K.	08:45	15:20		10:16	HB+NF3+F	F		96		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 7
31	17/12/2016	Kestrel_K.	08:45	15:20		10:33	CF+F	F+P	88			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 7
31	17/12/2016	Kestrel_K.	08:45	15:20		14:19	RG+F	F		8		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 7
31	17/12/2016	Kestrel_K.	08:45	15:20		14:34	HB+NF3+F	F	65	65		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 7
31	17/12/2016	Kestrel_K.	08:45	15:20		14:34	CF+F	F	14			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 7
31	17/12/2016	Sparrowhawk_SH	08:45	15:20		09:45	CF+F	F		55		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 7
31	17/12/2016	Sparrowhawk_SH	08:45	15:20		09:48	G+CF+F	F	5			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 7
31	17/12/2016	Sparrowhawk_SH	08:45	15:20		11:22	F	F		47		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 7
31	17/12/2016	Sparrowhawk_SH	08:45	15:20		11:29	CF+F	F	4			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 7
31	17/12/2016	Sparrowhawk_SH	08:45	15:20		13:56	CF+F	F		53		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 7
32	17/12/2016	Sparrowhawk_SH	10:30	16:30	Female	11:40	G	F+P	80			Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 5
15	18/12/2016	Kestrel_K.	08:40	14:40		10:12	G+RG	F	0	160		Rain: None Cloud: 3/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 2
15	18/12/2016	Kestrel_K.	08:40	14:40		14:16	G+DE	F	28	29		Rain: None Cloud: 3/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 2
18	18/12/2016	Kestrel_K.	08:30	13:00		11:03	RG	H	0	85		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 7
18	18/12/2016	Kestrel_K.	08:30	13:00		11:20	G+RG	H	0	180		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 7
18	18/12/2016	Kestrel_K.	08:30	13:00		11:39	F	F+P		18		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 7
18	18/12/2016	Peregrine_PE	08:30	13:00		11:50	G	F	0	20		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 7

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
18	18/12/2016	Raven_RN	08:30	13:00		11:38	G+F	F		165		Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 7
15	18/12/2016	Sparrowhawk_SH	08:40	14:40		13:46	G+F	F+P	62			Rain: None Cloud: 3/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 2
27	18/12/2016	Sparrowhawk_SH	13:35	16:05	Male	13:35	G+NF3	H	12			Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SE Temp (°C): 8
7	19/12/2016	Kestrel_K.	09:00	15:30		10:36	HB+NF4+F	H	96	95		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		10:54	HB+NF4+F	H		121		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		11:05	NF4+F	F	22	23		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		11:07	HB+NF4+F	F	13	14		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		11:27	F	H	80	80		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		11:34	F	H	0	405		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		11:44	HB+NF4+F	H	28	599		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		13:19	F	H	0	438		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		13:29	HB+F	H	0	478		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		13:40	F	H	0	795		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		13:55	F	H	0	50		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		14:01	G+F	H+F	97	97		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		14:23	F	H	63	63		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		14:50	F	H	13	13		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
7	19/12/2016	Kestrel_K.	09:00	15:30		14:53	HB+NF4+F	H+F		295		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		15:01	F	H+F		78	0	Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Kestrel_K.	09:00	15:30		15:12	HB+NF4+F	H+F		0	310	Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Peregrine_PE	09:00	15:30		11:27	G+F	F		15		Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Sparrowhawk_SH	09:00	15:30		11:05	NF4+F	F		45	22	Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Sparrowhawk_SH	09:00	15:30		11:07	HB+NF4+F	F		14	13	Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
7	19/12/2016	Sparrowhawk_SH	09:00	15:30		11:44	G+F	F		37	37	Rain: Misty Cloud: 4/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 6
21	05/01/2017	Golden Plover_GP	11:30	17:30		15:40	G+DE	F		29		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 7
21	05/01/2017	Golden Plover_GP	11:30	17:30		15:43	G+DE	F		18		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 7
8	05/01/2017	Peregrine_PE	10:00	16:00	Female	14:55	G	F+P		360	0	Rain: None Cloud: 8/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SE Temp (°C): 6
23	08/01/2017	Kestrel_K.	11:30	17:30		14:15	CF+NF3+NF4	H+F		0	35	Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: S Temp (°C): 10
11	09/01/2017	Kestrel_K.	10:00	16:00	Female	10:58	G+F	F		18	18	Rain: Light Cloud: 6/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: W Temp (°C): 6
3	13/01/2017	Kestrel_K.	11:00	17:00		12:15	HB+NF2+NF3	F		14		Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 1
3	13/01/2017	Kestrel_K.	11:00	17:00		13:05	HB+NF2+NF3	F+P		606	18	Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 1
32	20/01/2017	Kestrel_K.	09:15	15:15		13:35	G+HB+DE	F		0	26	Rain: None Cloud: 1/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: E Temp (°C): 4
32	20/01/2017	Peregrine_PE	09:15	15:15		15:02	G+HB+DE	F		3	12	Rain: None Cloud: 1/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: E Temp (°C): 4
2	25/01/2017	Sparrowhawk_SH	13:15	17:15	Female	15:59	HB+NF2	H		28		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: SE Temp (°C): 9

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
18	03/02/2017	Kestrel_K.	09:30	15:30		12:10	RG	F	4			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 4
18	03/02/2017	Kestrel_K.	09:30	15:30		14:35	RG	F	0	8		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 4
18	03/02/2017	Raven_RN	09:30	15:30		14:50	NF4	C+F	4	269		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 4
18	03/02/2017	Raven_RN	09:30	15:30		15:02	NF4	F		180		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 4
18	03/02/2017	Raven_RN	09:30	15:30		15:07	NF4	F		200		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 4
21	05/02/2017	Raven_RN	11:45	17:45		14:03	G+RG+NF4	F		23		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 5
5	07/02/2017	Kestrel_K.	11:00	17:00		14:15	G+DE+FF	F+P		245		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 4
7	08/02/2017	Kestrel_K.	13:15	16:15		15:30	G	F	0	10		Rain: None Cloud: 2/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SE Temp (°C): 9
7	08/02/2017	Kestrel_K.	13:15	16:15		15:47	G+NF2	P	540	0		Rain: None Cloud: 2/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SE Temp (°C): 9
7	08/02/2017	Raven_RN	09:45	12:45		11:39	G	F		40		Rain: None Cloud: 2/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SE Temp (°C): 9
15	09/02/2017	Peregrine_PE	09:30	12:30		12:00	G+RG+FF	F+P	254	53		Rain: Occasional showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 6
15	09/02/2017	Raven_RN	09:30	12:30		10:34	G	F		7		Rain: Occasional showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 6
15	09/02/2017	Sparrowhawk_SH	13:00	16:00		13:49	G	F	1			Rain: Occasional showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 6
23	10/02/2017	Brent Goose_BG	10:45	16:45		16:30	G	F	12			Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 2
23	10/02/2017	Kestrel_K.	10:45	16:45		12:20	NF1+NF2	H		33		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 2
31	10/02/2017	Kestrel_K.	09:30	12:30		12:11	CF	H		431		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 8
31	10/02/2017	Raven_RN	09:30	12:30		11:26	CF+FF	F		49		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 8

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
31	10/02/2017	Raven_RN	09:30	12:30		11:54	F	C+F	66			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 8
34	24/02/2017	Kestrel_K.	08:15	14:15		12:21	G+DE+NF3	F+P	367			Rain: Light Cloud: 7/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 3
34	24/02/2017	Raven_RN	08:15	14:15		11:01	F	C+F	16			Rain: Light Cloud: 7/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 3
34	24/02/2017	Raven_RN	08:15	14:15		11:05	F	C+F	14			Rain: Light Cloud: 7/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 3
12	27/02/2017	Buzzard_BZ	09:30	12:30		11:31	F	S	0	326		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 6
12	27/02/2017	Buzzard_BZ	09:30	12:30		11:53	G+F	S+F	512	0		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 6
12	27/02/2017	Buzzard_BZ	09:30	12:30		12:19	G+F	S	537	0		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 6
12	27/02/2017	Buzzard_BZ	09:30	12:30		12:27	F	F	10	0		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 6
12	27/02/2017	Kestrel_K.	09:30	12:30		11:18	RG+G	F	0	283		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 6
12	27/02/2017	Kestrel_K.	13:00	16:00		13:22	G+F	F		327		Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 6
12	27/02/2017	Peregrine_PE	09:30	12:30		12:10	G	F	41			Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 6
32	27/02/2017	Raven_RN	09:45	15:45		11:17	F	F		48		Rain: Heavy Showers Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 3
12	27/02/2017	Sparrowhawk_SH	13:00	16:00		14:05	G+RG	P	571			Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 6
32	27/02/2017	Sparrowhawk_SH	09:45	15:45		13:13	F	C+D		63		Rain: Heavy Showers Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 3
11	28/02/2017	Merlin_ML	09:00	15:00	Male	14:00	G	F	10			Rain: Light Cloud: 4/8 Visibility (km): 16 Wind Speed: F2 Wind Direction: NW Temp (°C):

Table 10: Sightings of other species breeding season March 2017 – September 2017

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
5	02/03/2017	Kestrel_K.	10:00	16:00		13:11	RG+NF4	H	18	0		Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 3
5	02/03/2017	Raven_RN	10:00	16:00		11:35	NF4	F	36			Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 3
18	09/03/2017	Kestrel_K.	10:40	13:40		12:58	G	H	0	125		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 11
18	09/03/2017	Kestrel_K.	10:40	13:40		13:24	G	H	0	68		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 11
18	09/03/2017	Kestrel_K.	10:40	13:40		14:02	G	H	6	30		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 11
21	12/03/2017	Goshawk	14:20	17:20		14:34	G+NF4	H+F+P	2	12		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 11
2	04/04/2017	Merlin_ML	09:00	12:00	Female	11:09	NF2	H	5	0		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 8
3	04/04/2017	Merlin_ML	12:00	15:00	Female	12:00	NF3	H	3	0		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 10
18	08/04/2017	Kestrel_K.	10:00	13:00		12:40	G+DE	H	0			Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
18	08/04/2017	Kestrel_K.	10:00	13:00		13:05	G+DE	H	0			Rain: None Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
27	08/04/2017	Kestrel_K.	13:05	16:05		13:40	G	H		22		Rain: None Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 14
7	10/04/2017	Buzzard_BZ	14:45	17:45		16:56	NF4	S+F	0	75		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
5	10/04/2017	Kestrel_K.	08:40	14:40		11:30	G	H+F	0	18		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 7
5	10/04/2017	Sparrowhawk_SH	08:40	14:40		11:05	HB+NF3	H+F		230		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 7
9	12/04/2017	Kestrel_K.	13:00	16:00		15:36	G+F	H+F	18	19		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 11
9	12/04/2017	Sparrowhawk_SH	09:30	12:30		11:53	G+F	F	6			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 11

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
9	12/04/2017	Sparrowhawk_SH	13:00	16:00		15:57	G+CF	S+F+P	208			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 11
8	13/04/2017	Goshawk	12:45	15:45		15:45	G+RG+2nd F4	F	0	310		Rain: Misty Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 10
8	13/04/2017	Kestrel_K.	09:15	12:15		11:45	G+F	F	0	223		Rain: Misty Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 10
8	13/04/2017	Peregrine_PE	09:15	12:15		12:06	G+RG+F	F	0	247		Rain: Misty Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 10
23	14/04/2017	Kestrel_K.	15:30	18:30		17:32	NF1	H+P	360	14		Rain: Misty Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: W Temp (°C): 10
15	14/04/2017	Sparrowhawk_SH	09:00	12:00		11:36	F	F		280		Rain: Heavy Showers Cloud: 6/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
12	15/04/2017	Goshawk	11:30	17:30		13:06	G+F	F		505		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 9
12	15/04/2017	Raven_RN	11:30	17:30		13:17	G+F	F		73		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 9
12	15/04/2017	Raven_RN	11:30	17:30		13:04	G	F		32		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 9
11	16/04/2017	Goshawk	10:00	16:00		14:15	RG	F+P	7	19		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
11	16/04/2017	Kestrel_K.	10:00	16:00		12:00	CF	H	0	35		Rain: None Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
7	18/04/2017	Buzzard_BZ	11:45	14:45		14:20	NF3	F	0	24		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 10
34	19/04/2017	Kestrel_K.	09:00	15:00		13:18	G+HB+F	H	0	48		Rain: None Cloud: 3/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: W Temp (°C): 9
34	19/04/2017	Kestrel_K.	09:00	15:00		13:28	F	H	0	48		Rain: None Cloud: 3/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: W Temp (°C): 9
32	20/04/2017	Buzzard_BZ	10:00	16:00		12:57	G+F	S	0	454		Rain: None Cloud: 3/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: W Temp (°C): 12
32	20/04/2017	Raven_RN	10:00	16:00		12:36	G+F	S+F		173		Rain: None Cloud: 3/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: W Temp (°C): 12
30	24/04/2017	Raven_RN	10:00	16:00		11:25	F	C+F		86		Rain: None Cloud: 8/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: NW Temp (°C): 9

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
5	07/06/2017	Kestrel_K	07:40	10:40		09:11	F	F	0	10		Rain: Heavy Showers Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 11
8	08/06/2017	Sparrowhawk_SH	10:45	16:45		16:08	G	H+F	5			Rain: Light Cloud: 7/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
11	12/06/2017	Kestrel_K.	12:00	18:00		12:45	F	F	0	15		Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: SW Temp (°C): 13
32	20/06/2017	Buzzard_BZ	08:35	14:35		10:10	G+RG+NF3	F		24		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 17
32	20/06/2017	Kestrel_K.	08:35	14:35		13:01	RG+HB	F	0	18		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 17
34	21/06/2017	Sparrowhawk_SH	08:30	14:30		12:48	G+HB+DE	H	21			Rain: None Cloud: 6/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
35	27/06/2017	Buzzard_BZ	11:05	17:05		16:20	F	C+F		81		Rain: None Cloud: 6/8 Visibility (km): 20 Wind Speed: F1 Wind Direction: S Temp (°C): 15
23	28/06/2017	Buzzard_BZ	11:15	17:15		11:33	NF1			375		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 15
3	01/07/2017	Kestrel_K.	10:45	16:45		15:06	NF3		0	46		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
3	01/07/2017	Kestrel_K.	10:45	16:45		16:05	NF3		0	19		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
3	01/07/2017	Raven_RN	10:45	16:45		12:45	F			180		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
3	01/07/2017	Raven_RN	10:45	16:45		13:27	F			240		Rain: None Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
1	05/07/2017	Kestrel_K.	11:05	15:05		11:01	HB+NF2+NF3	H+F	71	0		Rain: None Cloud: 7/8 Visibility (km): 5 Wind Speed: f1 Wind Direction: W Temp (°C): 16
13	17/07/2017	Kestrel_K.	09:30	15:30		09:20	CF+NF4	F		12		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: N Temp (°C): 15
13	17/07/2017	Kestrel_K.	09:30	15:30		09:35	NF4	F		9		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: N Temp (°C): 15
13	17/07/2017	Kestrel_K.	09:30	15:30		10:15	NF4	F	14	0		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: N Temp (°C): 15
13	17/07/2017	Kestrel_K.	09:30	15:30		11:25	NF3+NF4	D+F	2	23		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: N Temp (°C): 15

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
13	17/07/2017	Kestrel_K.	09:30	15:30		12:54	NF3+NF4	H+F	8	74		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: N Temp (°C): 15
13	17/07/2017	Kestrel_K.	09:30	15:30		12:57	NF4	H+F	83	0		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: N Temp (°C): 15
13	17/07/2017	Kestrel_K.	09:30	15:30		13:40	NF4	H+F	5	23		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: N Temp (°C): 15
13	17/07/2017	Kestrel_K.	09:30	15:30		14:27	NF4	F	15	0		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: N Temp (°C): 15
14	17/07/2017	Kestrel_K.	15:15	16:30		16:10	HB	H+F+P	14			Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: N Temp (°C): 16
14	17/07/2017	Kestrel_K.	15:15	16:30		16:10	NF4	H+F	0	5		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: N Temp (°C): 16
11	18/07/2017	Kestrel_K.	09:30	15:30		13:45	NF3+NF4	F	8	0		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 15
11	18/07/2017	Kestrel_K.	09:30	15:30		14:30	NF3+NF4	H+F	11	0		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 15
11	18/07/2017	Kestrel_K.	09:30	15:30		15:09	CF+NF3+NF4	H+F	55			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 15
10	21/07/2017	Kestrel_K.	09:00	15:00		11:11	NF3+NF4	H+F	25	36		Rain: none Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
10	21/07/2017	Kestrel_K.	09:00	15:00		12:00	RG+NF3+2nd F1/F2	H+F	156			Rain: none Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
10	21/07/2017	Raven_RN	09:00	15:00		10:42	RG+CF+NF3+NF4	F		45		Rain: none Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
4	24/07/2017	Goshawk	08:45	14:45		11:30	G+NF4	F	25			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: f3 Wind Direction: W Temp (°C): 15
4	24/07/2017	Kestrel_K.	08:45	14:45		12:14	G	H+F	7			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: f3 Wind Direction: W Temp (°C): 15
4	24/07/2017	Raven_RN	08:45	14:45		12:26	G+NF3+NF4	F	6	20		Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: f3 Wind Direction: W Temp (°C): 15
12	26/07/2017	Kestrel_K.	16:00	17:00		16:19	NF3+NF4	F		5		Rain: Occasional showers Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: W Temp (°C): 16
14	26/07/2017	Kestrel_K.	12:15	15:30		12:15	2nd F1/F2	H+F	14			Rain: none Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: W Temp (°C): 16

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
14	26/07/2017	Raven_RN	12:15	15:30		14:10	NF3+NF4	F	8			Rain: none Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: W Temp (°C): 16
12	27/07/2017	Kestrel_K.	11:30	16:30		13:40	NF3+NF4	F	6	0		Rain: none Cloud: 6/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: W Temp (°C): 15
7	31/07/2017	Buzzard_BZ	08:55	14:55		09:21	CF	F	20			Rain: Heavy Showers Cloud: 7/8 Visibility (km): 30 Wind Speed: F 1 Wind Direction: SW Temp (°C): 15
7	31/07/2017	Peregrine_PE	08:55	14:55		13:29	CF	P	6360	0		Rain: Heavy Showers Cloud: 7/8 Visibility (km): 30 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
7	13/08/2017	Goshawk	11:00	17:00		11:40	NF4+2nd F1/F2	F	9	14		Rain: Heavy Showers Cloud: 2/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 17
7	13/08/2017	Goshawk	11:00	17:00		15:20	G+NF1+NF3	F	18	0		Rain: Heavy Showers Cloud: 2/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 17
7	13/08/2017	Kestrel_K.	11:00	17:00		11:16	NF4+2nd F1/F2	F	11	0		Rain: Heavy Showers Cloud: 2/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 17
7	13/08/2017	Kestrel_K.	11:00	17:00		13:05	G+NF3	H+F+P	300	16		Rain: Heavy Showers Cloud: 2/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 17
7	13/08/2017	Kestrel_K.	11:00	17:00		15:03	G+NF3+NF4	F	8			Rain: Heavy Showers Cloud: 2/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 17
1	15/08/2017	Kestrel_K.	08:50	14:00		12:46	HB+NF2+NF4	F	8	0		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
1	15/08/2017	Kestrel_K.	08:50	14:00		14:07	NF3+NF4	F+P	14	0		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SW Temp (°C): 13
4	18/08/2017	Kestrel_K.	11:00	17:00		11:43	RG+NF4	F	0	14		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SW Temp (°C): 13
4	18/08/2017	Kestrel_K.	11:00	17:00		12:28	NF4+F	H		23		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SW Temp (°C): 13
4	18/08/2017	Kestrel_K.	11:00	17:00		12:26	NF4	H		10		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SW Temp (°C): 13
4	18/08/2017	Kestrel_K.	11:00	17:00		13:48	RG+GO	H		15		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SW Temp (°C): 13
4	18/08/2017	Kestrel_K.	11:00	17:00		15:26	RG+GO	H+F	80	265		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SW Temp (°C): 13
8	19/08/2017	Buzzard_BZ	11:00	17:00		14:08	G+F	C+F	10			Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: W Temp (°C): 15

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
8	19/08/2017	Kestrel_K.	11:00	17:00		13:12	G	H	0	75		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: W Temp (°C): 15
8	19/08/2017	Kestrel_K.	11:00	17:00		14:53	F	H	7	0		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: W Temp (°C): 15
9	25/08/2017	Buzzard_BZ	07:02	10:02		09:37	G+NF4	S+F		180		Rain: Dry Cloud: 5/8 Visibility (km): 30 Wind Speed: F1 Wind Direction: W Temp (°C): 12°
6	29/08/2017	Buzzard_BZ	11:51	17:51		14:21	G+NF4+2nd F4	F	6	715		Rain: Single shower Cloud: 6/8 Visibility (km): 30 Wind Speed: F 1 Wind Direction: W Temp (°C): 15°
6	29/08/2017	Buzzard_BZ	11:51	17:51		14:29	G+2nd F4	S+C		55		Rain: Single shower Cloud: 6/8 Visibility (km): 30 Wind Speed: F 1 Wind Direction: W Temp (°C): 15°
12	31/08/2017	Buzzard_BZ	15:30	18:30		16:47	G+F	S+C+F		37		Rain: None Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 12
2	31/08/2017	Raven_RN	12:25	15:25		14:03	G	S+C+F		115		Rain: Single shower Cloud: 7/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
11	01/09/2017	Kestrel_K.	14:00	17:00		14:00	CF	H+F+P	28	37		Rain: None Cloud: 3/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 17
11	01/09/2017	Kestrel_K.	14:00	17:00		16:00	CF+F	H+F	40			Rain: None Cloud: 3/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 17
14	01/09/2017	Kestrel_K.	10:00	14:00		11:19	HB	H+F		28		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
14	01/09/2017	Kestrel_K.	10:00	14:00		11:20	HB	H+F	113			Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
14	01/09/2017	Kestrel_K.	10:00	14:00		11:40	HB+NF3+F	H+F	45	315		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
14	01/09/2017	Kestrel_K.	10:00	14:00		11:49	HB+F	H+F	95	5		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
14	01/09/2017	Kestrel_K.	10:00	14:00		12:22	HB+F	H+F	75			Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
14	01/09/2017	Kestrel_K.	10:00	14:00		13:58	HB	F	17	33		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
11	01/09/2017	Peregrine_PE	14:00	17:00		14:18	CF+F	F	6	0		Rain: None Cloud: 3/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 17
14	01/09/2017	Peregrine_PE	10:00	14:00		12:42	HB	F	0	90		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 11

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
14	01/09/2017	Raven_RN	10:00	14:00		12:29	HB	F+P	17			Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
14	01/09/2017	Raven_RN	10:00	14:00		12:31	HB+F	F	18			Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
14	01/09/2017	Raven_RN	10:00	14:00		12:37	HB	F		60		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
14	01/09/2017	Raven_RN	10:00	14:00		12:42	HB	F		115		Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
14	01/09/2017	Raven_RN	10:00	14:00		12:01	HB	P	300			Rain: None Cloud: 1/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
11	02/09/2017	Kestrel_K.	09:20	10:20		09:30	2nd F1/F2+F	F	7			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: S Temp (°C): 12
14	02/09/2017	Kestrel_K.	10:30	12:30		11:18	RG+F	H+F	50	0		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: S Temp (°C): 12
14	02/09/2017	Raven_RN	10:30	12:30		11:50	RG	F	15			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: S Temp (°C): 12
14	02/09/2017	Raven_RN	10:30	12:30		12:10	RG+NF4	F	15			Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: S Temp (°C): 12

Table 11: Sightings of other species non-breeding season October 2017 – February 2018

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
4	04/10/2017	Kestrel_K.	10:00	16:00		11:33	G+NF4	F	40	0		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 11
6	05/10/2017	Raven_RN	10:30	16:30		12:00	G+NF4	F		22		Rain: None Cloud: 5/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 12
8	09/10/2017	Kestrel_K.	13:30	16:30		13:50	G+RG	H+F	30			Rain: Dry Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: SW Temp (°C): 13
8	09/10/2017	Kestrel_K.	13:30	16:30		15:37	G+RG+F	F	20			Rain: Dry Cloud: 8/8 Visibility (km): 4 Wind Speed: F7 Wind Direction: SW Temp (°C): 13
8	09/10/2017	Raven_RN	13:30	16:30		13:30	G	F		25		Rain: Dry Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 13
8	09/10/2017	Raven_RN	13:30	16:30		13:43	G	F		71		Rain: Dry Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
8	09/10/2017	Raven_RN	13:30	16:30		14:10	G	F	84			Rain: Dry Cloud: 8/8 Visibility (km): 4 Wind Speed: F5 Wind Direction: SW Temp (°C): 13
8	09/10/2017	Raven_RN	13:30	16:30		14:45	RG+F	S+F		83		Rain: Dry Cloud: 8/8 Visibility (km): 4 Wind Speed: F6 Wind Direction: SW Temp (°C): 13
9	11/10/2017	Buzzard_BZ	11:00	17:30		13:45	G	C+F	45			Rain: None Cloud: 0/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 13
9	11/10/2017	Jay_J	11:00	17:30		12:20	G	F	10			Rain: None Cloud: 0/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 13
9	11/10/2017	Jay_J	11:00	17:30		12:24	G	F+P	146			Rain: None Cloud: 0/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 13
9	11/10/2017	Jay_J	11:00	17:30		12:31	G	F	20			Rain: None Cloud: 0/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 13
9	11/10/2017	Jay_J	11:00	17:30		12:40	G	F+P	46			Rain: None Cloud: 0/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 13
1	17/10/2017	Raven_RN	15:30	18:30		18:00	2nd F1/F2+2nd F3+F	F		28		Rain: Dry Cloud: 3/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 13
1	17/10/2017	Raven_RN	16:30	19:30		18:01	HB+NF2	F	22			Rain: Dry Cloud: 3/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 13
1	17/10/2017	Raven_RN	17:30	20:30		18:30	HB+NF2	F	35			Rain: Dry Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
13	22/10/2017	Raven_RN	11:00	17:00		11:00	CF	F		70		Rain: dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: S Temp (°C): 9

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
5	23/10/2017	Buzzard_BZ	11:45	17:45		14:28	G+F	S+D+H+F		417		Rain: Dry Cloud: 7/8 Visibility (km): 4 Wind Speed: F5 Wind Direction: S Temp (°C): 14
5	23/10/2017	Goshawk	11:45	17:45		12:44	RG+NF4	H+F		9	0	Rain: Dry Cloud: 7/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: S Temp (°C): 14
5	23/10/2017	Kestrel_K.	11:45	17:45		14:25	RG+NF4+2nd F1/F2	D+H+F		177		Rain: Dry Cloud: 7/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: S Temp (°C): 14
5	23/10/2017	Kestrel_K.	11:45	17:45		15:29	G+DE+GO	F		4		Rain: Dry Cloud: 7/8 Visibility (km): 4 Wind Speed: F6 Wind Direction: S Temp (°C): 14
5	23/10/2017	Kestrel_K.	11:45	17:45		15:51	RG+NF4	P		160		Rain: Dry Cloud: 7/8 Visibility (km): 4 Wind Speed: F7 Wind Direction: S Temp (°C): 14
5	23/10/2017	Raven_RN	11:45	17:45		12:35	G+NF4+F	S+C+F		125		Rain: Dry Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 14
14	24/10/2017	Golden Plover_GP	10:00	13:00		10:35	HB+2nd F1/F2	F		11	33	Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
14	24/10/2017	Golden Plover_GP	10:00	13:00		11:29	HB	F		62		Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F10 Wind Direction: SW Temp (°C): 13
11	24/10/2017	Kestrel_K.	13:15	16:15		13:15	2nd F1/F2	F		25		Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 11
14	24/10/2017	Peregrine_PE	10:00	13:00		10:35	HB+NF2	H+F		12	25	Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 13
14	24/10/2017	Peregrine_PE	10:00	13:00		11:59	HB+NF2	F		14		Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F10 Wind Direction: SW Temp (°C): 13
11	24/10/2017	Raven_RN	13:15	16:15		13:14	2nd F1/F2	F		35		Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 11
11	24/10/2017	Raven_RN	13:15	16:15		13:29	2nd F1/F2	F		10		Rain: Light Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 11
7	31/10/2017	Kestrel_K.	10:00	16:00		11:53	G+DE+2nd F1/F2	H+P		45		Rain: Dry Cloud: 4/8 Visibility (km): 4 Wind Speed: F6 Wind Direction: NW Temp (°C): 8
7	31/10/2017	Kestrel_K.	10:00	16:00		12:00	G+DE	H		35		Rain: Dry Cloud: 4/8 Visibility (km): 4 Wind Speed: F7 Wind Direction: NW Temp (°C): 8
7	31/10/2017	Kestrel_K.	10:00	16:00		12:26	G+NF1+NF3	H		32		Rain: Dry Cloud: 4/8 Visibility (km): 4 Wind Speed: F8 Wind Direction: NW Temp (°C): 8
2	02/11/2017	Raven_RN	09:00	15:00		10:25	RG+2nd F1/F2	F		24		Rain: Dry Cloud: 7/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: NE Temp (°C): 9
1	03/11/2017	Kestrel_K.	09:00	15:00		09:48	NF3	F		18		Rain: Dry Cloud: 6/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NE Temp (°C): 7

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
1	03/11/2017	Raven_RN	09:00	15:00		12:55	NF3+NF4+2nd F3+F	D+F	15	60		Rain: Dry Cloud: 6/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NE Temp (°C): 7
1	03/11/2017	Sparrowhawk_SH	09:00	15:00	Female	14:10	HB+NF2+F	H+F	20			Rain: Dry Cloud: 6/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NE Temp (°C): 7
8	04/11/2017	Kestrel_K.	09:40	13:10		11:20	G	H+F	62			Rain: Single shower Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 7
8	04/11/2017	Raven_RN	09:40	13:10		12:33	NF4+F	S+D+F		187		Rain: Single shower Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 7
6	07/11/2017	Kestrel_K.	10:40	16:40	Female	15:30	NF4	F	23			Rain: None Cloud: 2/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: W Temp (°C): 5
6	07/11/2017	Kestrel_K.	10:40	16:40	Female	16:18	NF4	F	5	35		Rain: None Cloud: 2/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: W Temp (°C): 5
10	08/11/2017	Raven_RN	09:15	15:15		14:04	G+NF4	F		40		Rain: None Cloud: 4/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: W Temp (°C): 5
8	08/11/2017	Sparrowhawk_SH	14:30	17:30		16:22	G	F	8			Rain: Misty Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: W Temp (°C): 9
12	13/11/2017	Kestrel_K.	12:30	15:00	Female	13:59	DE+NF4	F+P	100			Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 9
12	13/11/2017	Raven_RN	12:30	15:00		14:47	G+NF4	F	20			Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 9
12	13/11/2017	Sparrowhawk_SH	12:30	15:00		13:10	DE+NF4	F	5			Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 9
9	14/11/2017	Buzzard_BZ	10:50	14:50		14:45	G+NF4	C+H+F	210			Rain: Light mist clearing Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: W Temp (°C): 12
9	14/11/2017	Jay_J	10:50	14:50		12:09	G	F	15			Rain: Light mist clearing Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: W Temp (°C): 12
4	16/11/2017	Buzzard_BZ	09:00	15:00		10:41	G+RG+HB+NF4	D+F	84			Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
4	16/11/2017	Kestrel_K.	09:00	15:00		10:26	G	H+F	33			Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
4	16/11/2017	Kestrel_K.	09:00	15:00		11:16	G+RG+GO	H	19	154		Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
4	16/11/2017	Kestrel_K.	09:00	15:00		11:41	G+F	F+P	200			Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
4	16/11/2017	Kestrel_K.	09:00	15:00		11:45	G+RG+GO	H	112	219		Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
4	16/11/2017	Kestrel_K.	09:00	15:00		12:35	RG+GO+NF4	H		90		Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
4	16/11/2017	Kestrel_K.	09:00	15:00		13:40	RG+NF4	H		240		Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
4	16/11/2017	Kestrel_K.	09:00	15:00		14:12	RG+GO+NF4	H		168		Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
4	16/11/2017	Kestrel_K.	09:00	15:00		14:26	RG	F		33		Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
13	24/11/2017	Merlin_ML	11:00	17:00	Female	11:00	CF+F	F+P		5		Rain: Heavy Showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 3
11	27/11/2017	Kestrel_K.	10:30	16:30		14:00	NF1	F+P		27	11	Rain: Heavy Showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: NW Temp (°C): 5
11	27/11/2017	Kestrel_K.	10:30	16:30		14:52	2nd F1/F2	H+F		300	30	Rain: Heavy Showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: NW Temp (°C): 5
11	27/11/2017	Raven_RN	10:30	16:30		12:08	NF3+2nd F1/F2	F		19	10	Rain: Heavy Showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: NW Temp (°C): 5
11	27/11/2017	Raven_RN	10:30	16:30		12:10	NF3+2nd F1/F2	F+P		24		Rain: Heavy Showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: NW Temp (°C): 5
	29/11/2017	Cormorant_CA	08:30	14:00		12:03				>60		Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: N Temp (°C): 1
	29/11/2017	Grey Heron_H.	08:30	14:00		12:18				>60		Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: N Temp (°C): 1
	29/11/2017	Grey Heron_H.	08:30	14:00		13:50	G			30		Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: N Temp (°C): 1
14	29/11/2017	Kestrel_K.	15:00	16:00		15:30	HB+F	H		63		Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: N Temp (°C): 3
	29/11/2017	Little Grebe_LG	08:30	14:00		14:30						Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: N Temp (°C): 1
	29/11/2017	Mallard_MA	08:30	14:00		11:07		F		10		Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: N Temp (°C): 1
14	29/11/2017	Raven_RN	15:00	16:00		15:40	HB+F	F		46		Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: N Temp (°C): 3
14	29/11/2017	Raven_RN	15:00	16:00		15:41	HB+F	F		38		Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: N Temp (°C): 3
	29/11/2017	Teal_T.	08:30	14:00		14:30	G+GO	F+P		30		Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: N Temp (°C): 1

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
2	02/12/2017	Kestrel_K.	10:00	16:00		11:05	G	F	24			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 4
2	02/12/2017	Kestrel_K.	10:00	16:00		11:24	G+RG	H	18			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 4
2	02/12/2017	Kestrel_K.	10:00	16:00		13:43	G+RG	H+F	145	25		Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 4
2	02/12/2017	Kestrel_K.	10:00	16:00		15:05	G+RG+HB	H	50			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 4
2	02/12/2017	Mallard_MA	10:00	16:00		15:36	G	F	55			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 4
2	02/12/2017	Raven_RN	10:00	16:00		12:58	G	F+P	206			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 4
2	02/12/2017	Raven_RN	10:00	16:00		13:54	G+RG+HB	F+P				Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 4
2	02/12/2017	Raven_RN	10:00	16:00		15:55	RG+HB	F	42			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 4
13	08/12/2017	Kestrel_K.	11:00	17:00		13:13	2nd F1/F2	H+F	22			Rain: Single shower Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: N Temp (°C): 4
13	08/12/2017	Kestrel_K.	11:00	17:00		13:32	2nd F1/F2	F	7			Rain: Single shower Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: N Temp (°C): 4
13	08/12/2017	Kestrel_K.	11:00	17:00		15:30	2nd F1/F2	F+P	15			Rain: Single shower Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: N Temp (°C): 4
13	08/12/2017	Raven_RN	11:00	17:00		14:00	F	F	5			Rain: Single shower Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: N Temp (°C): 4
7	11/12/2017	Sparrowhawk_SH	09:30	15:30	Male	11:05	2nd F1/F2+F	F+P	105			Rain: none Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 1
7	11/12/2017	Sparrowhawk_SH	09:30	15:30	Female	11:06	2nd F1/F2+2nd F3+F	F	44			Rain: none Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 1
5	14/12/2017	Sparrowhawk_SH	11:00	17:00	Male	11:16	RG+NF4	F	23			Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 3
5	14/12/2017	Sparrowhawk_SH	11:00	17:00	Male	15:31	G	F	8			Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 3
10	19/12/2017	Kestrel_K.	09:00	15:00			G	F	3			Rain: Light Cloud: 8/8 Visibility (km): <1 Wind Speed: F1 Wind Direction: SW Temp (°C): 10
10	19/12/2017	Kestrel_K.	09:00	15:00			G	F	3			Rain: Light Cloud: 8/8 Visibility (km): <1 Wind Speed: F1 Wind Direction: SW Temp (°C): 10

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
10	19/12/2017	Raven_RN	09:00	15:00		10:52	G	F		8		Rain: Light Cloud: 8/8 Visibility (km): <1 Wind Speed: F1 Wind Direction: SW Temp (°C): 10
10	19/12/2017	Raven_RN	09:00	15:00		11:20	G	S+F		10		Rain: Light Cloud: 8/8 Visibility (km): <1 Wind Speed: F1 Wind Direction: SW Temp (°C): 10
14	22/12/2017	Kestrel_K.	10:00	16:00		13:30	G+RG+GO	F		11		Rain: Light mist clearing Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
14	22/12/2017	Kestrel_K.	10:00	16:00		15:24	NF2+NF3	F+P		8		Rain: Light mist clearing Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
8	23/12/2017	Kestrel_K.	13:45	16:45		14:36	G+RG+GO	H		14		Rain: none Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
8	23/12/2017	Kestrel_K.	13:45	16:45		14:44	G	H+P		252		Rain: none Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
8	23/12/2017	Kestrel_K.	13:45	16:45		15:13	GO	H		3		Rain: none Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
8	23/12/2017	Kestrel_K.	13:45	16:45		16:16	G	H				Rain: none Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
8	23/12/2017	Raven_RN	13:45	16:45		12:36	G+RG	D		75		Rain: none Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
8	23/12/2017	Raven_RN	13:45	16:45		15:48	G	F		54		Rain: none Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
8	23/12/2017	Sparrowhawk_SH	13:45	16:45		16:15	NF4	F		90		Rain: none Cloud: 4/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
11	29/12/2017	Raven_RN	09:15	12:15		10:48	CF+NF3	F		12		Rain: Occasional showers Cloud: 3/8 Visibility (km): 5 Wind Speed: f4 Wind Direction: W Temp (°C): 2
11	29/12/2017	Raven_RN	09:15	12:15		12:02	CF+NF3	F		16		Rain: Occasional showers Cloud: 3/8 Visibility (km): 5 Wind Speed: f4 Wind Direction: W Temp (°C): 2
8	30/12/2017	Sparrowhawk_SH	10:30	13:30	Female	11:01	G+RG	H+F		25		Rain: none Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 8
7	03/01/2018	Sparrowhawk_SH	13:45	16:45	Female	16:00	CF+2nd F1/F1	F+P		22		Rain: none Cloud: 8/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: W Temp (°C): 8
1	04/01/2018	Kestrel_K.	10:30	16:30		14:22	NF2+NF3	H+F		23	64	Rain: none Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 6
7	07/01/2018	Raven_RN	14:00	17:00		16:25	2nd F1/F2	F+P		20		Rain: none Cloud: 0/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 3
13	15/01/2018	Buzzard_BZ	14:30	15:30		14:50	2nd F1/F2+F	S+D+F			52	Rain: Occasional showers Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 7

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
13	15/01/2018	Kestrel_K.	14:30	15:30		14:50	2nd F1/F2+H	D+F	12	15		Rain: Occasional showers Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 7
4	16/01/2018	Kestrel_K.	16:00	17:00		16:31	G	H+F	21			Rain: None Cloud: 6/8 Visibility (km): 4 Wind Speed: F4 Wind Direction: W Temp (°C): 4
6	17/01/2018	Kestrel_K.	08:30	14:30		09:53	G	F		8		Rain: None Cloud: 2/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: W Temp (°C): 2
10	18/01/2018	Kestrel_K.	10:20	15:20		12:25	G	F	5			Rain: None Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: W Temp (°C): 4
8	18/01/2018	Kestrel_K.	09:40	15:40		10:01	G	H+P	28			Rain: Heavy Showers Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 3
8	18/01/2018	Raven_RN	09:40	15:40		14:20	NF3+NF4	F	13			Rain: Heavy Showers Cloud: 4/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 3
2	22/01/2018	Cormorant_CA	13:20	15:20		14:55	G	F	12			Rain: none Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 9
5	22/01/2018	Kestrel_K.	10:10	13:10		12:25	G+NF3	H	63			Rain: Misty Cloud: 8/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: SW Temp (°C): 7
5	22/01/2018	Sparrowhawk_SH	10:10	13:10	Female	10:35	G+RG	H+F	6			Rain: Misty Cloud: 8/8 Visibility (km): 4 Wind Speed: F1 Wind Direction: SW Temp (°C): 7
7	24/01/2018	Buzzard_BZ	10:45	16:55		12:56	G+F	F	9			Rain: Misty Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: W Temp (°C): 9
7	24/01/2018	Buzzard_BZ	10:45	16:55		12:57	G+F	S+F	77	182		Rain: Misty Cloud: 8/8 Visibility (km): 3 Wind Speed: F3 Wind Direction: W Temp (°C): 9
14	24/01/2018	Raven_RN	09:30	15:30		12:25	HB	F+P	15			Rain: Occasional showers Cloud: 7/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SW Temp (°C): 4
14	24/01/2018	Raven_RN	09:30	15:30		12:50	HB	F	10			Rain: Occasional showers Cloud: 7/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SW Temp (°C): 4
7	06/02/2018	Kestrel_K.	13:30	16:30		15:18	2nd F1/F2+H	H+F	0	61		Rain: Dry Cloud: 4/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 3
7	06/02/2018	Raven_RN	13:30	16:30		15:14	2nd F1/F2+H	F		28		Rain: Dry Cloud: 4/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 3
7	06/02/2018	Raven_RN	13:30	16:30		15:24	2nd F1/F2	F+P	65			Rain: Dry Cloud: 4/8 Visibility (km): 5 Wind Direction: NW Temp (°C): 3
8	07/02/2018	Sparrowhawk_SH	15:20	17:20	Male	16:51	G	H+F	165			Rain: Light Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 5
2	09/02/2018	Grey Heron_H.	09:45	12:45		10:37	G	F	9			Rain: snow showers Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C):

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
11	15/02/2018	Buzzard_BZ	15:15	17:30		16:06	2nd F1/F2+H	H+H+P	830	10		Rain: dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C):
13	15/02/2018	Kestrel_K.	09:00	15:00		11:39	2nd F1/F2	H	0	26		Rain: snow showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: SW Temp (°C): 0
13	15/02/2018	Kestrel_K.	09:00	15:00		12:54	2nd F1/F2	F+P	25	14		Rain: snow showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F3 Wind Direction: SW Temp (°C):
11	15/02/2018	Kestrel_K.	15:15	17:30		15:58	2nd F1/F2	F	11			Rain: dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 3
1	20/02/2018	Raven_RN	16:50	18:05		18:03	F	F		5		Rain: None Cloud: 1\4 Visibility (km): 16Km Wind Speed: F1 Wind Direction: SW Temp (°C): 8°C
9	21/02/2018	Grey Heron_H.	09:35	12:35		10:11	G+NF4	F		112		Rain: None Cloud: 2/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: E Temp (°C): 4
9	21/02/2018	Kestrel_K.	09:35	12:35		09:58	G	F	26			Rain: None Cloud: 2/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: E Temp (°C): 4
9	21/02/2018	Kestrel_K.	09:35	12:35		11:24	G	F	0	30		Rain: None Cloud: 2/8 Visibility (km): 15 Wind Speed: F4 Wind Direction: E Temp (°C): 4
10	26/02/2018	Kestrel_K.	10:00	13:00		10:38	RG	H	29			Rain: dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 2
10	26/02/2018	Kestrel_K.	10:00	13:00		11:19	2nd F1/F2+H	H		57		Rain: dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 2
5	26/02/2018	Kestrel_K.	13:15	17:15		13:15	RG	F+P	4			Rain: dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SE Temp (°C): 2
10	26/02/2018	Sparrowhawk_SH	10:00	13:00	Male	12:43	2nd F1/F2+H	H+H	8			Rain: dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 2
5	26/02/2018	Sparrowhawk_SH	13:15	17:15	Male	17:06	RG	F+P	228			Rain: dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SE Temp (°C): 2
8	27/02/2018	Goshawk	15:30	17:30	Male	16:03	G	F+P	6			Rain: Single shower Cloud: 6/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NE Temp (°C): 3

Table 12: Sightings of other species breeding season March 2018 – September 2018

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
3	05/03/2018	Raven_RN	10:50	16:50		15:13	G+NF4	F	34			Rain: None Cloud: 8/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: NW Temp (°C): 3
4	08/03/2018	Goshawk	07:45	09:45		08:40	RG+F	F	11			Rain: dry Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 0
4	08/03/2018	Sparrowhawk_SH	09:45	12:45		12:05	RG+GO+F	F	11			Rain: none Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 0
8	08/03/2018	Sparrowhawk_SH	13:10	16:30	Female	13:56	G	H	9			Rain: dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
8	08/03/2018	Buzzard_BZ	13:10	16:30	Male/Female	14:03	G	S+D+F	360			Rain: dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
8	08/03/2018	Sparrowhawk_SH	13:10	16:30		14:04	G+2ndF4	F	19			Rain: dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
8	08/03/2018	Kestrel_K.	13:10	16:30		14:10	G	H+F	8			Rain: dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
8	08/03/2018	Buzzard_BZ	13:10	16:30	Male	15:52	NF4+F	D+F+P	240			Rain: dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
8	08/03/2018	Buzzard_BZ	13:10	16:30		15:58	NF4	D+F	111	55		Rain: dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
8	08/03/2018	Raven_RN	13:10	16:30		15:58	NF4	D+F	115	51		Rain: dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
7	09/03/2018	Kestrel_K.	07:00	13:10		07:21	NF1+NF2+NF3	F	14			Rain: none Cloud: 5/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 1
7	09/03/2018	Sparrowhawk_SH	07:00	13:10	Male	08:00	NF3+F	F	7			Rain: none Cloud: 5/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 1
7	09/03/2018	Kestrel_K.	07:00	13:10		11:52	2ndF1/F2+F	F+P	115			Rain: none Cloud: 5/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 1
5	12/03/2018	Kestrel_K.	15:00	18:00		15:36	G+F	F	47			Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: f3 Wind Direction: NW Temp (°C): 9
5	12/03/2018	Raven_RN	15:00	18:00		16:44	G+F	F	34			Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: f3 Wind Direction: NW Temp (°C): 9
5	12/03/2018	Kestrel_K.	15:00	18:00		16:45	F	F	25			Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: f3 Wind Direction: NW Temp (°C): 9

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
4	13/03/2018	Buzzard_BZ	08:15	11:15		10:08	F	F	3	14		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 8
4	13/03/2018	Buzzard_BZ	08:15	11:15		10:13	GO+F	F		65		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 8
4	13/03/2018	Kestrel_K.	08:15	11:15		10:36	F	F	140			Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 8
4	13/03/2018	Buzzard_BZ	08:15	11:15		11:01	F	D		120		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 8
4	13/03/2018	Buzzard_BZ	08:15	11:15		11:08	G+NF4+F	F		138		Rain: none Cloud: 2/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 8
8	13/03/2018	Goshawk	11:30	14:30	Male	12:35	G	S	0	122		Rain: none Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
8	13/03/2018	Kestrel_K.	11:30	14:30		12:41	G	F	36			Rain: none Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
8	13/03/2018	Kestrel_K.	11:30	14:30		13:18	G	F	45			Rain: none Cloud: 7/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
13	17/03/2018	Buzzard_BZ	08:30	14:30		11:46	CF+F	S+H		108		Rain: Occasional showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: N Temp (°C): 5
1	17/03/2018	Raven_RN	14:50	16:20		14:50	NF4	C+F	55			Rain: none Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NE Temp (°C): 2
1	17/03/2018	Raven_RN	14:50	16:20		15:00	NF3+NF4	F	10			Rain: none Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NE Temp (°C): 2
2	20/03/2018	Buzzard_BZ	11:00	17:00	Male/Female	15:35	NF3+NF4+F	S+D		390		Rain: none Cloud: 1/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 5
2	20/03/2018	Buzzard_BZ	11:00	17:00	Male/Female	15:54	G+NF4	S		419		Rain: none Cloud: 1/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 5
2	20/03/2018	Buzzard_BZ	11:00	17:00		16:25	G	F+P		38		Rain: none Cloud: 1/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 5
2	20/03/2018	Raven_RN	11:00	17:00		16:25	G	F	10			Rain: none Cloud: 1/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 5
14	21/03/2018	Kestrel_K.	10:00	17:00		12:59	NF3	H+P	95			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 5
14	21/03/2018	Raven_RN	10:00	17:00		12:59	F	F	83			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 5

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
14	21/03/2018	Merlin_ML	10:00	17:00	Male	14:25	CF+2nd F1/F2	H+P	27			Rain: none Cloud: 3/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 5
6	28/03/2018	Kestrel_K.	10:30	16:30		13:05	F	F	6			Rain: showers + Snow Cloud: 5/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: SE Temp (°C): 5
6	28/03/2018	Raven_RN	10:30	16:30		14:58	F	F	20			Rain: showers + Snow Cloud: 5/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: SE Temp (°C): 5
6	28/03/2018	Raven_RN	10:30	16:30		12:01	F	F	9			Rain: showers + Snow Cloud: 5/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: SE Temp (°C): 5
7	03/04/2018	Sparrowhawk_SH	08:10	14:10	Female	10:15	CF+2nd F1/F2+F	F	14			Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: f2 Wind Direction: S Temp (°C): 7
7	03/04/2018	Kestrel_K.	08:10	14:10		10:30	G+NF4+F	H	0	395		Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: f2 Wind Direction: S Temp (°C): 7
7	03/04/2018	Kestrel_K.	08:10	14:10		12:35	NF4	H	9			Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: f2 Wind Direction: S Temp (°C): 7
3	04/04/2018	Mallard_MA	10:40	16:40	Female	14:03	CF	F	20			Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 5
3	04/04/2018	Raven_RN	10:40	16:40		14:25	CF	F+P	36			Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 5
9	05/04/2018	Lesser Black-backed Gull_LB	09:00	15:00		09:29	G		2968			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 4
9	05/04/2018	Lesser Black-backed Gull_LB	09:00	15:00		09:44	G	F	10			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 4
9	05/04/2018	Raven_RN	09:00	15:00		09:46	DE	F	6			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 4
9	05/04/2018	Lesser Black-backed Gull_LB	09:00	15:00		10:02	G	F	40			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 4
4	05/04/2018	Buzzard_BZ	11:30	16:30		11:48	G+F	S+H+F	116	321		Rain: none Cloud: 8/8 Visibility (km): 5 Wind Speed: f3 Wind Direction: SE Temp (°C): 6
4	05/04/2018	Raven_RN	11:30	16:30		12:40	G+F	F+P	216	14		Rain: none Cloud: 8/8 Visibility (km): 5 Wind Speed: f3 Wind Direction: SE Temp (°C): 6
9	05/04/2018	Kestrel_K.	09:00	15:00		14:56	G	F	78			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 4
4	05/04/2018	Raven_RN	11:30	16:30		16:04	G	F	27	1		Rain: none Cloud: 8/8 Visibility (km): 5 Wind Speed: f3 Wind Direction: SE Temp (°C): 6

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
2	07/04/2018	Raven_RN	09:10	15:10		01:05		F		32		Rain: Heavy Showers Cloud: 8\8 Visibility (km): 2 Wind Speed: f1 Wind Direction: E Temp (°C): 9
2	07/04/2018	Buzzard_BZ	09:10	15:10		12:45	F	S+H+F		74		Rain: Heavy Showers Cloud: 8\8 Visibility (km): 2 Wind Speed: f1 Wind Direction: E Temp (°C): 9
10	12/04/2018	Lesser Black-backed Gull_LB	09:30	15:30		10:50	F	F		8		Rain: None/ very heavy fog Cloud: 8\8 Visibility (km): 0.02 Wind Speed: F1 Wind Direction: E Temp (°C): 8
10	12/04/2018	Raven_RN	09:30	15:30		12:02	F	F		12		Rain: None/ very heavy fog Cloud: 8\8 Visibility (km): 0.02 Wind Speed: F1 Wind Direction: E Temp (°C): 8
13	12/04/2018	Raven_RN	12:20	15:20		13:13	CF	F		6		Rain: Misty Cloud: 8\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: E Temp (°C): 10
10	12/04/2018	Raven_RN	09:30	15:30		13:55	F	F		35		Rain: None/ very heavy fog Cloud: 8\8 Visibility (km): 0.02 Wind Speed: F1 Wind Direction: E Temp (°C): 8
13	16/04/2018	Sparrowhawk_SH	10:30	16:30	Male	16:21	G	F		2		Rain: Heavy persistent rain Cloud: 8\8 Visibility (km): 4\8 Wind Speed: F3 Wind Direction: E Temp (°C): 9
11	17/04/2018	Peregrine_PE	10:30	16:30	Male+Female	15:30	HB	D+F		8	2	Rain: Very Heavy persistent rain Cloud: 8\8 Visibility (km): 2 Wind Speed: F3 Wind Direction: E Temp (°C): 10
7	02/05/2018	Kestrel_K.	08:15	14:15		09:26	2nd F1/F2	H		48	176	Rain: Heavy Showers Cloud: 5\8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 6
7	02/05/2018	Sparrowhawk_SH	08:15	14:15	Female	10:06	2nd F1/F2+F	S+H			58	Rain: Heavy Showers Cloud: 5\8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 6
7	02/05/2018	Kestrel_K.	08:15	14:15		13:02	NF4+2nd F1/F2	F+P		126		Rain: Heavy Showers Cloud: 5\8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 6
2	11/05/2018	Kestrel_K.	12:00	18:00		17:06	G+F	S+H+F			84	Rain: Light mist clearing Cloud: 4\8 Visibility (km): 5 Wind Speed: F3 Wind Direction: S Temp (°C): 8
9	16/05/2018	Raven_RN	09:50	15:00		13:22	G+F	F			5	Rain: None Cloud: 1 Visibility (km): 15 Wind Speed: F3 Wind Direction: N Temp (°C): 12
8	18/05/2018	Raven_RN	08:03	14:03		10:56	G+RG	F			35	Rain: Misty Cloud: 1 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 10
8	18/05/2018	Kestrel_K.	08:03	14:03	Male	13:08	RG	H+F+P		60		Rain: None Cloud: 4\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 10
8	18/05/2018	Kestrel_K.	08:03	14:03	Male	13:20	RG	H+F		0	180	Rain: None Cloud: 4\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 10
10	28/05/2018	Raven_RN	09:30	15:30		09:32	F	F		3		Rain: None Cloud: 8\8 Visibility (km): 2 Wind Speed: 1 Wind Direction: NW Temp (°C): 18

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
12	29/05/2018	Raven_RN	10:30	16:30		12:18	G	F	30			Rain: None Cloud: 0\8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 25
13	30/05/2018	Buzzard_BZ	09:30	15:30		09:32	G+DE	S+H	5			Rain: None Cloud: 0\8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 23
10	06/06/2018	Raven_RN	09:30	15:30		11:16	NF1	F	3			Rain: None Cloud: 8\8 Visibility (km): 2 Wind Speed: F1 Wind Direction: E Temp (°C): 16
10	06/06/2018	Buzzard_BZ	09:30	15:30		11:17	G+NF1	F	6			Rain: None Cloud: 8\8 Visibility (km): 2 Wind Speed: F1 Wind Direction: E Temp (°C): 16
10	06/06/2018	Buzzard_BZ	09:30	15:30		15:17	G+NF1	S	40			Rain: None Cloud: 8\8 Visibility (km): 2 Wind Speed: F1 Wind Direction: E Temp (°C): 16
10	06/06/2018	Lesser Black-backed Gull_LB	09:30	15:30		15:18	G+NF1	S	120			Rain: None Cloud: 8\8 Visibility (km): 2 Wind Speed: F1 Wind Direction: E Temp (°C): 16
7	08/06/2018	Kestrel_K.	07:35	10:25		09:07	2nd NF1/F2	P	240			Rain: None Cloud: 2\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 14
4	12/06/2018	Kestrel_K.	09:00	15:00		09:40	F	H	17			Rain: Light mist clearing Cloud: 8\8 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 13
8	12/06/2018	Buzzard_BZ	11:30	17:30		11:30	NF1	S	20			Rain: None Cloud: 8\8 Visibility (km): 10 Wind Speed: F1 Wind Direction: N Temp (°C): 20
2	12/06/2018	Raven_RN	15:15	18:15		16:13	G	F	39			Rain: None Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 17
2	12/06/2018	Raven_RN	15:15	18:15		16:48	G	F	47			Rain: None Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 17
13	19/06/2018	Kestrel_K.	08:58	14:58		09:34	F	F	5			Rain: misty Cloud: 8\8 Visibility (km): 2 Wind Speed: F4 Wind Direction: S Temp (°C): 13
13	19/06/2018	Kestrel_K.	08:58	14:58		09:58	CF+F	F	15			Rain: misty Cloud: 8\8 Visibility (km): 2 Wind Speed: F4 Wind Direction: S Temp (°C): 13
13	19/06/2018	Kestrel_K.	08:58	14:58		12:23	CF+F	H+F	22			Rain: misty Cloud: 8\8 Visibility (km): 2 Wind Speed: F4 Wind Direction: S Temp (°C): 13
13	19/06/2018	Buzzard_BZ	08:58	14:58		12:27	CF+F	F+P	3	61		Rain: misty Cloud: 8\8 Visibility (km): 2 Wind Speed: F4 Wind Direction: S Temp (°C): 13
13	19/06/2018	Kestrel_K.	08:58	14:58		14:01	CF+F	H+F	0	183		Rain: misty Cloud: 8\8 Visibility (km): 2 Wind Speed: F4 Wind Direction: S Temp (°C): 13
4	09/07/2018	Buzzard_BZ	11:30	17:30		16:41	F	S+F		270		Rain: none Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 21

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
12	10/07/2018	Raven_RN	11:00	17:00		13:49	G+RG	F		14		Rain: None Cloud: 0\8 Visibility (km): 20 Wind Speed: F1 Wind Direction: NW Temp (°C): 25
2	11/07/2018	Buzzard_BZ	08:30	14:30		09:47	G+HB+NF4+F	F	7			Rain: Single shower Cloud: 6\8 Visibility (km): 3 Wind Speed: F2 Wind Direction: SW Temp (°C): 16
10	11/07/2018	Raven_RN	10:45	16:45		11:46	G	F		12		Rain: None Cloud: 1\4 Visibility (km): 20 Wind Speed: F1 Wind Direction: NW Temp (°C): 23
8	12/07/2018	Kestrel_K.	07:30	13:30		12:31	G	F+P	45	130		Rain: None Cloud: 3\4 Visibility (km): 15 Wind Speed: F1 Wind Direction: NW Temp (°C): 22
11	16/07/2018	Sparrowhawk_SH	10:30	16:30	Male	12:43		F	3			Rain: Frequent Heavy Showers Cloud: 8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 18
11	16/07/2018	Raven_RN	10:30	16:30		15:06		F	4			Rain: Frequent Heavy Showers Cloud: 8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NW Temp (°C): 18
5	17/07/2018	Raven_RN	07:30	13:30		08:10	G	F	8			Rain: Frequent light Showers Cloud: 7\8 Visibility (km): 8 Wind Speed: F1 Wind Direction: NW Temp (°C): 18
13	31/07/2018	Raven_RN	11:05	14:35		13:00	NF4	F				Rain: Occasional showers Cloud: 7\8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SW Temp (°C): 15
7	08/08/2018	Sparrowhawk_SH	09:45	15:45	Male	10:25	NF1	F	5			Rain: Single shower Cloud: 6\8 Visibility (km): 5 Wind Speed: F4 Wind Direction: W Temp (°C): 15
12	08/08/2018	Buzzard_BZ	11:00	17:00		12:17	G	F	7			Rain: Some light showers Cloud: 8\8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SW Temp (°C): 16
12	08/08/2018	Lesser Black-backed Gull_LB	11:00	17:00		13:20	RG	F		5		Rain: Some light showers Cloud: 8\8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SW Temp (°C): 16
4	13/08/2018	Kestrel_K.	11:30	16:30		11:51		H	0	100		Rain: Dry Cloud: 6\8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19
4	13/08/2018	Buzzard_BZ	11:30	16:30		12:11		S+F		120		Rain: Dry Cloud: 6\8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19
4	13/08/2018	Kestrel_K.	11:30	16:30		12:14		F	58			Rain: Dry Cloud: 6\8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19
4	13/08/2018	Kestrel_K.	11:30	16:30		12:19		F	0	178		Rain: Dry Cloud: 6\8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19
4	13/08/2018	Kestrel_K.	11:30	16:30		12:20		H	35			Rain: Dry Cloud: 6\8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19
4	13/08/2018	Kestrel_K.	11:30	16:30		12:26		H	0	38		Rain: Dry Cloud: 6\8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
4	13/08/2018	Kestrel_K.	11:30	16:30		12:48		H	0	77		Rain: Dry Cloud: 6/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19
10	13/08/2018	Kestrel_K.	10:30	16:30		12:50		P	180			Rain: Some light showers Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: S Temp (°C): 18
4	13/08/2018	Kestrel_K.	11:30	16:30		12:57		H	71			Rain: Dry Cloud: 6/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19
10	13/08/2018	Raven_RN	10:30	16:30		12:59	RG	S		12		Rain: Some light showers Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: S Temp (°C): 18
10	13/08/2018	Raven_RN	10:30	16:30		13:10	G	F		4		Rain: Some light showers Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: S Temp (°C): 18
4	13/08/2018	Kestrel_K.	11:30	16:30		13:30		H	0	184		Rain: Dry Cloud: 6/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19
4	13/08/2018	Kestrel_K.	11:30	16:30		13:30		H		25		Rain: Dry Cloud: 6/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19
10	13/08/2018	Kestrel_K.	10:30	16:30		13:38	F	F	0	12		Rain: Some light showers Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: S Temp (°C): 18
10	13/08/2018	Raven_RN	10:30	16:30		13:47	G	F		5		Rain: Some light showers Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: S Temp (°C): 18
4	13/08/2018	Kestrel_K.	11:30	16:30		14:17		H	0	38		Rain: Dry Cloud: 6/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19
10	13/08/2018	Raven_RN	10:30	16:30		14:43	F	F		15		Rain: Some light showers Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: S Temp (°C): 18
4	13/08/2018	Kestrel_K.	11:30	16:30		14:54		H	0	14		Rain: Dry Cloud: 6/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19
4	13/08/2018	Kestrel_K.	11:30	16:30		14:57		H		52		Rain: Dry Cloud: 6/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): 19
10	13/08/2018	Raven_RN	10:30	16:30		15:06	F	F		17		Rain: Some light showers Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: S Temp (°C): 18
10	13/08/2018	Kestrel_K.	10:30	16:30		15:55	F	F	0	6		Rain: Some light showers Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: S Temp (°C): 18
10	13/08/2018	Kestrel_K.	10:30	16:30		15:57	F	F	0	3		Rain: Some light showers Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: S Temp (°C): 18
5	14/08/2018	Kestrel_K.	09:00	15:00		13:57	G	F	0	6		Rain: Frequent heavy showers Cloud: 8/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: W Temp (°C): 16

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
5	14/08/2018	Lesser Black-backed Gull_LB	09:00	15:00		13:58	G	F		5		Rain: Frequent heavy showers Cloud: 8\8 Visibility (km): 15 Wind Speed: F1 Wind Direction: W Temp (°C): 16
1	15/08/2018	Kestrel_K.	13:50	17:50		15:12	NF3	H		36		Rain: Misty Cloud: 8\8 Visibility (km): 2 Wind Speed: F3 Wind Direction: W Temp (°C): 16
8	16/08/2018	Kestrel_K.	10:00	16:00		10:40	G	F		5		Rain: Frequent light showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: W Temp (°C): 16
2	16/08/2018	Raven_RN	08:10	14:10		11:06	G	F		35		Rain: Occasional showers Cloud: 3\8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
8	16/08/2018	Lesser Black-backed Gull_LB	10:00	16:00		11:14	G	F		4		Rain: Frequent light showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: W Temp (°C): 16
8	16/08/2018	Raven_RN	10:00	16:00		12:28	G	F		14		Rain: Frequent light showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: W Temp (°C): 16
8	16/08/2018	Lesser Black-backed Gull_LB	10:00	16:00		12:38	G	F		13		Rain: Frequent light showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: W Temp (°C): 16
8	16/08/2018	Raven_RN	10:00	16:00		12:40	G	F		10		Rain: Frequent light showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: W Temp (°C): 16
8	16/08/2018	Raven_RN	10:00	16:00		13:52	G	F		4		Rain: Frequent light showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: W Temp (°C): 16
8	16/08/2018	Raven_RN	10:00	16:00		15:24	G	F		19		Rain: Frequent light showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: W Temp (°C): 16
1	16/08/2018	Kestrel_K.	15:40	17:40		15:45	NF3+NF4	H		163		Rain: Dry Cloud: 6\8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 16
3	21/08/2018	Kestrel_K.	10:30	16:30		12:20	F	F		0		Rain: None Cloud: 8\8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SW Temp (°C): 17
3	21/08/2018	Kestrel_K.	10:30	16:30		12:24	RG	H+F		40		Rain: None Cloud: 8\8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SW Temp (°C): 17
3	21/08/2018	Lesser Black-backed Gull_LB	10:30	16:30		15:15	G	F		6		Rain: None Cloud: 8\8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SW Temp (°C): 17
11	22/08/2018	Raven_RN	10:30	16:30		14:00	F	F		3		Rain: Frequent Showers Cloud: 8\8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19
11	22/08/2018	Kestrel_K.	10:30	16:30		15:08	RG	F		0	4	Rain: Frequent Showers Cloud: 8\8 Visibility (km): 10 Wind Speed: F1 Wind Direction: NW Temp (°C): 19

Table 13: Sightings of other species non-breeding season October 2018 – February 2019

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
5	09/10/2018	Kestrel_K.	10:02	13:02		10:02	RG	H+F+P	660	60		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: S Temp (°C): 13
5	09/10/2018	Kestrel_K.	10:02	13:02		10:22	RG	F	20			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: S Temp (°C): 13
5	09/10/2018	Kestrel_K.	10:02	13:02		10:27	RG	H+F	195			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: S Temp (°C): 13
5	09/10/2018	Kestrel_K.	10:02	13:02		10:47	RG+F	F	60			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: S Temp (°C): 13
5	09/10/2018	Kestrel_K.	10:02	13:02		10:55	RG+F	F	60			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: S Temp (°C): 13
5	09/10/2018	Kestrel_K.	10:02	13:02		11:33	RG	H+F	0	540		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: S Temp (°C): 13
5	09/10/2018	Kestrel_K.	10:02	13:02		12:08	RG	H+F	0	36		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: S Temp (°C): 13
5	09/10/2018	Kestrel_K.	10:02	13:02		12:18	G	H+F	120	360		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: S Temp (°C): 13
5	09/10/2018	Kestrel_K.	10:02	13:02		12:34	RG	H+F	30	210		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: S Temp (°C): 13
5	09/10/2018	Kestrel_K.	10:02	13:02		12:43	RG	H+F		180		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: S Temp (°C): 13
5	09/10/2018	Kestrel_K.	13:33	16:33	Male	13:37	RG	H+F+P	0	300		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SE Temp (°C): 13
5	09/10/2018	Kestrel_K.	13:33	16:33	Male	14:30	RG	H+F	10	530		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SE Temp (°C): 13
5	09/10/2018	Kestrel_K.	13:33	16:33	Male	14:40	RG	H+F	420			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SE Temp (°C): 13
5	09/10/2018	Buzzard_BZ	13:33	16:33		16:08	G+RG+F	S+H+F+P	70	290		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SE Temp (°C): 13
3	15/10/2018	Kestrel_K.	11:30	14:30		12:03	RG	H	4			Rain: None Cloud: 1\8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
3	15/10/2018	Buzzard_BZ	11:30	14:30		12:10	CF	H+F		14		Rain: None Cloud: 1\8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SW Temp (°C): 12

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
3	15/10/2018	Kestrel_K.	11:30	14:30		12:11	CF	H+F+P	15	125		Rain: None Cloud: 1\8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
3	15/10/2018	Kestrel_K.	11:30	14:30		13:12	G	F	8			Rain: None Cloud: 1\8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
3	15/10/2018	Kestrel_K.	11:30	14:30		13:49	G	F	12			Rain: None Cloud: 1\8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
3	15/10/2018	Kestrel_K.	11:30	14:30	Female	14:00	G+F	H+F	16			Rain: None Cloud: 1\8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
3	15/10/2018	Raven_RN	11:30	14:30		14:10	F	C		26		Rain: None Cloud: 1\8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
3	15/10/2018	Buzzard_BZ	11:30	14:30		14:12	F	S		12		Rain: None Cloud: 1\8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
3	15/10/2018	Kestrel_K.	11:30	14:30		14:15	G	F	15			Rain: None Cloud: 1\8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
3	15/10/2018	Lesser Black-backed Gull_LB	15:00	18:00		15:10	G	H+F	600	12		Rain: None Cloud: 1\8 Visibility (km): 20 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
9	16/10/2018	Herring Gull_HG	10:08	13:08		12:37	6	f		15		Rain: Misty Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 13
4	16/10/2018	Lesser Black-backed Gull_LB	13:30	16:30		13:33	G			36		Rain: Showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
4	16/10/2018	Raven_RN	13:30	16:30		14:12	G	F+P	600	12		Rain: Showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
4	16/10/2018	Lesser Black-backed Gull_LB	13:30	16:30		14:30	G+RG	F		22		Rain: Showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
4	16/10/2018	Lesser Black-backed Gull_LB	13:30	16:30		14:42	G+RG	F				Rain: Showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
4	16/10/2018	Kestrel_K.	13:30	16:30	Female	14:45	RG+F	H+F		35		Rain: Showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
4	16/10/2018	Raven_RN	13:30	16:30		15:42	G+RG	F		10		Rain: Showers Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
1	17/10/2018	Raven_RN	09:05	12:05		09:49	F	F	20			Rain: None Cloud: 3\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 8
1	17/10/2018	Buzzard_BZ	09:05	12:05		11:10	F	S		36		Rain: None Cloud: 3\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 8

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
1	17/10/2018	Kestrel_K.	09:05	12:05		11:39	F	H+F		42		Rain: None Cloud: 3/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: N Temp (°C): 8
2	17/10/2018	Buzzard_BZ	10:00	13:00		11:59	G	S+F		45		Rain: None Cloud: 1\8 Visibility (km): 18 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
2	17/10/2018	Buzzard_BZ	10:00	13:00		12:54	G			20		Rain: None Cloud: 1\8 Visibility (km): 18 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
2	17/10/2018	Raven_RN	13:30	16:30		13:10	G	F		5		Rain: None Cloud: 1\8 Visibility (km): 18 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
2	17/10/2018	Kestrel_K.	13:30	16:30	Female	13:35	G	H+F		18		Rain: None Cloud: 1\8 Visibility (km): 18 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
1	17/10/2018	Raven_RN	12:35	15:35	Male	15:03	F	F		10		Rain: None Cloud: 3/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 12
1	17/10/2018	Raven_RN	12:35	15:35		15:04	F	F		19		Rain: None Cloud: 3/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 12
2	17/10/2018	Lesser Black-backed Gull_LB	13:30	16:30		15:50	G	F		9		Rain: None Cloud: 1\8 Visibility (km): 18 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
11	18/10/2018	Raven_RN	09:30	12:30		13:16	HB	F		13		Rain: None Cloud: 1\8 Visibility (km): 24 Wind Speed: F1 Wind Direction: SW Temp (°C): 6
13	23/10/2018	Raven_RN	11:30	17:30		12:42	CF+F	F		203		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: WNW Temp (°C): 12
13	23/10/2018	Raven_RN	11:30	17:30		12:42	CF+F	F		90		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: WNW Temp (°C): 12
13	23/10/2018	Raven_RN	11:30	17:30		13:21	F	F		94		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: WNW Temp (°C): 12
13	23/10/2018	Raven_RN	11:30	17:30		14:27	F	F		39		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: WNW Temp (°C): 12
13	23/10/2018	Raven_RN	11:30	17:30		14:27	F	F		39		Rain: None Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: WNW Temp (°C): 12
12	24/10/2018	Kestrel_K.	13:27	16:27		13:36	G	H+F		49		Rain: None Cloud: 5/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: NW Temp (°C): 12
12	24/10/2018	Kestrel_K.	13:27	16:27		15:39	G	H+F		21		Rain: None Cloud: 5/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: NW Temp (°C): 12
8	25/10/2018	Herring Gull_HG	10:04	13:04		11:06	G	F		16		Rain: None Cloud: 8/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: NW Temp (°C): 9

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
8	25/10/2018	Herring Gull_HG	10:04	13:04		11:09	G	H+F+P	1279	17		Rain: None Cloud: 8/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: NW Temp (°C): 9
8	25/10/2018	Herring Gull_HG	10:04	13:04		11:29	G	F	21			Rain: None Cloud: 8/8 Visibility (km): 15 Wind Speed: F4 Wind Direction: NW Temp (°C): 9
8	25/10/2018	Herring Gull_HG	10:04	13:04		12:52	G	F	26			Rain: None Cloud: 8/8 Visibility (km): 15 Wind Speed: F5 Wind Direction: NW Temp (°C): 9
8	25/10/2018	Herring Gull_HG	10:04	13:04		13:49	G	H+F+P	3360			Rain: None Cloud: 5/8 Visibility (km): 15 Wind Speed: F6 Wind Direction: NW Temp (°C): 12
8	25/10/2018	Herring Gull_HG	10:04	13:04		15:19	G	F	12			Rain: None Cloud: 5/8 Visibility (km): 15 Wind Speed: F7 Wind Direction: NW Temp (°C): 12
8	25/10/2018	Herring Gull_HG	10:04	13:04		16:20	G	F	15			Rain: None Cloud: 5/8 Visibility (km): 15 Wind Speed: F8 Wind Direction: NW Temp (°C): 12
12	31/10/2018	Goshawk	13:30	16:30	Female	15:32	RG+F	F	14	0		Rain: Heavy Showers Cloud: 3\4 Visibility (km): 18 Wind Speed: F1 Wind Direction: S Temp (°C): 9
12	01/11/2018	Snipe_SN	13:30	16:30		16:25	RG	F	3	8		Rain: None Cloud: 1\4 Visibility (km): 20 Wind Speed: F1 Wind Direction: S Temp (°C): 7
9	02/11/2018	Lesser Black-backed Gull_LB	07:00	10:00		09:56	G	F		22		Rain: None Cloud: 1\2 Visibility (km): 18 Wind Speed: F1 Wind Direction: SW Temp (°C): 2
9	02/11/2018	Lesser Black-backed Gull_LB	07:00	10:00		10:20	G	F		16		Rain: None Cloud: 1\2 Visibility (km): 18 Wind Speed: F1 Wind Direction: SW Temp (°C): 2
9	02/11/2018	Lesser Black-backed Gull_LB	10:30	13:30		12:42	G	F		25		Rain: None Cloud: 1\2 Visibility (km): 18 Wind Speed: F1 Wind Direction: SW Temp (°C): 4
13	09/11/2018	Lesser Black-backed Gull_LB	10:30	13:30		09:39	G	F		15		Rain: Frequent Showers Cloud: 8\8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 8
13	09/11/2018	Kestrel_K.	14:00	17:00		14:25	G+F	F+P	429			Rain: Frequent Showers Cloud: 8\8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 8
8	15/11/2018	Kestrel_K.	09:44	12:44		11:30	RG	H+F		180		Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: S Temp (°C): 12
8	15/11/2018	Herring Gull_HG	09:44	16:14		11:40	G+RG	F	2063	37		Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: S Temp (°C): 12
8	15/11/2018	Kestrel_K.	09:44	12:44		12:00	G+RG	H+F	31			Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F5 Wind Direction: S Temp (°C): 12
8	15/11/2018	Kestrel_K.	13:14	16:14		15:04	RG	F	90			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: S Temp (°C): 9

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
8	15/11/2018	Kestrel_K.	13:14	16:14		15:13	G+RG	F	16			Rain: None Cloud: 8\8 Visibility (km): 10 Wind Speed: F2 Wind Direction: S Temp (°C): 9
8	15/11/2018	Kestrel_K.	13:14	16:14		15:15	G+RG	F	11			Rain: None Cloud: 8\8 Visibility (km): 10 Wind Speed: F2 Wind Direction: S Temp (°C): 9
8	15/11/2018	Herring Gull_HG	09:44	16:14		15:41	G+RG	F	48			Rain: None Cloud: 8\8 Visibility (km): 10 Wind Speed: F2 Wind Direction: S Temp (°C): 9
1	16/11/2018	Raven_RN	09:39	12:39		10:15	F	F	8			Rain: Misty Cloud: 8\8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 12
1	16/11/2018	Raven_RN	09:39	12:39		10:16	F	F	13			Rain: Misty Cloud: 8\8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 12
1	16/11/2018	Raven_RN	09:39	12:39		10:52	F	F	10			Rain: Misty Cloud: 8\8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 12
7	18/11/2018	Common Gull_CM	11:00	14:00		13:34	G	F	15			Rain: Frequent Showers Cloud: 8\8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SE Temp (°C): 11
7	18/11/2018	Raven_RN	11:00	14:00		14:30	CF	F		10		Rain: Frequent Showers Cloud: 8\8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SE Temp (°C): 11
5	04/12/2018	Snipe_SN	09:00	12:00		10:24	RG	F	10			Rain: None Cloud: 7\8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SE Temp (°C): 1
12	04/12/2018	Snipe_SN	10:00	13:00		10:43	G	F	7			Rain: heavy rain Cloud: 8\8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 5
10	06/12/2018	Raven_RN	09:00	12:00		09:53	G+F	F		21		Rain: heavy rain Cloud: 8\8 Visibility (km): 1 Wind Speed: F2 Wind Direction: SW Temp (°C): 13
10	06/12/2018	Raven_RN	12:30	15:30		12:40	F	F		120		Rain: heavy rain Cloud: 8\8 Visibility (km): 1 Wind Speed: F2 Wind Direction: SW Temp (°C): 13
10	06/12/2018	Raven_RN	12:30	15:30		12:49	G+F	F		21		Rain: heavy rain Cloud: 8\8 Visibility (km): 1 Wind Speed: F2 Wind Direction: SW Temp (°C): 13
4	11/12/2018	Raven_RN	09:30	12:30		11:43	RG+F	F		18		Rain: Misty showers Cloud: 8\8 Visibility (km): 1 Wind Speed: F2 Wind Direction: SE Temp (°C): 8
13	12/12/2018	Kestrel_K.	08:30	11:30	Female	10:00	G	F	15	10		Rain: None Cloud: 7\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 3
13	12/12/2018	Sparrowhawk_SH	08:30	11:30	Male	10:32	G	F+P	11			Rain: None Cloud: 7\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 3
13	12/12/2018	Buzzard_BZ	12:00	15:00		12:45	DE	F		8		Rain: None Cloud: 7\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 3

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
2	14/12/2018	Sparrowhawk_SH	10:00	16:00	Female	11:03	CF+NF3+2nd F1/F2	F			163	Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 8
2	14/12/2018	Kestrel_K.	10:00	16:00		12:16	G+DE+NF3	HH-F		136		Rain: Occasional showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: S Temp (°C): 8
1	19/12/2018	Sparrowhawk_SH	09:30	15:30	Female	12:16	G	H+P		114		Rain: Occasional showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
1	19/12/2018	Buzzard_BZ	09:30	15:30		13:53	G	F+P		142		Rain: Occasional showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
1	19/12/2018	Kestrel_K.	09:30	15:30		14:32	G+F	HH-F		0	54	Rain: Occasional showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
1	19/12/2018	Buzzard_BZ	09:30	15:30		14:59	G	F+P		44		Rain: Occasional showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
7	27/12/2018	Kestrel_K.	10:20	16:20		16:04	GO+CF	HH-F		45		Rain: Misty Cloud: 8/8 Visibility (km): 1 Wind Speed: F1 Wind Direction: S Temp (°C): 8
1	02/01/2019	Raven_RN	12:55	15:55		14:52	F	F		24		Rain: Misty Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SE Temp (°C): 7
9	03/01/2019	Snipe_SN	10:00	13:00		11:02	G	F		6	4	Rain: Constant Mist Cloud: 8\8 Visibility (km): 7 Wind Speed: F1 Wind Direction: SE Temp (°C): 6
9	03/01/2019	Lesser Black-backed Gull_LB	13:30	16:30		13:27	G	F			18	Rain: Constant Mist Cloud: 8\8 Visibility (km): 7 Wind Speed: F1 Wind Direction: SE Temp (°C): 6
12	04/01/2019	Raven_RN	08:00	11:00		09:33	G	F		8		Rain: Showers Cloud: 6\8 Visibility (km): 8 Wind Speed: F1 Wind Direction: S Temp (°C): 7
12	04/01/2019	Raven_RN	11:30	14:30		09:44	G	F			6	Rain: Showers Cloud: 6\8 Visibility (km): 8 Wind Speed: F1 Wind Direction: S Temp (°C): 7
2	21/01/2019	Lesser Black-backed Gull_LB	13:30	16:30		14:36	G	F			9	Rain: Heavy Showers Cloud: 8\8 Visibility (km): 7 Wind Speed: F2/F3 Wind Direction: SE Temp (°C): 4
2	21/01/2019	Raven_RN	13:30	16:30		14:39	G	F		7		Rain: Heavy Showers Cloud: 8\8 Visibility (km): 7 Wind Speed: F2/F3 Wind Direction: SE Temp (°C): 4
10	22/01/2019	Peregrine_PE	09:30	12:30		11:01	RG+F	HH-F		277		Rain: Snow showers Cloud: 8/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: SW Temp (°C): 3
10	22/01/2019	Peregrine_PE	09:30	12:30		11:20	G+F	F		0	234	Rain: Snow showers Cloud: 8/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: SW Temp (°C): 3
13	22/01/2019	Buzzard_BZ	09:00	12:00		11:25	G	F		12		Rain: Rain/Snow Cloud: 8\8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 3

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
10	22/01/2019	Peregrine_PE	09:30	12:30		12:24	RG+F	F	75			Rain: Snow showers Cloud: 8/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: SW Temp (°C): 3
10	22/01/2019	Buzzard_BZ	13:00	16:00		14:49	G+F	F+P	119			Rain: Snow showers Cloud: 8/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: SW Temp (°C): 3
5	23/01/2019	Raven_RN	13:00	16:00		14:45	G+F	F		12		Rain: Rain Cloud: 8\8 Visibility (km): 5 Wind Speed: F2/F3 Wind Direction: SW Temp (°C): 8
7	05/02/2019	Buzzard_BZ	13:30	16:30		14:50	2nd F1/F2	F+P	300			Rain: Constant rain Cloud: 8\8 Visibility (km): <1 Wind Speed: F3 Wind Direction: SE Temp (°C): 10
7	05/02/2019	Sparrowhawk_SH	13:30	16:30	Female	15:50	2nd F1/F2	F	4			Rain: Constant rain Cloud: 8\8 Visibility (km): <1 Wind Speed: F3 Wind Direction: SE Temp (°C): 10
5	06/02/2019	Sparrowhawk_SH	08:15	11:15	Male	08:56	G+F	S+F+P	71			Rain: Dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 6
5	06/02/2019	Sparrowhawk_SH	08:15	11:15	Male	09:02	F	F	22			Rain: Dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 6
5	06/02/2019	Sparrowhawk_SH	08:15	11:15	Male	09:20	F	F	16			Rain: Dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 6
5	06/02/2019	Sparrowhawk_SH	08:15	11:15	Male	09:24	RG+F	S+F	57			Rain: Dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 6
5	06/02/2019	Raven_RN	08:15	11:15		09:34	G+F	F	43			Rain: Dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 6
5	06/02/2019	Buzzard_BZ	08:15	11:15		10:05	RG+F	S+C	235	32		Rain: Dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
5	06/02/2019	Buzzard_BZ	08:15	11:15		10:36	RG+F	S+C	116			Rain: Dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 8
5	06/02/2019	Buzzard_BZ	08:15	11:15		11:01	G	S+F	170			Rain: Dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 8
5	06/02/2019	Buzzard_BZ	08:15	11:15		11:04	G+F	S+F	167			Rain: Dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 8
5	06/02/2019	Buzzard_BZ	11:15	14:45		11:26	G	S	93			Rain: Dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 8
5	06/02/2019	Sparrowhawk_SH	11:15	14:45	Male	11:29	G+F	F	75			Rain: Dry Cloud: 2/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 8
5	06/02/2019	Buzzard_BZ	11:45	14:45		13:33	F	S	18			Rain: Dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SW Temp (°C): 8

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
5	06/02/2019	Raven_RN	11:45	14:45		14:34	G+F	F	25			Rain: Occasional showers Cloud: 8\8 Visibility (km): 3 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
2	06/02/2019	Buzzard_BZ	14:00	17:00		16:00	G	F+P	450			Rain: None Cloud: 1\2 Visibility (km): 12 Wind Speed: F1 Wind Direction: SW Temp (°C): 9
11	07/02/2019	Kestrel_K.	08:30	11:30								Rain: None Cloud: 1\2 Visibility (km): 15 Wind Speed: F2 Wind Direction: SW Temp (°C): 5
12	08/02/2019	Snipe_SN	09:30	12:30		10:15	G	F	5			Rain: Showers Cloud: 3\4 Visibility (km): 6 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
12	08/02/2019	Snipe_SN	09:30	12:30		10:16	G	F	2			Rain: Showers Cloud: 3\4 Visibility (km): 6 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
12	08/02/2019	Sparrowhawk_SH	09:30	12:30	Male	11:20	G	F	5			Rain: Showers Cloud: 3\4 Visibility (km): 6 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
12	08/02/2019	Raven_RN	13:00	16:00		12:42	G	F	6			Rain: Showers Cloud: 3\4 Visibility (km): 6 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
12	08/02/2019	Snipe_SN	09:30	12:30		14:05	G	F	15	15		Rain: Showers Cloud: 3\4 Visibility (km): 6 Wind Speed: F3 Wind Direction: SW Temp (°C): 7
9	11/02/2019	Buzzard_BZ	14:00	17:00			G	F		30		Rain: None Cloud: 8\8 Visibility (km): 8 Wind Speed: F1 Wind Direction: SW Temp (°C): 8
9	11/02/2019	Lesser Black-backed Gull_LB	10:30	13:30			G	F		15		Rain: None Cloud: 8\8 Visibility (km): 8 Wind Speed: F1 Wind Direction: SW Temp (°C): 8
9	11/02/2019	Sparrowhawk_SH	14:00	17:00			G	F	4			Rain: None Cloud: 8\8 Visibility (km): 8 Wind Speed: F1 Wind Direction: SW Temp (°C): 8
8	26/02/2019	Raven_RN	08:05	11:05		10:01	G	F	41			Rain: Dry Cloud: 1\8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SE Temp (°C): 10
8	26/02/2019	Buzzard_BZ	11:35	14:35		11:50	G	F	30			Rain: Dry Cloud: 1\8 Visibility (km): 3 Wind Speed: F1 Wind Direction: SE Temp (°C): 13
8	26/02/2019	Kestrel_K.	11:35	14:35	Male	12:04	G	H+F+P	122			Rain: Dry Cloud: 1\8 Visibility (km): 3 Wind Speed: F1 Wind Direction: SE Temp (°C): 13
8	26/02/2019	Kestrel_K.	11:35	14:35	Male	12:08	G	F	15			Rain: Dry Cloud: 1\8 Visibility (km): 3 Wind Speed: F1 Wind Direction: SE Temp (°C): 13
8	26/02/2019	Buzzard_BZ	11:35	14:35		12:32	G	C	88			Rain: Dry Cloud: 1\8 Visibility (km): 3 Wind Speed: F1 Wind Direction: SE Temp (°C): 14
8	26/02/2019	Buzzard_BZ	11:35	14:35		13:54	G+F	S+F	28			Rain: Dry Cloud: 1\8 Visibility (km): 3 Wind Speed: F1 Wind Direction: SE Temp (°C): 14

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
8	26/02/2019	Buzzard_BZ	11:35	14:35		14:27	G	C+F+P	200	173		Rain: Dry Cloud: 1/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: SE Temp (°C): 14
1	27/02/2019	Raven_RN	10:20	13:10		11:41	F	F	22			Rain: Dry Cloud: 8/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: SE Temp (°C): 10
3	28/02/2019	Buzzard_BZ	09:00	12:00		11:15	F	C	160	1070		Rain: Dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 10
3	28/02/2019	Buzzard_BZ	09:00	12:00		11:32	F	C+F	160	60		Rain: Dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: NW Temp (°C): 10
13	28/02/2019	Buzzard_BZ	10:30	13:30		12:50	G+DE+CF	F	0	40		Rain: None Cloud: 6\8 Visibility (km): 6 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
13	28/02/2019	Kestrel_K.	14:00	17:00		15:40	DE+CF	F	35			Rain: None Cloud: 6\8 Visibility (km): 6 Wind Speed: F1 Wind Direction: SW Temp (°C): 12
13	28/02/2019	Buzzard_BZ	14:00	17:00		15:50	G+CF	F	0	54000		Rain: None Cloud: 6\8 Visibility (km): 6 Wind Speed: F1 Wind Direction: SW Temp (°C): 12

Table 14: Sightings of other species breeding season March 2019 – September 2019

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
5	04/03/2019	Snipe_SN	11:20	14:20		11:35	RG	F	37			Rain: Dry Cloud: 4 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 5
5	04/03/2019	Snipe_SN	11:20	14:20		11:43	RG	F	5			Rain: Dry Cloud: 4 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 5
5	04/03/2019	Sparrowhawk_SH	11:20	14:20	Female	11:50	G	F	13			Rain: Dry Cloud: 4 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 5
4	04/03/2019	Buzzard_BZ	11:30	17:30		12:22	G+F	S+C+F	0	360	80	Rain: None Cloud: 5 Visibility (km): 15 Wind Speed: F1 Wind Direction: W Temp (°C): 4
7	04/03/2019	Buzzard_BZ	11:30	14:30		12:50	RG	C	0	8		Rain: Snow & showers Cloud: 8/8 Visibility (km): 9 Wind Speed: F2 Wind Direction: W Temp (°C): 3
5	04/03/2019	Raven_RN	11:20	14:20		14:12	F	F	21			Rain: Dry Cloud: 4 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 6
4	04/03/2019	Kestrel_K.	11:30	17:30		14:38	F	H+F	0	38		Rain: None Cloud: 5 Visibility (km): 15 Wind Speed: F1 Wind Direction: W Temp (°C): 4
4	04/03/2019	Kestrel_K.	11:30	17:30		14:39	F	H	0	21		Rain: None Cloud: 5 Visibility (km): 15 Wind Speed: F1 Wind Direction: W Temp (°C): 4
5	04/03/2019	Buzzard_BZ	14:20	14:50		14:46	F	H	0	134		Rain: Dry Cloud: 4 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 6
4	04/03/2019	Kestrel_K.	11:30	17:30		14:59	F	H	66	92		Rain: None Cloud: 5 Visibility (km): 15 Wind Speed: F1 Wind Direction: W Temp (°C): 4
5	04/03/2019	Buzzard_BZ	14:50	17:50		15:45	F	H	0	206		Rain: Dry Cloud: 4 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 6
5	04/03/2019	Buzzard_BZ	14:50	17:50		16:04	G+F	H+P	121	159		Rain: Dry Cloud: 4 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 6
7	04/03/2019	Sparrowhawk_SH	15:00	18:00	Female	16:18	G	F	6			Rain: Snow & showers Cloud: 8/8 Visibility (km): 9 Wind Speed: F2 Wind Direction: W Temp (°C): 3
5	04/03/2019	Buzzard_BZ	14:50	17:50		17:27	G	F	19			Rain: Dry Cloud: 4 Visibility (km): 5 Wind Speed: F3 Wind Direction: W Temp (°C): 5
2	05/03/2019	Raven_RN	10:20	13:20		10:47	F	F		48		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F3 Wind Direction: S Temp (°C): 7
2	05/03/2019	Raven_RN	10:20	13:20		12:14	G	F	36			Rain: Constant Cloud: 8/8 Visibility (km): 1 Wind Speed: F3 Wind Direction: S Temp (°C): 8

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
8	13/03/2019	Kestrel_K.	11:45	17:45		12:49	G	F	29			Rain: Light Showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 9
8	13/03/2019	Raven_RN	11:45	17:45		14:42	G+RG	F	30			Rain: Light Showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 9
1	21/03/2019	Kestrel_K.	10:15	16:15		10:50	RGF	H	220			Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 10
1	21/03/2019	Buzzard_BZ	10:15	16:15		11:03	F	F	16			Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 11
5	03/04/2019	Buzzard_BZ	12:00	18:30		14:23	G+F	S+F	17	42		Rain: showers Cloud: 7 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 7
5	03/04/2019	Peregrine_PE	12:00	18:30		15:33	RG	F	11			Rain: showers Cloud: 7 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 7
5	03/04/2019	Raven_RN	12:00	18:30		17:21	RG	F	13			Rain: showers Cloud: 7 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 7
3	04/04/2019	Raven_RN	08:40	15:10		10:47	G+RG+CF	F+P	158			Rain: Misty Cloud: 5 Visibility (km): 2 Wind Speed: F2 Wind Direction: NE Temp (°C): 5
3	04/04/2019	Raven_RN	08:40	15:10		10:48	G+CF	F	38			Rain: Misty Cloud: 5 Visibility (km): 2 Wind Speed: F2 Wind Direction: NE Temp (°C): 5
3	04/04/2019	Buzzard_BZ	08:40	15:10		10:56	G+CF	S	53			Rain: Misty Cloud: 5 Visibility (km): 2 Wind Speed: F2 Wind Direction: NE Temp (°C): 5
3	04/04/2019	Buzzard_BZ	08:40	15:10		11:45	G+F	F	40			Rain: Misty Cloud: 5 Visibility (km): 2 Wind Speed: F2 Wind Direction: NE Temp (°C): 6
3	04/04/2019	Buzzard_BZ	08:40	15:10		12:25	G+F	C+F	56			Rain: Misty Cloud: 5 Visibility (km): 2 Wind Speed: F2 Wind Direction: NE Temp (°C): 6
3	04/04/2019	Buzzard_BZ	08:40	15:10		12:53	G	S+C	86			Rain: Misty Cloud: 5 Visibility (km): 2 Wind Speed: F2 Wind Direction: NE Temp (°C): 6
7	05/04/2019	Sparrowhawk_SH				10:17	CF+2nd F3+F	D+F	43			Rain: Dry Cloud: 1 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 4
7	05/04/2019	Sparrowhawk_SH				10:17	CF+2nd F3+F	D+F	43			Rain: Dry Cloud: 1 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 4
7	05/04/2019	Sparrowhawk_SH	09:30	12:30	Male	11:24	NF4+F	H+P	12			Rain: Dry Cloud: 1 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 4
7	05/04/2019	Sparrowhawk_SH	09:30	12:30	Male	11:24	NF4+F	H+P	12			Rain: Dry Cloud: 1 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 4

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
7	05/04/2019	Buzzard_BZ	09:30	12:30	Male	12:21	NF4+F	F	24	81		Rain: Dry Cloud: 1 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 4
7	05/04/2019	Buzzard_BZ	09:30	12:30	Male	12:21	NF4+F	F	24	81		Rain: Dry Cloud: 1 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 4
10	08/04/2019	Buzzard_BZ	12:45	15:45		13:48		F		15		Rain: dry Cloud: 4 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 8
10	08/04/2019	Buzzard_BZ	12:45	15:45		13:48		F		15		Rain: dry Cloud: 4 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 8
2	12/04/2019	Buzzard_BZ	09:55	15:55		11:38	G+NF4	H	147			Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
2	12/04/2019	Buzzard_BZ	09:55	15:55		11:38	G+NF4	H	147			Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
2	12/04/2019	Kestrel_K.	09:55	15:55		13:45	GO	H	37			Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
2	12/04/2019	Kestrel_K.	09:55	15:55		13:45	GO	H	37			Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
2	12/04/2019	Buzzard_BZ	09:55	15:55		14:31	GO+F	H	137			Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
2	12/04/2019	Buzzard_BZ	09:55	15:55		14:31	GO+F	H	137			Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
2	12/04/2019	Kestrel_K.	09:55	15:55		15:27	HB+GO	H	54			Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
2	12/04/2019	Kestrel_K.	09:55	15:55		15:27	HB+GO	H	54			Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
2	12/04/2019	Kestrel_K.	09:55	15:55		15:41	G	H	0	107		Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
2	12/04/2019	Kestrel_K.	09:55	15:55		15:41	G	H	0	107		Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
2	12/04/2019	Buzzard_BZ	09:55	15:55		15:43	G	H		75		Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
2	12/04/2019	Buzzard_BZ	09:55	15:55		15:43	G	H		75		Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SE Temp (°C): 8
10	20/04/2019	Kestrel_K.	13:00	16:00		14:00	CF+NF3	H	154			Rain: dry Cloud: 0 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 19

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
10	20/04/2019	Kestrel_K.	13:00	16:00		14:00	CF+NF3	H	154			Rain: dry Cloud: 0 Visibility (km): 5 Wind Speed: F1 Wind Direction: SE Temp (°C): 19
11	26/04/2019	Buzzard_BZ	09:34	15:34		11:47	F	F	25			Rain: showers Cloud: 8/8 Visibility (km): 8 Wind Speed: F3 Wind Direction: S Temp (°C): 6
11	26/04/2019	Sparrowhawk_SH	09:34	15:34	Female	11:49	CF	F	50			Rain: showers Cloud: 8/8 Visibility (km): 8 Wind Speed: F3 Wind Direction: S Temp (°C): 6
11	26/04/2019	Mallard_MA	09:34	15:34	Male+Female	12:05	CF	F	25			Rain: showers Cloud: 8/8 Visibility (km): 8 Wind Speed: F3 Wind Direction: S Temp (°C): 6
11	26/04/2019	Buzzard_BZ	09:34	15:34		12:41	F	F	40			Rain: showers Cloud: 8/8 Visibility (km): 8 Wind Speed: F3 Wind Direction: S Temp (°C): 6
11	26/04/2019	Buzzard_BZ	09:34	15:34		12:47	F	F	25			Rain: showers Cloud: 8/8 Visibility (km): 8 Wind Speed: F3 Wind Direction: S Temp (°C): 6
11	26/04/2019	Buzzard_BZ	09:34	15:34		12:53	F	F	180			Rain: showers Cloud: 8/8 Visibility (km): 8 Wind Speed: F3 Wind Direction: S Temp (°C): 6
11	26/04/2019	Kestrel_K.	09:34	15:34		12:58	CF	H	0	60		Rain: showers Cloud: 8/8 Visibility (km): 8 Wind Speed: F3 Wind Direction: S Temp (°C): 6
4	27/04/2019	Peregrine_PE	10:30	16:30		11:28	F	F	35			Rain: Dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 6
4	27/04/2019	Buzzard_BZ	10:30	16:30		14:18	F	F	180			Rain: Dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 6
4	27/04/2019	Buzzard_BZ	10:30	16:30		14:29	HB	F	0	20		Rain: Dry Cloud: 5/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: NW Temp (°C): 6
8	29/04/2019	Sparrowhawk_SH	09:02	12:20		10:28		H	56			Rain: Drizzle Cloud: 1 Visibility (km): 3 Wind Speed: F3 Wind Direction: SE Temp (°C): 10
8	29/04/2019	Sparrowhawk_SH	09:02	12:20		10:28		H	56			Rain: Drizzle Cloud: 1 Visibility (km): 3 Wind Speed: F3 Wind Direction: SE Temp (°C): 10
12	29/04/2019	Kestrel_K.	13:10	16:10		16:04	CF+2nd F3	F	48			Rain: Drizzle Cloud: 1 Visibility (km): 3 Wind Speed: F3 Wind Direction: SE Temp (°C): 10
12	29/04/2019	Kestrel_K.	13:10	16:10		16:04	CF+2nd F3	F	0	48		Rain: Drizzle Cloud: 1 Visibility (km): 3 Wind Speed: F3 Wind Direction: SE Temp (°C): 10
11	05/05/2019	Goshawk	12:00	15:00	Female	14:35	F	F	0	14		Rain: none Cloud: 8 Visibility (km): 6 Wind Speed: F2 Wind Direction: NW Temp (°C): 17
7	08/05/2019	Kestrel_K.	16:05	19:40		16:15	NF1	H	80			Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F4 Wind Direction: NW Temp (°C): 7

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
7	08/05/2019	Kestrel_K.	16:05	19:40		16:32	CF+NF1+F	H	20			Rain: Cloud: Visibility (km): Wind Speed: Wind Direction: Temp (°C):
7	08/05/2019	Kestrel_K.	16:05	19:40		16:41	NF1+F	F	8			Rain: Cloud: Visibility (km): Wind Speed: Wind Direction: Temp (°C):
7	08/05/2019	Kestrel_K.	16:05	19:40		17:27	NF1+NF3	H	5			Rain: Cloud: Visibility (km): Wind Speed: Wind Direction: Temp (°C):
7	08/05/2019	Kestrel_K.	16:05	19:40		17:58	NF1+F	H	59	101		Rain: Cloud: Visibility (km): Wind Speed: Wind Direction: Temp (°C):
13	15/05/2019	Buzzard_BZ	10:15	16:40		11:55	F	F	0	5		Rain: dry Cloud: 5 Visibility (km): 16
13	15/05/2019	Raven_RN	10:15	16:40		15:54	G	F	10			Rain: dry Cloud: 5 Visibility (km): 14
13	15/05/2019	Buzzard_BZ	10:15	04:40		16:10	G	C	577			Rain: dry Cloud: 5 Visibility (km): 14
13	15/05/2019	Buzzard_BZ	10:15	04:40		16:20	G	C	0	150		Rain: dry Cloud: 5 Visibility (km): 14
12	15/05/2019	Buzzard_BZ	18:00	20:00		18:56	G+DE	F	5			Rain: dry Cloud: 7 Visibility (km): 4 Wind Speed: F2 Wind Direction: SE Temp (°C): 13
12	15/05/2019	Buzzard_BZ	18:00	20:00		19:28	F	F	0	4		Rain: Cloud: Visibility (km): Wind Speed: Wind Direction: Temp (°C):
4	16/05/2019	Skylark_S.	10:05	16:30		10:22	G	F	20			Rain: drizzle Cloud: 5 Visibility (km): 16
4	16/05/2019	Raven_RN	10:05	16:30		11:10	G	F	15			Rain: drizzle Cloud: 5 Visibility (km): 16
5	16/05/2019	Sparrowhawk_SH	18:00	20:00	Female	11:57	RG+NF3	H	6			Rain: Cloud: Visibility (km): Wind Speed: Wind Direction: Temp (°C):
5	16/05/2019	Kestrel_K.	18:00	20:00		12:23	G+NF3	H+F	10	44		Rain: Cloud: Visibility (km): Wind Speed: Wind Direction: Temp (°C):
5	16/05/2019	Buzzard_BZ	18:00	20:00		12:41	NF3+NF4	H+F	0	62		Rain: Cloud: Visibility (km): Wind Speed: Wind Direction: Temp (°C):
5	16/05/2019	Buzzard_BZ	18:00	20:00		13:16	NF4	H	7			Rain: Cloud: Visibility (km): Wind Speed: Wind Direction: Temp (°C):
4	16/05/2019	Kestrel_K.	10:05	16:30		13:40	G	F	0	10		Rain: dry Cloud: 5 Visibility (km): 16
5	16/05/2019	Sparrowhawk_SH	18:00	20:00	Female	18:10			32			Rain: Cloud: Visibility (km): Wind Speed: Wind Direction: Temp (°C):
2	21/05/2019	Buzzard_BZ	09:30	12:30	Female	09:30	G	H+F	0	120		Rain: dry Cloud: 2 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 13
3	29/05/2019	Buzzard_BZ	10:05	13:05		10:15	F	S	14			Rain: dry Cloud: 1 Visibility (km): 8 Wind Speed: F3 Wind Direction: W Temp (°C): 14
3	29/05/2019	Buzzard_BZ	10:05	13:05		10:45	F	S	6			Rain: dry Cloud: 1 Visibility (km): 8 Wind Speed: F3 Wind Direction: W Temp (°C): 14

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
3	29/05/2019	Kestrel_K.	10:05	13:05	Female	11:18	G	H	42			Rain: dry Cloud: 1 Visibility (km): 8 Wind Speed: F3 Wind Direction: W Temp (°C): 14
3	29/05/2019	Raven_RN	10:05	13:05		11:42	G+F	F	18			Rain: dry Cloud: 1 Visibility (km): 8 Wind Speed: F3 Wind Direction: W Temp (°C): 14
5	30/05/2019	Buzzard_BZ	10:10	13:10		11:53	G+F	S	0	320		Rain: dry Cloud: 1/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 18
5	30/05/2019	Buzzard_BZ	10:10	13:10		12:29	F	S	0	42		Rain: dry Cloud: 1/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 18
5	30/05/2019	Kestrel_K.	10:10	13:10	Female	13:05	G	H	21			Rain: dry Cloud: 1/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 18
5	30/05/2019	Buzzard_BZ	13:40	16:40		14:33	G	S	0	960		Rain: dry Cloud: 5/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: SW Temp (°C): 19
5	30/05/2019	Buzzard_BZ	13:40	16:40		15:15	G	S	0	31		Rain: dry Cloud: 5/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: SW Temp (°C): 19
5	30/05/2019	Kestrel_K.	13:40	16:40	Female	15:15	G	S	43			Rain: dry Cloud: 5/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: SW Temp (°C): 19
5	30/05/2019	Buzzard_BZ	13:40	16:40		15:34	F	S	0	18		Rain: dry Cloud: 5/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: SW Temp (°C): 19
5	30/05/2019	Buzzard_BZ	13:40	16:40		15:54	G	S	30			Rain: dry Cloud: 5/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: SW Temp (°C): 19
10	15/06/2019	Buzzard_BZ	11:55	15:00		12:05	G+NF4	S+F	10	190		Rain: Occasional shower Cloud: 1 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 14
10	15/06/2019	Buzzard_BZ	11:55	15:00		12:19	G+NF4	C	60	60		Rain: Occasional shower Cloud: 1 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 14
10	15/06/2019	Buzzard_BZ	11:55	15:00	Female+Male	13:34	F	C+H	0	350		Rain: Occasional shower Cloud: 1 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 14
10	15/06/2019	Sparrowhawk_SH	11:55	15:00	Female	13:50	F	S+C		240		Rain: Occasional shower Cloud: 1 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 14
8	17/06/2019	Kestrel_k	13:58	17:28	Female	15:59	RG	H	85			Rain: 0 Cloud: 6/8 Visibility (km): 14 Wind Speed: F4 Wind Direction: SW Temp (°C): 15
8	17/06/2019	Herring Gull_HG	13:58	17:28		16:09	G	F	8			Rain: 0 Cloud: 6/8 Visibility (km): 14 Wind Speed: F4 Wind Direction: SW Temp (°C): 15
8	17/06/2019	Herring Gull_HG	13:58	17:28		16:32	G	F	21			Rain: 0 Cloud: 6/8 Visibility (km): 14 Wind Speed: F4 Wind Direction: SW Temp (°C): 15

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
4	20/06/2019	Buzzard_BZ	14:27	16:27		14:36	F	H+F	69			Rain: 0 Cloud: 3/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 14
4	20/06/2019	Buzzard_BZ	14:27	16:27		14:46	F	S+F	80	262		Rain: 0 Cloud: 3/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 14
4	21/06/2019	Raven_RN	08:57	11:57		11:06	G	F	13			Rain: 0 Cloud: 2/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 11
4	21/06/2019	Buzzard_BZ	08:57	11:57		11:50	F		2	23		Rain: 0 Cloud: 2/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 11
4	21/06/2019	Buzzard_BZ	08:57	11:57		11:55	F		110	80		Rain: 0 Cloud: 2/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 11
4	21/06/2019	Buzzard_BZ	12:27	13:27		12:54	G	S+H	30	90		Rain: 0 Cloud: 4/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: S Temp (°C): 16
3	22/06/2019	Lesser Black-backed Gull_LB	08:21	14:21		08:36		F	50			Rain: 0 Cloud: 7/8 Visibility (km): 7 Wind Speed: F2 Wind Direction: SE Temp (°C): 13
3	22/06/2019	Kestrel_K.	08:21	14:21		10:34	F	H	0	100		Rain: 0 Cloud: 7/8 Visibility (km): 7 Wind Speed: F2 Wind Direction: SE Temp (°C): 13
3	22/06/2019	Kestrel_K.	08:21	14:21		12:10	F	H	25			Rain: 0 Cloud: 7/8 Visibility (km): 7 Wind Speed: F2 Wind Direction: SE Temp (°C): 13
3	22/06/2019	Kestrel_K.	08:21	14:21		13:03	G	H	25	65		Rain: 0 Cloud: 7/8 Visibility (km): 7 Wind Speed: F2 Wind Direction: SE Temp (°C): 13
12	22/06/2019	Buzzard_BZ	14:47	17:47		15:22	F	S		240		Rain: 0 Cloud: 7/8 Visibility (km): 7 Wind Speed: F2 Wind Direction: SE Temp (°C): 13
12	22/06/2019	Lesser Black-backed Gull_LB	14:47	17:47		15:58	F	F		30		Rain: 0 Cloud: 7/8 Visibility (km): 7 Wind Speed: F2 Wind Direction: SE Temp (°C): 13
8	24/06/2019	Sparrowhawk_SH	08:25	14:25		11:26	F	F	4			Rain: 0 Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 15
8	24/06/2019	Buzzard_BZ	08:25	14:25		13:36	F	H		240		Rain: 0 Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 15
8	24/06/2019	Lesser Black-backed Gull_LB	08:25	14:25		13:59	F	F	20			Rain: 0 Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 15
8	24/06/2019	Lesser Black-backed Gull_LB	08:25	14:25		14:05	F	S		120		Rain: 0 Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 15
8	24/06/2019	Buzzard_BZ	08:25	14:25		14:19	RG	S		180		Rain: 0 Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 15

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
8	24/06/2019	Buzzard_BZ	08:25	14:25		14:59	F	F	50			Rain: 0 Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 15
12	24/06/2019	Buzzard_BZ	14:43	17:43		14:59	G	F	50			Rain: 0 Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 15
8	24/06/2019	Peregrine_PE	08:25	14:25		16:31	G+F	H	25	20		Rain: 0 Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 15
12	24/06/2019	Peregrine_PE	14:43	17:43		16:31	F	H	20	30		Rain: 0 Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NE Temp (°C): 15
2	24/06/2019	Buzzard_BZ	15:50	18:25		16:48	G+F	H+F	12			Rain: dry Cloud: 7 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 17
8	24/06/2019	Buzzard_BZ	08:25	14:25		16:55	G+F	F	140			Rain: dry Cloud: 7 Visibility (km): 8 Wind Speed: F2 Wind Direction: NE Temp (°C): 18
12	24/06/2019	Buzzard_BZ	14:43	17:43		16:55	F	F	140			Rain: dry Cloud: 5 Visibility (km): 8 Wind Speed: F2 Wind Direction: NE Temp (°C): 18
8	24/06/2019	Buzzard_BZ	08:25	14:25		17:09	RG	F	100			Rain: dry Cloud: 7 Visibility (km): 8 Wind Speed: F2 Wind Direction: NE Temp (°C): 18
12	24/06/2019	Buzzard_BZ	14:43	17:43		17:09	F	F	100			Rain: dry Cloud: 5 Visibility (km): 8 Wind Speed: F2 Wind Direction: NE Temp (°C): 18
8	24/06/2019	Buzzard_BZ	08:25	14:25		17:33	RG	F	50			Rain: dry Cloud: 7 Visibility (km): 8 Wind Speed: F2 Wind Direction: NE Temp (°C): 18
12	24/06/2019	Buzzard_BZ	14:43	17:43		17:33	G	H	50			Rain: dry Cloud: 5 Visibility (km): 8 Wind Speed: F2 Wind Direction: NE Temp (°C): 18
1	27/06/2019	Buzzard_BZ	09:55	15:55		11:16	HB+NF2	H	13			Rain: dry Cloud: 3 Visibility (km): 5 Wind Speed: F3 Wind Direction: E Temp (°C): 19
5	03/07/2019	Buzzard_BZ	12:30	16:30		12:55	NF4	F	9			Rain: dry Cloud: 3 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 17
5	03/07/2019	Buzzard_BZ	12:30	16:30		13:30	G+NF4	F	22			Rain: dry Cloud: 3 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 17
7	04/07/2019	Buzzard_BZ	01:20	16:20		14:16	CF	F	16			Rain: dry Cloud: 1 Visibility (km): 5 Wind Speed: F1 Wind Direction: NW Temp (°C): 17
1	05/07/2019	Kestrel_K	12:05	16:05		14:02	NF3	S	120			Rain: dry Cloud: 7 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 19
5	10/07/2019	Buzzard_BZ	14:30	16:30		16:18	F	S	262			Rain: dry Cloud: 7 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 19

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
10	10/07/2019	Kestrel_K.	16:35	19:05		17:15	G+CF+NF4	F	19			Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 19
9	19/07/2019	Raven_RN	13:03	16:03		15:36	G	F	13			Rain: dry Cloud: 8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SW Temp (°C): 19
1	22/07/2019	Kestrel_K.	10:00	01:00		11:27	NF4+F	F+P	126			Rain: dry Cloud: 1 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
3	22/07/2019	Kestrel_K.	12:00	15:00		12:39	G+F	H	9	104		Rain: Light Cloud: 1 Visibility (km): 10 Wind Speed: F4 Wind Direction: S Temp (°C): 20
4	23/07/2019	Raven_RN	12:15	15:15		12:43	G	F+P	4			Rain: Misty Cloud: 1 Visibility (km): 3 Wind Speed: F4 Wind Direction: SE Temp (°C): 17
4	23/07/2019	Raven_RN	12:15	15:15		13:19	G	F	17			Rain: Misty Cloud: 1 Visibility (km): 3 Wind Speed: F4 Wind Direction: SE Temp (°C): 17
4	23/07/2019	Raven_RN	12:15	15:15		14:19	G	S	69			Rain: Misty Cloud: 1 Visibility (km): 3 Wind Speed: F4 Wind Direction: SE Temp (°C): 17
4	23/07/2019	Buzzard_BZ	12:15	15:15		14:48	G	S+P	114			Rain: Misty Cloud: 1 Visibility (km): 3 Wind Speed: F4 Wind Direction: SE Temp (°C): 17
13	27/07/2019	Buzzard_BZ	10:17	13:17		11:58	F	S	10	25		Rain: Dry Cloud: Cloud Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
13	27/07/2019	Kestrel_K.	10:17	13:17		12:12	F	H	20	30		Rain: Dry Cloud: 7/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
11	27/07/2019	Sparrowhawk_SH	13:50	19:50	Female	13:51	F	F		40		Rain: Dry Cloud: 7/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
11	27/07/2019	Buzzard_BZ	13:50	19:50		13:59	F	H	25	35		Rain: Dry Cloud: 7/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
11	27/07/2019	Sparrowhawk_SH	13:50	19:50		14:01	F	F	20			Rain: Dry Cloud: 7/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
11	27/07/2019	Kestrel_K.	13:50	19:50		14:17	F	H		60		Rain: Dry Cloud: 7/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
11	27/07/2019	Buzzard_BZ	13:50	19:50		14:21	F	S		40		Rain: Dry Cloud: 7/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
11	27/07/2019	Kestrel_K.	13:50	19:50		14:22	F	F		60		Rain: Dry Cloud: 7/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
11	27/07/2019	Buzzard_BZ	13:50	19:50		14:37	CF	H	100	100		Rain: Dry Cloud: 7/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
11	27/07/2019	Buzzard_BZ	13:50	19:50		15:00	F	S		200		Rain: Dry Cloud: 7/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
11	27/07/2019	Buzzard_BZ	13:50	19:50		15:11	F	S		50		Rain: Dry Cloud: 7/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
11	27/07/2019	Sparrowhawk_SH	13:50	19:50	Female	16:43	F	F		50		Rain: Dry Cloud: 7/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
12	28/07/2019	Kestrel_K.	10:41	16:41		11:03	F	H		30		Rain: Dry Cloud: 7/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 18
12	28/07/2019	Buzzard_BZ	10:41	16:41		15:12	F	S		40		Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 15
12	28/07/2019	Sparrowhawk_SH	10:41	16:41	Female	16:28	F	S		20	340	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 15
13	28/07/2019	Buzzard_BZ	17:13	20:13		17:18	CF	F		40	10	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: SW Temp (°C): 15
13	28/07/2019	Buzzard_BZ	17:13	20:13		17:22	CF	F		20		Rain: Dry Cloud: 8/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 17
13	28/07/2019	Kestrel_K.	17:13	20:13		19:59	F	H		80		Rain: Dry Cloud: 8/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SW Temp (°C): 17
2	29/07/2019	Kestrel_K.	11:15	14:15	Female	11:27	G	H		40		Rain: Dry Cloud: 5 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 18
2	29/07/2019	Buzzard_BZ	11:15	14:15		12:10	G	H		44	38	Rain: Dry Cloud: 5 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 18
2	29/07/2019	Kestrel_K.	11:15	14:15	Female	13:27	G+F	H		136		Rain: Dry Cloud: 5 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 18
2	29/07/2019	Kestrel_K.	11:15	14:15		13:42	G+2nd F1/F2	H		85		Rain: Dry Cloud: 5 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 18
2	29/07/2019	Kestrel_K.	11:15	14:15		13:47	G+2nd F1/F2	H+P		42		Rain: Dry Cloud: 5 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 18
2	29/07/2019	Raven_RN	11:15	14:15		13:48	G	F		25		Rain: Dry Cloud: 5 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 18
8	30/07/2019	Buzzard_BZ	08:30	11:30		10:42	F	S		720		Rain: Dry Cloud: 1 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 14
8	30/07/2019	Buzzard_BZ	08:30	11:30		11:11	F	S		580		Rain: Dry Cloud: 1 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 14

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
8	30/07/2019	Kestrel_K.	08:30	11:30		11:16	F	H	25			Rain: Dry Cloud: 1 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 14
8	30/07/2019	Kestrel_K.	08:30	11:30		11:24	G	H	36			Rain: Dry Cloud: 1 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 14
8	30/07/2019	Buzzard_BZ	08:30	11:30		11:27	F	S	0	240		Rain: Dry Cloud: 1 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 14
8	30/07/2019	Kestrel_K.	12:00	15:00		13:09	G	H	57			Rain: Single shower Cloud: 7 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 17
8	30/07/2019	Raven_RN	12:00	15:00		13:15	G	F	12			Rain: Single shower Cloud: 7 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 17
8	30/07/2019	Kestrel_K.	12:00	15:00		13:54	G	F	5			Rain: Single shower Cloud: 7 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 17
8	30/07/2019	Kestrel_K.	12:00	15:00		14:19	G	H	20			Rain: Single shower Cloud: 7 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 17
8	30/07/2019	Kestrel_K.	12:00	15:00		14:35	F	H	77	60		Rain: Single shower Cloud: 7 Visibility (km): 10 Wind Speed: F3 Wind Direction: NW Temp (°C): 17
4	02/08/2019	Kestrel_K.	10:10	13:10		11:52	G	H+F	58			Rain: dry Cloud: 5 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 16
13	06/08/2019	Buzzard_BZ	10:30	13:30		11:28	F	F	6			Rain: showers Cloud: 1 Visibility (km): 2 Wind Speed: F2 Wind Direction: W Temp (°C): 19
5	13/08/2019	Kestrel	12:30	18:30		16:40	G+NF3	H+F	195			Rain: light rain Cloud: 1 Visibility (km): 4 Wind Speed: F2 Wind Direction: SW Temp (°C): 15
3	15/08/2019	Buzzard_BZ	10:30	13:30		11:37	F	S	22			Rain: Occasional showers Cloud: 1 Visibility (km): 1 Wind Speed: F3 Wind Direction: W Temp (°C): 17
3	15/08/2019	Buzzard_BZ	13:30	16:30		13:31	F	S	98			Rain: Dry Cloud: 06 Visibility (km): 6 Wind Speed: F3 Wind Direction: W Temp (°C): 18
3	15/08/2019	Kestrel_K.	13:30	16:30		13:33	G+CF	H+P	331			Rain: Dry Cloud: 06 Visibility (km): 6 Wind Speed: F3 Wind Direction: W Temp (°C): 18
3	15/08/2019	Kestrel_K.	13:30	16:30		16:14	G	H+F	15			Rain: Dry Cloud: 06 Visibility (km): 6 Wind Speed: F3 Wind Direction: W Temp (°C): 18
1	15/08/2019	Sparrowhawk	12:00	18:00		16:31	GO	F	3			Rain: dry Cloud: 5 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 16
9	16/08/2019	Lesser Black-backed Gull_LB	10:10	13:10		11:27	G	F	30			Rain: showers Cloud: 1 Visibility (km): 11 Wind Speed: F3 Wind Direction: SW Temp (°C): 15

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
9	16/08/2019	Lesser Black-backed Gull_LB	10:10	13:10		11:39	G	F	30			Rain: showers Cloud: 1 Visibility (km): 11 Wind Speed: F3 Wind Direction: SW Temp (°C): 15
9	16/08/2019	Kestrel_K.	10:10	13:10		11:54	F	H	45			Rain: showers Cloud: 1 Visibility (km): 11 Wind Speed: F3 Wind Direction: SW Temp (°C): 15
9	16/08/2019	Kestrel_K.	10:10	13:10		12:01	F	F	540			Rain: showers Cloud: 1 Visibility (km): 11 Wind Speed: F3 Wind Direction: SW Temp (°C): 15
9	16/08/2019	Lesser Black-backed Gull_LB	10:10	13:10		12:02	G	F	15			Rain: showers Cloud: 1 Visibility (km): 11 Wind Speed: F3 Wind Direction: SW Temp (°C): 15
9	16/08/2019	Kestrel_K.	10:10	13:10		12:04	G	H	150			Rain: showers Cloud: 1 Visibility (km): 11 Wind Speed: F3 Wind Direction: SW Temp (°C): 15
9	16/08/2019	Lesser Black-backed Gull_LB	10:10	13:10		12:06	G_F	F	405			Rain: showers Cloud: 1 Visibility (km): 11 Wind Speed: F3 Wind Direction: SW Temp (°C): 15
9	16/08/2019	Kestrel_K.	10:10	13:10		12:51	G	F	30			Rain: showers Cloud: 1 Visibility (km): 11 Wind Speed: F3 Wind Direction: SW Temp (°C): 15
9	16/08/2019	Lesser Black-backed Gull_LB	13:40	16:40		13:44	G	F	165			Rain: showers Cloud: 3 Visibility (km): 16 Wind Speed: F2 Wind Direction: SW Temp (°C): 19
8	19/08/2019	Lesser Black-backed Gull_LB	13:05	16:05		13:53	G+DE	F	41			Rain: None Cloud: 3 Visibility (km): 13 Wind Speed: F1 Wind Direction: SE Temp (°C): 18
8	19/08/2019	Lesser Black-backed Gull_LB	13:05	16:05		14:55	G+DE	F	57			Rain: None Cloud: 07 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 16
10	22/08/2019	Kestrel	10:15	16:15		12:59	G+NF2+NF4	H	430			Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 16
10	22/08/2019	Kestrel	10:15	16:15		13:08	NF2+NF4	H	84			Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 16
10	22/08/2019	Kestrel	10:15	16:15		13:34	RG	H	0	53		Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 16
10	22/08/2019	Kestrel	10:15	16:15		14:05	RG	H	0	35		Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 16
10	22/08/2019	Sparrowhawk	10:15	16:15		14:06	F	S+D	24			Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 16
10	22/08/2019	Kestrel	10:15	16:15		14:15	CF	H	0	69		Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 16
10	22/08/2019	Kestrel	10:15	16:15		14:18	F	H	0	84		Rain: dry Cloud: 1 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 16

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
12	26/08/2019	Kestrel_K.	15:30	17:30		15:57	DE	H+F	172			Rain: Mist Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 16
12	26/08/2019	Kestrel_K.	15:30	17:30		16:16	F	H+F	46	79		Rain: None Cloud: 5 Visibility (km): 10 Wind Speed: F1 Wind Direction: S Temp (°C): 18
2	26/08/2019	Buzzard_BZ	09:30	12:30			G	S	0	29		Rain: dry Cloud: 3/8 Visibility (km): 6 Wind Speed: F1 Wind Direction: SE Temp (°C): 21
1	27/08/2019	Sparrowhawk_SH	11:45	13:45		12:12	F	F	20			Rain: None Cloud: 07 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 16
12	27/08/2019	Raven_RN	15:20	19:20		16:17	DE	F	24			Rain: Light Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 16
12	27/08/2019	Kestrel_K.	15:20	19:20		16:51	DE	F	41			Rain: Mist Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 16
11	28/08/2019	Kestrel_K.	08:05	12:05		08:57	F	H	0	30		Rain: Dry Cloud: 2/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: W Temp (°C): 13
11	28/08/2019	Buzzard_BZ	08:50	12:05		09:21	F	F	0	50		Rain: Dry Cloud: 2/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: W Temp (°C): 13
11	28/08/2019	Sparrowhawk_SH	08:50	12:05		09:57	F	F	20	70		Rain: Dry Cloud: 2/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: W Temp (°C): 13
11	28/08/2019	Kestrel_K.	08:50	12:05		10:01	F	F	0	40		Rain: Dry Cloud: 2/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: W Temp (°C): 13
11	28/08/2019	Kestrel_K.	08:50	12:50		10:30	HB	H	40	80		Rain: Dry Cloud: 2/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: W Temp (°C): 13
11	28/08/2019	Kestrel_K.	08:50	12:50		10:57	HB	H	0	100		Rain: Dry Cloud: 2/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: W Temp (°C): 13
11	28/08/2019	Peregrine_PE	08:50	12:50		11:50	CF	H	15	0		Rain: Dry Cloud: 2/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: W Temp (°C): 13
11	28/08/2019	Kestrel_K.	08:50	12:50		11:53	F	H	60	60		Rain: Dry Cloud: 2/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: W Temp (°C): 13
11	28/08/2019	Buzzard_BZ	08:50	12:50		11:56	F	F	0	90		Rain: Dry Cloud: 2/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: W Temp (°C): 13
11	31/08/2019	Kestrel_K.	10:03	12:03		10:24	F	F	25	25		Rain: Dry Cloud: 5/8 Visibility (km): 6 Wind Speed: F3 Wind Direction: W Temp (°C): 12
11	31/08/2019	Grey Heron_H.	10:03	12:03		11:25	F	F	5			Rain: Dry Cloud: 5/8 Visibility (km): 6 Wind Speed: F3 Wind Direction: W Temp (°C): 12

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
2	31/08/2019	Lesser Black-backed Gull_LB	12:42	18:42		13:11	F	F		120		Rain: showers Cloud: 5/8 Visibility (km): 6 Wind Speed: F3 Wind Direction: W Temp (°C): 13
2	31/08/2019	Buzzard_BZ	12:42	18:42		16:21	G	F		60		Rain: showers Cloud: 5/8 Visibility (km): 6 Wind Speed: F3 Wind Direction: W Temp (°C): 13
2	31/08/2019	Sparrowhawk_SH	12:42	18:42	Female	16:52	F	F		30		Rain: showers Cloud: 5/8 Visibility (km): 6 Wind Speed: F3 Wind Direction: W Temp (°C): 13
7	12/09/2019	Goshawk	12:00	18:00		12:26	2nd F1/F2+F	F		8		Rain: light rain Cloud: 1 Visibility (km): 5 Wind Speed: F3 Wind Direction: WSW Temp (°C): 19
11	13/09/2019	Kestrel_K.	08:53	14:53		10:53	CF	H		25	0	Rain: Dry Cloud: 3/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
11	13/09/2019	Kestrel_K.	08:53	14:53		11:16	CF	H		60	0	Rain: Dry Cloud: 3/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
11	13/09/2019	Kestrel_K.	08:53	14:53		12:09	CF	S		30	0	Rain: Dry Cloud: 3/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
11	13/09/2019	Sparrowhawk_SH	08:53	14:53		12:48	F	F		10	90	Rain: Dry Cloud: 3/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
5	13/09/2019	Sparrowhawk	11:30	14:30	Male	13:29	NF3	H		5		Rain: dry Cloud: 2 Visibility (km): 5 Wind Speed: F2 Wind Direction: E Temp (°C): 16
11	13/09/2019	Sparrowhawk_SH	08:53	14:53	Male	13:43	F	C		40		Rain: Dry Cloud: 3/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
10	13/09/2019	Buzzard_BZ	14:30	17:30		14:31	G+NF4+F	H+F		10	75	Rain: dry Cloud: 2 Visibility (km): 5 Wind Speed: F2 Wind Direction: E Temp (°C): 16
11	13/09/2019	Buzzard_BZ	08:53	14:53		14:44	F	F		90		Rain: Dry Cloud: 3/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: W Temp (°C): 12
8	15/09/2019	Lesser Black-backed Gull_LB	10:26	13:26		11:06	G	F		10	170	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 15
8	15/09/2019	Lesser Black-backed Gull_LB	10:26	13:26		11:58	G	C+F		90		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 15
8	15/09/2019	Peregrine_PE	10:26	13:26		12:36	G+F	H+F		0	180	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 15
8	15/09/2019	Kestrel_K.	10:26	13:26		12:52	F	H		50	0	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 15
13	15/09/2019	Kestrel_K.	13:56	19:56		14:03	CF	H		120	0	Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 15

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
13	15/09/2019	Kestrel_K.	13:56	19:56		14:47	F	H	0	30		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 15
13	15/09/2019	Kestrel_K.	13:56	19:56		16:15	F	H	0	40		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 15
13	15/09/2019	Kestrel_K.	13:56	19:56		18:18	F	F	0	20		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 15
13	15/09/2019	Lesser Black-backed Gull_LB	13:56	19:56		18:46	CF+F	S+F		90		Rain: Dry Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 15
1	16/09/2019	Buzzard_BZ	10:10	16:10		10:00	NF3	H+F		23		Rain: occ drizzle Cloud: 1 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 16
1	16/09/2019	Goshawk	10:10	16:10	Male	13:03	HB+NF2	H	8	0		Rain: occ drizzle Cloud: 1 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 16
1	16/09/2019	Sparrowhawk	10:10	16:10	fem/imm	14:02	HB+NF2	H	6			Rain: occ drizzle Cloud: 1 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 16
2	17/09/2019	Sparrowhawk_SH	10:14	16:14	Female	10:22	G	F	120	180		Rain: Dry Cloud: 0/8 Visibility (km): 7 Wind Speed: F1 Wind Direction: E Temp (°C): 16
2	17/09/2019	Sparrowhawk_SH	10:14	16:14		10:28	F	H	20			Rain: Dry Cloud: 0/8 Visibility (km): 7 Wind Speed: F1 Wind Direction: E Temp (°C): 16
2	17/09/2019	Kestrel_K.	10:14	16:14		10:52	F	F	0	180		Rain: Dry Cloud: 0/8 Visibility (km): 7 Wind Speed: F1 Wind Direction: E Temp (°C): 16
2	17/09/2019	Sparrowhawk_SH	10:14	16:14		11:04	F	F		90		Rain: Dry Cloud: 0/8 Visibility (km): 7 Wind Speed: F1 Wind Direction: E Temp (°C): 16
2	17/09/2019	Lesser Black-backed Gull_LB	10:14	16:14		11:09	G+F	H	120			Rain: Dry Cloud: 0/8 Visibility (km): 7 Wind Speed: F1 Wind Direction: E Temp (°C): 16
2	17/09/2019	Kestrel_K.	10:14	16:14		11:14	F		0	90		Rain: Dry Cloud: 0/8 Visibility (km): 7 Wind Speed: F1 Wind Direction: E Temp (°C): 16
2	17/09/2019	Sparrowhawk_SH	10:14	16:14		11:33	F	C		50		Rain: Dry Cloud: 0/8 Visibility (km): 7 Wind Speed: F1 Wind Direction: E Temp (°C): 16
10	17/09/2019	Buzzard_BZ	10:00	13:00		11:43	G+F	H	12			Rain: dry Cloud: 0 Visibility (km): 5 Wind Speed: F1 Wind Direction: NE Temp (°C): 11
2	17/09/2019	Lesser Black-backed Gull_LB	10:14	16:14		12:26	G	F	30	90		Rain: Dry Cloud: 1/8 Visibility (km): 7 Wind Speed: F1 Wind Direction: E Temp (°C): 16
2	17/09/2019	Buzzard_BZ	10:14	16:14		12:38	G+F	F		280		Rain: Dry Cloud: 1/8 Visibility (km): 7 Wind Speed: F1 Wind Direction: E Temp (°C): 16

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
2	17/09/2019	Sparrowhawk_SH	10:14	16:14		15:42	F	F		40		Rain: Dry Cloud: 1/8 Visibility (km): 7 Wind Speed: F1 Wind Direction: E Temp (°C): 16
2	17/09/2019	Kestrel_K.	10:14	16:14		15:44	F	H	0	150		Rain: Dry Cloud: 1/8 Visibility (km): 7 Wind Speed: F1 Wind Direction: E Temp (°C): 16
8	18/09/2019	Lesser Black-backed Gull_LB	09:35	12:35		09:46	G	F		60		Rain: Dry Cloud: 1/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SE Temp (°C): 15
8	18/09/2019	Sparrowhawk_SH	09:35	12:35	Female	09:56	F	F	10	30		Rain: Dry Cloud: 1/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SE Temp (°C): 15
8	18/09/2019	Sparrowhawk_SH	09:35	12:35	Female	10:47	G	F	20			Rain: Dry Cloud: 1/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SE Temp (°C): 15
8	18/09/2019	Lesser Black-backed Gull_LB	09:35	12:35		10:49	F	F		120		Rain: Dry Cloud: 1/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SE Temp (°C): 15
8	18/09/2019	Kestrel_K.	09:35	12:35		12:34	G	F	50	0		Rain: Dry Cloud: 1/8 Visibility (km): 8 Wind Speed: F2 Wind Direction: SE Temp (°C): 15
12	19/09/2019	Sparrowhawk_SH	09:14	15:14		09:46	G	F	5			Rain: Dry Cloud: 0/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 15
12	19/09/2019	Sparrowhawk_SH	09:14	15:14		09:52	F	F		180		Rain: Dry Cloud: 0/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 16
12	19/09/2019	Kestrel_K.	09:14	15:14		09:54	G	F	0	30		Rain: Dry Cloud: 0/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 16
12	19/09/2019	Buzzard_BZ	09:14	15:14		12:02	G+F	F		120		Rain: Dry Cloud: 0/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 16
12	19/09/2019	Buzzard_BZ	09:14	15:14		12:18	G+F	F	20	20		Rain: Dry Cloud: 0/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 15
12	19/09/2019	Kestrel_K.	09:14	15:14		12:36	G+F	H	25	0		Rain: Dry Cloud: 0/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 15
4	19/09/2019	Buzzard_BZ	13:00	16:00		13:29	5			71		Rain: None Cloud: 0/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SSE Temp (°C): 17
4	19/09/2019	Sparrowhawk_SH	13:00	16:00		13:32	G			31		Rain: None Cloud: 0/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SSE Temp (°C): 17
12	19/09/2019	Buzzard_BZ	09:14	15:14		13:59	F	S		360		Rain: Dry Cloud: 0/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 15
4	19/09/2019	Buzzard_BZ	13:00	16:00		15:13	F			169		Rain: None Cloud: 0/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SSE Temp (°C): 17

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	310-170	>170	
4	19/09/2019	Buzzard_BZ	13:00	16:00		15:30	HB+F		193			Rain: None Cloud: 0/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SSE Temp (°C): 17
4	19/09/2019	Buzzard_BZ	13:00	16:00		15:39	F		9	120		Rain: None Cloud: 0/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SSE Temp (°C): 17
4	19/09/2019	Buzzard_BZ	13:00	16:00		15:49	HB+F	F	320	169		Rain: None Cloud: 0/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SSE Temp (°C): 17
4	19/09/2019	Buzzard_BZ	16:30	19:30		17:21	F	F	539			Rain: None Cloud: 1 Visibility (km): 15 Wind Speed: F1 Wind Direction: ESE Temp (°C): 22
4	19/09/2019	Sparrowhawk_SH	16:30	19:30		17:56	G	F	38			Rain: None Cloud: 1 Visibility (km): 15 Wind Speed: F1 Wind Direction: ESE Temp (°C): 22
4	19/09/2019	Buzzard_BZ	16:30	19:30		18:07	F	F	67			Rain: None Cloud: 1 Visibility (km): 15 Wind Speed: F1 Wind Direction: ESE Temp (°C): 22
3	20/09/2019	Kestrel_K.	09:12	15:12		09:35	G	H	40	0		Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SE Temp (°C): 15
3	20/09/2019	Buzzard_BZ	09:12	15:12		10:08	F	F	20	0		Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SE Temp (°C): 15
3	20/09/2019	Lesser Black-backed Gull_LB	09:12	15:12		10:37	F	F		60		Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SE Temp (°C): 15
9	20/09/2019	Buzzard_BZ	09:30	12:30		10:45	G	F	22			Rain: None Cloud: 06 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 11
9	20/09/2019	Lesser Black-backed Gull_LB	09:30	12:30		10:49	G	F	58			Rain: None Cloud: 6 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 11
9	20/09/2019	Lesser Black-backed Gull_LB	09:30	12:30		11:46	G	F	53			Rain: None Cloud: 6 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 11
9	20/09/2019	Lesser Black-backed Gull_LB	09:30	12:30		12:14	G	F	5			Rain: None Cloud: 6 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 11
3	20/09/2019	Buzzard_BZ	09:12	15:12		13:23	F	F	0	20		Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SE Temp (°C): 15
9	20/09/2019	Lesser Black-backed Gull_LB	13:00	16:00		13:54	G	F				Rain: None Cloud: 6 Visibility (km): 10 Wind Speed: F1 Wind Direction: SE Temp (°C): 19
3	20/09/2019	Kestrel_K.	09:12	15:12		14:24	F	H+F	0	30		Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SE Temp (°C): 15
3	20/09/2019	Buzzard_BZ	09:12	15:12		15:07	F	F	0	20		Rain: Dry Cloud: 7/8 Visibility (km): 5 Wind Speed: F4 Wind Direction: SE Temp (°C): 15

Table 15: Sightings of HH non-breeding season October 2017 – February 2018 for Grid Connection

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
A	25/10/2017	05:02	05:02	Female	12:21	2nd F1/F2+2nd F3+F	F	45			Rain: none Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
B	25/10/2017	11:10	17:10	Female/immature	11:25	HB+NF2	S+F	50			Rain: none Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
B	25/10/2017	11:10	17:10	Female/immature	12:08	HB+NF2	S+F	37			Rain: none Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
A	14/11/2017	09:25	15:25	Male	11:04	G+NF4	H+F	14			Rain: Mist Cloud: 7 Visibility (km): 10km Wind Speed: F1 Wind Direction: SW Temp (°C): 12
B	14/11/2017	09:20	15:20	Male	11:22	G+NF4+F	F	26			Rain: Mist Cloud: 7 Visibility (km): 7km Wind Speed: F1 Wind Direction: SW Temp (°C): 12
B	14/11/2017	09:20	15:20	Male	12:20	RG+NF4	F	22			Rain: Started misty, but cleared Cloud: 7 Visibility (km): 7km Wind Speed: F1 Wind Direction: SW Temp (°C): 12
B	14/11/2017	09:20	15:20	Male	13:19	RG+NF4+2nd F1/F2	C+H+F	21			Rain: Started misty, but cleared Cloud: 7 Visibility (km): 7km Wind Speed: F1 Wind Direction: SW Temp (°C): 12
C	17/11/2017	09:30	15:30	Ringtail	10:04	G+F	F	9			Rain: Dry Cloud: 3 Visibility (km): 30KM Wind Speed: F1 Wind Direction: NW Temp (°C): 7
A	04/01/2018	10:45	16:45	Ringtail	14:12	G+DE+GO	C+F	22			Rain: Heavy Showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F4 Wind Direction: W Temp (°C): 7

Table 16: Sightings of HH breeding season March 2018 – September 2018 for Grid Connection

VP	Date	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
								<30	30-170	>170	
A	20/03/2018	11:20	17:20	Female	16:56	RG+NF4	F	28			Rain: None Cloud: 2/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 6
B	22/03/2018	07:35	13:35	Female	10:33	G+NF4	S		5		Rain: Heavy Showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 8
A	10/04/2018	11:00	17:00	Female	11:28	G+NF4	F+P	2777			Rain: Occasional showers Cloud: 8/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: N Temp (°C): 8
A	10/04/2018	11:00	17:00	Male	12:15	G	F	10			Rain: Occasional showers Cloud: 8/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: N Temp (°C): 8
A	10/04/2018	11:00	17:00	Female	12:42	G+NF4	F	23			Rain: Occasional showers Cloud: 8/8 Visibility (km): 3 Wind Speed: F1 Wind Direction: N Temp (°C): 8
D	18/06/2018	16:30	17:30	Male	17:12	G+F	F	25			Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 18

Table 17: Sightings of other species non-breeding season October 2017 – February 2018 for Grid Connection

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)		Weather
									<30	30-170	
B	25/10/2017	Peregrine_PE	11:10	17:10	Juvenile	13:30	2nd F1/F2+2ndF4	HH+F	20		Rain: none Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
A	25/10/2017	Golden Plover_GP	05:02	05:02		13:47	G+NF1	F	12		Rain: none Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
B	25/10/2017	Buzzard_BZ	11:10	17:10	Juvenile	14:02	G	S+F	197		Rain: none Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
D	28/10/2017	Buzzard_BZ	10:15	16:15	Unaged	14:11	2nd F1/F2+2ndF4	S+F+P	37		Rain: none Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
D	28/10/2017	Buzzard_BZ	10:15	16:15	Unaged	14:46	G	C+F	87		Rain: none Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
D	28/10/2017	Buzzard_BZ	10:15	16:15	Unaged	15:03	G	C+H+F	124		Rain: none Cloud: 8/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 14
D	17/11/2017	Golden Plover_GP	09:20	15:20		10:47	RG+2nd F1/F2	C+F	120		Rain: Dry Cloud: 3 Visibility (km): 30KM Wind Speed: F1 Wind Direction: NW Temp (°C): 7
C	17/11/2017	Golden Plover_GP	09:30	15:30		10:54	G+RG+NF3+NF4	C+F	40		Rain: Dry Cloud: 3 Visibility (km): 30KM Wind Speed: F1 Wind Direction: NW Temp (°C): 7
D	17/11/2017	Buzzard_BZ	09:20	15:20	Juvenile	13:59	G+NF4	F+P	26		Rain: Dry Cloud: 3 Visibility (km): 30KM Wind Speed: F1 Wind Direction: NW Temp (°C): 7
A	22/12/2017	Kestrel_K.	10:00	16:00		13:30	G+RG+GO	C+F	11		Rain: Light mist Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
A	22/12/2017	Kestrel_K.	10:00	16:00		15:24	NF2+NF3	F+P	8		Rain: Light mist Cloud: 8 Visibility (km): 2 Wind Speed: F2 Wind Direction: NW Temp (°C): 11
C	28/12/2017	Buzzard_BZ	09:30	15:30		09:36	G	F	10		Rain: snow showers Cloud: 8 Visibility (km): 1 Wind Speed: F2 Wind Direction: W Temp (°C): 0
C	28/12/2017	Jay_J	09:30	15:30		14:24	G	F	8		Rain: snow showers Cloud: 8/8 Visibility (km): 1 Wind Speed: F2 Wind Direction: W Temp (°C): 0
D	29/12/2017	Kestrel_K.	09:41	15:41		10:06	CF	H+F	55		Rain: showers Cloud: 4 Visibility (km): 10 Wind Speed: F4 Wind Direction: W Temp (°C): 3
D	29/12/2017	Raven_RN	09:41	15:41		10:48	CF	F	10		Rain: showers Cloud: 4/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: W Temp (°C): 3

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)		Weather
									<30	30-170	
D	29/12/2017	Sparrowhawk_SH	09:41	15:41	Male/Female	11:22	CF	F	40		Rain: showers Cloud: 4/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: W Temp (°C): 3
D	29/12/2017	Grey Heron_H.	09:41	15:41		12:14	CF	F	10		Rain: showers Cloud: 4/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: W Temp (°C): 3
D	29/12/2017	Herring Gull_HG	09:41	15:41		12:31	CF	F	85		Rain: showers Cloud: 4/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: W Temp (°C): 3
D	29/12/2017	Sparrowhawk_SH	09:41	15:41		12:46	CF	F	25		Rain: showers Cloud: 4/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: W Temp (°C): 3
D	29/12/2017	Sparrowhawk_SH	09:41	15:41		14:12	CF	F	7		Rain: showers Cloud: 4/8 Visibility (km): 10 Wind Speed: F4 Wind Direction: W Temp (°C): 3
B	30/12/2017	Kestrel_K.	09:45	15:45		10:53	G	H+F	47		Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
B	30/12/2017	Lesser Black-backed Gull_LB	09:45	15:45		13:33	CF	F	22		Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
B	30/12/2017	Raven_RN	09:45	15:45		14:01	F	F	5		Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
B	30/12/2017	Kestrel_K.	09:45	15:45		14:09		H+F	46		Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
B	30/12/2017	Kestrel_K.	09:45	15:45	Male	14:15	F	F	8		Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
B	30/12/2017	Fieldfare_FF	09:45	15:45		14:22	G	F	20		Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
B	30/12/2017	Kestrel_K.	09:45	15:45		14:40		F	8		Rain: Dry Cloud: 8/8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 10
A	04/01/2018	Golden Plover_GP	10:45	16:45		11:42	G	F	15		Rain: Heavy Showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F4 Wind Direction: W Temp (°C): 7
A	04/01/2018	Golden Plover_GP	10:45	16:45		12:55	G+NF4	F	16		Rain: Heavy Showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F4 Wind Direction: W Temp (°C): 7
A	04/01/2018	Kestrel_K.	10:45	16:45		14:20	NF4	H+F	55		Rain: Heavy Showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F4 Wind Direction: W Temp (°C): 7
A	04/01/2018	Kestrel_K.	10:45	16:45		14:23	G+NF4	H+F	118		Rain: Heavy Showers Cloud: 8/8 Visibility (km): 2 Wind Speed: F4 Wind Direction: W Temp (°C): 7

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)		Weather
									<30	30-170	
D	05/01/2018	Raven_RN	09:15	15:15		13:18	NF4	F+P		30	Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: W Temp (°C): 2
B	19/01/2018	Kestrel_K.	09:00	15:00		11:00	RG	F			Rain: Light Cloud: 3/8 Visibility (km): 3 Wind Speed: F2 Wind Direction: W Temp (°C): 1
A	12/02/2018	Raven_RN	11:35	17:35		14:04	G+NF4	S		218	Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 2
A	12/02/2018	Raven_RN	11:35	17:35		14:49	G+NF4	S+F+P	294		Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 2
A	12/02/2018	Raven_RN	11:35	17:35		15:07	G+NF4	S		43	Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 2
A	12/02/2018	Kestrel_K.	11:35	17:35		15:34	G+NF4	F	21		Rain: None Cloud: 4/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: SW Temp (°C): 2
D	20/02/2018	Buzzard_BZ	12:35	15:35		12:54	NF4	F	20		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 8
D	20/02/2018	Buzzard_BZ	12:35	15:35		12:56	G+NF4	F	113		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 8
D	20/02/2018	Buzzard_BZ	12:35	15:35		12:58	NF4	F	49		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 8
D	20/02/2018	Buzzard_BZ	12:35	15:35		12:58	G+NF4	F	51		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 8
D	20/02/2018	Buzzard_BZ	12:35	15:35		13:08	G+NF4	F	72		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 8
D	20/02/2018	Buzzard_BZ	12:35	15:35		13:09	NF4	C	121		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 8
D	20/02/2018	Buzzard_BZ	12:35	15:35		13:50	G+NF4	F	38	30	Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 8
D	20/02/2018	Buzzard_BZ	12:35	15:35		14:31	G	S	41		Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 8
D	20/02/2018	Raven_RN	12:35	15:35		14:51	G+NF4	C	39	11	Rain: None Cloud: 6/8 Visibility (km): 5 Wind Speed: F2 Wind Direction: NW Temp (°C): 8
C	21/02/2018	Kestrel_K.	09:30	15:30		10:30	G	F	4		Rain: None Cloud: 8 Visibility (km): 10km Wind Speed: F1 Wind Direction: SW Temp (°C): 1-7°C

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
C	21/02/2018	Sparrowhawk_SH	09:30	15:30	Male	10:40	G	F	3			Rain: None Cloud: 8\8 Visibility (km): 10Km Wind Speed: F1 Wind Direction: SW Temp (°C): 1-7°C
D	21/02/2018	Grey Heron_H.	13:30	16:30		14:11	G+NF4	F	37			Rain: None Cloud: 5/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: S Temp (°C): 6

Table 18: Sightings of other species breeding season March 2018 – September 2018 for Grid Connection

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)		Weather
									<30	30-170	
A	20/03/2018	Kestrel_K.	11:20	17:20	Male	12:35	G	F+P	48		Rain: None Cloud: 2\8 Visibility (km): 10 Wind Speed: F1 Wind Direction: W Temp (°C): 6
C	21/03/2018	Raven_RN	10:30	16:30		10:35	G	F	8		Rain: None Cloud: 1\8 Visibility (km): 16 Wind Speed: F1 Wind Direction: SE Temp (°C): 8
C	21/03/2018	Buzzard_BZ	10:30	16:30		10:38	G	S		15	Rain: None Cloud: 1\8 Visibility (km): 16 Wind Speed: F1 Wind Direction: SE Temp (°C): 8
C	21/03/2018	Raven_RN	10:30	16:30		10:40	G+DE	F		12	Rain: None Cloud: 1\8 Visibility (km): 16 Wind Speed: F1 Wind Direction: SE Temp (°C): 8
C	21/03/2018	Buzzard_BZ	10:30	16:30		11:16	G	S		8	Rain: None Cloud: 1\8 Visibility (km): 16 Wind Speed: F1 Wind Direction: SE Temp (°C): 8
C	21/03/2018	Buzzard_BZ	10:30	16:30		11:20	G	S		30	Rain: None Cloud: 1\8 Visibility (km): 16 Wind Speed: F1 Wind Direction: SE Temp (°C): 8
C	21/03/2018	Raven_RN	10:30	16:30		11:20	G	F			Rain: None Cloud: 1\8 Visibility (km): 16 Wind Speed: F1 Wind Direction: SE Temp (°C): 8
C	21/03/2018	Buzzard_BZ	10:30	16:30		12:46	G	F	5	10	Rain: None Cloud: 1\8 Visibility (km): 16 Wind Speed: F1 Wind Direction: SE Temp (°C): 8
C	21/03/2018	Raven_RN	10:30	16:30		12:46	G	F			Rain: None Cloud: 1\8 Visibility (km): 16 Wind Speed: F1 Wind Direction: SE Temp (°C): 8
D	21/03/2018	Kestrel_K.	09:25	15:25	Female	13:11	RG+2nd F1/F2	F+P	314		Rain: None Cloud: 5\8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SW Temp (°C): 3
D	21/03/2018	Kestrel_K.	09:25	15:25	Female	13:44	G	H+P+P	285	159	Rain: None Cloud: 5\8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SW Temp (°C): 3
D	21/03/2018	Kestrel_K.	09:25	15:25		14:24	G	F	8		Rain: None Cloud: 5\8 Visibility (km): 15 Wind Speed: F1 Wind Direction: SW Temp (°C): 3
C	10/04/2018	Buzzard_BZ	10:40	17:40		14:00	F	F		12	Rain: Light rain and fog Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
C	10/04/2018	Raven_RN	10:40	17:40		14:00	F	F		12	Rain: Light rain and fog Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
A	10/04/2018	Mallard_MA	11:00	17:00	Male	14:08	G	F	6		Rain: Occasional showers Cloud: 8\8 Visibility (km): 3 Wind Speed: F1 Wind Direction: N Temp (°C): 8

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
C	10/04/2018	Buzzard_BZ	10:40	17:40		14:10	F	F		120		Rain: Light rain and fog Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
C	10/04/2018	Buzzard_BZ	10:40	17:40		14:13	F	F		30		Rain: Light rain and fog Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
C	10/04/2018	Raven_RN	10:40	17:40		14:13	F	F		30		Rain: Light rain and fog Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
C	10/04/2018	Buzzard_BZ	10:40	17:40		14:20	F	F		240		Rain: Light rain and fog Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
C	10/04/2018	Raven_RN	10:40	17:40		14:20	F	F		240		Rain: Light rain and fog Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
C	10/04/2018	Sparrowhawk_SH	10:40	17:40		14:25	F	D	1	3		Rain: Light rain and fog Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
C	10/04/2018	Raven_RN	10:40	17:40		14:36	F	F		180		Rain: Light rain and fog Cloud: 8\8 Visibility (km): 5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
D	11/04/2018	Mallard_MA	10:15	13:15	Male	10:18	G+CF	F		27		Rain: Misty Cloud: 7/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: N Temp (°C): 7
D	11/04/2018	Grey Heron_H.	10:15	13:15		10:41	G+NF4	F		26		Rain: Misty Cloud: 7/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: N Temp (°C): 7
B	11/04/2018	Kestrel_K.	10:30	13:30		10:43	G	F		7		Rain: None Cloud: 8\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 11
D	11/04/2018	Grey Heron_H.	10:15	13:15		10:57	G	F		48		Rain: Misty Cloud: 7/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: N Temp (°C): 7
B	11/04/2018	Raven_RN	10:30	13:30		11:30	G	F		20		Rain: None Cloud: 8\8 Visibility (km): 5 Wind Speed: F1 Wind Direction: S Temp (°C): 11
D	11/04/2018	Buzzard_BZ	10:15	13:15		12:24	G+NF4	S+C+F		48		Rain: Misty Cloud: 7/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: N Temp (°C): 7
D	11/04/2018	Raven_RN	10:15	13:15		13:07	H+NF4	F		64		Rain: Misty Cloud: 7/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: N Temp (°C): 7
D	12/04/2018	Kestrel_K.	08:45	11:45		11:39	NF4	F+P		273		Rain: Misty Cloud: 7/8 Visibility (km): 2 Wind Speed: F1 Wind Direction: E Temp (°C): 7
A	17/05/2018	Raven_RN	11:30	16:30		16:20	NF4	F		28		Rain: None Cloud: 8/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: E Temp (°C): 12

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
D	21/05/2018	Kestrel_K.	11:30	17:30		14:10	G	F	153			Rain: Heavy Showers Cloud: 8\8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SW Temp (°C): 10
D	21/05/2018	Kestrel_K.	11:30	17:30		15:10	G	H+F	43			Rain: Heavy Showers Cloud: 8\8 Visibility (km): 2 Wind Speed: F1 Wind Direction: SW Temp (°C): 10
B	11/06/2018	Buzzard_BZ	10:40	16:40		12:24	G	S+F		40		Rain: None Cloud: 8\8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 15
B	11/06/2018	Buzzard_BZ	10:40	16:40		15:55	G	S+F	20			Rain: None Cloud: 8\8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 15
B	11/06/2018	Buzzard_BZ	10:40	16:40		16:16	G	F	20			Rain: None Cloud: 8\8 Visibility (km): 5 Wind Speed: F3 Wind Direction: SE Temp (°C): 15
C	13/06/2018	Raven_RN	08:30	14:30		10:22	G	F	6			Rain: Showers Cloud: 8\8 Visibility (km): 10 Wind Speed: 1 Wind Direction: SW Temp (°C): 17
C	13/06/2018	Kestrel_K.	08:30	14:30		12:54	G	F	4			Rain: Showers Cloud: 8\8 Visibility (km): 10 Wind Speed: 1 Wind Direction: SW Temp (°C): 17
A	18/06/2018	Raven_RN	10:14	16:14		10:48	G+F	F	20			Rain: None Cloud: 7\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 14
A	18/06/2018	Buzzard_BZ	10:14	16:14		11:41	G+F	S+F		50		Rain: None Cloud: 7\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 14
A	18/06/2018	Buzzard_BZ	10:14	16:14		11:41	G+F	S+F		50		Rain: None Cloud: 7\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 14
A	18/06/2018	Buzzard_BZ	10:14	16:14		11:42	G+F	S+F		50		Rain: None Cloud: 7\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 14
A	18/06/2018	Buzzard_BZ	10:14	16:14		11:42	G+F	S+F		50		Rain: None Cloud: 7\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 14
A	18/06/2018	Buzzard_BZ	10:14	16:14		11:56	G+F	S		10		Rain: None Cloud: 7\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 14
A	18/06/2018	Buzzard_BZ	10:14	16:14		12:29	G+F	S		10		Rain: None Cloud: 7\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 14
A	18/06/2018	Kestrel_K.	10:14	16:14		15:03	G+F	H+F		95		Rain: None Cloud: 7\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 14
A	18/06/2018	Kestrel_K.	10:14	16:14		15:23	G	F		40		Rain: None Cloud: 7\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 14

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
A	18/06/2018	Buzzard_BZ	10:14	16:14		15:46	G+F	S+F		50		Rain: None Cloud: 7\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 14
D	18/06/2018	Kestrel_K.	16:30	17:30		16:37	G	H+F				Rain: None Cloud: 8\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 18
D	18/06/2018	Kestrel_K.	16:30	17:30		16:52	G	H		10		Rain: None Cloud: 8\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 18
D	18/06/2018	Kestrel_K.	16:30	17:30		16:56	G	H		20		Rain: None Cloud: 8\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 18
D	18/06/2018	Kestrel_K.	16:30	17:30		17:10	G	H+F		20		Rain: None Cloud: 8\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 18
D	18/06/2018	Kestrel_K.	16:30	17:30		17:12	G	H		15		Rain: None Cloud: 8\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 18
D	18/06/2018	Kestrel_K.	16:30	17:30		17:27	G	H		10		Rain: None Cloud: 8\8 Visibility (km): 10 Wind Speed: F3 Wind Direction: SW Temp (°C): 18
A	03/07/2018	Buzzard_BZ	10:22	16:22		10:53	G+F	S+F		100		Rain: None Cloud: 1/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 21
A	03/07/2018	Kestrel_K.	10:22	16:22	Female	11:16	G	F+P		20		Rain: None Cloud: 1/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 21
A	03/07/2018	Kestrel_K.	10:22	16:22		11:21	G	F+P		25		Rain: None Cloud: 1/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 21
A	03/07/2018	Kestrel_K.	10:22	16:22		12:11	G	F+P		5		Rain: None Cloud: 1/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 21
A	03/07/2018	Kestrel_K.	10:22	16:22		12:33	G	H+F		20		Rain: None Cloud: 1/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 21
A	03/07/2018	Kestrel_K.	10:22	16:22		12:50	G+F	H+F		30		Rain: None Cloud: 1/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 21
A	03/07/2018	Kestrel_K.	10:22	16:22		12:50	G+F	F		100		Rain: None Cloud: 1/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 21
A	03/07/2018	Buzzard_BZ	10:22	16:22		12:53	G+F	F		100		Rain: None Cloud: 1/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 21
A	03/07/2018	Kestrel_K.	10:22	16:22		12:54	G	F+P		2		Rain: None Cloud: 1/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 21

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
A	03/07/2018	Buzzard_BZ	10:22	16:22		13:23	G	F		40		Rain: None Cloud: 1/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 21
A	03/07/2018	Kestrel_K.	10:22	16:22		13:27	G	F+P		50		Rain: None Cloud: 1/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 21
A	03/07/2018	Kestrel_K.	10:22	16:22	Female	14:35	G	F+P		20		Rain: None Cloud: 1/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 21
A	03/07/2018	Kestrel_K.	10:22	16:22		14:51	G	H+F		20		Rain: None Cloud: 1/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: E Temp (°C): 21
D	05/07/2018	Kestrel_K.	15:04	17:04		14:37	G	F		35		Rain: None Cloud: 6/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 22
D	05/07/2018	Buzzard_BZ	15:04	17:04		15:45	G	S		354		Rain: None Cloud: 6/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 22
D	06/07/2018	Herring Gull_HG	07:48	11:48		08:08	G	F	30			Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 16
D	06/07/2018	Kestrel_K.	07:48	11:48		08:26	G	H+F		50		Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 16
D	06/07/2018	Kestrel_K.	07:48	11:48		08:45	G	H+F	20			Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 16
D	06/07/2018	Kestrel_K.	07:48	11:48		08:57	G	H+F	30			Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 16
D	06/07/2018	Kestrel_K.	07:48	11:48		09:41	G	H+F	30			Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 16
D	06/07/2018	Raven_RN	07:48	11:48		09:53	G	F	20	60		Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 16
D	06/07/2018	Raven_RN	07:48	11:48		10:11	G	F		50		Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 16
D	06/07/2018	Kestrel_K.	07:48	11:48		10:24	G	H+F				Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: NE Temp (°C): 16
B	09/07/2018	Buzzard_BZ	11:52	15:52		14:07	G+F	S+F		100		Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
B	09/07/2018	Raven_RN	11:52	15:52		14:08	G+F	F+P		50		Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
B	09/07/2018	Buzzard_BZ	11:52	15:52		14:09	G+F	S+F	100			Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
B	09/07/2018	Buzzard_BZ	11:52	15:52		15:16	G+F	S+F	100			Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
C	10/07/2018	Raven_RN	08:01	13:01		09:00	G+F	F	50			Rain: None Cloud: 7/8 Visibility (km): 10 Wind Speed: F1 Wind Direction: N Temp (°C): 16
C	10/07/2018	Buzzard_BZ	08:01	13:01		11:37	G	S+F	100			Rain: None Cloud: 0 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
C	10/07/2018	Buzzard_BZ	08:01	13:01		11:38	G	S+F	10			Rain: None Cloud: 0 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
B	10/07/2018	Raven_RN	13:23	15:23		11:48	G+F	F	30			Rain: None Cloud: 0 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
B	10/07/2018	Raven_RN	13:23	15:23		11:48	G+F	F	30			Rain: None Cloud: 0 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
C	10/07/2018	Buzzard_BZ	08:01	13:01		11:56	G	S+F+P	100			Rain: None Cloud: 0 Visibility (km): 10 Wind Speed: F2 Wind Direction: N Temp (°C): 21
D	08/08/2018	Kestrel_K.	11:15	14:16		11:17	G	H+F	15			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16	Female	11:35	G	H+F	10			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16	Female	11:42	G	H+F	15			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16		12:18	G	H+F	15			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16		12:29	G	H+F	20			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16		12:29	G	H+F	10			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16		12:35	G	H+F	20			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Raven_RN	11:15	14:16		12:38	G	F	15			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
D	08/08/2018	Kestrel_K.	11:15	14:16		12:39	G	H	15			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16		12:52	G	H+F	20			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16		12:52	G	H+F	15			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16		13:21	G	H+F	15			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16		13:33	G	H+F	10			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16		13:44	G	H+F	10			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16		13:45	G	H+F	20			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16		14:00	G	H+F	20			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	11:15	14:16		14:01	G	F	30			Rain: None Cloud: 7/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: W Temp (°C): 17
D	08/08/2018	Kestrel_K.	14:46	17:46		15:04	G	F				Rain: None Cloud: 3/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 13
D	08/08/2018	Kestrel_K.	14:46	17:46		15:11	G	F	5			Rain: None Cloud: 3/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 13
D	08/08/2018	Kestrel_K.	14:46	17:46		15:47	G	H	10			Rain: None Cloud: 3/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 13
D	08/08/2018	Kestrel_K.	14:46	17:46		16:14	G	H	10			Rain: None Cloud: 3/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 13
D	08/08/2018	Kestrel_K.	14:46	17:46		16:18	G	H	20			Rain: None Cloud: 3/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 13
D	08/08/2018	Kestrel_K.	14:46	17:46		16:35	G	H+F	30			Rain: None Cloud: 3/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 13
D	08/08/2018	Kestrel_K.	14:46	17:46		16:47	G	H+F	10			Rain: None Cloud: 3/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 13

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
D	08/08/2018	Kestrel_K.	14:46	17:46		17:09	G+F	H+F	20			Rain: None Cloud: 3/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 13
B	09/08/2018	Raven_RN	08:35	11:35		09:00	G+F	F	40			Rain: None Cloud: 1/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: W Temp (°C): 12
B	09/08/2018	Raven_RN	08:35	11:35		09:00	G	F	40			Rain: None Cloud: 1/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: W Temp (°C): 12
B	09/08/2018	Buzzard_BZ	08:35	11:35		09:37	G	S+F	100			Rain: None Cloud: 1/8 Visibility (km): 15 Wind Speed: F1 Wind Direction: W Temp (°C): 12
B	09/08/2018	Raven_RN	12:05	15:05		13:14	G	F	20			Rain: light occasional Cloud: 6/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 15
B	09/08/2018	Buzzard_BZ	12:05	15:05		14:41	G	S+F	30			Rain: light occasional Cloud: 6/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 15
B	09/08/2018	Buzzard_BZ	12:05	15:05		14:41	G	S+F	30			Rain: light occasional Cloud: 6/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 15
B	09/08/2018	Buzzard_BZ	12:05	15:05		14:48	G+NF3	S+F	100			Rain: light occasional Cloud: 6/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 15
B	09/08/2018	Buzzard_BZ	12:05	15:05		15:00	G	F	30			Rain: light occasional Cloud: 6/8 Visibility (km): 15 Wind Speed: F2 Wind Direction: W Temp (°C): 15
C	10/08/2018	Raven_RN	08:39	11:39		09:17	DE	F	150			Rain: None Cloud: 3/8 Visibility (km): 15 Wind Speed: F3 Wind Direction: NW Temp (°C): 13
C	10/08/2018	Sparrowhawk_SH	08:39	11:39		11:37	G	F	60			Rain: None Cloud: 3/8 Visibility (km): 15 Wind Speed: F4 Wind Direction: NW Temp (°C): 13
C	10/08/2018	Buzzard_BZ	12:09	15:09		12:11	DE	F				Rain: None Cloud: 3/8 Visibility (km): 15 Wind Speed: F5 Wind Direction: NW Temp (°C): 13
A	14/08/2018	Buzzard_BZ	09:30	12:30		10:44	NF4	S+C	20	240		Rain: None Cloud: 1 Visibility (km): >20 Wind Speed: F4 Wind Direction: W Temp (°C): 17
A	14/08/2018	Buzzard_BZ	09:30	12:30		10:56	G+NF4	S	420			Rain: None Cloud: 1 Visibility (km): >20 Wind Speed: F4 Wind Direction: W Temp (°C): 17
A	14/08/2018	Kestrel_K.	09:30	12:30		12:04	G+NF4	F+P	60			Rain: None Cloud: 1 Visibility (km): >20 Wind Speed: F4 Wind Direction: W Temp (°C): 17
A	14/08/2018	Sparrowhawk_SH	13:00	16:00	Female	13:22	G+RG+NF4	S	180			Rain: None Cloud: 6/8 Visibility (km): >20 Wind Speed: F3 Wind Direction: W Temp (°C): 19

VP	Date	Species	Start Time	End Time	Sex	Time of sighting	Habitat	Behaviour	Duration (seconds) at height (metres)			Weather
									<30	30-170	>170	
A	14/08/2018	Lesser Black-backed Gull_LB	13:00	16:00		13:40	G+RG+NF4	F		45		Rain: None Cloud: 6/8 Visibility (km): >20 Wind Speed: F3 Wind Direction: W Temp (°C): 19
A	14/08/2018	Kestrel_K.	13:00	16:00		13:44	NF4	F		30		Rain: None Cloud: 6/8 Visibility (km): >20 Wind Speed: F3 Wind Direction: W Temp (°C): 19
A	14/08/2018	Kestrel_K.	13:00	16:00		14:22	G+RG+NF4	H+F		195	585	Rain: None Cloud: 6/8 Visibility (km): >20 Wind Speed: F3 Wind Direction: W Temp (°C): 19
A	14/08/2018	Kestrel_K.	13:00	16:00		14:50	RG	H+P		150	30	Rain: None Cloud: 6/8 Visibility (km): >20 Wind Speed: F3 Wind Direction: W Temp (°C): 19
B	17/09/2018	Raven_RN	09:30	12:30		11:05	G	F		20		Rain: showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
A	17/09/2018	Raven_RN	10:42	13:42		13:31	F	F		25		Rain: None Cloud:1 Visibility (km):2 Wind Speed: F4 Wind Direction: S Temp (°C): 17
B	17/09/2018	Raven_RN	13:00	16:00		13:34	G	F		12		Rain: Light showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 17
B	17/09/2018	Raven_RN	13:00	16:00		13:40	G	F		6		Rain: Light showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 17
B	17/09/2018	Lesser Black Backed Gull	13:00	16:00		14:05	G	F		16		Rain: Light showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 17
B	17/09/2018	Sparrowhawk	13:00	16:00	Female	14:30	G	H		40		Rain: Light showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 17
C	18/09/2018	Lesser Black Backed Gull	09:00	12:00		10:27	G	F				Rain: Persistent Heavy Rain Cloud: 8/8 Visibility (km):2 Wind Speed: F1 Wind Direction: SW Temp (°C): 11
C	18/09/2018	Kestrel_K.	13:00	16:00		15:15	G	F		90		Rain: showers Cloud: 8/8 Visibility (km): 5 Wind Speed: F1 Wind Direction: SW Temp (°C): 15
D	20/09/2018	Lesser Black Backed Gull	09:00	12:00		10:50	G	F				Rain: Persistent Heavy Rain Cloud: 8/8 Visibility (km):2 Wind Speed: F1 Wind Direction: SW Temp (°C): 11
D	20/09/2018	Lesser Black Backed Gull	13:00	16:00		14:03	G	F+P		50		Rain: Persistent Heavy Rain Cloud: 8/8 Visibility (km):2 Wind Speed: F1 Wind Direction: SW Temp (°C): 11

Table 19: Sightings of HH during roost watches November 2016 – March 2018

Date	VP grid	Location	Roost grid	Dusk/Dawn	Time of Sighting	Sex	Habitat	Weather
11/12/2016	W 63971 89127	Knocknaskagh	W 709 957	Dusk	16:35	Female/ Immature	F2, SCR, F3	Cloud: low Visibility (km): 0.8
18/12/2016	W 63971 89128	Bottle Hill borrow pit	W 709 957	Dusk	17:05	Female	F3, HB, SCR	No information available
20/01/2017	W 65126 88422	Coom (Fitzgerald)/ Glashaboy Nth	W 643 889	Dusk	17:18	Female	F1	No information available
12/02/2017	W 70940 95752	Knocknaskagh	W 709 958	Dawn	07:55	Male	MF	No information available
12/02/2017	W 70940 95752	Knocknaskagh	W 709 958	Dawn	07:55	Female/Immature	MF	No information available
25/10/2017	Not available	Knocknaskagh	Not available	Dusk	07:55	Male	2nd F3	Rain: None Cloud:4/8 Visibility (km):4 Wind Speed: F2 Wind Direction: NW
25/10/2017	Not available	Knocknaskagh	Not available	Dusk	07:55	Female	2nd F3	Rain: None Cloud:4/8 Visibility (km):4 Wind Speed: F2 Wind Direction: NW
13/11/2017	Not available	Fiddane	Not available	Dusk	18:03	Male	RG, GO	Rain: None Cloud:8/8 Visibility (km):3 Wind Speed: F4 Wind Direction: W
13/11/2017	Not available	Fiddane	Not available	Dusk	18:20	Male	RG, GO	Rain: None Cloud:8/8 Visibility (km):3 Wind Speed: F4 Wind Direction: W
13/11/2017	Not available	Fiddane	Not available	Dusk	18:35	Male	RG, NF3	Rain: None Cloud:8/8 Visibility (km):3 Wind Speed: F4 Wind Direction: W
18/01/2018	VP1	Knocknaskagh	Not available	Dawn	08:57	Male	G,	Rain: light Cloud:3/8 Visibility (km):2 Wind Speed: F1 Wind Direction: W
17/01/2018	Not available	Fiddane	Not available	Dusk	17:07	Female	RG	Rain: Heavy showers Cloud:8/8 Visibility (km):2 Wind Speed: F2 Wind Direction: SW

18/01/2018	Not available	Fiddane	Not available	Dawn	09:07	Male	RG	Rain: Dry Cloud:5/8 Visibility (km):5 Wind Speed: F1 Wind Direction: W
22/03/2018	Not available	Knocknaskagh	Not available	Dawn	06:40	Male+Female	2nd F1/F2	Rain: None Cloud:5/8 Visibility (km):5 Wind Speed: F2 Wind Direction: SE

Table 20: Sightings of other species during roost watches season November 2016 – March 2018

Date	VP grid	Location	Roost grid	Dusk/Dawn	Time of Sighting	Species	Habitat	Weather
20/02/2018	Not available	Knocknaskagh	Not available	Dusk	18:03	Raven	F	Rain: None Cloud:4/8 Visibility (km):16 Wind Speed: F1 Wind Direction: SW
21/03/2018	Not available	Knocknaskagh	Not available	Dusk	18:40	Kestrel	F	Rain: None Cloud:8/8 Visibility (km):5 Wind Speed: F1 Wind Direction: SE

Table 21: VP Locations March 2016 – June 2017

VP	X Co-ordinates	Y Co-ordinates
34	563727	593047
5	565505	590048
7	565667	588717
32	563816	592694
31	571203	593223
17	569062	591840
18	562762	591992
2	562595	589148
21	563238	591038
23	564281	590129
15	569876	593023
30	569476	590229
14a	567471	590506
3	563396	588985
12	566369	593908
27a	562070	592423
9	565423	593243
11	566360	593892
27	562320	591177
8	566622	591680
11a	565377	594867
14	568620	590635
14b	567680	590386
18a	562301	592504
34a	563624	593495

Table 22: VP Locations July 2017 – February 2018

VP	X Co-ordinates	Y Co-ordinates
1	563396	588985
2	565667	588717
3	565423	593243
4	566369	593908
5	569062	591840
7	564281	590129
8	562070	592423
9	569476	590229
10	571203	593223
11	569202	594962
12	569414	592659
13	567641	596801
14	569537	595050
15	569889	593032

Table 23: VP Locations March 2018 – March 2019

VP	X Co-ordinates	Y Co-ordinates
1	563396	588985
2	565667	588717
3	565423	593243
4	566369	593908
5	569062	591840
7	564281	590129
8	562070	592423
9	569476	590229
10	571203	593223
11	569202	594962
12	569414	592659
13	567641	596801
14	569537	595050

Table 24: VP Locations April 2019 – September 2019

VP	X Co-ordinates	Y Co-ordinates
1	563396	588985
2	565667	588717
3	565423	593243
4	566369	593908
5	569062	591840
7	564281	590129
8	562070	592423
9	569476	590229
10	571203	593223
11	569202	594962
12	569414	592659
13	567641	596801

Transect No.	Early Visit							Late visit						
	T1	T2	T3	T4	T5	T6	T7	T1	T2	T3	T4	T5	T6	T7
Date	17/05	15/05	23/05	18/05	18/05	24/05	16/05	27/06	14/06	16/06	26/06	26/06	20/06	15/06
Species														
Lesser Black Backed Gull								28						
Linnet	1							10						
Magpie				1				5				1		1
Mallard							2							
Meadow Pipit	2		7	3				4		6				4
Mistle Thrush	1	4	7	4	2	8	2	9	3	4	4	4	5	3
Pheasant	2	1		3	1			1			2	2		
Pied Wagtail								6						
Reed Bunting				2				2						
Robin	5	8	5	3	3	8	2		4	2			1	1
Rook		1			4	1		7	2	1	3			
Herring Gull			1											
Woodpigeon	2	6	3	5	5	9	6	4		1	6	13	4	4
Raven			1			1								
Skylark				1										
Long-tailed Tit									7					
Willow Warbler	5	8	7	6	5			2	6	7	6	3		7
Sedge Warbler					2			2						
Whitethroat			3	1	3		1		1	3				1
Wren	5	11	15	5	9	14	10	5	13	17	11	15	21	8

Table 26: Results of General Wintering Bird Surveys along transects T1 to T7 at CGEP during 2016/ 2017 winter season

Transect No.	December 2016							January 2017							February 2017						
	T1	T2	T3	T4	T5	T6	T7	T1	T2	T3	T4	T5	T6	T7	T1	T2	T3	T4	T5	T6	T7
Date	21/12	14/12	21/12	21/12	21/12	15/12	15/12	23/01	24/01	23/01	23/01	23/01	23/01	24/01	16/02	16/02	16/02	16/02	16/02	17/02	17/02
Species																					
Blackbird	3	1	2	2	4	2	1	2	2	2	6				1	1	3	2	3	1	1
Blue Tit	1		2		1				1			1	2					1			
Bullfinch			3																		
Chaffinch	1		6		1	2			1	2	5	1			10	1	4	6	2	2	2
Coal Tit		1	3	1	2	4			17	1	1	30	11		3	4	4	1	8	2	3
Duncock	1		4	1	2	1				1	1				2	1	2	1			
Fieldfare		31			100	1		250							22	9			1		
Goldcrest	2					4	2		5	1	3	6	4		7	2	2	1	7	6	4
Great Tit								1	1							2					
Hen Harrier																		1			
Hooded Crow	4		1	3	1			4		1	2	4			7	2	3	2	3		
Jackdaw		1														1		2			
Kestrel																	1				
Linnet							5														
Magpie	1			1	4			1		2	4	1			3			2	2		
Mallard								4							14						
Meadow Pipit	7							7							6	2	5	4	2		
Mistle Thrush				2					2	1	1						1	2			
Pheasant	1			2							1								1		

Transect No.	December 2016							January 2017							February 2017						
	T1	T2	T3	T4	T5	T6	T7	T1	T2	T3	T4	T5	T6	T7	T1	T2	T3	T4	T5	T6	T7
Date	21/12	14/12	21/12	21/12	21/12	15/12	15/12	23/01	24/01	23/01	23/01	23/01	24/01	24/01	16/02	16/02	16/02	16/02	16/02	17/02	17/02
Species																					
Pied Wagtail	5							1		3					3		1				
Redwing		1			200			70													
Reed Bunting			1													2					
Robin	4	7		2	3	6	4	2	1	1	1	3	4		5	6	2	4	5	2	7
Rook	4	19	1	20	46			8	10	18	6	32			1	8	4	2			
Woodpigeon	1	1								1	2	1					3	3			2
Raven	1				2	4		2		2						2					
Long-tailed Tit					1						6										
Wren	2	6	9	7	8		7		5	7	3	5	2	1	1	3	6	5	1	5	5
Snipe			1					1	4								1				
Starling				10	30			120			30	5			63						
Song Thrush									2			3	3			3	1	1		2	1
Stonechat	2							2													
Teal								5							2						

Transect No.	Wintering Bird Survey 2018						Breeding Bird Survey 2018					
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6
Date	18/01	21/02	18/01	05/01	19/01	19/01	11/04	11/04	18/04	21/03	30/03	30/03
Species												
Pied Wagtail								1	1			
Robin	3	8	1	1	1	1	5	2	6	5	6	1
Rook		1	35		50	1		2	18	7	6	21
Woodpigeon		1	1		1	1	3		2	1		1
Raven							1					
Long-tailed Tit	2	1										
Willow Warbler							2	1	1			
Wren		1			1		7	4	4	1	4	5
Starling				5		1					3	1
Song Thrush								1				1

Table 28: Results of Wintering Wildfowl Surveys at CGEP during 2016/2017

Date	VP	Dawn Watch		Dusk Watch		Mallow-Fermoy Circuit	Notes
		Swans	Geese	Swans	Geese		
25/10/2016	W 66990 93927	Nil Sightings	Nil Sightings	Nil Sightings	Nil Sightings	Nil Sightings	2 MS at Killavullen
25/11/2016	W 66990 93927	Nil Sightings	Nil Sightings	Nil Sightings	Nil Sightings	Nil Sightings	
13/12/2016	W 66990 93927	Nil Sightings	Nil Sightings	Nil Sightings	Nil Sightings	Nil Sightings	2 MS at Killavullen
26/01/2017	W 66990 93927	Nil Sightings	Nil Sightings	Nil Sightings	Nil Sightings	Nil Sightings	

Table 29: Results of Goshawk Survey at CGEP 2018

Date	Start Time	End Time	Sex	Weather	Notes
09/04/2018	14:10	17:10	Nil Sightings	Rain: Light showers Cloud: 8/8 Wind Speed: F1 Wind Direction: S Temp (°C): 12	A pair of HH were observed hunting from the VP.
10/04/2018	07:30	09:30	Nil Sightings	Rain: Light showers Cloud: 8/8 Wind Speed: F1 Wind Direction: S Temp (°C): 12	BZ observed calling/soaring near the NW corner of the landfill site. High densities of corvids were observed

Table 30: Results of Dipper Survey 2018

Date	Start Time	End Time	Sex	Nest	Location	Weather
18/05/2018	Not available	Not available	Nil sightings	Old nest	574401 588905	Not available
18/05/2018	Not available	Not available	Nil sightings	Old nest	579098 589946	Not available
22/06/2018	Not available	Not available	Nil sightings	Nil sightings	N/A	Not available

Table 31: Results of Kingfisher Survey 2018

Date	Start Time	End Time	Sex	Nest	Location	Weather
18/05/2018	Not available	Not available	Nil sightings	Nil sightings	N/A	Not available
22/06/2018	Not available	Not available	Nil sightings	Nil sightings	N/A	Not available

Table 32: Results of Merlin Survey 2019

Date	Start time	End Time	Sex	Signs	Location	Weather
31/05/2019	10:30	17:15	Nil sightings	1 Pellet	569435 595578	Rain: Showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: SE Temp (°C): 16
31/05/2019	06:55	11:55	Nil Sightings	Nil Sightings	N/A	Rain: Showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
31/05/2019	08:45	14:45	Nil Sightings	Nil Sightings	N/A	Rain: Showers Cloud: 8/8 Visibility (km): 4 Wind Speed: F3 Wind Direction: SW Temp (°C): 12
29/06/2019	Not available	Not available	Nil Sightings	1 Pellet	571356 595724	Not available
30/06/2019	Not available	Not available	Nil Sightings	Nil Sightings	N/A	Not available

Table 33: Results of Hen Harrier Surveys carried out in 2020

Date	Time of Sighting	Bout Number	Sex	Notes	Weather
18/04/2020	13:57	1	Male	Observed in flight north of Knocknaskagh.	Not available
20/04/2020	10:54	2	Male & Female	Observed in flight south-west of Knocknaskagh.	Not available
20/04/2020	12:53	3	Male	Observed flying north from Moneygorm towards Knocknaskagh.	Not available
20/04/2020	13:56	4	Male	Observed in flight south-west of Knocknaskagh.	Not available
20/04/2020	14:05	5	Male	Observed at Knocknaskagh flying west to east.	Not available
20/04/2020	14:17	6	Male	Observed in flying south to Moneygorm.	Not available
20/04/2020	15:14	7	Male	Observed at Toorgarriff.	Not available
25/04/2020	-	-	-	Nil Hen Harrier sightings.	Not available
07/05/2020	13:24	1	Male	Observed in flight near Moneygorm.	Rain: Light showers/mist Cloud: 8/8 Visibility (km): 2 Wind Speed: F2 Wind Direction: SE Temp (°C): 11.5
10/05/2020	12:15	-	Male	Observed flying south near Lackendarragh North.	Rain: None Cloud: 7/8 Visibility (km): >5 Wind Speed: F2 Wind Direction: S Temp (°C): 11
15/05/2020	10:43	1	Male	Observed hunting and in flight at Lackendarragh North.	Rain: None Cloud: 7/8 Visibility (km): >5 Wind Speed: F3 Wind Direction: N Temp (°C): 11.5
15/05/2020	11:59	3	Male	Observed flying east from Lackendarragh North to Moneygorm.	Rain: None Cloud: 4/8 Visibility (km): >5 Wind Speed: F3 Wind Direction: N Temp (°C): 11.5
15/05/2020	12:06	4	Male	Observed in flight at Moneygorm.	Rain: None Cloud: 4/8 Visibility (km): >5 Wind Speed: F3 Wind Direction: N Temp (°C): -
02/06/2020	-	-	-	Nil Hen Harrier sightings	Rain: None Cloud: 3/8 Visibility (km): >3 Wind Speed: F3 Wind Direction: SW Temp (°C): -
05/06/2020	-	-	-	Nil Hen Harrier sightings	Rain: Occasional showers Cloud: 8/8 Visibility (km): good Wind Speed: F1 Wind Direction: NW Temp (°C): -
26/06/2020	-	-	-	Nil Hen Harrier sightings	Rain: Dry: 3/8 Visibility (km): 4 Wind Speed: F2 Wind Direction: W Temp (°C): -

Table 28: Results of Wintering Wildfowl Surveys at CGEP during 2017/2018

Date	Vantage Point (Irish Grid Location)	Dawn Watch		Dusk Watch		Blackwater Valley (Mallow-Fermoy Circuit) – WEBS Count
		Swans	Geese	Swans	Geese	
29/11/2017	W 66990 93929	-	-	Nil Sightings	Nil Sightings	Mallard (3), Cormorant, Grey Heron (3), Teal (8), Little grebe (2)
30/11/2017	W 66990 93929	Nil Sightings	Nil Sightings	-	-	Nil Sightings
18/12/2017	W670 939	Nil Sightings	Nil Sightings			Nil Sightings
21/12/2017	W670 939	-	-	-	-	Nil Sightings
29/12/2017	W670 939	-	-	Nil Sightings	Nil Sightings	Nil Sightings
15/01/2018	W670 939	-	-	Nil Sightings	Nil Sightings	Mute Swan (2), Grey Heron (3)
12/02/2018	W670 939					Nil Sighting
23/02/2018	W667 943	-	-	Nil Sighting	Nil Sighting	Nil Sighting
08/03/2018	W670 939	-	-	Nil Sighting	Nil Sighting	Nil Sighting

Fisheries assessment of Coom Green Energy Park, Co. Cork



Prepared by Triturus Environmental Ltd. for INIS Environmental Consultants Ltd.

September 2020

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were contracted by INIS Environmental Consultants Ltd. (on behalf of Brookfield Renewable Ireland) to undertake a baseline fisheries assessment on numerous watercourses in the footprint of the proposed Coom Green Energy Park development, located near Bottlehill, Co. Cork.

The survey was undertaken to establish baseline fisheries data used in the preparation of the EIAR for the proposed development, which includes a proposed wind turbine layout and associated cable route alignment (Figure 1.1). In order to gain an accurate overview of the existing and potential fisheries value of the riverine watercourses within the footprint of the proposed development, a catchment-wide electro-fishing survey across $n=25$ sites was undertaken (Figure 1.1, Table 1.1). Electro-fishing helped to identify the importance of the watercourses as nurseries and habitats for salmonids, lamprey and European eel (*Anguilla anguilla*), as well as other species, and helped to further inform impact assessment and any subsequent mitigation for the development.

Triturus Environmental Ltd. made an application under Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962, to undertake a catchment-wide electro-fishing survey in the footprint of the proposed Coom Green Energy Park located near Bottlehill, Co. Cork. Permission was granted on Monday 27th July 2020 and the survey was undertaken over Wednesday 29th to Friday 31st July 2020.

1.2 Fisheries asset of the survey area

The proposed Coom Green Energy Park development encompasses numerous small streams and rivers in Co. Cork, located. The majority of survey sites were located in the Munster Blackwater catchment (sub-catchment ID: Blackwater [Munster]_SC_080 and Blackwater [Munster]_SC_110) although, to the east, numerous sites drained the Bride [Waterford] catchment (Bride [Waterford]_SC_010). A single site was located within the northernmost extent of the Manin_SC_010 sub-catchment. Several aquatic survey sites are located within or have connectivity with the River Blackwater SAC (site code: 002170) (Figure 1). Survey sites were present on the Tooreen North Stream (EPA code: 19T33), Slievedotia Stream (19S09), Monparson River (18M58), Toor River (18T51), Coom Stream and River (18C03), Lyravarrig Streams (18L82 and 18L66), Seefin Stream (18S52), River Bride (18B05), Field Chimney Stream (18F43), Inchinanagah River (18I16), Bunnaglanna Stream (18B07), Slumberhill Stream, Ross Stream (18S40), Shanowen Trib 1 Stream (18S42) and Farran North River (18F27), as well as several unnamed watercourses (Table 1.1).

The River Bride (Waterford) is a major tributary of the (Munster) River Blackwater and is known to support a range of fish species including Atlantic salmon (*Salmo salar*), brown and sea trout (*Salmo trutta*), European eel and stone loach (*Barbatula barbatula*) (Kelly et al., 2011). Salmon, brown trout and sea trout angling are all popular on the River Bride (O'Reilly, 2009). The Bride is

also known to support river lamprey (*Lampetra fluviatilis*) in its lower reaches (NPWS data). Additionally, surveys conducted as part of the National European eel monitoring programme on the River Bride sub-catchment found that eels occupied a very uniform distribution throughout the Bride catchment (IFI, 2015).

Fisheries data for other, more minor watercourses within the survey area was largely lacking. However, the Clyda River to which the Monparson River (site A6) joins is known locally to support Atlantic salmon, brown trout and European eel as well as non-native roach (*Rutilus rutilus*) and dace (*Leuciscus leuciscus*) (pers. obs.). *Lampetra* sp. lamprey and sea lamprey (*Petromyzon marinus*) are also known from the Clyda River (King & Linnane, 2004).

Furthermore, a catchment-wide electro-fishing survey was undertaken by Triturus in 2017 for an early precursor to the Coom Green Energy Park development (Triturus, 2017). Some of the 2020 survey sites overlapped with those visited in 2017 and, where applicable, this is referred to in the Results section of this report. The wider catchment was found to support brown trout, European eel, *Lampetra* sp. ammocoetes and low numbers of Atlantic salmon in 2017.

Table 1.1 Electro-fishing survey site locations in the footprint of the proposed Coom Green Energy Park development, Co. Cork.

Site no.	Watercourse	EPA code	Location / townland	ITM (x)	ITM (y)
A1	Unnamed stream	n/a	Knuttery Bridge	562621	591186
A2	Unnamed stream	n/a	Tooreen North	561491	589545
A3	Tooreen North Stream	19T33	Tooreen North	561359	589281
A4	Slievedotia 19 Stream	19S09	Daly's Cross Roads	561011	587722
A5	Unnamed stream	n/a	Lissard	559515	588386
A6	Monparson River	18M58	Lissard	558677	590203
B1	Toor River	18T51	Mullenaboree	564085	591709
B2	Coom 18 Stream	18C03	Bottlehill Landfill	563229	589796
B3	Coom 18 River	18C03	Coom	565442	588887
B4	Toor River	18T51	Raheen	565547	589591
B5	Lyravarrig 18 Stream	18L82	Commons	566739	593598
B6	Seefin 18 Stream	18S52	Commons	566862	593456
B7	River Bride	18B05	Commons	566523	592989
B8	Lyravarrig 18 Stream	18L66	Mullenaboree	565741	592184
B9	Field Chimney Stream	18F43	Chimneyfield	568146	591922
B10	Inchinanagh River	18I16	Inchinanagh	568592	590845
B11	River Bride	18B05	Bride Bridge	568376	590182

Site no.	Watercourse	EPA code	Location / townland	ITM (x)	ITM (y)
B12	Unnamed stream	n/a	Knockdoorty	570075	594332
B13	Unnamed stream	n/a	Powers Bridge	570337	593908
B14	Bunnaglanna Stream	18B07	Moneygorm	570301	593711
B15	River Bride	18B05	Old Bridge	571380	589562
C1	Slumberhill 18 Stream	18S40	Knockacullata	564792	594397
C2	Ross Stream	18R02	Knockacullata	563403	593486
D1	Shanowen Trib 1	18S42	Ballynahina	578462	595293
D2	Farran North River	18F27	Farran North	582016	594305

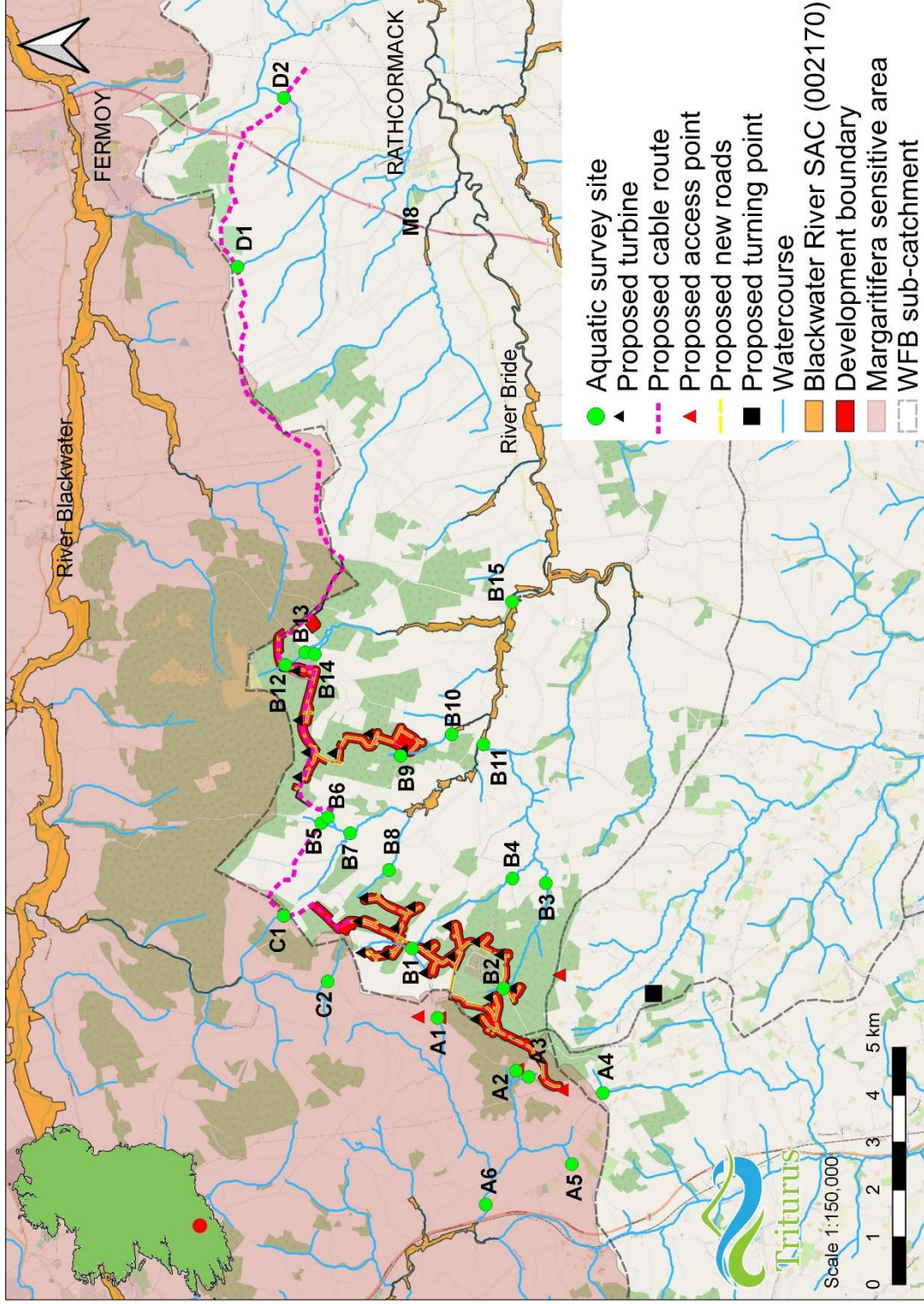


Figure 1.1 Location overview of the electro-fishing sites in vicinity of the proposed Coom Green Energy Park, Co. Cork.

2. Methodology

2.1 Fish stock assessment (electro-fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on both named and unnamed watercourses in the footprint of the proposed Coom Green Energy Park over the course of Wednesday 29th to Friday 31st July 2020, following notification to Inland Fisheries Ireland (Macroom) and under the conditions of a Department of Communications, Climate Action & Environment (DCCA) license. Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable battery-powered aerator was also used to further reduce stress to any captured fish contained in the holding tank.

Salmonids, European eel and other captured fish species were transferred to a holding container with oxygenated fresh river water following capture. Where captured, European eel and larval lamprey were anaesthetised using 0.5ml/l clove oil solution (emulsified in ethanol at a ratio of 1:9) to facilitate accurate measurement and speciation. All other fish (e.g. salmonids) were not anaesthetised, to reduce fish stress levels. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

As three primary species groups were targeted during the survey, i.e. salmonids, lamprey, and eel, the electro-fishing settings were tailored for each species. By undertaking electro-fishing using the rapid electro-fishing technique (see methodology below), the broad characterisation of the fish community at each sampling reach could be determined as a longer representative length of channel can be surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and best practice (e.g. CFB, 2008) and is outlined below.

The catchment-wide electro-fishing (CWEF) survey was undertaken across $n=25$ sites (see Table 1.1, Figure 1.1). Length frequency graphs and species composition graphs for all species with numbers captured are illustrated in the Results section.

2.1.1 Salmonids, European eel and cyprinids

For salmonid species and European eel, as well as other incidental species such as three-spined stickleback (*Gasterosteus aculeatus*), electro-fishing was carried out in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (Matson et al., 2018). A total of approx. ≥ 100 m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages. At certain, more minor watercourse sites or sites with limited access, it was more feasible to undertake electro-fishing for a 5-minute CPUE. Discrepancies in fishing effort (CPUE) between sites are accounted for in the subsequent results section.

Relative conductivity of the water at each site was checked in-situ with a conductivity meter and the electro-fishing backpack was energised with the appropriate voltage and frequency to provide enough draw to attract salmonids and European eel to the anode without harm. For the low to

moderate conductivity waters of the sites (most draining upland/sandstone areas) a voltage of 250-300V, frequency of 40-45Hz and pulse duration of 3.5ms was utilised to draw fish to the anode without causing physical damage.

2.1.2 Lamprey

Electro-fishing for lamprey ammocoetes was conducted using targeted box quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable areas of sand/silt, where encountered. As lamprey take longer to emerge from silts and require a more persistent approach, they were targeted at a lower frequency (30Hz) setting which also allowed detection of European eel, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx (2003), APEM (2004) and Niven & McAuley (2013). Using this approach, the anode was placed under the water's surface, approx. 10–15 cm above the sediment, to prevent immobilising lamprey ammocoetes within the sediment. The anode was energised with 100V of pulsed DC for 15-20 seconds and then turned off for approximately five seconds to allow ammocoetes to emerge from their burrows. The anode was switched on and off in this way for approximately two minutes. Immobilised ammocoetes were collected by a second operator using a fine-mesh hand net as they emerged.

Lamprey species were identified to species level, where possible, with the assistance of a hand lens, through external pigmentation patterns and trunk myomere counts as described by Potter & Osborne (1975) and Gardiner (2003).

2.2 Fisheries habitat

2.2.1 Salmonids

Fisheries habitat quality for salmonids was assessed using the Life Cycle Unit method (Kennedy, 1984; O'Connor & Kennedy, 2002) to map the $n=25$ riverine sites as nursery, spawning and holding habitat, by assigning quality scores to each type of habitat. Those habitats with poor quality substrata, shallow depth and a poorly defined river profile receive a higher score. Higher scores in the Life Cycle Unit method of fisheries quantification are representative of poorer value, with lower scores being more optimal despite this appearing counter-intuitive.

Table 2.1 Life Cycle Unit scoring system for salmonid nursery, spawning and holding habitat value (as per Kennedy, 1984 & O'Connor & Kennedy, 2002)

Habitat quality	Habitat score	Total score (three components)
Poor	4	12
Moderate	3	9-11
Good	2	6-8
Excellent	1	3-5

2.2.2 Lamprey

Lamprey habitat evaluation for each survey site was undertaken using the Lamprey Habitat Quality Index (LHQI) scoring system, as devised by Macklin et al. (2018). The LHQI broadly follows a similar rationale as the Life Cycle Unit score for salmonids. Those habitats with a lack of soft, largely organic sediment areas for ammocoete burrowing, shallow sediment depth (<10cm) or compacted sediment nature receive a higher score. Higher scores in this index are thus of poorer value (in a similar fashion to the salmonid Life Cycle Unit Index), with lower scores being more optimal. Overall scores are calculated as a simple function of the sum of individual habitat scores.

Larval lamprey habitat quality as well as the suitability of adult spawning habitat is assessed based on the information provided in Maitland (2003) and other relevant literature (e.g. Gardiner, 2003). Unlike the salmonid Life Cycle Unit index, holding habitat for adult lamprey is not assessed owing to their different migratory and life history strategies, and that electro-fishing surveys routinely only sample larval lamprey.

The LHQI scoring system provides additional information compared to the habitat classification based on the observations of Applegate (1950) and Slade et al. (2003), which deals specifically with larval (sea) lamprey settlement habitat. Under this scheme, habitat is classified into three different types: preferred (Type 1), acceptable (Type 2), and not acceptable for larvae (Type 3) (Slade et al. 2003). Type 1 habitat is characterized by soft substrate materials usually consisting of a mixture of sand and fine organic matter, often with some cover over the top such as detritus

or twigs in areas of deposition. Type 2 habitat is characterized by substrates consisting of shifting sand with little if any organic matter and may also contain some gravel and cobble (lamprey may be present but at much lower densities than Type 1). Type 3 habitat consists of materials too hard for larvae to burrow including bedrock and highly compacted sediment. This classification can also be broadly applied to other lamprey species ammocoetes, including *Lampetra* species.

Table 2.2 Lamprey Habitat Quality Index (LHQI) scoring system for lamprey spawning and nursery habitat value (Macklin et al., 2018).

Habitat quality	Habitat score	Total score (two components)
Poor	4	8
Moderate	3	6-7
Good	2	3-5
Excellent	1	2

2.2.3 General fisheries habitat

A broad appraisal / overview of the upstream and downstream habitat at each site was also undertaken to evaluate the wider contribution to salmonid and lamprey spawning and general fisheries habitat. River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (Environment Agency, 2003) and Fishery Assessment Methodology (O’Grady, 2006) to broadly characterise the river sites (i.e. channel profiles, substrata etc.).

2.3 Biosecurity

A strict biosecurity protocol following the Check-Clean-Dry approach was employed during the survey. Equipment and PPE used was disinfected with Virkon® between survey sites to prevent the transfer of pathogens and/or invasive species between survey areas. Where feasible, equipment was also be thoroughly dried (through UV exposure) between survey areas. As per best practice, surveys were undertaken at sites in a downstream order (i.e. uppermost site surveyed first etc.) to prevent the upstream mobilisation of invasive propagules and pathogens. Any invasive species recorded within or adjoining the survey area were geo-referenced.

3. Results

A catchment-wide electro-fishing survey of $n=25$ sites in the footprint of the proposed Coom Green Energy Park was conducted over Wednesday 29th to Friday 31st July 2020 following notification to Inland Fisheries Ireland (Macroom). The results of the survey are discussed below in terms of fish population structure, population size and the suitability and value of the surveyed areas as nursery and spawning habitat for salmonids, European eel and lamprey species. Scientific names are provided at first mention only.

3.1 Fish stock assessment (electro-fishing)

Site A1 – unnamed stream, Knuttery Bridge

No fish were recorded during electro-fishing at site A1. The stream was dry at the time of survey (July 2020) and was not capable of supporting resident fish. The stream may be utilised by brown trout and European eel during periods of higher flow (e.g. autumn, winter) although its overall fisheries value was considered very low given likely seasonality.

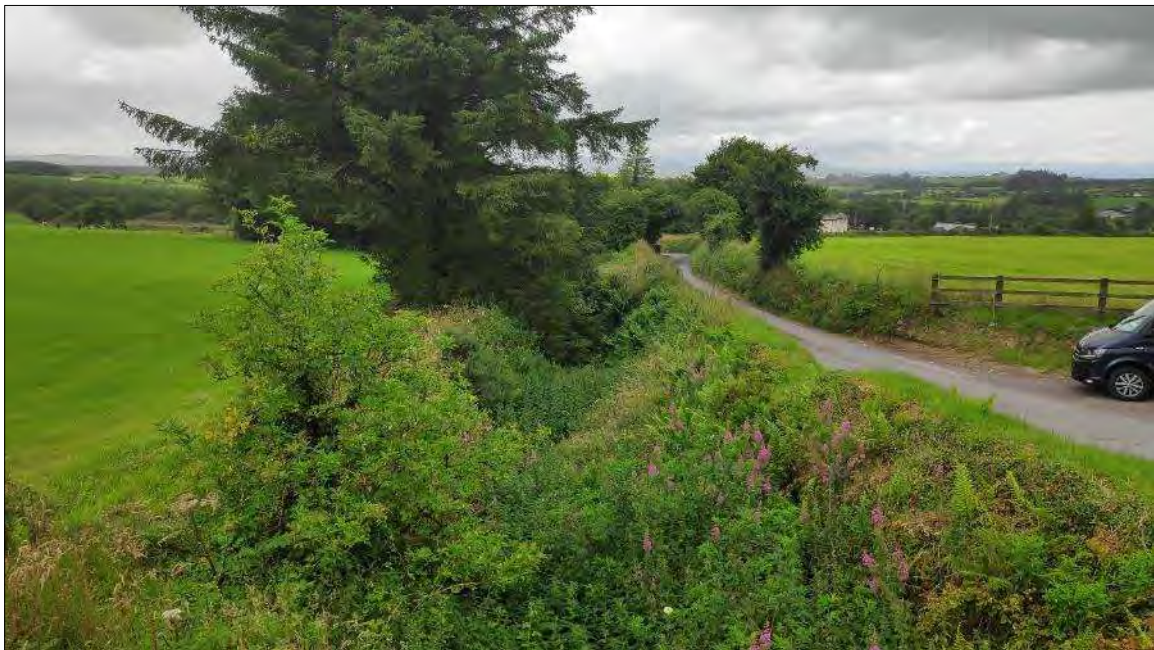


Plate 3.1 Representative image of site A1 on an unnamed stream at Knuttery Bridge (no fish recorded via electro-fishing, channel semi-dry).

Site A2 – unnamed stream, St. John’s Well, Tooreen North

No fish were recorded during electro-fishing at site A2. The site (i.e. at source, St. John’s Well) was not considered of fisheries value due to its very small size, shallow depth and situation in the uppermost reaches of a catchment. The upstream catchment is extremely short, emanating from a small spring <50m upstream of the survey area.



Plate 3.2 Representative image of site A2 on an unnamed stream at Tooreen North (no fish recorded via electro-fishing).

Site A3 – Tooreen North Stream, Tooreen North

No fish were recorded during electro-fishing at site A3. The site was not considered of fisheries value due to its very small size and situation in the uppermost reaches of a catchment with water shallow depth and very limited holding pool habitat. The stream may be utilised by migratory European eel during periods of higher flow although its overall fisheries value was considered low given likely seasonality.



Plate 3.3 Representative image of site A3 on the Tooreen North Stream at Tooreen North.

Site A4 – Slievedotia Stream, Daly’s Cross

No fish were recorded during electro-fishing at site A4. The stream was semi-dry at the time of survey (July 2020) and was not capable of supporting resident fish. The stream may be utilised by migratory European eel during periods of higher flow (e.g. autumn, winter) although its overall fisheries value was considered low given likely seasonality and overall modified nature.



Plate 3.4 Representative image of site A4 on the Slievedotia Stream (no fish recorded via electro-fishing, channel semi-dry).

Site A5 – unnamed stream, Lissard

No fish were recorded during electro-fishing at site A5. The stream was 100% dry at the time of survey (July 2020) and was not capable of supporting resident fish (no fisheries value). Given downstream connectivity to the Monparson River, the stream may be migratory European eel during periods of higher flow (e.g. autumn, winter) although its overall fisheries value was considered low given likely seasonality.



Plate 3.5 Representative image of site A5 on an unnamed stream at Lissard (no fish recorded via electro-fishing, channel 100% dry).

Site A6 – Monparson River, Lissard

Three fish species were recorded from the Monparson River at site A6 (Figure 3.1). Brown trout ($n=47$) followed by Atlantic salmon ($n=27$) dominated the site, with moderate number of *Lampetra* sp. ammocoetes recorded from small marginal silt patches in the vicinity of the bridge structure. Both juvenile and adult trout were recorded, with two size classes of Atlantic salmon present.

Despite historical straightening (good recovery), salmonid habitat scored as ‘excellent’ overall according to Life Cycle Unit scores (Table 3.2). The site was evidently an excellent nursery for both brown trout and Atlantic salmon and offered some good quality holding and spawning habitat. The quality of the latter was reduced somewhat given compaction and sedimentation of substrata, locally. Lamprey spawning and nursery habitat were both considered of good quality (Table 3.3), with localised small-medium gravel patches between cobble and small boulder in addition to marginal pockets of silt/sand (some up to 10cm in depth). Although none were recorded, European eel habitat was considered good given the presence of deeper pool areas and ample refugia.

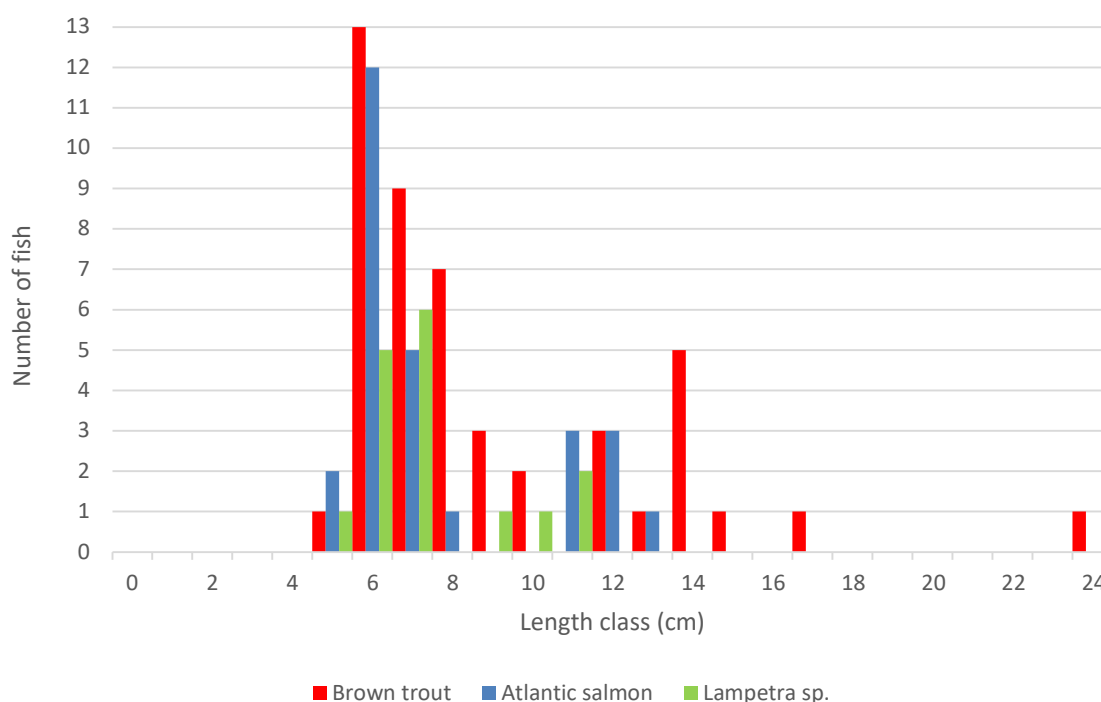


Figure 3.1 Fish stock length distribution recorded via electro-fishing at site A6 on the Monparson River, Lissard in July 2020.



Plate 3.6 Representative image of Atlantic salmon parr recorded from site A6 on the Monparson River at Lissard, July 2020.



Plate 3.7 Representative image of site B1 on the upper Toor River at Mullenaboree (no fish recorded via electro-fishing, channel very shallow and heavily overgrown).

Site B1 – Toor River, Mullenaboree

No fish were recorded during electro-fishing at site B1. The stream had been extensively deepened and straightened and retained very little natural character, with (upstream of bridge) heavy macrophyte and (downstream) riparian cover present, in addition to shallow water (<0.1m). Given improved fisheries habitat downstream, the site may be utilised by brown trout and European eel during periods of higher flow (e.g. autumn, winter) although its overall fisheries value was considered low at this location.

Site B2 – Coom Stream, Bottlehill landfill

No fish were recorded during electro-fishing at site B2 but only 70m² was effectively fished due to the overgrown nature of the channel. The site was considered to have poor fisheries value given the shallow, upland nature of the stream at this site, with no suitability for lamprey or salmonids. Given improved fisheries habitat downstream, the site may be utilised by European eel during periods of higher flow (e.g. autumn, winter) although its overall fisheries value was considered low at this location.



Plate 3.8 Representative image of site B2 on the upper Coom Stream near Bottlehill Landfill (no fish recorded via electro-fishing).

Site B3 – Coom River, Coom

Atlantic salmon ($n=43$) and brown trout ($n=36$) were the only two fish species recorded from site B3 on the Coom River (Figure 3.2). Both juvenile and (small) adult trout were recorded, with two size classes of Atlantic salmon present. With the exception of European eel, the same species assemblage was recorded during a 2017 survey of this site (Triturus, 2017).

The river was considered an excellent salmonid nursery with good holding and spawning habitat present (Table 3.2). Atlantic salmon density was the highest recorded across all survey sites (0.225 fish per m^2 ; Table 3.1). However, the site's spawning potential for salmonids was impacted by siltation with partial bedding of the substrata. Holding habitat was limited to a large pool downstream of the weir below the bridge. The site was of too high energy for lamprey despite the presence of some limited potential spawning substrata marginally. The site was considered of low value as an eel nursery due to the sites location high in the catchment and evident absence of the species during electro-fishing.

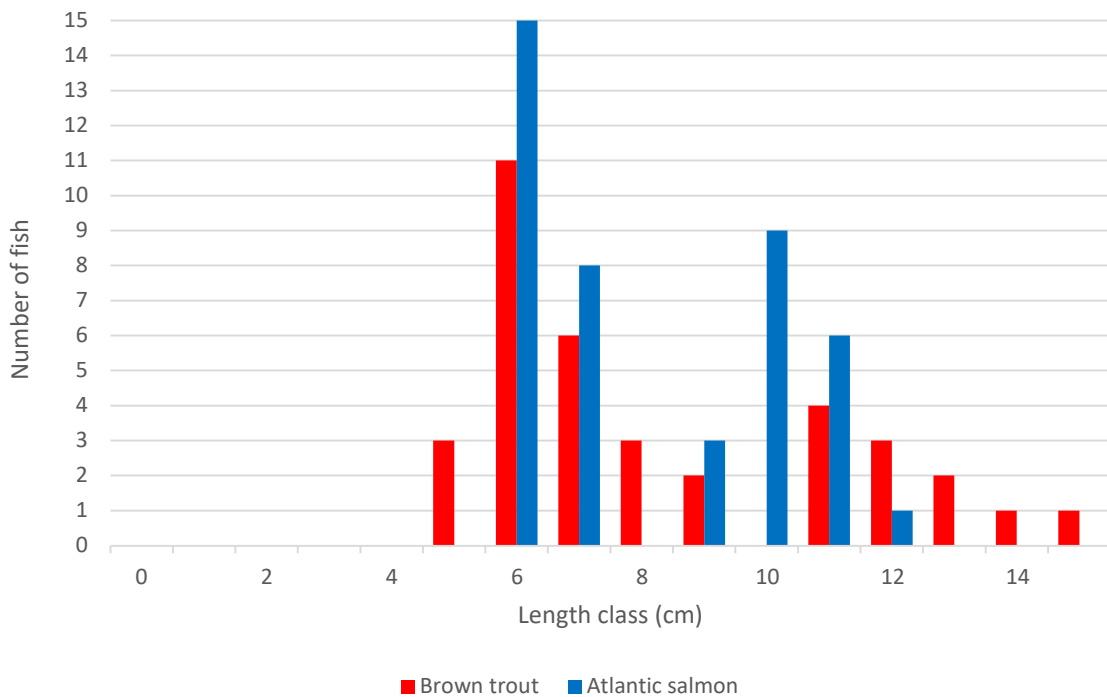


Figure 3.2 Fish stock length distribution recorded via electro-fishing at site B3 on the Coom River, Coom, July 2020.



Plate 3.9 Representative image of site B3 on the Coom River at Coom.

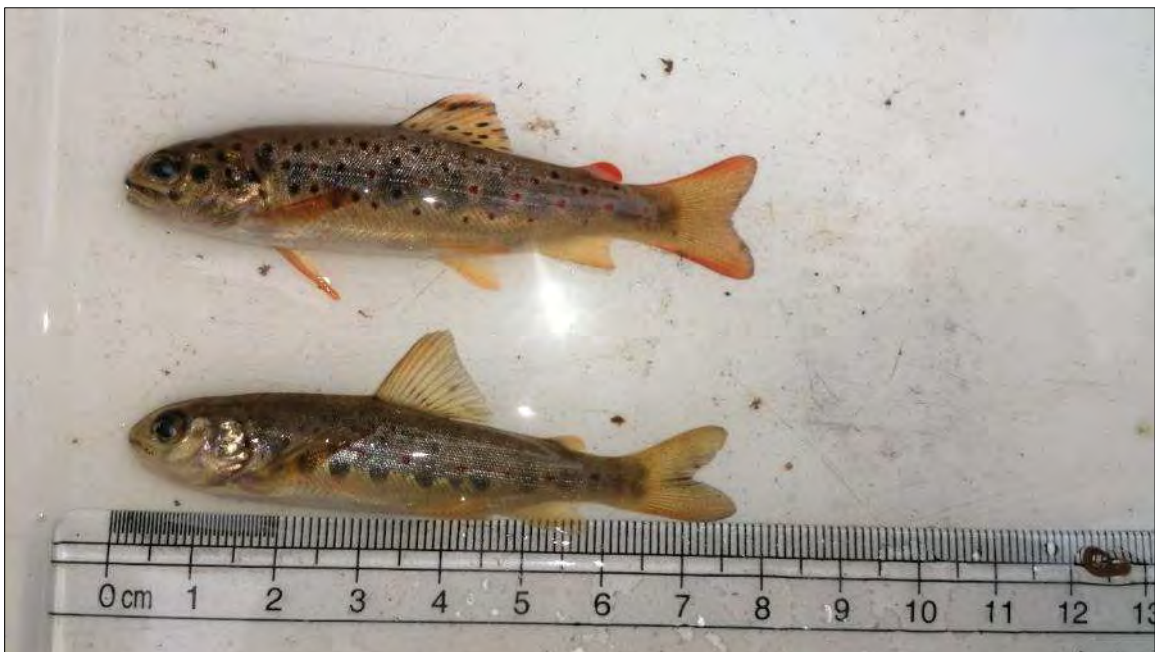


Plate 3.10 Representative image of brown trout and Atlantic salmon parr recorded from site B4 on the Toor River, Raheen, July 2020.

Site B4 – Toor River, Raheen

Two fish species were recorded from site B4. Brown trout dominated ($n=36$) with a small number of Atlantic salmon parr ($n=3$) also captured (Figure 3.3). Both juvenile and adult trout were present, with two size classes of Atlantic salmon recorded. With the exception of European eel, the same species assemblage was recorded during a 2017 survey of this site (Triturus, 2017).

The river was considered a good salmonid nursery with good holding and spawning habitat present (Table 3.1). However, the site’s spawning potential for salmonids was impacted by siltation with partial bedding of the substrata and light to moderate siltation pressures. The site was of too high energy for lamprey despite the presence of some limited potential spawning substrata marginally. Soft sediment areas were scarce and, where present, were typically compacted and composed predominantly of sand, thus providing poor larval lamprey nursery habitat. The site was considered of low value as an eel nursery and foraging habitat.

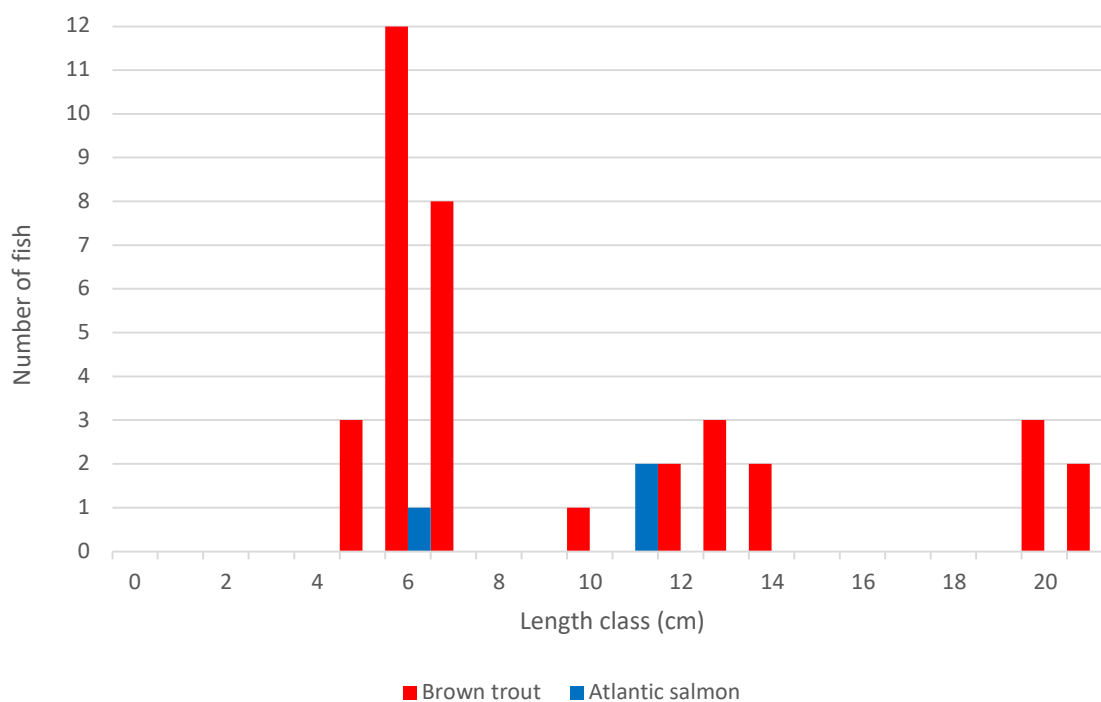


Figure 3.3 Fish stock length distribution recorded via electro-fishing at site B4 on the Toor River, Raheen, July 2020.

Site B5 – Lyravarrig Stream, Commons

Brown trout and European eel were the only two fish species recorded from site B5 on the Lyravarrig Stream, a tributary of the upper River Bride. A low number of juvenile brown trout ($n=7$) and maturing European eel were present.

The historically straightened and deepened stream suffered from heavy siltation with the majority of the substrata covered in silt. Overall, the stream was considered a lower value nursery and spawning area for brown trout, with moderate quality nursery, spawning and holding habitat present (Table 3.2). It was also a lower value nursery for European eel. The stream appeared to be of moderate value for lamprey (Table 3.3) given frequent soft sediment areas but none were recorded during the survey.

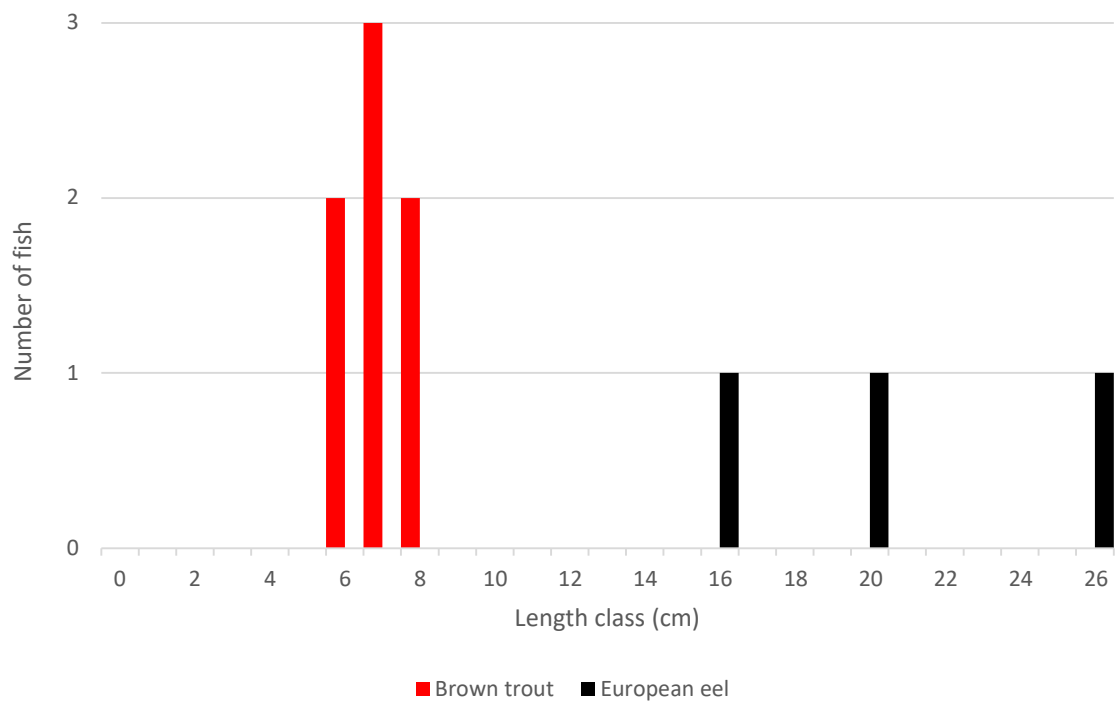


Figure 3.4 Fish stock length distribution recorded via electro-fishing at site B5 on the Lyravarrig Stream, Commons in July 2020.



Plate 3.11 Juvenile brown trout and European eel recorded from site B5 on the Lyravarrig Stream, Commons in July 2020.



Plate 3.12 European eel recorded from site B6 on the Seefin Stream, Commons in July 2020.

Site B6 – Seefin Stream, Commons

A single European eel was the only fish recorded from site B6 on the Seefin Stream (Figure 3.5). The channel suffered from very low flows at the time of survey, with localised semi-stagnant pools. Thus, salmonid habitat was not present. The site had no inherent fisheries value given small size and low flows although, given downstream connectivity with the River Bride, may support brown trout and greater densities of European eel during higher flow periods (e.g. winter).

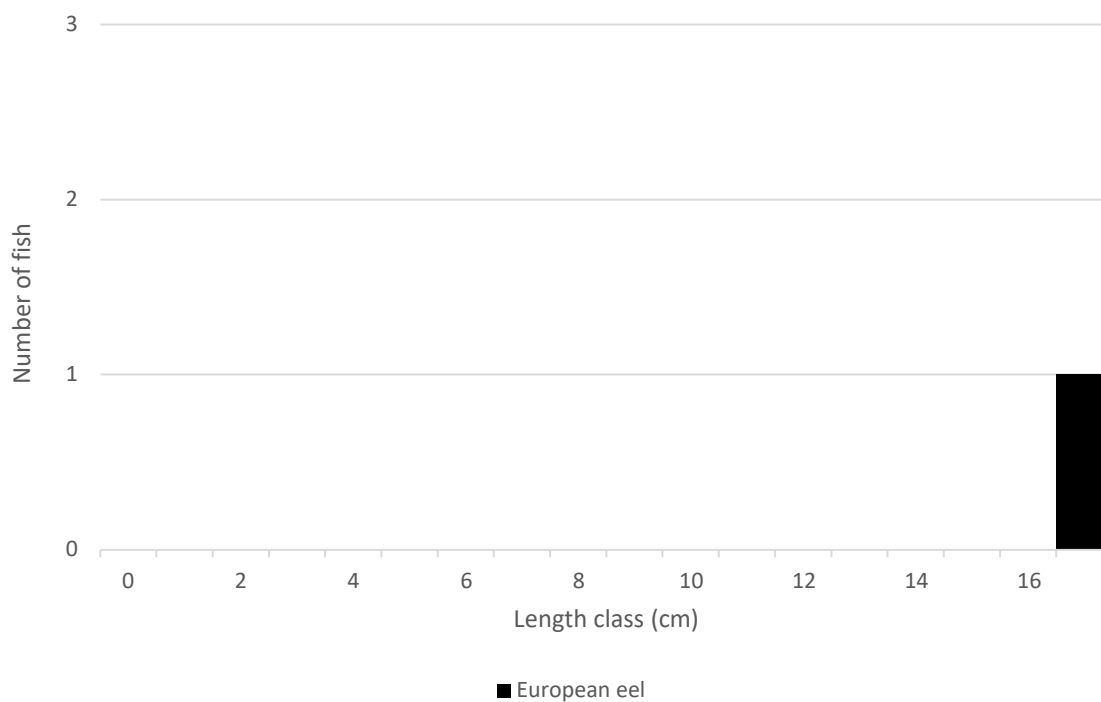


Figure 3.5 Fish stock length distribution recorded via electro-fishing at site B6 on the Seefin Stream, Commons in July 2020.

Site B7 – River Bride, Commons

Brown trout were the dominant species recorded from site B7 on the River Bride ($n=37$), with a single European eel also captured (Figure 3.6). Relatively high numbers of juvenile trout were present in addition to a range of adult size classes.

The site was evidently a very good salmonid nursery with good quality spawning and holding habitat (on meanders) present also (Table 3.2). However, the overall value was diminished due to siltation and evident enrichment (excessive filamentous algae present). Whilst some localised lamprey spawning habitat (smaller gravel fractions) was present, the site was generally unsuitable for larval lamprey given its higher energy nature and none were recorded. European eel habitat was considered moderate as localised pool was present with some suitable instream refugia.

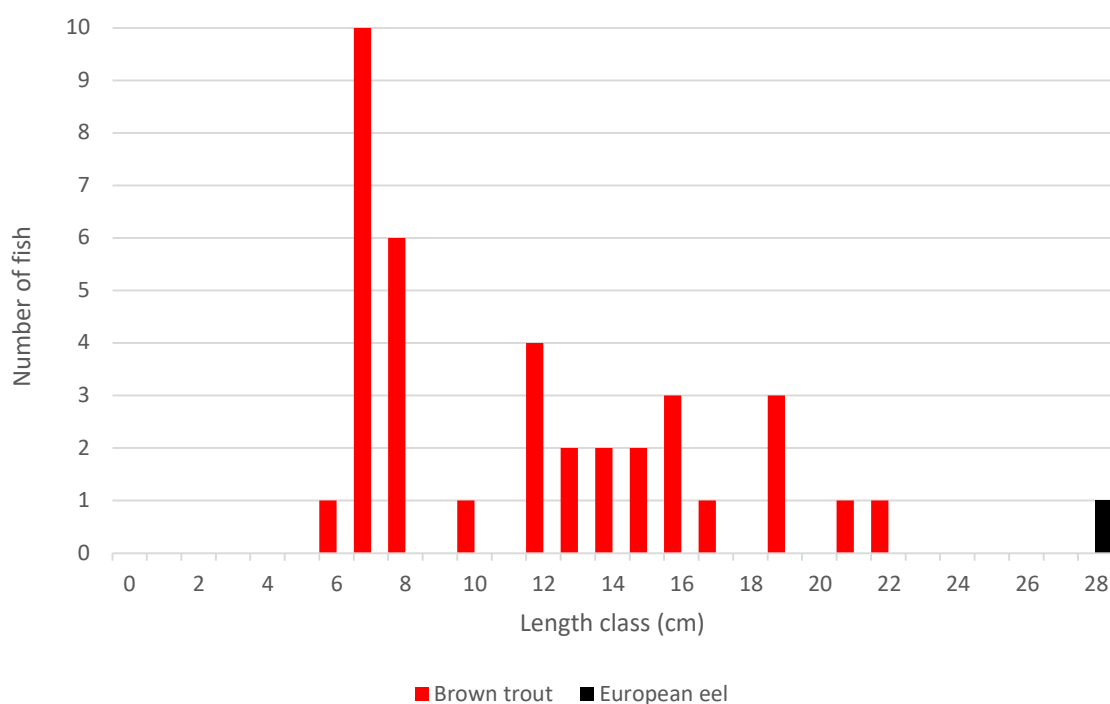


Figure 3.6 Fish stock length distribution recorded via electro-fishing at site B7 on the River Bride, Commons in July 2020.



Plate 3.13 A range of brown trout size classes recorded from site B7 on the upper River Bride, Commons in July 2020.

Site B8 – Lyravarrig Stream, Mullenaboree

Brown trout were the dominant species recorded from site B8 on the Lyravarrig Stream ($n=38$), with a single European eel also captured (Figure 3.7). Relatively high numbers of juvenile trout were present (majority ≤ 7.6 cm FL) with only two small adults recorded.

The site was evidently a good salmonid nursery although it was impacted by siltation pressures. The spawning habitat was considered of moderate quality (siltation) with a paucity of deeper holding areas for adults (Table 3.2). The site was generally unsuitable for lamprey (Table 3.3) given its higher energy nature and lack of suitable sediment accumulations and none were recorded. European eel habitat was moderate, at best, given the lack of deeper pool habitat and overall shallow nature of the stream.

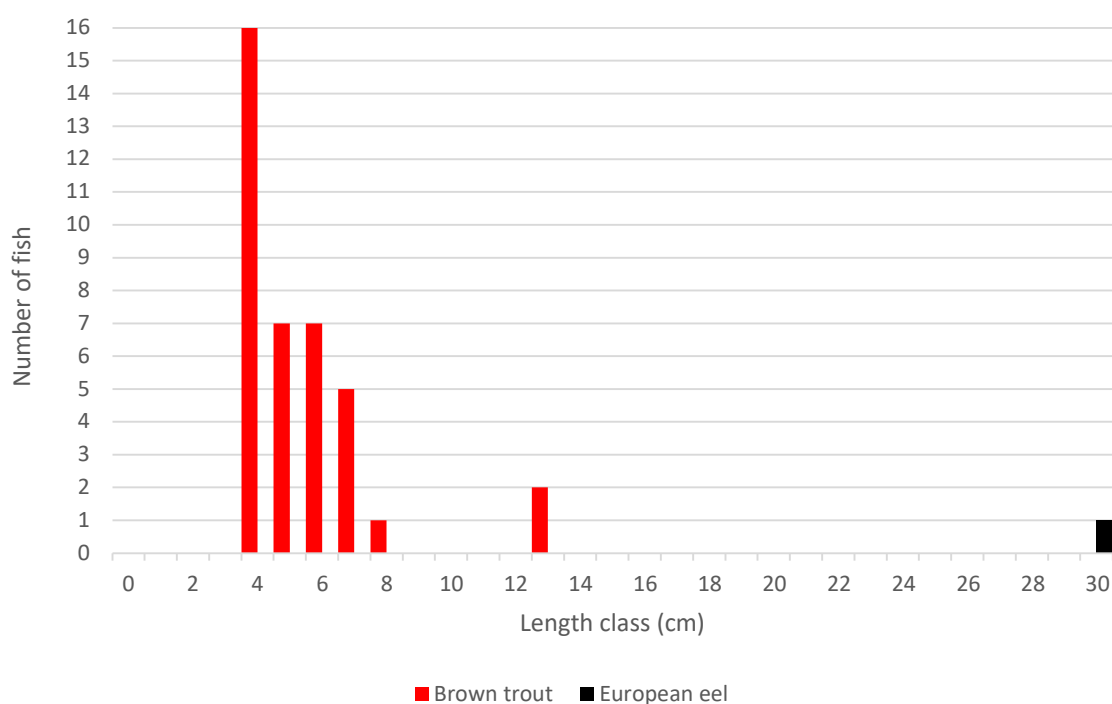


Figure 3.7 Fish stock length distribution recorded via electro-fishing at site B8 on Lyravarrig Stream, Mullenaboree in July 2020.



Plate 3.14 Juvenile brown trout recorded from site B8 on the Lyravarrig Stream, Mullenaboree in July 2020.



Plate 3.15 Representative image of site B9 on the Field Chimney Stream, Chimneyfield, July 2020.

Site B9 – Field Chimney Stream, Chimneyfield

A total of two fish species were recorded from site B9 on the Field Chimney Stream. Brown trout dominated ($n=15$) with low numbers ($n=5$) of Atlantic salmon parr also captured (Figure 3.8). All fish recorded were juveniles.

The site was evidently a good salmonid nursery although it was impacted by siltation pressures. Salmonid spawning and holding habitat were both considered of moderate value (Table 3.2). The site was of too high energy to support lamprey and none were recorded. Despite some moderate suitability as a nursery/foraging area, no European eel were recorded.

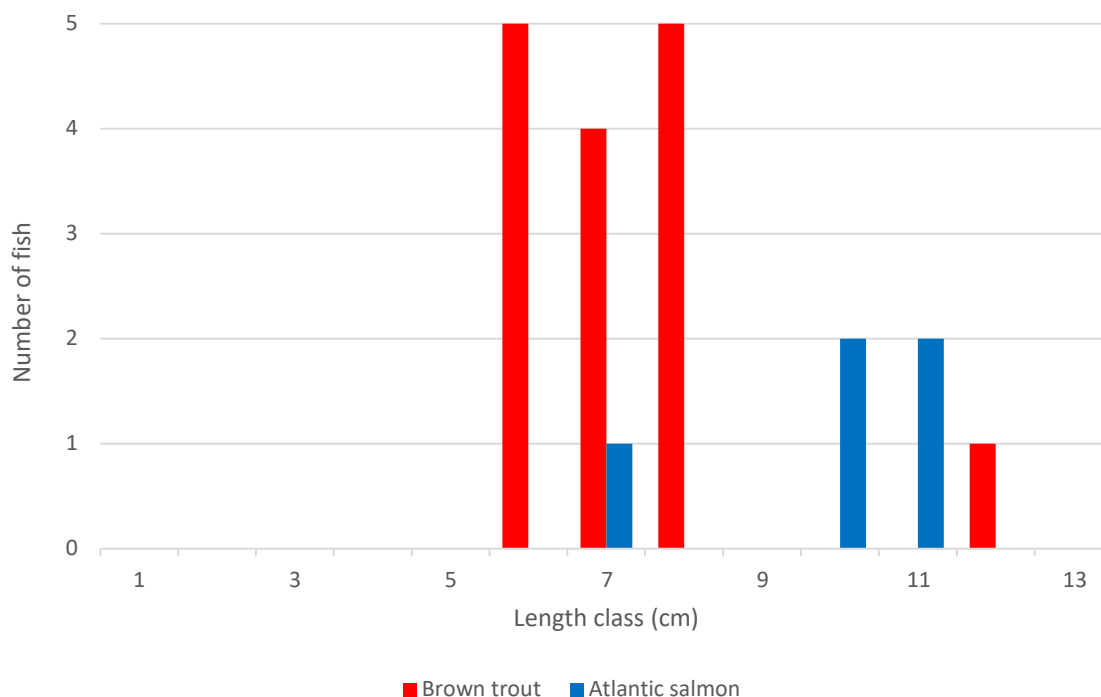


Figure 3.8 Fish stock length distribution recorded via electro-fishing at site B9 on Field Chimney Stream, Chimneyfield, July 2020.

Site B10 – Inchinanagh River, Inchinanagh

A total of three fish species were recorded from site B10 on the Inchinanagh River (Figure 3.9). Brown trout predominated ($n=50$), with a particularly high abundance of juveniles recorded in addition to low numbers of small adults. Brown trout density was the highest recorded across all survey sites (0.385 fish per m^2 ; Table 3.1). A low number of Atlantic salmon parr (two size classes) and adult European eel were also present.

The river was evidently a good salmonid nursery with some good spawning habitat but had only moderate holding habitat with limited deeper pools (Table 3.2). The small river site was of too high energy for larval lamprey, despite some physical spawning habitat suitability (Table 3.3). The site was considered a good eel nursery/foraging area with ample boulder habitat present throughout.

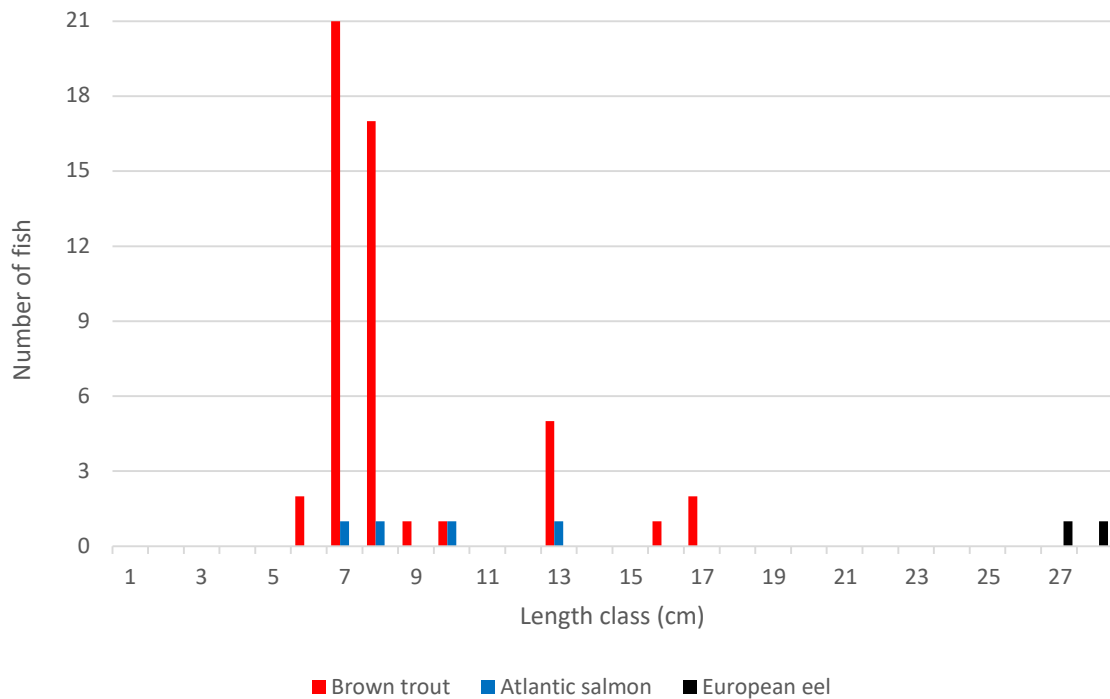


Figure 3.9 Fish stock length distribution recorded via electro-fishing at site B10 on the Inchinanagh River, Inchinanagh, July 2020.



Plate 3.16 Representative image of site B10 on the Inchinanagh River, Inchinanagh, July 2020.



Plate 3.17 Representative image of site B11 on River Bridge downstream of Bride Bridge, July 2020.

Site B11 – River Bride, Bride Bridge

Brown trout and Atlantic salmon were the only two species recorded from site B10 on the River Bride (Figure 3.10). Brown trout dominated ($n=35$), with a healthy range of juvenile and adult size classes present. Moderate numbers of Atlantic salmon parr ($n=16$) were also recorded (two size classes). The same species assemblage was also recorded during a 2017 survey of this site (Triturus, 2017) although abundances of Atlantic salmon were notably higher in 2020.

The upland, cascading site offered excellent holding habitat for adult salmonids, in addition to being an evidently good nursery (Table 3.2). Spawning was of good quality (frequent well-sorted coarse-medium gravels) although typically more suited to Atlantic salmon. Whilst localised spawning substrata for lamprey were present, larval lamprey habitat was not present given the higher energy nature of the site. Although no European eel were recorded during the survey, the site did offer some good suitability for the species, especially in deeper pool areas.

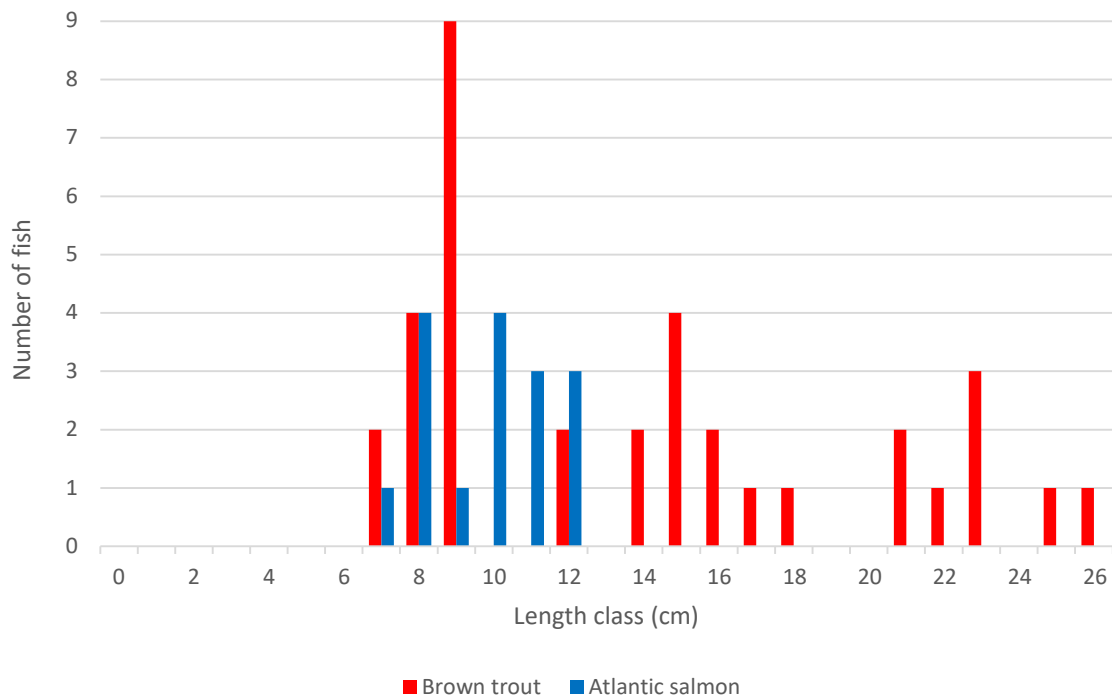


Figure 3.10 Fish stock length distribution recorded via electro-fishing at site B11 on the River Bride at Bride Bridge, July 2020.

Site B12 – unnamed stream, Knockdoorty

No fish were recorded during electro-fishing at site B12. The shallow, upland nature of the small channel with heavily bedded substrata (moderate siltation) reduced its viability for salmonids albeit populations would be present further downstream in higher order reaches. Lamprey habitat was absent. The stream may be utilised seasonally by migratory European eel during periods of higher flow (e.g. autumn, winter) although the site's overall fisheries value was considered low.



Plate 3.18 Representative image of site B12 on an unnamed stream at Knockdoorty, July 2020.

Site B13 – unnamed stream, Power’s Bridge

European eel was the only species recorded from site B13, with two juveniles captured via electro-fishing (Figure 3.11).

Overall, the shallow nature of the small stream channel, with heavily bedded substrata, reduced its viability for salmonids. However, populations were present further downstream as the channel deepened and widened. The upland site was not suitable for lamprey. A small European eel population was present, exemplifying its value as a nursery and likely utilisation as a seasonal migratory pathway for the species.

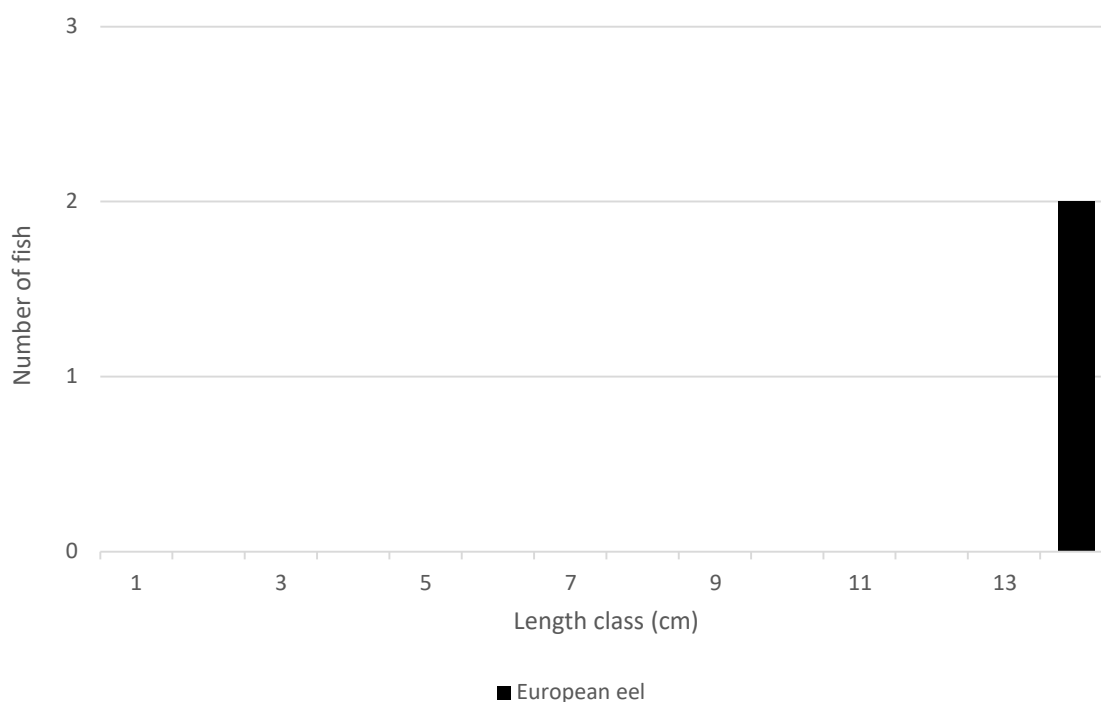


Figure 3.11 Fish stock length distribution recorded via electro-fishing at site B13 on an unnamed stream at Power’s Bridge, July 2020.



Plate 3.19 Representative image of site B13 on an unnamed stream at Powers Bridge, July 2020.



Plate 3.20 Representative image of site B14 on the Bunnaglanna Stream at Moneygorm, July 2020.

Site B14 – Bunnaglanna Stream, Moneygorm

No fish were recorded during electro-fishing at site B14. The shallow, upland nature of the small channel with heavily bedded substrata (heavy siltation) reduced its viability for salmonids albeit populations were present further downstream in higher order reaches. Lamprey habitat was absent. The stream may be utilised seasonally by migratory European eel during periods of higher flow (e.g. autumn, winter) although the site’s overall fisheries value was considered low.

Site B15 – River Bride, Old Bridge

Atlantic salmon and brown trout were the only two species recorded from site B15 on the River Bride (Figure 3.12). Both species were recorded in similar numbers ($n=22$, $n=21$ respectively). A healthy range of juvenile and adult trout size classes were present along with two distinct Atlantic salmon size classes. With the exception of European eel, the same species assemblage was also recorded during a 2017 survey of this site (Triturus, 2017) although abundances of juvenile Atlantic salmon and brown trout were notably higher in 2020.

The site was evidently an excellent salmonid nursery (Table 3.2) and also exhibited good spawning habitat locally, as reflected by the stock demographic captured during the survey. The best nursery areas were in the faster riffle area near the bridge. Holding habitat was also good moving upstream where pool habitat existed below large instream boulders. However, the River Bride was of too high energy at site B15 to support lamprey species. Some suitability existed as an eel nursery in the boulder and cobble areas although none were recorded during the survey.

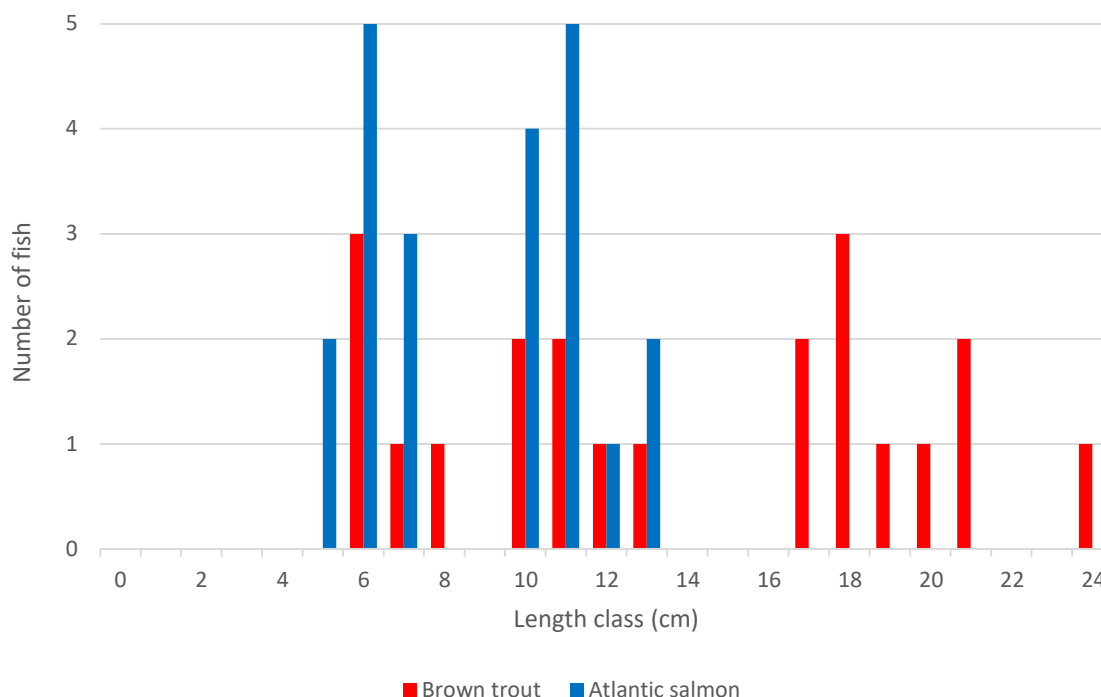


Figure 3.12 Fish stock length distribution recorded via electro-fishing at site B15 on the River Bride at Old Bridge, July 2020.



Plate 3.21 Adult brown trout and Atlantic salmon parr recorded from site B15 on the River Bride at Old Bridge, July 2020.



Plate 3.22 Representative image of site C1 on the upper Slumberhill Stream, Knockacullata, July 2020.

Site C1 – Slumberhill Stream, Knockacullata

No fish were recorded from site C1 on the Slumberhill Stream. The historically straightened and deepened site was of poor fisheries value given the very shallow and likely seasonal nature of the stream at this location. Given downstream connectivity, the stream may be of some value to migratory European eel during higher flow periods (e.g. autumn, winter).

Site C2 – Ross Stream, Knockacullata

Three fish species were recorded from site C2 on the upper reaches of the Ross Stream (Figure 3.13), with low numbers of brown trout and European eel present. A single three-spined stickleback was also captured.

The heavily silted stream site was considered a lower value nursery and spawning area for brown trout, with poor quality spawning and holding habitat present (Table 3.2). It was also a lower value nursery and foraging area for European eel. Lamprey habitat was considered sub-optimal due to the position of the survey area high up in catchment. Despite the presence of silt areas for lamprey ammocoete burial, the sediment was more mobile in nature and its presence due to constant siltation pressure from bank erosion and cattle fords (Table 3.3).

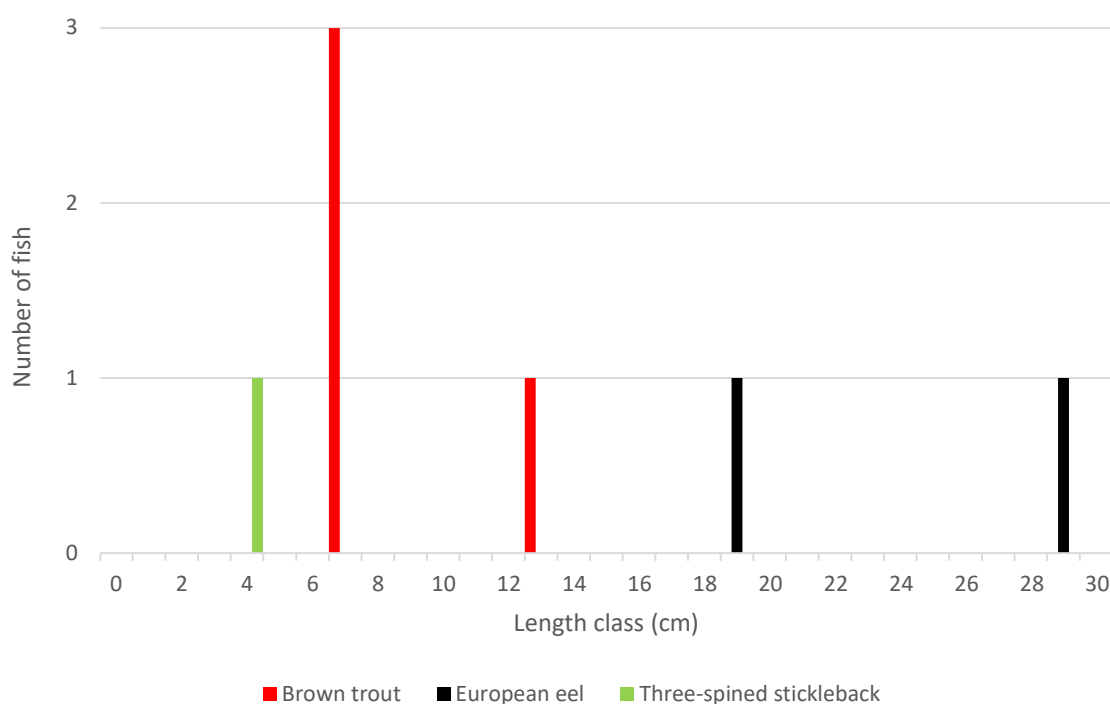


Figure 3.13 Fish stock length distribution recorded via electro-fishing at site C2 on Ross Stream, Knockacullata in July 2020.



Plate 3.23 Juvenile and small adult brown trout recorded from site C2 on the Ross Stream, Knockacullata, July 2020.



Plate 3.24 Representative image of site D1 on the upper reaches of the Shanowen Trib Stream Ballynahina, July 2020.

Site D1 – Shanowen Trib 1, Ballynahina

No fish were recorded from site D1 on the Shanowen Trib 1 Stream via electro-fishing. The very shallow ($\leq 0.05\text{m}$), heavily modified lowland stream featured moderate siltation with bedded substrata and was not considered of fisheries value at the time of survey, although, given downstream connectivity, it may be utilised seasonally by migratory European eel.

Site D2 – Farran North River, Farran North

A total of five fish species were recorded from site D2 on the Farran North Stream. Larval lamprey (*Lampetra* sp.) were the most abundant ($n=65$) followed by brown trout ($n=10$) (Figure 3.14). The majority of lamprey ammocoetes were recorded from targeted 1m^2 quadrats in suitable soft sediment areas (some were captured incidentally). The density of lamprey ammocoetes was the highest recorded across all survey sites (16.25 larvae per m^2 of targeted 1m^2 quadrat; Table 3.1). Both juvenile and adult trout were captured. Low numbers of Atlantic salmon parr, European eel and three-spined stickleback were also recorded. A 2017 electro-fishing survey of this site reported only brown trout and *Lampetra* sp. ammocoetes (Triturus, 2017).

The heavily modified site D2 suffered from heavy (locally, very heavy) siltation. As such, it was considered a lower value salmonid nursery area, with better spawning habitat noted upstream of the survey area. Holding habitat for adult salmonids was largely absent (Table 3.2). However, the site was considered an excellent nursery area for lamprey (likely brook lamprey) (Table 3.3), with moderate spawning substrata. The site was also a good eel nursery but had a paucity of stone refugia. Most eel emanated from soft sediment as with lamprey and the species can avail of softer sediment as nursery habitat in the absence of stone refugia. A storm drain at the meander appeared to be contributing to the majority of the habitat degradation.

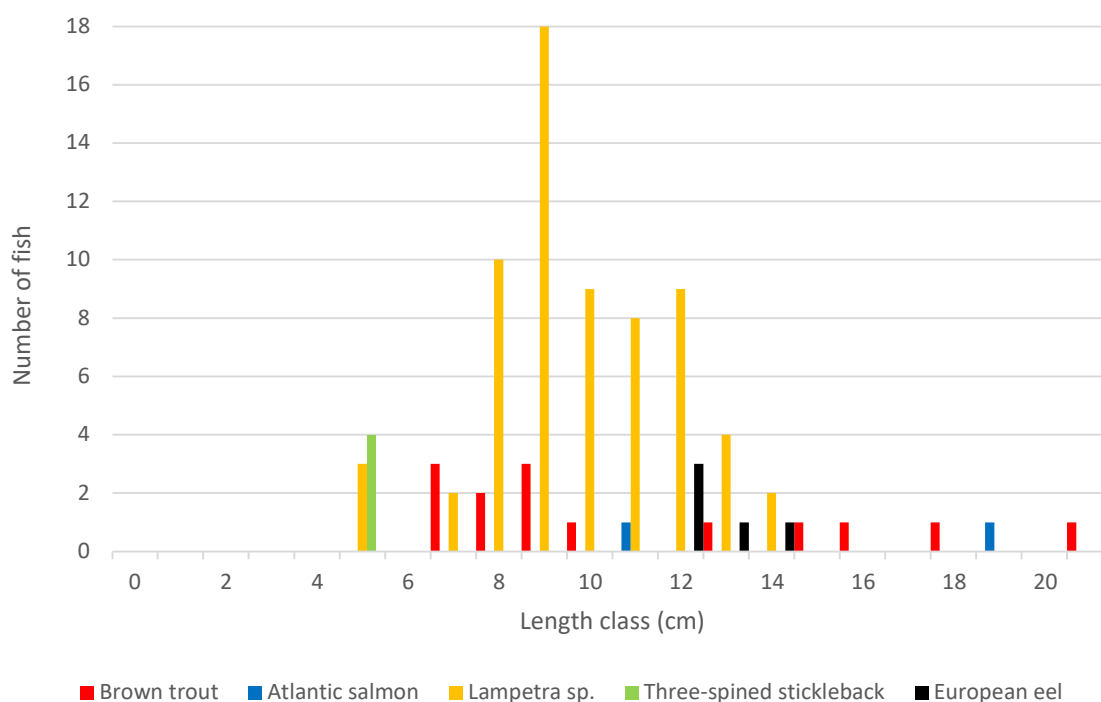


Figure 3.14 Fish stock length distribution recorded via electro-fishing at site D2 on the Farran North River, Farran North in July 2020.



Plate 3.25 Representative image of site D2 on the Farran North River, Farran North, July 2020.

Table 3.1 Fish species densities per m² recorded at sites in the vicinity of Coom Green Energy Park via electro-fishing in July 2020. Values in **bold** represent the highest densities recorded for each species, respectively. Lamprey numbers are presented per 1m² targeted quadrat unless otherwise stated.

Site	CPUE	Approx. area fished (m ²)	Fish density (number fish per m ²)					Three-spined stickleback
			Brown trout	Atlantic salmon	<i>Lampetra</i> sp.	European eel		
A1	5-minute	40	0	0	0	0	0	0
A2	5-minute	45	0	0	0	0	0	0
A3	5-minute	50	0	0	0	0	0	0
A4	5-minute	75	0	0	0	0	0	0
A5	n/a – site dry at time of survey							
A6	10-minute	250	0.108	0.192	5 per 1m ² quadrat	0	0	0
B1	10-minute	50	0	0	0	0	0	0
B2	10-minute	70	0	0	0	0	0	0
B3	10-minute	200	0.180	0.225	0	0	0	0
B4	10-minute	150	0.240	0.020	0	0	0	0
B5	10-minute	100	0.080	0	0	0.040	0	0
B6	10-minute	50	0	0	0	0.020	0	0
B7	10-minute	200	0.185	0	0	0.005	0	0
B8	10-minute	150	0.253	0	0	0.013	0	0
B9	10-minute	120	0.133	0.042	0	0	0	0

Site	CPUE	Approx. area fished (m ²)	Fish density (number fish per m ²)					Three-spined stickleback
			Brown trout	Atlantic salmon	<i>Lampetra</i> sp.	European eel		
B10	10-minute	130	0.385	0.031	0	0.015	0	
B11	10-minute	200	0.095	0.080	0	0	0	
B12	10-minute	100	0	0	0	0	0	
B13	10-minute	50	0	0	0	0	0	
B14	10-minute	65	0	0	0	0	0	
B15	10-minute	240	0.088	0.092	0	0	0	
C1	5-minute	75	0	0	0	0	0	
C2	10-minute	100	0.040	0	0	0.020	0.010	
D1	10-minute	90	0	0	0	0	0	
D2	10-minute	110	0.091	0.009	16.25 per 1m² quadrat	0.045	0.036	

3.2 Fisheries habitat

3.2.1 Salmonid habitat

Salmonid habitat ranged from poor to excellent value across the survey sites (Table 3.2). Of the $n=25$ sites, four sites in total offered excellent quality salmonid habitat according to life Cycle Unit scores. These were sites A6 (Monparson River), B3 (Coom River) and B11 and B15 (River Bride).

Sites B4, B7, B9, B10 and D2 offered good quality salmonid habitat, with these sites often featuring moderate-heavy siltation, thus reducing overall scores. Sites B5, B8, C1, C2 and D1 scored as moderate quality salmonid habitat. Nine sites in total (sites A2, A3, A4, B1, B2, B6, B12, B13 and B14) offered little or no value for salmonids and scored as ‘poor’ in terms of salmonid habitat. Sites A1 (unnamed stream, Knuttery Bridge) and A5 (unnamed stream, Lissard) were 100% dry at the time of survey and thus a Life Cycle Unit score was not applicable (no fisheries habitat present).

Table 3.2 Life Cycle Unit scores for sites surveyed in the vicinity of the proposed Coom Green Energy Park, July 2020.

Site	Salmonid habitat value	Spawning	Nursery	Pool (holding)	Total score
A1		n/a – channel 100% dry			
A2	Poor	4	4	4	12
A3	Poor	4	4	4	12
A4	Poor	4	4	4	12
A5		n/a – channel 100% dry			
A6	Excellent	2	1	2	5
B1	Poor	4	4	4	12
B2	Poor	4	4	4	12
B3	Excellent	2	1	2	5
B4	Good	2	2	2	6
B5	Moderate	3	3	4	10
B6	Poor	4	4	4	12
B7	Good	2	2	2	6
B8	Moderate	3	2	4	9

Site	Salmonid habitat value	Spawning	Nursery	Pool (holding)	Total score
B9	Good	3	2	3	8
B10	Good	2	2	3	7
B11	Excellent	2	2	1	5
B12	Poor	4	4	4	12
B13	Poor	4	4	4	12
B14	Poor	4	4	4	12
B15	Excellent	2	1	2	5
C1	Moderate	3	4	4	11
C2	Moderate	4	3	4	11
D1	Moderate	4	4	4	12
D2	Good	3	2	2	7

3.2.2 Lamprey habitat

Lamprey habitat was typically of poor to moderate quality across the majority of the survey area (21 or 91% of 23 sites) based on Lamprey Habitat Quality Index (LHQI) scores (Table 3.3). Eleven sites offered poor lamprey habitat whilst ten sites offered moderate quality lamprey habitat. However, sites B7 (River Bride) and B10 (Inchinanagh River) (both achieved 'moderate' scores) provided some good quality spawning substrata by way of finer gravel fractions.

Only sites A6 (Monparson River) and D2 (Farran North Stream) provided overall good quality lamprey habitat. Sites A1 and A5 were 100% dry at the time of survey and was therefore not assessable via LHQI scores (no fisheries habitat present).

Table 3.3 Lamprey Habitat Quality Index (LHQI) scores for sites surveyed in the vicinity of the proposed Coom Green Energy Park, July 2020.

Site	Lamprey habitat value	Spawning	Nursery	Total score
A1	n/a – channel 100% dry			
A2	Poor	4	4	8
A3	Poor	4	4	8
A4	Poor	4	4	8
A5	n/a – channel 100% dry			
A6	Good	2	2	4
B1	Poor	4	4	8
B2	Poor	4	4	8
B3	Moderate	3	4	7
B4	Moderate	4	3	7
B5	Moderate	3	3	6
B6	Poor	4	4	8
B7	Moderate	2	4	6
B8	Poor	4	4	8
B9	Moderate	3	4	7
B10	Moderate	2	4	6

Site	Lamprey habitat value	Spawning	Nursery	Total score
B11	Moderate	3	4	7
B12	Poor	4	4	8
B13	Poor	4	4	8
B14	Poor	4	4	8
B15	Moderate	3	4	7
C1	Moderate	3	4	7
C2	Moderate	4	3	7
D1	Poor	4	4	8
D2	Good	2	1	3

3.2.3 European eel habitat

European eel were recorded from a total of seven sites (i.e. B5, B6, B7, B8, B10, B13 and C2). Eel habitat ranged from poor to moderate across the majority of survey sites, with only a few larger sites providing better quality eel habitat (e.g. Monparson River, River Bride, Inchinanagh River).

4. Discussion

4.1 Most valuable sites

4.1.1 Salmonids

Across $n=25$ sites, Atlantic salmon were recorded from a total of eight sites (i.e. sites A6, B3, B4, B9, B10, B11, B15 and D2), with brown trout present at a total of twelve sites (i.e. A6, B3, B4, B5, B7, B8, B9, B10, B11, B15, C2 and D2). Atlantic salmon density was highest at site B3 (Coom River), with brown trout density highest at site B10 (Inchinanagh River) (Table 3.1).

Salmonid habitat ranged from poor to excellent value across the survey sites according to Life Cycle Unit scores (Table 3.2). Sites A6 (Monparson River), B3 (Coom River), B11 and B15 (River Bride) and D2 (Farran North Stream) offered excellent quality salmonid habitat. Typically, these high scores were a result of the presence of excellent quality nursery habitat for brown trout and or Atlantic salmon. Sites B4, B7, B9 and B10 offered good quality salmonid habitat, with these sites often featuring moderate siltation, thus reducing overall scores.

Sites B5, B8, C1, C2, D1 and D2 scored as moderate quality salmonid habitat, with overall scores reduced given siltation pressures in addition to a lack of deeper holding habitat (i.e. shallow watercourses).

Ten sites (sites A1, A2, A3, A4, B1, B2, B6, B12, B13 and B14) offered little or no value for salmonids and scored as 'poor' in terms of salmonid habitat. Site A5 (unnamed stream, Lissard) was 100% dry at the time of survey and thus a Life Cycle Unit score was not applicable (no fisheries habitat present; Table 3.2).

In general, smaller and or more upland sites received higher (worse) scores given their lack or even absence of suitable spawning substrata and nursery habitat resulting from higher gradients, higher-energy flows and spate natures. Stream gradient is known to be one of the principal determinants of juvenile salmonid production, with medium gradients most optimal in terms of successful recruitment and population persistence (Wood & Budy, 2009; O'Grady, 2006; Amiro, 1993). Furthermore, as would be expected in catchments exposed to pressures including afforestation and agriculture, survey sites on larger watercourses typically offered better quality salmonid habitat and supported higher densities of salmonids (e.g. River Bride).

Biological water quality was typically of less than good status (i.e. $\leq Q3-4$) across the survey sites, with only sites B15 on the River Bride meeting Water Framework Directive (i.e. $\geq Q4$) and Surface Water Regulations (S.I. No. 77/2019) standards (i.e. EQR high/good ≥ 0.85). The abundance of salmonids (especially Atlantic salmon as opposed to brown trout) is more stable at better quality sites ($\geq Q4$), with salmon populations tending to oscillate due to fry abundance 'pulses' at moderate quality sites (i.e. $Q3-4$) (Kelly et al., 2007; Champ et al., 2009).

4.1.2 Lamprey

Lamprey habitat was typically of poor to moderate quality across the majority of the survey area (21 or 91% of 23 sites) based on Lamprey Habitat Quality Index (LHQI) scores (Table 3.3). Twelve sites offered poor lamprey habitat given the absence of suitable larval habitat (e.g. in higher flow sites) and or little to no suitable spawning substrata. Many of the survey sites were located on upland eroding watercourses and naturally such sites do not encourage the deposition of fine, organic rich sediment required by larval lamprey (Goodwin et al., 2008; Aronsuu & Virkkala, 2014).

Ten sites offered moderate quality lamprey habitat with scores invariably reduced given a paucity or lack of suitable soft sediment areas for ammocoetes. However, sites B7 (River Bride) and B10 (Inchinanagh River) (both of which achieved 'moderate' overall scores) provided some good quality spawning substrata by way of finer gravel fractions.

Only sites A6 (Monparson River) and D2 (Farran North Stream) provided overall good quality lamprey habitat. Site A6 offered a combination of good quality spawning and nursery habitat, whilst site D2 featured some good spawning substrata in addition to excellent quality larval habitat. Site D2 provided the best lamprey habitat of any survey site.

4.1.3 European eel

On both a global and Irish scale European eel is listed as 'critically endangered' (Pike et al., 2020; King et al., 2011). European eel were recorded from a total of seven sites (i.e. B5, B6, B7, B8, B10, B13 and C2), typically in low abundances. Eel habitat ranged from poor to moderate across the majority of survey sites, with only a few larger sites providing better (good) quality eel habitat (e.g. Monparson River, River Bride, Inchinanagh River). The highest eel density was recorded at site D2 on the Farran North Stream (0.045 fish per m²; Table 3.1). In general, the majority of sites featured a paucity of suitable refugia, deeper pool areas and or were too shallow/high energy to be considered of good value to eel. Nonetheless, even smaller channels with poor or little overall fisheries value (e.g. B5, B6, C2 etc.) offered value as potential European eel migratory pathways given their downstream connectivity to larger channels. (e.g. adult migration seawards, usually from September/October onwards).

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**FRESHWATER PEARL MUSSEL (*Margaritifera margaritifera*) SURVEY
IN WATERCOURSES DOWNSTREAM OF
COOM WINDFARM SITE**



09 September 2020

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1.0 INTRODUCTION

The purpose of this report is to assess the occurrence of the legally protected freshwater pearl mussel (*Margaritifera margaritifera*) in watercourses downstream of the proposed Coom Windfarm. The windfarm site and proposed cable routes are mainly within the catchment of the River Bride (EPA Code 18B05), but small watercourses from the subject site also flow to the Clyda River (EPA Code 18C02) and the River Martin (EPA Code 19M01).

2.0 METHODOLOGY

2.1 SITE SELECTION

In 2017, seven sections of small watercourses in the upper Bride catchment were surveyed by Daireann McDonnell and were found to be of unsuitable habitat quality for freshwater pearl mussels (FPM) due to unstable substrata resulting from high energy water flows. Surveys in this general area carried out by Sweeney Consultancy for a variety of other projects confirms this. Therefore, it was decided that surveying for the present project should be undertaken farther downstream of the subject site, where the gradient decreases, with consequent improvement in the suitability of the habitat for FPM. In each of the three river catchments downstream of the subject site, sections of channel were selected, based on previous experience of these watercourses (Figure 1). While there are no previous records of FPM in the Rivers Bride or Martin, some mussels have been found at the lower end of the Clyda River in the past, just upstream of the confluence with the Munster Blackwater, where there is a significant population of this species (Evelyn Moorkens, *pers. comm.*).

The river sections selected were,

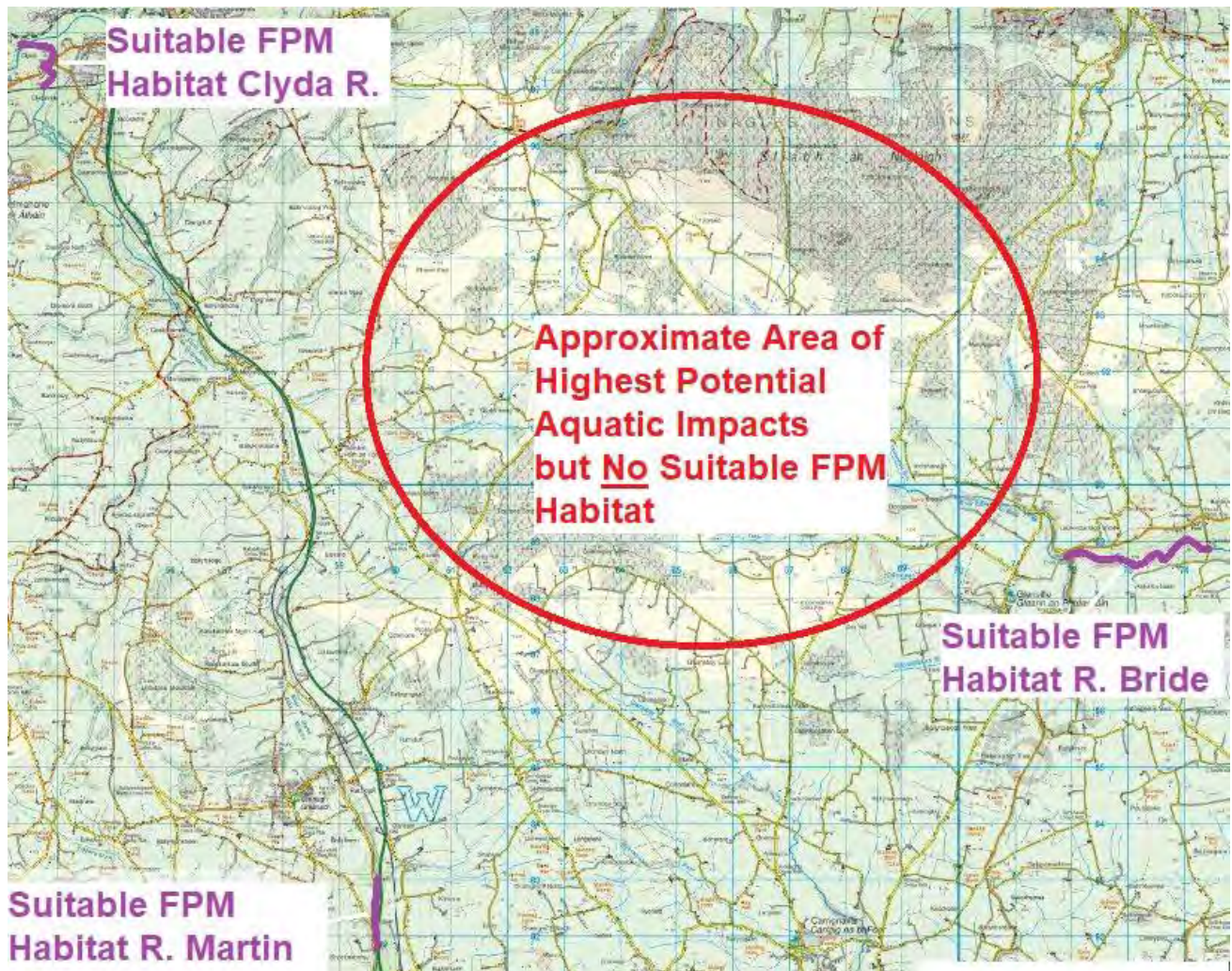
R. Bride: Keam Br. (ITM 571887 588835) to Corbally Br. (ITM 574407 588928).

Clyda R.: Railway viaduct (ITM 553387 597840) to Blackwater confluence (ITM 553387 597840).

R. Martin: Stream confluence at ITM 559650 583050 to car park at ITM 559606 581840.



Figure 1: Watercourses Surveyed



2.1 SURVEY METHODS

Field surveys were carried out under Licence No. C15/2020, issued by the National Parks and Wildlife Service. The survey methodology used was in accordance with the guidelines given in Irish Wildlife Manual No. 12, NPWS (Anon., 2004). Surveying was carried out from September 4th to 7th, 2020, in bright weather, with good visibility. Following an initial safety inspection of stretches to be surveyed, the riverbed was examined visually with a bathyscope. Exposed banks of gravel and sand were checked for the presence of mussel shells. Biosecurity measures were strictly adhered to, with all equipment in contact with river water washed down with Virkon Aquatic disinfectant between sites. Assessments were made of the habitat suitability for freshwater pearl mussels, based on the criteria of Hastie *et al.* (2000) and Skinner *et al.* (2003).



3.0 Results

3.1 Freshwater Pearl Mussel Survey Results

No live freshwater pearl mussels were found at any of the sites surveyed. No empty shells were found.

The physical habitat of the stretch of the River Bride surveyed was rated as very good, based on substrate type, flow, aquatic plant cover and degree of shade (Photos 1 & 2, Appendix 1). The stretch of the River Martin surveyed was mostly of good habitat quality for FPM (Photos 3 & 4), although absence of trees along parts of the right (western) bank result in little shade here. While the instream habitat of the section of the Clyda River appears good (Photos 5 & 6), there is a field of maize to the right bank from the railway viaduct to the road bridge, while downstream of the road bridge, grassland on the left side of the river has been re-seeded and there has been some bank erosion (Photo 7) and reinforcement with rocks (Photo 8). In 2012, the treeline on the right bank near the confluence with the Blackwater, where FPM were previously recorded was removed and the bank re-contoured. Further tree removal had occurred on the left bank at the confluence by May 2018. This can be seen in the Google Earth images presented in Appendix 2.



4.0 Conclusions

There is no indication of the current presence of freshwater pearl mussels in the River Bride, the River Martin or the Clyda River.

There are no freshwater pearl mussels records farther downstream of the stretches surveyed in the Rivers Bride and Martin.

Freshwater pearl mussels are known to occur in the Munster Blackwater River, downstream of the Clyda River confluence.

The current absence of mussels from the lower reaches of the Clyda River is probably due to land use practices.



Appendix 1 Photographs

Photo 1: River Bride. Suitable FPM Habitat



Photo 2: River Bride. Suitable FPM Habitat



Photo 3: River Martin. Suitable FPM Habitat



Photo 4: River Martin. Suitable FPM Habitat



Photo 5: Clyda River. Suitable FPM Habitat downstream of Railway viaduct



Photo 6: Clyda River. Suitable FPM Habitat



Photo 7: Clyda River. Bank Erosion



Photo 8: Clyda River. Bank Reinforcement



Appendix 2 Google Earth Images of Clyda River

27/03/2012



03/09/2012



24/05/2018



Appendix 3 References

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Aquatic baseline report for Coom Green Energy Park, Co. Cork



Prepared by Triturus Environmental Ltd. for INIS Environmental Consultants Ltd.

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were contracted by INIS Environmental Consultants Ltd. (on behalf of Brookfield Renewable Ireland) to undertake a baseline aquatic survey along numerous watercourses in the footprint of the proposed Coom Green Energy Park development, located near Bottlehill, Co. Cork.

The survey was undertaken to establish baseline aquatic and fisheries data used in the preparation of the EIAR for the proposed development, which includes a proposed wind turbine layout and associated cable route alignment (see Table 2.1, Figure 2.1). The majority of the proposed survey sites were located in the Munster Blackwater catchment (sub-catchment ID: Blackwater[Munster]_SC_080 and Blackwater[Munster]_SC_110) although, to the east, numerous sites drained the Bride [Waterford] catchment (Bride[Waterford]_SC_010). A single site was located within the northernmost extent of the Manin_SC_010 sub-catchment. Several survey sites were located within, or had connectivity with, the River Blackwater SAC (site code: 002170). The northern extent of the survey area also overlapped with the River Blackwater *Margaritifera* sensitive area (Figure 2.1).

The baseline survey was focused on aquatic habitats in relation to fisheries potential (including both salmonid and lamprey habitat), white-clawed crayfish (*Austropotamobius pallipes*), and freshwater pearl mussel (*Margaritifera margaritifera*), macro-invertebrates, physiochemical water quality, macrophytes, aquatic invasive species, and Annex II aquatic species which may use the relevant watercourses in the vicinity of the proposed development.

1.2 Project description

A full description of the proposed works for the Coom Green Energy Park development are described in chapter 3 of the EIAR.

2. Methodology

2.1 Desktop review

A desktop review was undertaken to collate and review available information, datasets and documentation sources pertaining to the natural environment of the aquatic survey sites. Records available on the National Biodiversity Data Centre and National Parks and Wildlife Service websites were reviewed.

A sensitive species data request for terrestrial and aquatic flora and fauna covering 10km grid squares adjoining the proposed wind turbine layout and cable route alignment (i.e. W58, W59, W68, W69, W78, W79 and W89) was requested from the Department of Culture, Heritage and the Gaeltacht on Tuesday 28th July 2020 and received on 4th August 2020.

Furthermore, a catchment-wide electro-fishing survey was undertaken by Triturus in 2017 for an early precursor to the Coom Green Energy Park development (Triturus, 2017). Some of the 2020 survey sites overlapped with those visited in 2017 and, where applicable, this is referred to in the Results section of this report and Appendix A.

2.2 Walkover surveys

All watercourses which could be affected directly or indirectly by the proposed development were considered as part of the current baseline assessment. This included proposed cable route crossings of riverine watercourses (Figure 2.1, Table 2.1) or watercourses in close proximity to/draining the proposed wind turbine layout. The nomenclature for the watercourses surveyed is as per the Environmental Protection Agency's (EPA) online map viewer.

Site visits of the aquatic survey sites were conducted on Friday 24th, Saturday 25th and Wednesday 29th to Friday 31st July 2020 by Triturus Environmental Ltd. Survey sites were assessed in light of the proposed development and associated cable route, with survey effort focused on both instream and riparian habitats at each location. Surveys at each aquatic site included a fisheries assessment (electro-fishing, see section 2.3 below), fisheries habitat appraisal and white-clawed crayfish assessment. A freshwater pearl mussel assessment was undertaken across the wider catchment of the proposed development (see section 2.6 and Appendix B). Additionally, biological water quality (Q-sampling) was undertaken at $n=12$ sites (Figure 2.2). Rare, protected and or conservation interest aquatic species such as otter were also searched for at each survey site. This holistic approach informed the overall aquatic ecological evaluation of each site in context of the proposed development and onshore cable route.

A broad aquatic habitat assessment was conducted at each site utilising elements of the methodology given in the Environment Agency's '*River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003*' (EA, 2003) and the Irish Heritage Council's '*A Guide to Habitats in Ireland*' (Fossitt, 2000). All sites were assessed in terms of:

- Stream width and depth and other physical characteristics.

- Substrate type, listing substrate fractions in order of dominance, i.e. bedrock, boulder, cobble, gravel, sand, silt etc.
- Flow type, listing percentage of riffle, glide and pool in the sampling area.
- In-stream macrophyte, bryophytes occurring and their percentage coverage of the stream bottom at the sampling sites.
- Riparian vegetation composition.

The watercourse at each aquatic survey site was described in terms of the important aquatic habitats and species. This helped to evaluate species and habitats of ecological value in the vicinity of the proposed development and watercourse crossings. The aquatic baseline prepared would inform mitigation for the Coom Green Energy Park development.

Table 2.1 Aquatic survey site locations in the footprint of the proposed Coom Green Energy Park development, Co. Cork.

Site no.	Watercourse	EPA code	Location / townland	ITM (x)	ITM (y)
A1	Unnamed stream	n/a	Knuttery Bridge	562621	591186
A2	Unnamed stream	n/a	Tooreen North	561491	589545
A3	Tooreen North Stream	19T33	Tooreen North	561359	589281
A4	Slievedotia 19 Stream	19S09	Daly's Cross Roads	561011	587722
A5	Unnamed stream	n/a	Lissard	559515	588386
A6	Monparson River	18M58	Lissard	558677	590203
B1	Toor River	18T51	Mullenaboree	564085	591709
B2	Coom 18 Stream	18C03	Bottlehill Landfill	563229	589796
B3	Coom 18 River	18C03	Coom	565442	588887
B4	Toor River	18T51	Raheen	565547	589591
B5	Lyravarrig 18 Stream	18L82	Commons	566739	593598
B6	Seefin 18 Stream	18S52	Commons	566862	593456
B7	River Bride	18B05	Commons	566523	592989
B8	Lyravarrig 18 Stream	18L66	Mullenaboree	565741	592184
B9	Field Chimney Stream	18F43	Chimneyfield	568146	591922
B10	Inchinnanagh River	18I16	Inchinnanagh	568592	590845
B11	River Bride	18B05	Bride Bridge	568376	590182
B12	Unnamed stream	n/a	Knockdoorty	570075	594332
B13	Unnamed stream	n/a	Powers Bridge	570337	593908
B14	Bunnaglanna Stream	18B07	Moneygorm	570301	593711

Site no.	Watercourse	EPA code	Location / townland	ITM (x)	ITM (y)
B15	River Bride	18B05	Old Bridge	571380	589562
C1	Slumberhill 18 Stream	18S40	Knockacullata	564792	594397
C2	Ross Stream	18R02	Knockacullata	563403	593486
D1	Shanowen Trib 1	18S42	Ballynahina	578462	595293
D2	Farran North River	18F27	Farran North	582016	594305

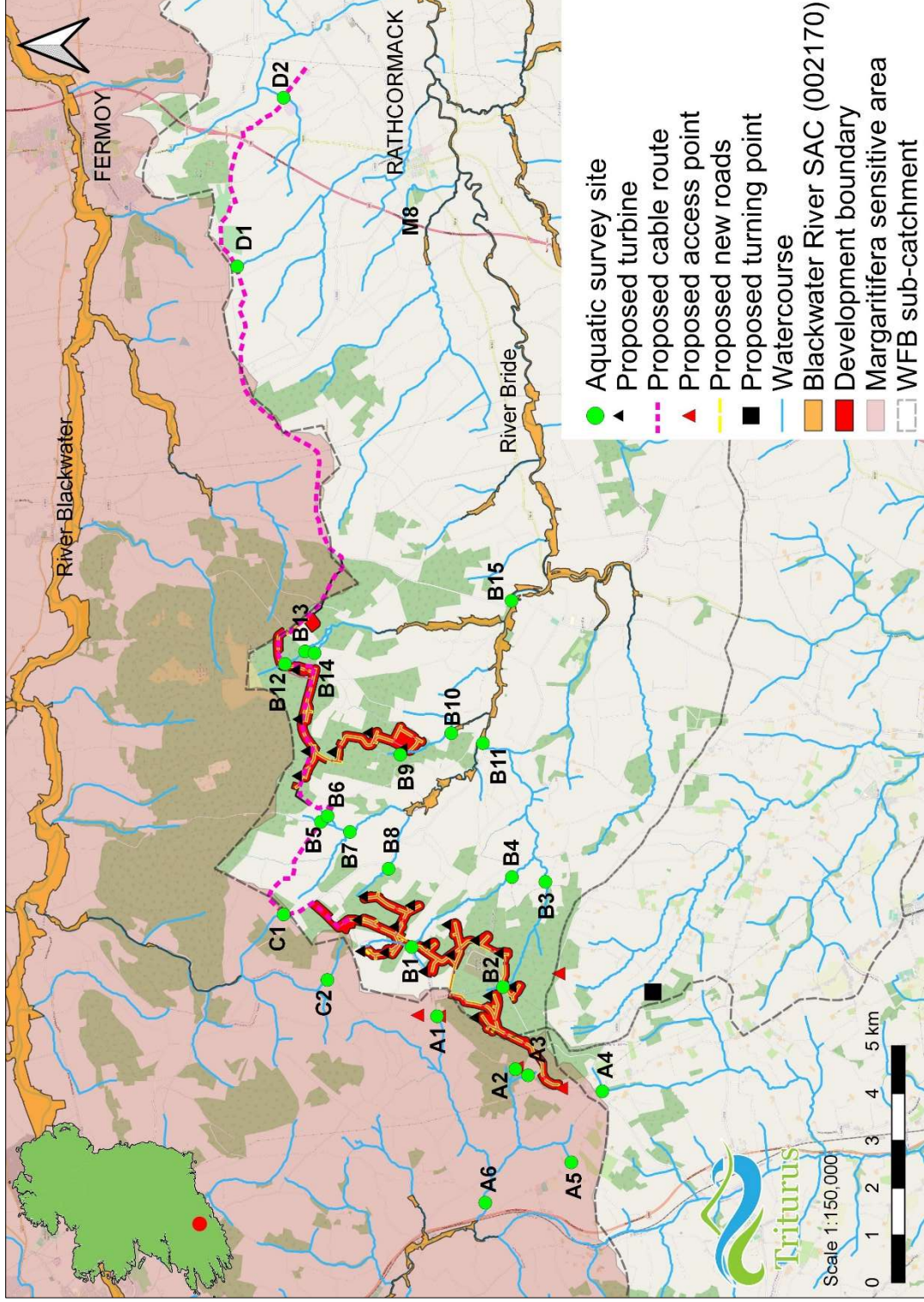


Figure 2.1 Location of aquatic survey sites in the vicinity of the proposed Coom Green Energy Park, Co. Cork

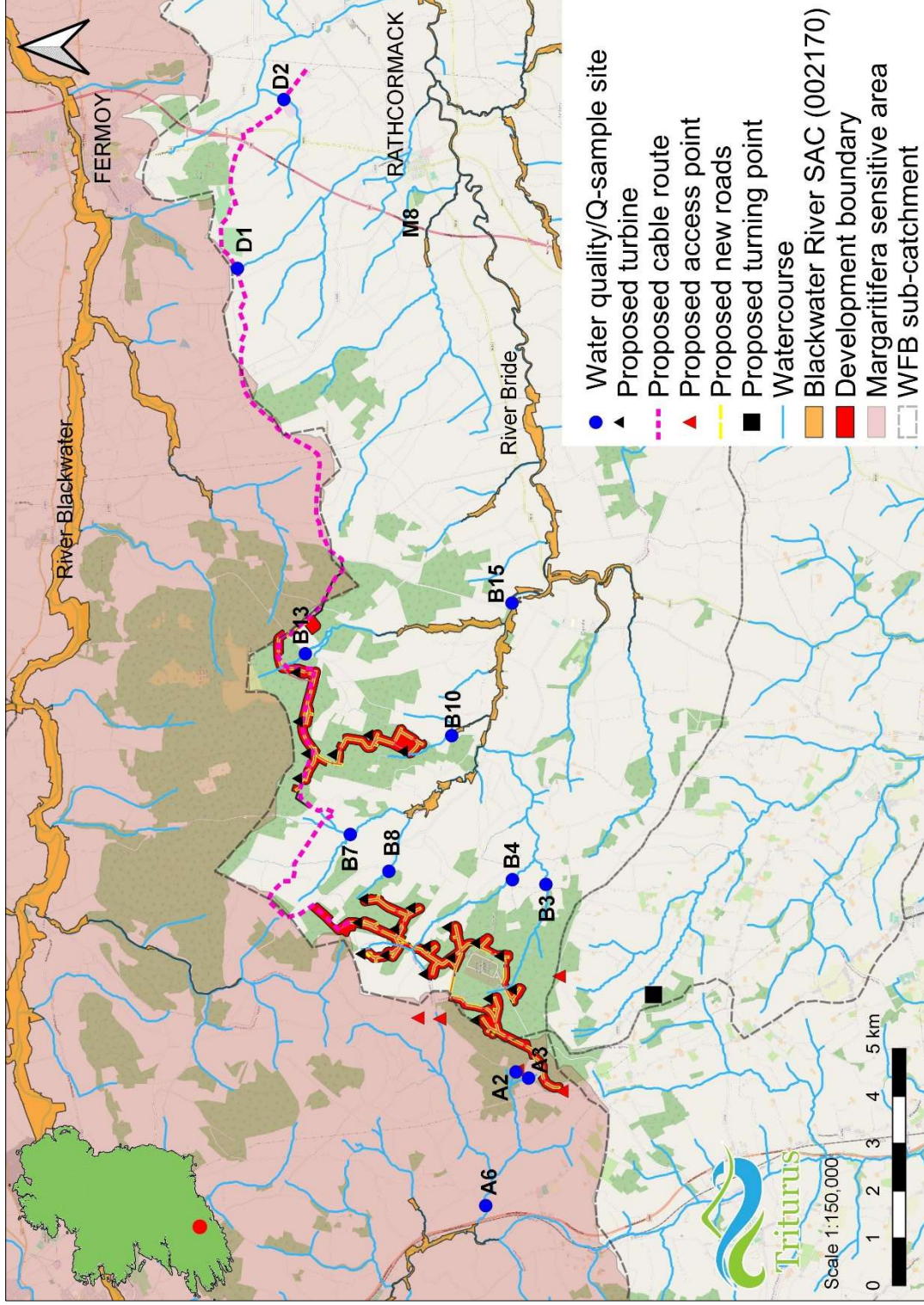


Figure 2.2 Location of Q-sampling sites in the vicinity of the proposed Coom Green Energy Park, Co. Cork.

2.3 Fisheries assessment (electro-fishing)

Triturus Environmental Ltd. made an application under Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962, to undertake a catchment-wide electro-fishing survey ($n=25$ sites) in the footprint of the proposed Coom Green Energy Park located. Permission was granted on Monday 27th July 2020 and the survey was undertaken over Wednesday 29th to Friday 31st July 2020.

Please refer to Appendix A for electro-fishing methodology and detailed results and analysis.

2.4 Fisheries habitat

A fisheries habitat appraisal of the watercourses in the footprint of the proposed Coom Green Energy Park and associated cable route (Figure 2.1) was undertaken to establish their importance for salmonid, lamprey, European eel and other fish species. The baseline assessment considered the quality of spawning, nursery and holding habitat within the vicinity of the survey sites using Life Cycle Unit (salmonids) and Lamprey Habitat Quality Index scores (lamprey).

Please refer to Appendix A for fisheries habitat methodology and detailed results and analysis.

2.5 White-clawed crayfish

White-clawed crayfish surveys were undertaken at the aquatic survey sites under a National Parks and Wildlife (NPWS) open licence (no. C79/2020), as prescribed by Sections 9, 23 and 34 of the Wildlife Act (1976-2012), to capture and release crayfish to their site of capture, under condition no. 5 of the licence. As per Inland Fisheries Ireland recommendations, the crayfish licence sampling started at the uppermost site(s) of the wind farm catchment/sub-catchments in the survey area to minimise the risk of transfer invasive propagules (including crayfish plague) in an upstream direction.

Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds et al. (2010). Trapping of crayfish was not feasible given the small nature of most aquatic survey sites sampled. An appraisal of white-clawed crayfish habitat at each site was also carried out based on physical channel attributes, water chemistry and incidental records in otter spraint. Furthermore, a desktop review of known distributions of crayfish within the relevant watercourses and wider catchment(s) was also completed.

2.6 Freshwater pearl mussel

Freshwater pearl mussel surveys of watercourses in the wider footprint of the proposed Green Energy Park were completed by Pascal Sweeny of Sweeny Consultancy over the 4th to 7th September 2020 (Appendix B). Conditions were suitable, with bright, sunny weather and good water visibility under base flow conditions. This helped to maximise visibility of pearl mussel against dark substrata and also improved chances of detection when mussels were filter feeding in brighter conditions. Pearl mussel surveys were carried out under a national open licence

(licence no. C15/2020), issued by the National Parks and Wildlife Service (NPWS). The survey methodology used was in accordance with the Stage 1 & 2 guidelines given in Irish Wildlife Manual No. 12, NPWS (Anon., 2004).

For a more detailed methodology please refer to Appendix B (freshwater pearl mussel survey).

2.7 Biological water quality (macro-invertebrates)

To evaluate biological water quality across the survey area, Q-sampling was carried out at $n=12$ riverine sites, namely sites A6 (Monparson River), B3 (Coom River), B4 (Toor River), B7 (River Bride), B8 (Lyrvarrig Stream), B10 (Inchinagah River), B11 (River Bride), B13 (unnamed stream), B15 (River Bride), C1 (Slumberhill Stream), D1 (Shanowen Trib 1 Stream) and D2 (Farran North Stream) (Figure 2.1, Table 2.1).

Macro-invertebrate samples were converted to Q-ratings as per Toner et al. (2005). All riverine samples were taken with a standard kick sampling hand net (250mm width, 500 μ m mesh size) from areas of riffle/glide utilising a two-minute sample, as per ISO standards for water quality sampling (ISO 10870:2012). Large cobble was also washed at each site where present and samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification. Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012) and other relevant taxa (i.e. Feeney et al., 2020; Byrne et al., 2009; Nelson et al., 2011).

Table 2.4 Reference Categories for EPA Q-Ratings (Q1 to Q5)

Q Value	WFD Status	Pollution Status	Condition
Q5 or Q4-5	High Status	Unpolluted	Satisfactory
Q4	Good Status	Unpolluted	Satisfactory
Q3-4	Moderate Status	Slightly polluted	Unsatisfactory
Q3 or Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2 or Q1	Bad	Seriously polluted	Unsatisfactory

2.8 Aquatic ecological evaluation

The evaluation of ecological receptors contained within this report uses the geographic scale and criteria defined in the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009).

2.9 Biosecurity

A strict biosecurity protocol following the Check-Clean-Dry approach was employed during the survey. Equipment and PPE used was disinfected with Virkon® between survey sites to prevent the transfer of pathogens and/or invasive species between survey areas. Where feasible, equipment was also be thoroughly dried (through UV exposure) between survey areas. As per best practice, surveys were undertaken at sites in a downstream order (i.e. uppermost site surveyed first etc.) to prevent the upstream mobilisation of invasive propagules and pathogens. Any invasive species recorded within or adjoining the survey area were geo-referenced.

3. Results

The following section summarises each aquatic survey site in terms of aquatic habitats, physical characteristics and overall value for fish, macrophyte communities and macro-invertebrates. Biological water quality (rivers only) results are also summarised. Habitat codes are according to Fossitt (2000). Scientific names are provided at first mention only. An evaluation of the aquatic ecological importance of each survey site based on the aquatic surveys is provided below and summarised in Table 3.4.

3.1 Desktop review

A sensitive species data request for terrestrial and aquatic flora and fauna covering 10km grid squares adjoining the proposed development (i.e. W58, W59, W68, W69, W78, W79 and W89) revealed records for a number of protected (freshwater) aquatic species in the vicinity of the proposed watercourses crossings, as did data from the National Biodiversity Data Centre (NBDC, 2020).

Otter (*Lutra lutra*) records were widespread throughout the respective grid squares, with several records overlapping the survey area (NBDC data; NPWS data). A single otter record was available for the lower Ross Stream, approx. 2.8km downstream from survey site C1, the Lyravarrig Stream approx. 1km downstream from site B8, Bride Bridge on the River Bride (site B11) and at Old Bridge on the River Bride (site B15) (NPWS data).

Numerous records for freshwater pearl mussel (*Margaritifera margaritifera*) were available for the respective grid squares but all were confined to the River Blackwater. No records overlapped with the survey area. Similarly, white-clawed crayfish (*Austropotamobius pallipes*) records were available for the River Blackwater and the Ballyclogh Stream (upper tributary upstream of Mallow, W59) but no records overlapped with the survey area.

Numerous sea lamprey (*Petromyzon marinus*) records were available for the Munster Blackwater catchment (e.g. River Blackwater, Clyda River) but no records overlapped with the survey area. River lamprey (*Lampetra fluviatilis*) records were available for the River Blackwater and River Bride at Rathcormack Bridge (not within survey area).

A catchment-wide electro-fishing survey was undertaken by Triturus in 2017 for an early precursor to the Coom Green Energy Park development (Triturus, 2017). The wider catchment was found to support brown trout, European eel, *Lampetra* sp. ammocoetes and low numbers of Atlantic salmon in 2017.

3.2 Site descriptions

Site A1 – unnamed stream, Knuttery Bridge

Site A1 was located on the upper reaches of a small, unnamed stream (no EPA code; aka Leapford Stream) at Knuttery Bridge. The small stream, a tributary of the Monparson River, had been straightened and deepened historically in the vicinity of the local road crossing and featured a deep V-shaped channel, less than 1m wide with 2.5-3m bank heights over a moderate gradient. The channel did not contain water at the time of survey (100% dry). The bed comprised compacted cobble, gravel and mud (likely dry for a significant period of time). The banks were heavily scrubbed over and comprised primarily nettle (*Urtica dioica*), rosebay willowherb (*Chamaenerion angustifolium*), bracken (*Pteridium aquilinum*), foxglove (*Digitalis purpurea*) and hogweed (*Heracleum sphondylium*). Scattered hawthorn (*Crataegus monoygna*) and sitka spruce (*Picea sitchensis*) were present downstream. The adjoining land use patterns were of coniferous afforestation (WD4) upstream and heavily improved agricultural grassland (GA1) downstream and adjoining the survey area.

The upper reaches of the unnamed stream at site A1 offered no fisheries value at the time of survey owing to the lack of water and was considered unlikely to support fish throughout much of the year due to evident seasonality (Appendix A). Given the dry nature of the site, it was not possible to take a Q-sample to infer water quality.

Given the lack of fisheries value and seasonality of the channel, the aquatic ecological evaluation of site A1 was of **local importance (lower value)**.



Plate 3.1 Representative image of site A1 on an unnamed stream at Knuttery Bridge, July 2020.

Site A2 – unnamed stream, Tooreen North

Site A2 was located on the upper reaches of an unnamed stream (no EPA code) at St. John's Well, Tooreen North. The site represented a small upland eroding watercourse (FW1), 0.5m wide and 0.1-0.2m deep on average. The stream emerged from a spring known as St. John's Well and then flowed through a steep valley in a sitka spruce plantation (WD4) with a buffer of grey willow. The gradient steepened significantly moving through the plantation with cascading reaches visible. Low banks (0.5m high) graded into the adjoining valley. The profile was dominated by riffle (95%) with a single localised shallow pool located at the well itself. The substrata were clean and unbedded, dominated by fine, medium and coarse gravels. The riparian areas were dominated by scrub (WS1) with bracken, bramble and nettle being very dense. The site supported no macrophytes although abundant opposite-leaved golden saxifrage (*Chrysosplenium oppositifolium*) was present in the margins (visible downstream, away from the well).

No fish were recorded via electro-fishing. The stream was not of fisheries value due to its very small size and location in the very upper reaches of a catchment with limited accessibility for fish. The site was unsuitable for white-clawed crayfish and offered no otter value given the lack of a prey resource. A biological water quality rating of **Q3**, corresponding to WFD '**Poor**' status was assigned for this site (Table 3.3a).

Given the lack of fisheries value and small nature of the site, the aquatic ecological evaluation of site A2 was of **local importance (lower value)**.



Plate 3.2 Representative image of site A2 on an unnamed stream, Tooreen North, July 2020.

Site A3 – Tooreen North Stream, Tooreen North

The Tooreen North Stream (EPA code: 19T33) at site A3 was a small, semi-natural upland eroding watercourse (FW1), characteristic of an upland spate channel. The stream flowed in a deep U-shaped channel (2m to 3m bank heights), 1.5m wide and had shallow water (<0.1m deep). The profile was dominated by riffle (90%) with 10% glide and an absence of pools due to its very small nature. The bed comprised compacted small boulder, cobble and mixed medium and fine gravels. Siltation was considered moderate. The riparian zone was composed of mature conifers (lodgepole pine) and dense bracken and bramble scrub (WS1). Adjoining land uses were improved agriculture (GA1) and coniferous afforestation (WD4) upstream. Macrophyte growth was not present although the liverwort species jagged germanderwort (*Riccardia chamedryfolia*) was locally abundant on instream boulders and cobble.

No fish were recorded via electro-fishing. The stream was not considered of fisheries value due to its very small size and location in the very upper reaches of a catchment with limited accessibility for fish. The site was unsuitable for white-clawed crayfish and offered no otter value given the lack of a prey resource. A biological water quality rating of **Q3-4**, corresponding to WFD ‘**Moderate**’ status was assigned for this site (Table 3.3a).

Given the lack of fisheries value and small nature of the site, the aquatic ecological evaluation of site A3 was of **local importance (lower value)**.



Plate 3.3 Representative image of site A3 on the Tooreen North Stream, Tooreen North, July 2020.

Site A4 - Slievedotia 19 Stream, Daly's Cross

The Slievedotia 19 Stream (EPA code: 19S09) at site A4 was a small drainage channel (FW4) which averaged less than 1 and 0.1m deep. The stream had been historically straightened and deepened in the vicinity of the road crossing (culverted underneath Daly's Cross) and was contained in a deep U-shaped channel. The channel substrata comprised a 100% deep silt base with an imperceptible flow at the time of survey. The channel was bordered to the east by an earthen embankment (2.5m high) and grassy meadow habitat with improved grassland (GA1) to the west. The stream was heavily scrubbed-over with bramble, gorse and bracken scrub (WS1) encroaching into the channel- riparian shading was approaching 100%. Consequently, there were no macrophytes recorded instream. A small block of willow-dominated scrub was present in vicinity of the road crossing with a small linear block of coniferous afforestation (WD4) present along the channel downstream of the survey site.

No fish were recorded present at the site via electro-fishing and it was not considered of fisheries value due to its small size and heavily modified nature and likely seasonality (Appendix A). However, the site may be utilised by migratory European eel during periods of higher flow (e.g. autumn, winter). The site was unsuitable for white-clawed crayfish and offered little to no otter value.

Given the lack of fisheries value and small nature of the site, the aquatic ecological evaluation of site A4 was of **local importance (lower value)**.



Plate 3.4 Representative image of site A4 on the Slievedotia 19 Stream, Daly's Cross, July 2020.

Site A5 – unnamed stream, Lissard

Site A5 was located on the upper reaches of unnamed stream at Lissard in the vicinity of a local road crossing. The stream was 100% dry at the time of survey and the 100% dry mud channel bed indicated it had been dry for some time prior to the survey. The channel was 1.0m wide with bank heights of 1.5-2m. The channel was culverted under the local road (small pipe culvert) and was bordered by a treeline (WL2) of grey willow, hawthorn, blackthorn (*Prunus spinosa*), elder (*Sambucus nigra*) and gorse on the east bank. The west bank featured dense scrub (WS1) with bramble, nettle, great willowherb (*Epilobium hirsutum*), wild angelica (*Angelica sylvestris*) and rank grasses. This adjoined a trackway that was colonised by a dry grassy meadow habitat (GS2). The wider landscape comprised heavily improved grassland (GA1).

The channel was evidently of no fisheries value. However, given downstream connectivity to the Monparson River, the stream may be migratory European eel during periods of higher flow (e.g. autumn, winter) although its overall fisheries value was considered low given likely seasonality (Appendix A).

Given the dry nature of the seasonal site and lack of fisheries value, the aquatic ecological evaluation of site A5 was of **local importance (lower value)**.



Plate 3.5 Representative image of site A5 on a dry, unnamed stream at Lissard, July 2020.

Site A6 – Monparson River, Lissard

The Monparson River (EPA code: 18M58) at site A6 was a small lowland depositing watercourse (FW2), averaging 5-6m wide and 0.2-0.3m deep. Located in the vicinity of a local road crossing, the tributary of the River Clyda had been historically straightened but good recovery was present throughout. The bankfull heights were 1.0m with no historical deepening evident. The river profile was dominated by glide (60%), 30% riffle and 10% pool. The bed was dominated by cobble (60%), boulder 10% with fine and medium gravel making up 20% by surface area of the bed. Coarse gravel, sand and silt made up the remaining 10%. The substrata were partially bedded with moderate siltation evident. The riparian areas comprised mature alder and grey willow woodland supporting an understory dominated by nettle, bracken, meadowsweet, opposite-leaved golden saxifrage and bramble. Dry grassy fields (GS2) bordered the river to the south. Shading was moderate, locally (higher upstream of the bridge). The macrophyte community comprised abundant hemlock water dropwort in the margins and riparian areas with localised yellow iris (*Iris pseudacorus*). Stream water crowfoot (*Ranunculus penicillatus* var. *penicillatus*) was rare and was only present in more open riffle areas. The aquatic bryophytes included frequent *Chiloscyphus polyanthos* on cobble with occasional *Fontinalis antipyretica*. The macrophyte and bryophyte community composition shared links with the Annex I Habitat, *Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation* (3260) given the presence of two aquatic bryophyte indicators and crowfoot vegetation. Green filamentous algae was present but very localised (1% cover).

Overall, the site offered excellent salmonid habitat, with good spawning, good spawning and excellent nursery habitat present. The quality of the spawning substrata was reduced somewhat due to siltation and compaction. High densities of both Atlantic salmon and brown trout were recorded via electro-fishing, in addition to moderate abundances of *Lampetra* sp. ammocoetes (Appendix A). Good quality lamprey spawning and larval habitat was present locally. European eel habitat as considered moderate to good despite none being recorded via electro-fishing. No white-clawed crayfish were recorded and the site was considered unsuitable given the species' known absence from the wider catchment (i.e. sandstone dominated). No signs of otter were recorded but the presence of healthy salmonid population and seclusion from human activity provided high suitability. A biological water quality rating of **Q3**, corresponding to WFD 'Poor' status was assigned for this site (Table 3.3a).

In summary, given the excellent quality salmonid habitat present, in addition to good lamprey and otter habitat, the aquatic ecological evaluation of site A6 was of **local importance (higher value)**.

Site B1 – Toor River, Mullenaboree

Site B1 was located on the upper reaches of the Toor River (EPA code: 18T51) at a local road crossing. Here, the channel flowed through a deep U-shaped channel, averaging 1-1.5m wide with very shallow water <0.1m deep. The bank heights were variable but typically 1.2m (locally higher downstream of the bridge). The river had been extensively deepened and straightened historically and retained very little natural character. Shallow glide and riffle characterised the site with only very localised shallow pools present downstream of the bridge. The substrata were dominated by small cobble with occasional boulder and frequent pockets of medium to coarse gravels. These were invariably bedded and siltation was moderate overall. The riparian areas comprised dense bramble, gorse, wild angelica and willow scrub with rank grasses. Adjoining the riparian areas, young conifer plantations with ‘additional broadleaved’ (ADB) birch buffers present. The catchment land use practices were primarily coniferous plantations (WD4) and improved grassland (GA1). The channel featured heavy macrophyte cover in open areas (up to 90% cover) with watercress (*Nasturtium officinale*), water-forget-me-not (*Myosotis scorpioides*), water mint (*Mentha aquatica*), and localised common water starwort (*Callitriche stagnalis*). No aquatic bryophytes were recorded.

No fish were recorded during electro-fishing but only 50m² was effectively fished due to the overgrown nature of the channel. The site was considered to have poor fisheries value given the shallow, overgrown nature of the river at his site. Given improved fisheries habitat downstream, the site may be utilised by brown trout and European eel during periods of higher flow (e.g. autumn, winter) although its overall fisheries value was considered low at this location. No white-clawed crayfish were recorded and the site was considered unsuitable given the species’ known absence from the wider catchment. No signs of otter were recorded and suitability was considered low.

In summary, given the poor fisheries value, the aquatic ecological evaluation of site B1 was of **local importance (lower value)**.



Plate 3.6 Representative image of site A6 on the Monparson River, Lissard (facing downstream from bridge), July 2020.



Plate 3.7 Representative image of site B1 on the upper reaches of the Toor River, Mullenaboree (facing upstream), July 2020.

Site B2 – Coom Stream, Bottlehill landfill

Site B2 on the upper reaches of the Coom Stream (EPA code: 18C03) was located at a local road crossing near the entrance to the Bottlehill Landfill site. The semi-natural upland eroding watercourse (FW1) averaged 0.5-1m wide with low bank heights grading into the surrounding conifer plantations (WD4). The stream was predominantly shallow (0.1m deep) with localised pools to 0.4m. The channel was dominated by riffle and glide habitat with 40% by surface area of each and 20% pool. The stream bed comprised small boulder, coarse, medium and fine gravels which were angular and unbedded. The riparian zone supported mosaics of wet heath (HH3), scrub (WS1) and wet grassland (GS4) in small, narrow strips between adjoining mixed aged conifer plantations. The stream had good sinuosity meandering through a narrow stream valley and had low levels of siltation. Macrophyte growth was absent and the aquatic bryophyte community was poorly represented.

No fish were recorded during electro-fishing but only 70m² was effectively fished due to the overgrown nature of the channel. The site was considered to have poor fisheries value given the shallow, upland nature of the stream at this site. Given improved fisheries habitat downstream, the site may be utilised by European eel during periods of higher flow (e.g. autumn, winter) although its overall fisheries value was considered low at this location. No white-clawed crayfish were recorded and the site was considered unsuitable given the species' known absence from the wider catchment. No signs of otter were recorded and suitability was considered low.

In summary, given the poor fisheries value, the aquatic ecological evaluation of site B2 was of **local importance (lower value)**.



Plate 3.8 Representative image of site B2 on the upper reaches of the Coom Stream near Bottlehill Landfill, July 2020.

Site B3 – Coom River, Coom

Site B3 was located on the lower reaches of the Coom River (EPA code: 18C03) at a local road crossing, approx. downstream from site B2. The small, lowland depositing river (FW2) averaged 4m wide and 0.1-0.4m deep. The bankfull heights were c.1.0m with no significant deepening. Although the channel had been historically straightened, good recovery was evident (i.e. still retaining good semi-natural habitat). The river profile was characterised by riffle (60%) with 30% glide and 10% pool. The bed comprised abundant boulder and cobble (40%) but was dominated by coarse, medium and fine gravels that formed large patches between coarser substrata. The substrata suffered from partial bedding and moderate siltation. The riparian areas bordering the river were rank grassy areas forming a buffer to adjoining heavily improved pasture (GA1). Scattered ash (*Fraxinus excelsior*), beech (*Fagus sylvatica*) and conifers were also present adjoining riparian areas. No macrophytes were recorded present. The aquatic bryophytes were limited to localised *Fontinalis squamosa* an oligotrophic indicator species.

The site offered excellent salmonid habitat, with excellent quality nursery and good quality spawning and holding habitat present (Appendix A). The quality of the spawning substrata was reduced somewhat due to siltation and partial compaction. High densities of both Atlantic salmon and brown trout were recorded via electro-fishing. The site was considered of too high energy for lamprey and provided a low value European eel nursery (none recorded). No white-clawed crayfish were recorded and the site was considered unsuitable given the species' known absence from the wider catchment. No signs of otter were recorded but the presence of healthy salmonid population provided high suitability. A biological water quality rating of **Q3-4**, corresponding to WFD '**Moderate**' status was assigned for this site (Table 3.3a).

In summary, given the excellent quality salmonid habitat present, the aquatic ecological evaluation of site B3 was of **local importance (higher value)**.



Plate 3.9 Representative image of site B3 on the Coom River, Coom, July 2020.

Site B4 – Toor River, Raheen

Site B4 was located on the middle reaches of the Toor River (EPA code: 18T51) at a local road crossing. The small lowland depositing watercourse was 3m wide and 0.3-0.6m wide on average. The river had been historically straightened but good recovery was evident (i.e. still retaining good semi-natural habitat). The bankfull heights were 1.0m with no significant deepening. The river profile was dominated by glide (60%), 10% riffle and 30% pool. The bed was dominated by cobble (40%), boulder 30% with coarse and medium gravels making up the remaining 30% by surface area of the bed. The riparian areas comprised of low scrubby areas of gorse, bracken, wild angelica and bramble with scattered blackthorn and ash. The bordering land uses were heavily improved pasture (GA1) upstream of the bridge and maturing conifer plantation (WD4) downstream. The macrophyte community comprised abundant hemlock water dropwort in the margins with localised branched bur-reed (*Sparganium erectum*). Water crowfoot (*Ranunculus* sp.) was locally frequent near shallow glide and riffle areas with common water starwort recorded as rare. The aquatic bryophytes included frequent *Chiloscyphus polyanthos* on boulder with localised *Fontanalis squamosa*. The macrophyte and bryophyte community composition shared links with the Annex I Habitat, *Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation* (3260) given the presence of two aquatic bryophyte indicators and crowfoot vegetation.

The site was considered a good salmonid nursery with a relatively high number of brown trout present in addition to a small number of Atlantic salmon parr (Appendix A). The site's spawning potential for salmonids was impacted by siltation with partial bedding of the substrata and light to moderate siltation pressures. The site was of too high energy for lamprey and was considered of low value as an eel nursery and foraging habitat. No white-clawed crayfish were recorded and the site was considered unsuitable given the species' known absence from the wider catchment. No signs of otter were recorded but the presence of healthy salmonid population provided high suitability. A biological water quality rating of **Q3**, corresponding to WFD '**Poor**' status was assigned for this site (Table 3.3a).

In summary, given the good quality salmonid habitat present, the aquatic ecological evaluation of site B4 was of **local importance (higher value)**.



Plate 3.10 Representative image of site B4 on the Toor River, Raheen, July 2020.



Plate 3.11 Representative image of site B5 on the Lyravarrig Stream at Commons, July 2020.

Site B5 – Lyravarrig Stream, Commons

Site B5 was located on the Lyravarrig Stream (EPA code: 18L82) at a local road crossing. The stream was a heavily modified lowland depositing watercourse (FW2) habitat, contained in a 1m to 1.5m wide channel that averaged 0.1m deep. The stream profile comprised 70% shallow glide 20% riffle and 10% shallow pool (max. depth 0.25m). The bank heights were variable but typically 2-3m high. The stream flowed through a deep U-shaped channel that had been historically straightened and deepened. The stream suffered from very heavy siltation with the majority of the substrata covered in silt. No macrophytes were present due to heavy shading and siltation. The stream was bordered by a mature riparian zone dominated by ash and sycamore (*Acer pseudoplatanus*) with a bramble understory. The land use was predominantly of heavily improved grassland (GA1) bordering the stream with the upstream catchment comprising mature conifer plantations (WD4).

The stream was considered a lower value nursery and spawning area for brown trout (moderate quality habitat), with low numbers recorded via electro-fishing. It was also a lower value nursery for European eel. The stream appeared to be of moderate value for lamprey (given abundant silt accumulations) but none were recorded during the survey. No white-clawed crayfish were recorded and the site was considered unsuitable given high siltation, small nature and the species' known absence from the wider catchment. The site was not considered of value for otter.

In summary, given the presence of salmonids (brown trout) and European eel, the aquatic ecological evaluation of site B5 was of **local importance (higher value)**.

Site B6 – Seefin Stream, Commons

Site B6 on Seefin Stream (EPA code: 18S52) was located in the vicinity of a local road crossing (pipe culvert). Here, the stream was a heavily modified, historically straightened and over-deepened watercourse contained in a 1-1.5m wide channel that averaged 0.05m deep. The site was semi-dry at the time of survey, with low flows and localised near-stagnant pools. The stream profile comprised of 90% slow glide and 10% riffle with very low flow in a very deep, U-shaped channel. The bank heights were variable but typically 3-4m. The substrata comprised 20% boulder, 40% cobble and 30% sand and silt. There was also a small proportion of medium and fine gravels (10% overall). The stream suffered from moderate to heavy siltation with the majority of the wetted substrata covered in silt. The land use was predominantly of heavily improved grassland (GA1) bordering the stream with the upstream catchment comprising mature conifer plantations (WD4). The stream was bordered by a mature treeline of beech, ash, hawthorn and grey willow. No macrophytes were present due to heavy shading and siltation.

The stream had very poor inherent fisheries value given the small size and low flows apart from a single eel captured during targeted electro-fishing. The site was not of value for salmonids, lamprey, white-clawed crayfish or otter.

In summary, given the presence of European eel, the aquatic ecological evaluation of site B6 was of **local importance (higher value)**.



Plate 3.12 Representative image of site B6 on the semi-dry upper reaches of the Seefin Stream, Commons, July 2020.

Site B7 – River Bride, Commons

Site B7, located on the upper River Bride (EPA code: 18B05), was transitional between an upland eroding watercourse (FW1) and a lowland depositing watercourse (FW2). The spate channel was 2.5m wide and 0.2m deep with substrata dominated by small boulder and cobble (40% by area of both). The remaining proportions were of coarse gravel that was situated between boulder and cobble areas. The river profile comprised 40% glide and 40% riffle with 20% pool, invariably located on meanders. The bank heights were between 0.5-1.2m. The river had some localised straightening but retained some meanders and had overall a good semi-natural profile with a well-defined thalweg. The stream suffered from moderate siltation with silt plumes underfoot. Livestock poaching was frequent throughout the site (no riparian fencing). The river was bordered by mature treelines of Norway spruce (*Picea abies*), scattered grey willow and rowan (*Sorbus aucuparia*) with frequent bilberry (*Vaccinium myrtillus*), gorse, marsh thistle (*Cirsium palustre*), butterbur (*Petasites hybridus*), meadowsweet, soft rush, foxglove, marsh ragwort, fuchsia (*Fuchsia magellanica*), bramble and nettle. The adjoining land use was predominantly of heavily improved grassland (GA1) and large tracts of gorse and bramble-dominated scrub (WS1). Instream macrophytes were limited to common water starwort (rare) and marginal reed canary grass (*Phalaris arundinacea*). Instream, the bryophyte community was represented by occasional *Chiloscyphus polyanthos* and *Hygroamblystegium fluviatile*. The river suffered from heavy enrichment with filamentous algae visible on the bed covering 40% by surface area.

The river was evidently a very good salmonid nursery, with moderate numbers of juvenile and small adult brown trout only recorded via electro-fishing. However, the overall value of the site was diminished due to siltation and enrichment. Spawning habitat was good locally with some good holding habitat present locally, especially in association with meanders. European eel habitat was moderate given the paucity of deeper pool areas and instream refugia. Although some localised lamprey spawning habitat was present (interstitial spaces), larval lamprey habitat was not present (i.e. no fine sediment accumulations). There was no white-clawed crayfish potential given the known absence of the species from the wider catchment. There were no otter signs in the vicinity of the survey site although there was good potential. A biological water quality rating of **Q3**, corresponding to WFD '**Poor**' status was assigned for this site (Table 3.3a).

In summary, given the presence of good quality salmonid habitat and a healthy brown trout population, the aquatic ecological evaluation of site B7 was of **local importance (higher value)**.



Plate 3.13 Representative image of site B7 on the upper River Bride at Commons (facing downstream).



Plate 3.14 Representative image of site B8 on the Lyravarrig Stream, Mullenaboree, July 2020.

Site B8 – Lyravarrig Stream, Mullenaboree

Site B8 on the Lyravarrig Stream (EPA code: 18L66; not the same watercourse as site B5 despite identical nomenclature) was located at a local track crossing approx. 1.4km upstream of the River Bride confluence. Here, the stream was a semi-natural lowland depositing watercourse (FW2) that was 2.0m wide and 0.1-0.2m deep. The bank heights were between 0.5m and 1.2m high. The substrata were dominated by small boulder and cobble (35% by area of both) with coarse medium and fine gravels making up 25% of the remaining composition along with a small proportion of silt (5%). The profile comprised 45% glide and 45% riffle with 10% pool. The stream exhibited historical straightening and deepening but retained some meanders and had a moderate to good semi-natural profile, overall. The stream, however, suffered from moderate to heavy siltation with heavy bedding of the substrata and evident filling of interstitial gravels between boulder and cobble. The river was bordered by mature treelines of grey willow and hawthorn with frequent bramble scrub, particularly downstream of the bridge. Cattle poaching of the banks upstream and downstream of the bridge was evident and runoff from the adjoining land was contributing to heavy siltation. The land uses beyond the immediate riparian areas were improved grassland (GA1, very wet in nature) and mature sitka spruce plantations (WD4).

The river was evidently a good brown trout nursery, with relatively high numbers of juveniles recorded via electro-fishing. Adult numbers were low. Spawning habitat was impacted by siltation pressures and holding habitat was largely lacking in the shallow stream. European eel were present in low numbers and the habitat as considered moderate overall. No lamprey were recorded and the site was considered sub-optimal (no larval habitat). There was no white-clawed crayfish potential given the known absence of the species from the wider catchment. There were no otter signs in the vicinity of the survey site although there was some low potential for the species. A biological water quality rating of **Q3**, corresponding to WFD '**Poor**' status was assigned for this site (Table 3.3a).

Given the site's value as a salmonid nursery, and the ability to support aquatic species of conservation value such as European eel, the aquatic ecological evaluation of site B8 was of **local importance (higher value)**.

Site B9 – Field Chimney Stream, Chimneyfield

Site B9 on the Field Chimney Stream (EPA code: 18F43) was located approx. 1.2km upstream from site B10. The site represented a semi-natural upland eroding channel (FW1) that was 1.5m wide and between 0.1m to 0.2m deep. The bank heights were between 0.5m and 1.5m high but there was no evidence of channel modification works at the survey location; the stream exhibited good sinuosity. The stream profile comprised of 30% glide and 60% riffle with 10% pool. The substrata comprised abundant small boulder and cobble (both making up 50% by surface area) with coarse medium and fine gravels making up the remaining 45%, along with a small proportion of silt and sand (5%). However, the suffered from moderate siltation (plumes underfoot) with partial bedding of the substrata. The river was bordered by a broadleaved buffer zone of beech, rowan (*Sorbus aucuparia*), ash and grey willow for approximately 15m. The riparian buffer area adjoined large tracts of mature conifer plantation (WD4).

The site was evidently a good salmonid nursery, with moderate numbers of brown trout and low numbers Atlantic salmon recorded via electro-fishing (all juveniles; Appendix A). Salmonid spawning (impacted by siltation) and holding habitat were both considered of moderate value. The site was of too high energy to support lamprey and none were recorded. Despite some moderate suitability as a nursery/foraging area, no European eel were recorded. There was no white-clawed crayfish potential given the known absence of the species from the wider catchment. There were no otter signs in the vicinity of the survey site although there was good potential.

Given the site's value as a salmonid nursery, the aquatic ecological evaluation of site B9 was of **local importance (higher value)**.



Plate 3.15 Representative image of site B9 on the Field Chimney Stream, Chimneyfield, July 2020.

Site B10 - Inchinanagh River, Inchinanagh

Site B10 on the Inchinanagh River (EPA code: 18116) (also known locally as the Chimneyfield River) was a semi-natural lowland depositing river (FW2) that averaged 2.0m wide and 0.1-0.2m deep. The bank heights were between 1.2m high and the site had a well-defined thalweg. The substrata had good proportions of small boulder and cobble making up 60% of the bed area with coarse, medium and fine gravels making up the remaining 50%. The bed however suffered from moderate siltation with evident partial bedding of the substrata and silt plumes underfoot. The profile comprised of 40% glide and 50% riffle with 10% pool. The river was bordered by rank grassy areas with scrub comprising bramble, great willowherb, rosebay willowherb, gorse, bracken and bramble. The land uses beyond the immediate riparian areas were of improved grassland (GA1) with mature sitka spruce plantations (WD4) c.0.5km upstream. Instream macrophytes were absent with occasional *Chiloscyphus polyanthos* and *Hygroamblystegium fluviatile* on instream boulder.

The river was evidently a good salmonid nursery with a particularly high abundance of juvenile brown trout recorded via electro-fishing, in addition to low numbers of small adults (Appendix A). Brown trout density was the highest recorded across all survey sites (0.385 fish per m²). A low number of Atlantic salmon parr (two size classes) and adult European eel were also present. The site was of too high energy for larval lamprey. The site was considered a good eel nursery/foraging area with ample boulder habitat present throughout. There was no white-clawed crayfish potential given the known absence of the species from the wider catchment. A single old otter spraint (containing salmonid bones) was present on an instream boulder (ITM 568573, 590853). A biological water quality rating of **Q3-4**, corresponding to WFD '**Moderate**' status was assigned for this site (Table 3.3a).

Given the site's location with the Blackwater River SAC (002170), the aquatic ecological evaluation of site B10 was of **International importance**.



Plate 3.16 Representative image of site B10 on the Inchinanagh River, Inchinanagh, July 2020.



Plate 3.17 Representative image of site B11 on River Bridge downstream of Bride Bridge, July 2020.

Site B11 – River Bride, Bride Bridge

Site B11 was located on the River Bride (EPA code: 18B05) at Bride Bridge. The river represented an upland eroding watercourse (FW1) with cascading reaches of channel with a largely natural profile. The river averaged 6-7m in width and 0.2-0.6m deep, with localised deeper pools to >1.2m. The bank height varied from 1.5-3m. The substrata were largely free of sediment and dominated by cobble (40%) and boulder (20%) with plentiful well-sorted medium-coarse gravels. Exposed bedrock was also present (10%) at this high energy site. Riffle, glide and pool were present in roughly equal proportions. The river was bordered by dense willow/bracken and bramble-dominated scrub (WS1) and treelines. Moving away from the riparian zone, the site was adjoined by mature coniferous afforestation (WD4) and improved agricultural grassland (GA1). Given the high shading and high flow rates, instream macrophytes were absent. The bryophyte community was well developed with *Chiloscyphus polyanthos* and *Hygroamblystegium fluviatile* frequent on instream boulders.

The upland, cascading site offered excellent holding habitat for adult salmonids, in addition to being an evidently good nursery. Brown trout and Atlantic salmon were present in moderate numbers. The same species assemblage was also recorded during a 2017 survey of this site (Triturus, 2017) although abundances of Atlantic salmon were notably higher in 2020. Spawning habitat was of good quality (frequent well-sorted coarse-medium gravels) although typically more suited to Atlantic salmon. The site was not suitable for lamprey given the higher energy nature of the site. While no European eel were recorded during the survey, the site did offer some good suitability for the species, especially in deeper pool areas. There was no white-clawed crayfish potential given the known absence of the species from the wider catchment and high energy nature. There were no otter signs in the vicinity of the survey site although there was good potential throughout.

Given the site's location with the Blackwater River SAC (002170), the aquatic ecological evaluation of site B11 was of **International importance**.

Site B12 – unnamed stream, Knockdoorty

Site B12 was located on an unnamed historical branch of the Bunnaglanna River at a forestry track crossing. The small upland eroding watercourse (FW1) averaged 1-1.5m wide and 0.1m deep and flowed in a V-shaped channel that graded into a natural river valley with bank heights at the gradient of the stream grading into the valley. The river profile was dominated by riffle (80%) with 15% glide and 5% pool. The bed was dominated by boulder and cobble that made up 70% by surface area of the streambed. The remaining proportions were comprised of coarse, medium and fine gravels with sand. The substrata were heavily bedded with moderate siltation evident. The riparian areas were hazel woodland with scattered rowan (WN2). The understory comprised of bramble, wood sorrel (*Oxalis acetosella*) and a well-developed moss layer. Away from the riparian buffer areas, mature conifer plantations (WD4) were present. No macrophytes were present due to heavy shading of the channel. The aquatic bryophytes were limited to frequent *Chiloscyphus polyanthos* on submerged boulders and in splash zones.

No fish were recorded during electro-fishing at site B12. The shallow, upland nature of the small channel with heavily bedded substrata (moderate siltation) reduced its viability for salmonids albeit populations would be present further downstream in higher order reaches. Lamprey habitat was absent. The stream may be utilised seasonally by migratory European eel during periods of higher flow (e.g. autumn, winter) although the site's overall fisheries value was considered low. The site was not suitable for white-clawed crayfish and no otter signs were recorded (suitability low).

Given the site's poor fisheries value, the aquatic ecological evaluation of site B12 was of **local importance (lower value)**.



Plate 3.18 Representative image of site B12 on an unnamed stream, Knockdoorty, July 2020.

Site B13 – unnamed stream, Powers Bridge

Site B13 was located on an unnamed historical branch of the Bunnaglanna River at Powers Bridge, approx. 1km downstream of site B12. The stream represented an upland eroding watercourse (FW1) which averaged 2-3m wide and 0.1m deep which featured a V-shaped channel of variable gradient. The banks graded into a natural river valley with bank heights at the gradient of the stream. The river profile was dominated by riffle (60%) with 30% glide and 10% pool. The bed was dominated by boulder and cobble that made up 60% by surface area of the riverbed, with the remaining proportions comprised of coarse, medium and fine gravels with sand. The substrata were heavily bedded with moderate siltation evident. The riparian areas comprised of dense willow, bracken and bramble scrub (WD1) with mature conifer plantations (WD4) upstream. No macrophytes were present due to heavy shading. The aquatic bryophytes were limited to frequent *Chiloscyphus polyanthos* on submerged boulders and in splash zones.

The shallow nature of the small river channel with heavily bedded substrata reduced its viability for salmonids (none recorded) albeit populations were present downstream as the channel deepened. However, a small eel population was present. The site was not suitable for white-clawed crayfish and no otter signs were recorded (suitability low). A biological water quality rating of **Q3-4**, corresponding to WFD '**Moderate**' status was assigned for this site (Table 3.3b).

Given the site's capacity to support European eel, the aquatic ecological evaluation of site B13 was of **local importance (higher value)**.



Plate 3.19 Representative image of site B13 on an unnamed stream at Powers Bridge, July 2020.

Site B14 – Bunnaglanna River, Moneygorm

Site B14 was located on the upper reaches of the Bunnaglanna River (EPA code: 18B07) at a local road crossing. The small upland eroding watercourse (FW1) averaged 2m wide and 0.15m deep in a shallow V-shaped channel grading into a natural river valley. The river profile was dominated by riffle (50%) with 30% glide and 10% pool. The bed was dominated by boulder and sand 40% by surface area of each with coarse, medium and fine gravels making up the remaining 20%. The substrata were heavily bedded with heavy siltation evident. The riparian areas comprised of dense willow, bracken and bramble scrub (WS1) with mature conifer plantations (WD4) upstream. No macrophytes were present due to heavy riparian shading. The aquatic bryophytes were limited to locally frequent water earwort (*Scapania undulata*) on the topsides of instream boulders and more locally *Chiloscyphus polyanthos* on submerged boulders.

No fish were recorded during electro-fishing at site B14. The shallow, upland nature of the small channel with heavily bedded substrata and heavy siltation reduced its viability for salmonids albeit populations were present further downstream in higher order reaches. Lamprey habitat was absent. The stream may be utilised seasonally by migratory European eel during periods of higher flow (e.g. autumn, winter) although the site's overall fisheries value was considered low. The site was not suitable for white-clawed crayfish and no otter signs were recorded (suitability low).

Given the site's poor fisheries value, the aquatic ecological evaluation of site B14 was of **local importance (lower value)**.



Plate 3.20 Representative image of site B14 on Bunnaglanna River, Moneygorm, July 2020.

Site B15 – River Bride, Old Bridge

Site B15 was located on the River Bride (EPA code: 18B05) at Old Bridge, approx. 3.3km downstream from site B11. The river represented a large upland eroding watercourse (FW1) that was approximately 8m wide with depths of 0.4- 0.6m deep. The bank heights were low and were 0.5-1m high. The substrata were dominated by boulder and cobble (60%) with coarse medium and fine gravels making up the remaining 40% of the riverbed in small pockets between areas of larger substrata. The substrata were largely unbedded and clean with light siltation only. The stream profile comprised of 70% deeper glide, 20% riffle and 10% pool. The channel exhibited a high degree of naturalness with no evident significant bank modification works. The river was more open near the bridge with areas of amenity grassland (GA2) near picnic areas. However, further upstream the channel became more canopied with a mature riparian zone of alder, ash and willow (WD1/WL2). The land uses beyond the immediate riparian areas comprised of mixed broadleaved woodland (WD1) and conifer woodland (WD4). Macrophytes were absent apart from a very localised stand of water crowfoot.

The site was evidently an excellent salmonid nursery (Appendix A) and also exhibited good spawning habitat locally, as reflected by the stock demographic captured during the survey (moderate numbers of Atlantic salmon and brown trout). With the exception of European eel, the same species assemblage was also recorded during a 2017 survey of this site (Triturus, 2017) although abundances of juvenile Atlantic salmon and brown trout were notably higher in 2020. However, the River Bride was of too high energy at site B15 to support lamprey species. Some suitability existed as an eel nursery in the boulder and cobble areas although none were recorded during the survey. No white-clawed crayfish were recorded; unsurprising given the known absence of the species from the wider catchment. There were no otter signs in the vicinity of the survey site although there was good potential throughout. A biological water quality rating of **Q4**, corresponding to WFD '**Good**' status was assigned for this site (Table 3.3b).

Given the site's location with the Blackwater River SAC (002170), the aquatic ecological evaluation of site B15 was of **International importance**.



Plate 3.21 Representative image of site B15 on River Bride at Old Bridge, July 2020.



Plate 3.22 Representative image of site C1 on Slumberhill Stream, Knockacullata, July 2020.

Site C1 – Slumberhill Stream, Knockacullata

Site C1 was located on the Slumberhill Stream (EPA code: 18S40) in the Ross River (Killavullen) sub-catchment at a local road crossing (pipe culvert) and flowed north away from the proposed development boundary. The channel represented an upland eroding stream habitat (FW1) contained in a 1-1.5m wide channel that was, on average, 0.05m deep. The bank heights were variable but typically 1-1.5m high. The stream had been historically straightened and deepened (a two-stage channel had naturally formed in places). The stream sat in a shallow U-shaped channel with some local bank erosion indicating a spate nature. The profile was dominated by shallow glide and riffle with very little pool (0.1m max where present). The substrata were comprised of coarse gravel and small cobble (70% overall) with localised finer gravels. Siltation was light overall. Flow was slight at the time of survey. The stream was heavily shaded by low-lying riparian vegetation which included soft rush, great willowherb, rank grasses, hogweed, marsh ragwort, St. John's wort (*Hypericum* sp.), selfheal (*Prunella vulgaris*), wild angelica, creeping thistle (*Cirsium arvense*), broad-leaved dock (*Rumex obtusifolius*), nettle and bramble. A treeline of grey willow scrub and with abundant rosebay willowherb was present along the roadside. Species-poor wet grassland (GS4) bordered the stream on the south bank with improved agricultural grassland (GA1) to the north. Macrophytes were limited to occasional watercress and some localised brooklime (*Veronica beccabunga*).

The site had poor fisheries value given the very shallow and likely seasonal nature of the stream at this location. No fish were recorded via electro-fishing although the site had some low suitability for European eel. The site was not suitable for white-clawed crayfish or otter.

In summary, given the poor fisheries value, the aquatic ecological evaluation of site C1 was of **local importance (lower value)**.

Site C2 – Ross Stream, Knockacullata

Site C2 was located on the upper reaches of the Ross Stream (EPA code: 18R02) in the Ross River (Killavullen) sub-catchment. The site represented a small upland eroding stream habitat (FW1), contained in a 1-1.5m wide channel that averaged just 0.1-0.15m deep. The bank heights were variable but typically 1.5-2.5m high. The stream flowed through a deep U-shaped channel that had been recently straightened upstream of the road crossing and historically deepened downstream. Downstream of the road culvert, the stream retained some semi-natural characteristics with riffle, glide and pool sequences in roughly equal proportions. It did however suffer from heavy livestock poaching of the northern bank and the site, resultingly, suffered from heavy siltation. Much of the bedrock, boulder, cobble and coarse gravels were covered with silt. The stream was bordered by a mature riparian zone dominated by alder with localised grey willow and dense bramble scrub. The land use was predominantly of heavily improved grassland (GA1). Riparian shading of the narrow channel was locally high. No macrophytes were present due to heavy shading but *Chiloscyphus polyanthos* was present on instream cobbles. Filamentous algae covered 20% by surface area of the bed.

The site had poor fisheries value given the shallow and very heavily silted nature. However, a low number of brown trout (juveniles and small adults) were recorded in addition to European eel. The stream was considered to be of moderate value, at best, for both species. The site as not suitable for white-clawed crayfish or otter.

In summary, given the presence of brown trout and European eel, the aquatic ecological evaluation of site C2 was of **local importance (higher value)**.



Plate 3.23 Representative image of site C2 on the upper reaches of the Ross Stream, Knockacullata, July 2020.

Site D1 – Shanowen Trib 1 Stream, Ballynahina

Site D1 was located on the upper reaches of the Shanowen Trib 1 Stream (EPA code: 18S42) in the Bride (Blackwater)_030 sub-catchment at a proposed cable route crossing (i.e. local road crossing). The site represented a small, very shallow lowland depositing small stream habitat (FW2) that was very heavily modified in a shallow U-shaped channel which had been historically deepened and straightened. The stream was 0.5-1m wide and 0.05m deep, with bank heights of 1.0m. The river profile was dominated by slow moving shallow glide and riffle (approximately 50% by area of each). The substrata comprised small boulder, cobble with mixed coarse, medium and fine gravels. The channel bed suffered from moderate siltation with the majority of the harder substrata bedded. No filamentous algae was visible on the stream bed. The small stream channel was bordered by a hawthorn hedgerow (WL1) with bramble, foxglove, willowherb and rank grasses in the understory. The channel was bordered by heavily improved pasture (GA1) downstream.

No fish were recorded via electro-fishing and the site was considered too shallow to be of fisheries value (seasonality likely). In higher flow periods, the site was considered likely to offer some low suitability for European eel as a migratory pathway. The site as not suitable for white-clawed crayfish or otter. A biological water quality rating of **Q3**, corresponding to WFD ‘**Poor**’ status was assigned for this site (Table 3.3b).

In summary, given the poor fisheries value, the aquatic ecological evaluation of site D1 was of **local importance (lower value)**.



Plate 3.24 Representative image of site D1 on the upper reaches of the Shanowen Trib Stream Ballynahina, July 2020.

Site D2 – Farran North River, Farran North

Site D2 was located on the Farran North River (EPA code: 18F27) in the Bride (Blackwater)_030 sub-catchment at a proposed cable route crossing (i.e. local road crossing). The site represented a small lowland depositing habitat (FW2) that was very heavily modified in a deep U-shaped channel which had been historically deepened and straightened. The bank heights were variable but typically 1.5-2.5m. The profile was dominated by slow moving glide and pool (approximately 50% by area of each). The channel bed suffered from very heavy siltation with the majority of the harder substrata not visible apart from the overgrown upper reaches upstream of the meander bordering the road crossing. At this location the channel was dominated by bedded coarse and medium gravels with more localised cobble. Deep beds of fine soft silt to 0.4m deep made up the majority of the bed composition. Filamentous algae covered 10% by surface area of the bed along with localised sewage fungus present (5% cover). The site evidently suffered from water quality issues and a storm drain at the meander appeared to be contributing to the majority of the habitat degradation. The site was bordered by a mature beech, willow and ash (WD1) with bramble and nettle in the understory. The channel was bordered by a road upstream and heavily improved pasture (GA1) downstream.

A total of five fish species were recorded from site D2 on the Farran North Stream. Larval lamprey (*Lampetra* sp.) were the most abundant, followed by brown trout, European eel, three-spined stickleback and a low number Atlantic salmon parr. (Appendix A). The density of lamprey ammocoetes was the highest recorded across all survey sites (16.25 larvae per m² of targeted 1m² quadrat; Appendix A). A 2017 electro-fishing survey of this site reported only brown trout and *Lampetra* sp. ammocoetes (Triturus, 2017).

The site was considered a lower value salmonid nursery area (due to siltation), with better spawning habitat noted upstream of the survey area. However, the site was considered an excellent nursery area for lamprey (likely brook lamprey) and a good eel habitat also, despite evident water quality issues. No white-clawed crayfish or otter signs were recorded. A biological water quality rating of **Q3**, corresponding to WFD '**Poor**' status was assigned for this site (Table 3.3b).

Given the site's value as a *Lampetra* sp. nursery and presence of salmonids and European eel, the aquatic ecological evaluation of site D2 was of **local importance (higher value)**.



Plate 3.25 Representative image of site D2 on the Farran North River, Farran North, July 2020.

3.3 White-clawed crayfish

No white-clawed crayfish were recorded from the $n=25$ riverine survey sites. Furthermore, no crayfish remains were identified in mustelid spraint, where encountered, in the vicinity of the survey sites. There were no historical or contemporary records for the species within the survey area, although crayfish are known from the wider River Blackwater SAC (002170) site (i.e. Blackwater main channel).

3.4 Freshwater pearl mussel

No freshwater pearl mussel were recorded from wider catchment of the proposed development, including sites on the River Bride, Martin and Clyda (Appendix B). This was despite some physical habitat suitability (e.g. River Bride). There were no freshwater pearl mussels records farther downstream of the stretches surveyed in the Rivers Bride and Martin. Freshwater pearl mussels are known to occur in the Munster River Blackwater, downstream of the Clyda River confluence. The current absence of mussels from the lower reaches of the Clyda River was considered probably due to land use practices (Appendix B).

3.5 Biological water quality

Q-samples were collected and analysed from $n=12$ riverine sites in the footprint of the proposed Coom Green Energy Park development and associated cable route. A total of $n=46$ species across $n=33$ families were recorded in the kick samples. A summary of results is presented in Table 3.3a and 3.3b and Figure 3.1.

Following the methodology of Toner et al. (2005), the Environmental Protection Agency (EPA) group invertebrates into classes whereby pollution intolerant species are denoted class A, and species with greater pollution tolerance fall into successive classes (B through E, respectively). As such, the presence or absence of these groups and their relative abundance facilitates an assessment of biological river health. Good status (Q4) unpolluted water quality is achieved according to the EPA if at least one Group A taxon is present in, at least, fair numbers (5-10% total sample composition). Group B taxa may be common or absent and *Baetis rhodani* (large dark olive mayfly) is often dominant. Other Group C taxa are never excessive and group D / E taxa are present in small numbers or absent (Toner et. al., 2005). Our results are discussed in this context in order to interpret potential changes in the macroinvertebrate community composition.

Of the 12 Q sampling sites seven (A2, A6, B4, B7, B8, D1 & D2) had **Q3** poor status water quality. These sites typically had low numbers of EPA group B taxa and a dominance of EPA group C taxa. Four sites (site A3, B3, B10 & B13) had **Q3-4** water quality. These sites had low numbers of EPA group A taxa and from only a single taxonomic group only (i.e. clean water stonefly or mayfly species).

A single site, B15 on the River Bride at Old Bridge, achieved 'good status (Q4) water quality as required under the Water Framework Directive. The presence of moderate numbers of clean-water EPA group A (Plecoptera) stoneflies and good numbers of class B stoneflies (Plecoptera) was indicative of cleaner water.

No invertebrate species of higher conservation value than 'least concern' were recorded in the invertebrate assemblage when compared to national red lists (Feely et al. 2020; Kelly-Quinn & Regan, 2012; Byrne et al. 2009; Foster et al. 2009).

Table 3.3a Summary of the biological water quality (Q-rating) recorded at selected sites in the footprint of the proposed Coom Green Energy Park.

Taxon	Family	Species	Site A2	Site A3	Site A6	Site B3	Site B4	Site B7	Site B8	Site B10	EPA Group
Plecoptera	Chloroperlidae	<i>Siphonoperla torrentium</i>									A
Plecoptera	Nemouridae	<i>Amphinemura sulcicollis</i>								2	A
Plecoptera	Nemouridae	<i>Protonemura meyeri</i>		3							A
Plecoptera	Leuctridae	<i>Leuctra hippopus</i>			1	10	5	1	6	1	B
Ephemeroptera	Heptageniidae	<i>Ecdyonurus dispar</i>				2				1	A
Ephemeroptera	Caeniidae	<i>Caenis rivulorum</i>									C
Ephemeroptera	Baetidae	<i>Baetis rhodani</i>				11	6	2		40	C
Ephemeroptera	Ephemerellidae	<i>Serratella ignita</i>				5	8	1		15	C
Trichoptera	Glossosomatidae	<i>Glossosoma boltoni</i>	4	2	1						B
Trichoptera	Glossosomatidae	<i>Agapetus fuscipes</i>									B
Trichoptera	Hydropsychidae	<i>Hydropsyche sitalai</i>	4					3			B
Trichoptera	Hydropsychidae	<i>Hydropsyche contubernalis</i>								1	B
Trichoptera	Limnephilidae	<i>Drusus annulatus</i>			1			1			B
Trichoptera	Limnephilidae	<i>Potamophylax cingulatus</i>					2				B
Trichoptera	Odontoceridae	<i>Odontocerum albicorne</i>							1	1	B
Trichoptera	Sericostomatidae	<i>Sericostoma personatum</i>							1		B
Trichoptera	Polycentropodidae	<i>Polycentropus flavomaculatus</i>	8					5			C
Trichoptera	Polycentropodidae	<i>Plectrocnemia geniculata</i>							1		C
Trichoptera	Polycentropodidae	<i>Polycentropus kingi</i>									C
Trichoptera	Psychomyiidae	<i>Psychomyia fragilis</i>									C
Trichoptera	Rhyacophilidae	<i>Rhyacophila dorsalis</i>					1	1		2	C
Coleoptera	Dytiscidae	<i>Oreodytes sanmarkii</i>			8	2	1	3	6		C
Coleoptera	Dytiscidae	<i>Hydroporus tessellatus</i>				1					C
Coleoptera	Dytiscidae	<i>Dytiscidae larva</i>							1	2	C

Taxon	Family	Species	Site A2	Site A3	Site A6	Site B3	Site B4	Site B7	Site B8	Site B10	EPA Group
Coleoptera	Elmidae	<i>Elmis aenea larva</i>			2		4	3			C
Coleoptera	Elmidae	<i>Elmid larva</i>			1		3	1		1	C
Coleoptera	Elmidae	<i>Esolus parrallelepipedus</i>			1			1			C
Coleoptera	Elmidae	<i>Limnius volckmari</i>						2			C
Coleoptera	Elmidae	<i>Elmis aenea</i>						1	1		C
Coleoptera	Halplidae	<i>Brychius elevatus</i>									C
Coleoptera	Hydraenidae	<i>Hydraena gracilis</i>							1		C
Coleoptera	Scirtidae	<i>Elodes sp. Larva</i>									C
Amphipoda	Gammaridae	<i>Gammarus duebeni</i>	21	6	44	3	14	63	54	11	C
Diptera	Chironomidae	(grouped excluding <i>Chironomus riparius</i> sp.)			17	10	21	10	8	5	C
Diptera	Ephydriidae	larva				1				1	C
Diptera	Limoniidae/Pediciidae	<i>Dicranota sp.</i>			1	3	5	11	7	13	C
Diptera	Psychodidae	larva				1					C
Diptera	Simuliidae	<i>Simulium sp.</i>	6				2				C
Hemiptera	Veliidae	<i>Velia nymph</i>						1			C
Mollusca	Planorbidae	<i>Ancylus fluviatilis</i>				1	1	3			C
Mollusca	Lymnaeidae	<i>Radix balthica</i>				5					D
Annelida	Hirudinidae	<i>Erpobdella octoculata</i>						1			D
Annelida	Hirudinidae	<i>Glossiphonia complanata</i>									D
Annelidae	Oligochaeta	<i>not speciated</i>			4	3	7	1		1	n/a
Arachnida	Hydrachnidiae	<i>not speciated</i>			3	1		5	3	10	n/a
Tricladida	Planariidae	<i>Polycelis felina</i>		2							n/a
Taxon Richness			43	11	84	59	80	120	90	107	
Q Rating			Q3	Q3-4	Q3	Q3-4	Q3	Q3	Q3	Q3-4	
WFD Status			Poor	Mod	Poor	Mod	Poor	Poor	Poor	Mod	

Table 3.3b Summary of the biological water quality (Q-rating) recorded at selected sites in the footprint of the proposed Coom Green Energy Park.

Taxon	Family	Species	Site B13	Site B15	Site D1	Site D2	EPA Group
Plecoptera	Chloroperlidae	<i>Siphonoperla torrentium</i>		6			A
Plecoptera	Nemouridae	<i>Amphinemura sulcicollis</i>		3			A
Plecoptera	Nemouridae	<i>Protonemura meyeri</i>	1				A
Plecoptera	Leuctridae	<i>Leuctra hippopus</i>	6	30			B
Ephemeroptera	Heptageniidae	<i>Ecdyonurus dispar</i>					A
Ephemeroptera	Caeniidae	<i>Caenis rivulorum</i>		1			C
Ephemeroptera	Baetidae	<i>Baetis rhodani</i>	5	2	1		C
Ephemeroptera	Ephemerellidae	<i>Serratella ignita</i>		2	2		C
Trichoptera	Glossosomatidae	<i>Glossosoma boltoni</i>					B
Trichoptera	Glossosomatidae	<i>Agapetus fuscipes</i>			2		B
Trichoptera	Hydropsychidae	<i>Hydropsyche sitalai</i>					B
Trichoptera	Hydropsychidae	<i>Hydropsyche contubernalis</i>					B
Trichoptera	Limnephilidae	<i>Drusus annulatus</i>					B
Trichoptera	Limnephilidae	<i>Potamophylax cingulatus</i>			1		B
Trichoptera	Odontoceridae	<i>Odontocerum albicorne</i>					B
Trichoptera	Sericostomatidae	<i>Sericostoma personatum</i>		1			B
Trichoptera	Polycentropodidae	<i>Polycentropus flavomaculatus</i>		1		4	C
Trichoptera	Polycentropodidae	<i>Plectrocnemia geniculata</i>					C
Trichoptera	Polycentropodidae	<i>Polycentropus kingi</i>			1		C
Trichoptera	Psychomyiidae	<i>Psychomyia fragilis</i>	1				C
Trichoptera	Rhyacophilidae	<i>Rhyacophila dorsalis</i>					C
Coleoptera	Dytiscidae	<i>Oreodytes sanmarkii</i>				1	C
Coleoptera	Dytiscidae	<i>Hydroporus tessellatus</i>					C
Coleoptera	Dytiscidae	<i>Dytiscidae larva</i>					C

Taxon	Family	Species	Site B13	Site B15	Site D1	Site D2	EPA Group
Coleoptera	Elmidae	<i>Elmis aenea larva</i>		1			C
Coleoptera	Elmidae	<i>Elmid larva</i>	1	2		2	C
Coleoptera	Elmidae	<i>Esolus parrallelepipedus</i>					C
Coleoptera	Elmidae	<i>Limnius volckmari</i>				5	C
Coleoptera	Elmidae	<i>Elmis aenea</i>	1		1	5	C
Coleoptera	Halplidae	<i>Brychius elevatus</i>				1	C
Coleoptera	Hydraenidae	<i>Hydraena gracilis</i>	2				C
Coleoptera	Scirtidae	<i>Elodes sp. Larva</i>	1				C
Amphipoda	Gammaridae	<i>Gammarus duebeni</i>	25		132	110	C
Diptera	Chironomidae	<i>(grouped excluding Chironomus riparius sp.)</i>	2	25	5	9	C
Diptera	Ephydriidae	larva					C
Diptera	Limoniidae/Pediciidae	<i>Dicranota sp.</i>	4	3	1		C
Diptera	Psychodidae	larva					C
Diptera	Simuliidae	<i>Simulium sp.</i>	11				C
Hemiptera	Veliidae	<i>Velia nymph</i>					C
Mollusca	Planorbidae	<i>Ancylus fluviatilis</i>		1			C
Mollusca	Lymnaeidae	<i>Radix balthica</i>					D
Annelida	Hirudinidae	<i>Erpobdella octoculata</i>					D
Annelida	Hirudinidae	<i>Glossiphonia complanata</i>				1	D
Annelidae	Oligochaeta	<i>not speciated</i>		1		2	n/a
Arachnida	Hydrachnidae	<i>not speciated</i>	1	1	11	10	n/a
Tricladida	Planariidae	<i>Polycelis felina</i>					
Taxon Richness			61	80	154	153	
Q Rating			Q3-4	Q4	Q3	Q3	
WFD Status			Mod	Good	Poor	Poor	

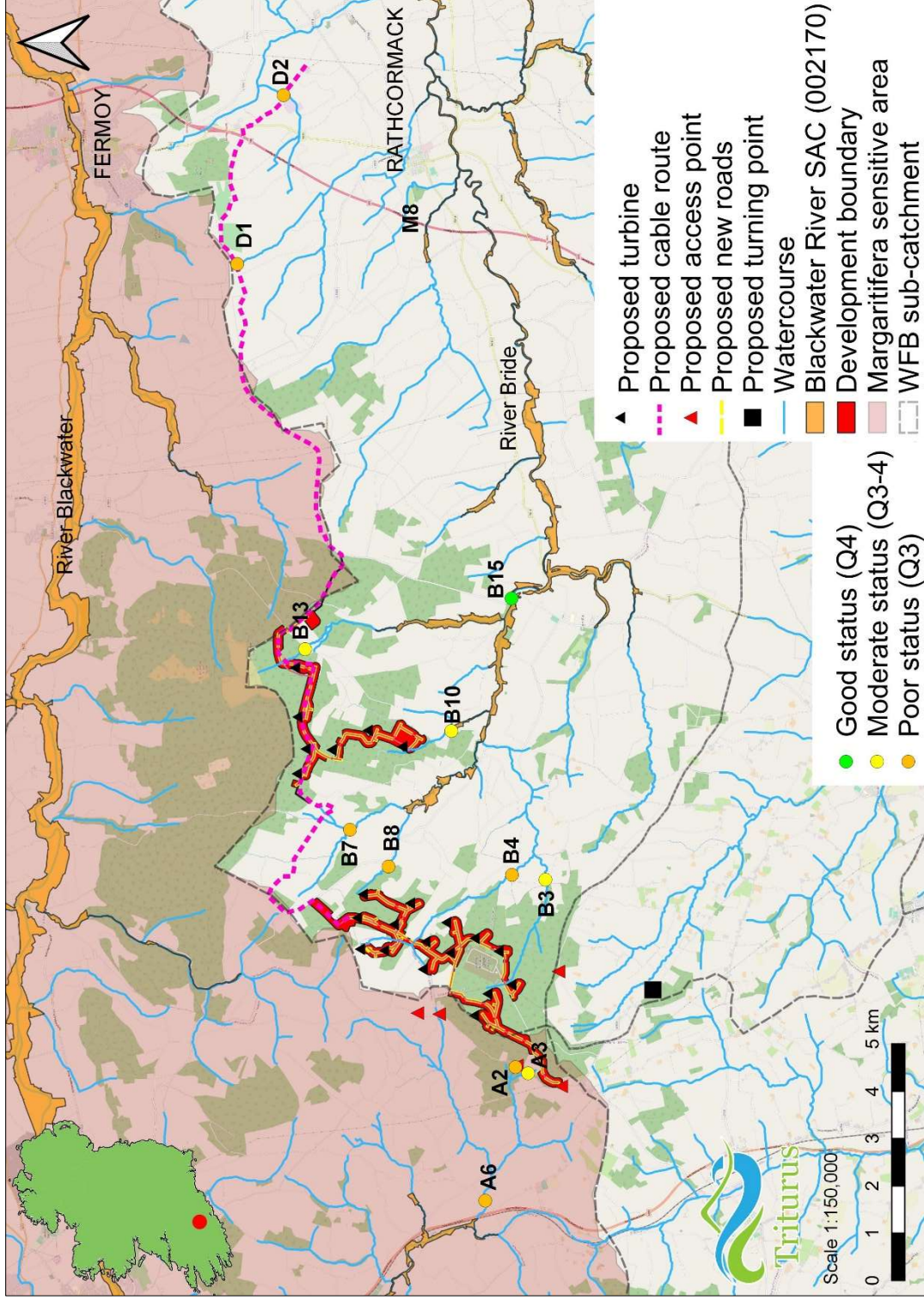


Figure 3.1 Summary of Q-ratings for aquatic survey sites in the vicinity of the proposed Coom Green Energy Park, Co. Cork.

3.6 Aquatic ecological evaluation

An evaluation of each aquatic survey site was based on the results of the aquatic surveys (Table 3.4). A total of eleven aquatic survey sites (A6, B3, B4, B5, B6, B7, B8, B9, B13, C2, D2) were considered of **local importance (higher value)** given the presence of moderate to good salmonid, lamprey and or European eel habitat.

A further eleven sites (A1, A2, A3, A4, A5, B1, B2, B12, B14, C1 and D1) were considered of **local importance (lower value)** due to their small size, low fisheries value and absence of good status Q4 water quality.

A total of three sites (B10 (Inchinanagh River) and B11 & B15 (River Bride)) were considered of **International importance** given they form part of the Blackwater River SAC (002170).

Table 3.4 Aquatic evaluation summary of the survey sites (according to NRA, 2009 guidelines)

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
A1	Unnamed stream	n/a	Local Importance (lower value)	No fisheries value (100% dry habitat)
A2	Unnamed stream	n/a	Local Importance (lower value)	No fisheries value
A3	Tooreen North Stream	19T33	Local Importance (lower value)	No fisheries value
A4	Slievedotia 19 Stream	19S09	Local Importance (lower value)	Low fisheries value
A5	Unnamed stream	n/a	Local Importance (lower value)	No fisheries value (100% dry habitat)
A6	Monparson River	18M58	Local Importance (higher value)	Excellent quality salmonid habitat; Atlantic salmon, lamprey and European eel present
B1	Toor River	18T51	Local Importance (lower value)	Low fisheries value
B2	Coom 18 Stream	18C03	Local Importance (lower value)	No fisheries value
B3	Coom 18 River	18C03	Local Importance (higher value)	Excellent quality salmonid habitat
B4	Toor River	18T51	Local Importance (higher value)	Good quality salmonid habitat
B5	Lyravarrig 18 Stream	18L82	Local Importance (higher value)	Salmonids and European eel present
B6	Seefin 18 Stream	18S52	Local Importance (higher value)	European eel present
B7	River Bride	18B05	Local Importance (higher value)	Good quality salmonid habitat; European eel present
B8	Lyravarrig 18 Stream	18L66	Local Importance (higher value)	Good salmonid nursery; European eel present
B9	Field Chimney Stream	18F43	Local Importance (higher value)	Good salmonid nursery (Atlantic salmon & brown trout)
B10	Inchinanagh River	18I16	International importance	Within River Blackwater SAC (002170)
B11	River Bride	18B05	International importance	Within River Blackwater SAC (002170)

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
B12	Unnamed stream	n/a	Local Importance (lower value)	Low fisheries value
B13	Unnamed stream	n/a	Local Importance (higher value)	European eel present
B14	Bunnaglanna Stream	18B07	Local Importance (lower value)	Low fisheries value
B15	River Bride	18B05	International importance	Within River Blackwater SAC (002170)
C1	Slumberhill 18 Stream	18S40	Local Importance (lower value)	Low fisheries value
C2	Ross Stream	18R02	Local Importance (higher value)	Salmonids and European eel present
D1	Shanowen Trib 1	18S42	Local Importance (lower value)	Low fisheries value
D2	Farran North River	18F27	Local Importance (higher value)	Excellent lamprey nursery; good salmonid habitat; European eel present

4. Discussion

The baseline surveys focused on aquatic habitats in relation to fisheries habitat, white-clawed crayfish, freshwater pearl mussel, macro-invertebrates, water quality, macrophytes and bryophytes (i.e. corresponding to Annex I floating river vegetation) which are present in the watercourses in the vicinity of the proposed Coom Green Energy Park development and associated cable route. A number of sites were found to support and or offer value to a number of aquatic receptors of ecological value such as Atlantic salmon, brown trout, *Lampetra* sp., European eel and floating river vegetation. No white-clawed crayfish or freshwater pearl mussel were recorded from the survey area.

4.1 Most valuable sites

In terms of aquatic ecology, the majority of survey sites (sites A6, B3, B4, B5, B6, B7, B8, B9, B13, C2, D2) were considered of **local importance (higher value)** based on the presence of salmonids and or the ability to support a range of species of conservation value such as Annex II otter, Annex II *Lampetra* sp. and or Red-listed (King et al., 2011) and critically endangered (Pike et al., 2020) European eel. Furthermore, whilst not a required criterion for assigning ecological value to aquatic habitats (NRA, 2009), biological water quality (calculated from Q-samples) was taken into consideration when assessing a value to the survey sites. Notably, only site B15 (River Bride, Old Bridge) achieved $\geq Q4$ and was thus meeting the target 'good status' ($\geq Q4$) water quality as required under the Water Framework Directive (2000/60/EC). All of the other sites evaluated for biological water quality (sites A2, A3, A6, B3, B4, B7, B8, B10, B13, D1 and D2) failed to meet the target 'good status' ($\geq Q4$) water quality as required under the Water Framework Directive (2000/60/EC) (i.e. all were $\leq 3-4$, moderate status). Notably two of the survey sites (B4 & A6) supported macrophyte and bryophyte assemblages which shared links with the Annex I Habitat, *Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation* (3260).

Sites B10 (Inchinanagh River) and B11 and B15 (River Bride) were considered of **International importance** given they form part of the Blackwater River SAC (002170). These sites also offered good to excellent quality salmonid habitat, good European eel habitat and good otter potential.

Sites A1, A2, A3, A4, B1, B12, B14, C1 and D1 were considered of **local importance (lower value)** due to their low fisheries value or incapacity to support resident fish and aquatic fauna. Nevertheless, given downstream hydrological connectivity, the inherent value of these sites may improve during periods of higher flow for migratory species such as Red-listed European eel.

5. References

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Appendix A – fisheries report

Appendix B – freshwater pearl mussel survey report



Triturus Environmental Ltd.

42 Norwood Court,

Rochestown,

Co. Cork,

T12 ECF3.



Triturus Environmental Ltd.

42 Norwood Court,

Rochestown,

Co. Cork,

T12 ECF3.

Appendix 8-B: Aquatic Ecology, Fishery and Freshwater Pearl Mussel Report 2020 Report

Appendix 8.-B: Aquatic Habitats and Species Survey Data

List of Tables:

Table 1: CWF Bottlehill Aquatic Survey Photos

Table A7. Physio-chemical site characteristics for the $n=13$ electro-fishing sites surveyed as part of the proposed windfarm development at Bottlehill, Co. Cork.

Table A7.12.2 Representative site photos of the watercourses surveyed during the 2017 electrofishing surveys.

Table 1: CWF Bottlehill Aquatic Survey Photos



Plate 1.1: Bride Bridge



Plate 1.2: Bride Bridge



Plate 1.3: EF9 Bunnaglanna IE_SW_18B050320



Plate 1.4: EF9 Bunnaglanna IE_SW_18B050320



Plate 1.5: Toor River (upper) IE_SW_18C030400



Plate 1.6: Toor River (upper) IE_SW_18C030400



Plate 1.7: Toor River (lower) IE_SW_18C030400



Plate 1.8: Toor River (lower) IE_SW_18C030400



Plate 1.9: Coom18 (Upper) IE_SW_18C030400



Plate 1.10: Coom18 (Upper) IE_SW_18C030400



Plate 1.11: Coom 18 IE_SW_18C030400



Plate 1.12: Coom 18 IE_SW_18C030400 d/s to IE_SW_18B050050



Plate 1.13: Bride [Waterford] IE_SW_18B050050



Plate 1.14: Bride [Waterford] IE_SW_18B050050



Plate 1.15: Toorgarriff IE_SW_18B050320



Plate 1.16: Toorgarriff IE_SW_18B050320



Plate 1.17: Inchinanagh 18 IE_SW_18B050320



Plate 1.18: Inchinanagh 18 IE_SW_18B050320



Plate 1.19: Lyravarrig_18 IE_SW_18B050050



Plate 1.20: Lyravarrig_18 IE_SW_18B050050



Plate 1.21: Lyravarrig_18 IE_SW_18B050050



Plate 1.22: Lyravarrig_18 IE_SW_18B050050



Plate 1.23: Aunamihoonagh Stream, Lisnagar
Demesne Stream Trib. (unnamed)



Plate 1.24: Lisnagar Demense stream
IE_SW_18B050320



Plate 1.25: Farran North IE_SW_18B050400



Plate 1.26: Farran North IE_SW_18B050400



Plate 1.27: Shanowennadrimina Stream



Plate 1.28: Shanowennadrimina Stream



Plate 1.29: Ross [Killavullen] IE_SW_18R020500
FPM F



Plate 1.30: Ross [Killavullen] IE_SW_18R020500
FPM F



Plate 1.31: Monaparson IE_SW_18C020300



Plate 1.32: Monaparson IE_SW_18C020300



Plate 1.33: Lisheen Cross Roads
IE_SW_18B022100 FPM X



Plate 1.34: Lisheen Cross Roads
IE_SW_18B022100 FPM X



Plate 1.35: North Lackendarragh
IE_SW_18B022100 FPM B



Plate 1.36: North Lackendarragh
IE_SW_18B022100 FPM B



Plate 1.37: Bride [Waterford] IE_SW_18B050050

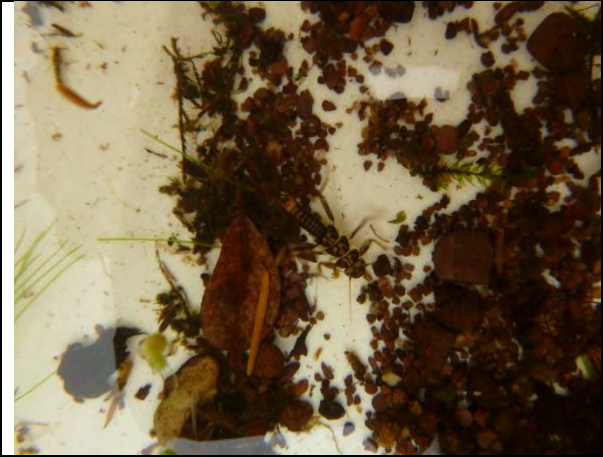


Plate 1.38: Bride [Waterford] IE_SW_18B050050



Plate 1.39: Recording results of aquatic surveys



Plate 1.40: Aquatic survey methods



Plate 1.41: Kick sampling survey method



Plate 1.42: Brown trout (*Salmo trutta*) from Toor River site



Plate 1.43: Brook/river (*Lampetra* sp.) lamprey transformer from Farran North stream

Table A7. Physio-chemical site characteristics for the $n=13$ electro-fishing sites surveyed as part of the proposed windfarm development at Bottlehill, Co. Cork.

Site characteristic	Site					
	1	2	3	4	5	6
Channel width (m)	3.5m	2.5m	14m wide	4m	5m	7m
Water width (m)	2.5m	2.5m	14m wide	3.5m	3m	5.5m
Bank height (m)	5m (variable)	1.6m	2.1m	1.5m	0.9m	1.1m
Flow type	cascading riffle-glide-pool (upland eroding)	broken riffle-glide (upland eroding)	cascading riffle-glide-pool (upland eroding)	broken riffle-glide (upland eroding)	broken riffle-glide (upland eroding)	broken riffle-glide (upland eroding)
River depth (m)	0.15m	0.4m	4/8m	0.15m	0.4m	2/8m
Channel profile	Deep V	Moderate U	Moderate V	Moderate U (semi natural profile)	Moderate U (semi natural profile)	Moderate U (semi natural profile)
Riffle %	40%	30%	20%	50%	20%	30%
Pool %	20%	60%	30%	40%	20%	10%
Glide %	40%	10%	50%	10%%	60% (deeper glide)	60%
Substrata %	Bedrock 10%; Boulder 10%; Cobble 10%; Coarse Gravel 40%; Medium Gravel 10%; Fine 10%	Boulder 20%; Cobble 30%; Coarse Gravel 20%; Medium Gravel 15%; Fine Gravel	Bedrock 10%; Boulder 20%; Cobble 20%; Coarse Gravel 20%; Medium Gravel 20%; Fine Gravel 20%	Boulder 10%; Cobble 50%; Coarse Gravel 20%; Medium Gravel 10%; Fine Gravel 5%; Sand 5%	Boulder 20%; Cobble 30%; Coarse Gravel 20%; Medium Gravel 10%; Fine Gravel	Boulder 5%; Cobble 30%; Coarse Gravel 20%; Medium Gravel 20%; Fine Gravel

Site characteristic	Site					
	1	2	3	4	5	6
	Gravel 10%; Sand 5%, Silt 5%.	10%; Sand 5%.	Gravel 5%; Sand 5%.		15%; Sand 5%.	20%; Sand 5%.
Shading %	40%	20%	30%	10%	15%	20%
D.O.	11.2mg/l	9.9mg/l	9.2mg/l	14.1mg/l	10.1mg/l	10.7mg/l
pH	7.33	6.97	7.26	7.1	7.02	7.02
Conductivity	149us	142us	139us	160us	140us	94us
Dissolved Solids	74ppm	71ppm	69ppm	82	70ppm	47ppm
Temperature	10.9	11.5	11.6	11.5	11.7	11.7
Macrophytes	None	Ranunculus penicillatus <1%	Hemlock water dropwort <1%; Callitriche stagnalis 1%; Ranunculus penicillatus <1%	Callitriche stagnalis <1%; Ranunculus penicillatus <5%.	Ranunculus penicillatus 10%; Hemlock water dropwort 5%; Sparaganium erectum <1%	Brooklime <1%
Liverworts/mosses		Pinnate scalewort <1%; Fontanalis antpyretica <1%	Fontanalis squamosa <5%	Pellia species on muddy littoral	Fontanalis antipyretica <5%	Pinnate Scalewort <5%
Riparian treelines	Lodgepole Pine, Ash, Bramble, Bracken	Lodgepole pine stands locally in corners of GA1 fields, with willow, bramble, heather and gorse scrub on the southern bank.	Willow, Bracken & Bramble Scrub	Wet GA1 and Wet Alder - Willow Scrub	Hawthorn, Ash and Willow with Bracken, Bramble, Wild Angelica.	Ash, Sycamore, Willow, Gorse, Bramble, Hawthorn
Bordering land uses (after Fossitt, 2000)	Improved agricultural grassland	Wetter improved grassland and scrub	Mature Sitka Spruce Plantation	Improved agricultural grassland and coniferous afforestation in upper catchment	GA1 improved grassland and coniferous afforestation semi-mature.	Wet GA1 (improved & heavily grazed) very heavy

Table A7.12.1 (contd.) Physio-chemical site characteristics for the $n=13$ electro-fishing sites surveyed as part of the proposed windfarm development at Bottlehill, Co. Cork.

Site characteristic	Site						
	7	8	9	10	11	12	13
Channel width (m)	4m	7m	7-8m	18m	4m	1.7m	1.5m
Water width (m)	3m	1.5m	7m	18m	4m	1.5m	1.5m
Bank height (m)	1.8m	2.5m	0.6m	0.9m	2m	1.2m	2.2m
Flow type	broken riffle-glide (upland eroding)	broken riffle-glide (upland eroding)	broken riffle-glide (upland eroding)	broken riffle-glide (upland eroding)	broken riffle-glide (upland eroding)	Lowland depositing (semi-natural)	lowland depositing (highly modified)
River depth (m)	0.15m	0.3m	0.35m	0.45m	2/8m	0.4m	0.4m
Channel profile	Moderate U	Moderate U	Moderate U	Moderate U extending into moderate V valley	Moderate U (semi natural profile)	Moderate U	Deep U
Riffle %	70%	60%	20%	10%	35%	10%	20
Pool %	25%	0%	30%	10%	55%	20%	20
Glide %	5%	40%	50%	80% (deep glide)	5%	70%	60%
Substrata %	Boulder 30%; Cobble 40%; Coarse Gravel 10%; Medium Gravel 10%; Fine Gravel 5%; Sand 5%.	Boulder 5%; Cobble 30%; Coarse Gravel 40%; Medium Gravel 10%; Fine Gravel 10%; Sand 10% & Sand 5%	Boulder 20%; Cobble 30%; Coarse Gravel 30%; Medium Gravel 10%; Fine Gravel 5% & Sand 5%	Boulder 20%; Cobble 40%; Coarse Gravel 20%; Medium Gravel 15%; Fine Gravel 10%; Sand 10%; Sand 5%.	Boulder 20%; Cobble 30%; Coarse Gravel 20%; Medium Gravel 15%; Fine Gravel 5%; Sand 10%.	Cobble 40%; Coarse Gravel 30%; Medium Gravel 15%; Fine Gravel 10%; Sand 5%.	Cobble 20%; Coarse Gravel 20%; Medium Gravel 10%; Fine Gravel 10%; Sand 10%; Silt 30%
Shading %	10%	10%	30%	30%	20%	<5% (very open)	40%
D.O.	10.9mg/l	14.7mg/l	12.1mg/l	11.4mg/l	8.5mg/l	12.4	11.1mg/l
pH	7.04	7.1	7.27	7.47	7.46	6.88	7.94
Conductivity	127us	164us	129us	143us	230us	149us	176us

Site characteristic	Site						
	7	8	9	10	11	12	13
Dissolved Solids	64ppm	82ppm	64ppm	72ppm	115ppm	75ppm	352us
Temperature	11.4	11.8	10.8	10.7	11.8	11.6	11.5
Macrophytes	Ranunculus penicillatus <1%; Callitriche stagnalis <1%; Brooklime <5%	Abundant fool's watercress	None (shaded)	Ranunculus penicillatus <5%	Lesser Water Parsnip <5%; Ranunculus penicillatus <5%; Hemlock Water Dropwort <5%	Brooklime <5%; Glyceria maxima <1%; Water Mint <1%	Apium
Liverworts/mosses	Fontinalis squamosa <5%		Porella pinnata, Font. Squamosa	Porella pinnata, Font. Antip.	Fontinalis squamosa <10%	Fontinalis antipyretica <5%	None
Riparian treelines	Gorse, Bramble, Hawthorn & Willow	Ash, Hazel & Willow mature treeline	Hazel, Ivy and Willow bordering the stream	Birch, Ash Willow Along riparian corridor but Lodgepole pine higher up valley	Bracken and Bramble with occasional scattered Ash, Hawthorn & Willow.	Marsh Habitat with Yellow Flag, Wild Angelica and Meadow Sweet	Beech, Ash, Bramble & H. balsam
Bordering land uses (after Fossitt, 2000)	Improved agricultural grassland	Heavily improved grassland (with cattle access to stream)	GA1 improved grassland RHS facing downstream.	Coniferous Afforestation	Scrubbed over valley with improved grassland adjoining valley, afforestation in upper catchment.	Improved Grassland (GA1)	Improved agricultural grassland & industrial built land

Table A7.12.2 Representative site photos of the watercourses surveyed during the 2017 electrofishing surveys.



Site 1 - Lyravarrig 18 stream



Site 2 - River Bride (Lyravarrig)



Site 3 - River Bride (Knocknacaheragh)



Site 4 - Toor River (upper)



Site 5 - Toor River



Site 6 - Coom 18 stream



Site 7 - Inchinanagh 18 stream



Site 8 - Toogarriff Stream



Site 9 - Bunnaglanna stream

Table A7.12.2 (contd.) Representative site photos of the watercourses surveyed during the 2017 electrofishing surveys.



Site 10 - River Bride (Glenville)



Site 11 - Monaperson River



Site 12 - Lisnagar Demense stream



Site 13 – Farran North stream

Appendix 8-C: Turbine Delivery Route EcIA Report 2020

COOM GREEN ENERGY PARK

TURBINE DELIVERY ROUTE ECOLOGICAL APPRAISAL

Prepared for: Coom Green Energy Park Ltd.



Date: December 2020

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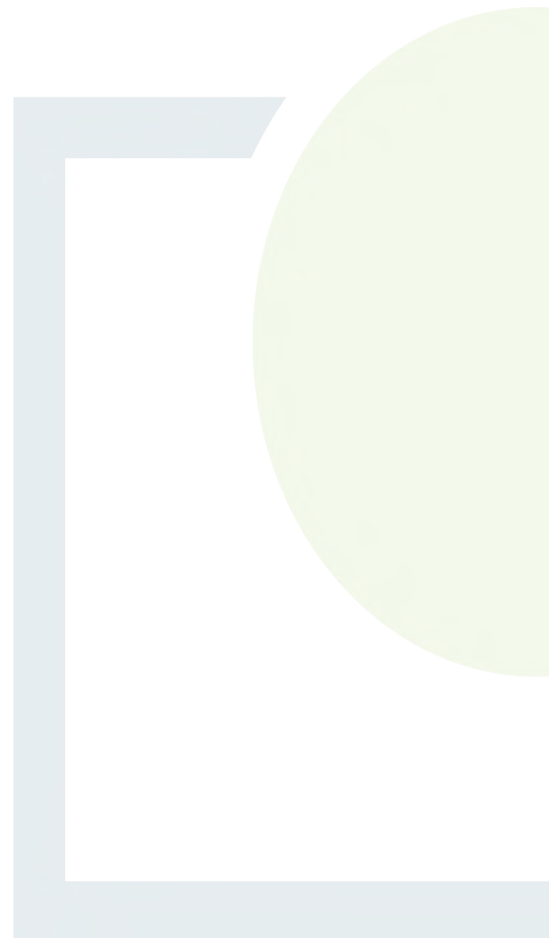


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1. INTRODUCTION

1.1 Fehily Timoney and Company

Fehily Timoney & Company (FT) were commissioned by Coom Green Energy Park Ltd. to provide consultancy services in respect of the turbine delivery routes (TDR) for the proposed wind farm at Coom Green Energy Park at Bottlehill/Mullenaboree and Knockdoorty, Co. Cork. An Ecological Appraisal has been prepared in respect of the proposed TDR.

The purpose of this evaluation was to:

- Undertake a desktop review of available ecological data for both the receiving environment and greater area, including a review of designated sites within 15 km the turbine delivery route;
- Undertake ecological field surveys of the turbine delivery route;
- Identify flora and fauna present within the footprint of the turbine delivery route;
- Identify the presence of invasive flora and/or fauna;
- Evaluate the ecological significance of the receiving environment;
- Appraise the potential effects of the project on the ecology of the turbine delivery route;
- Habitats or species that are protected and/or are qualifying interests of designated sites, or have potential connections to the designated sites;
- Consider measures to mitigate the potential negative effect(s) of the project on the ecology of the receiving environment.

1.1.1 Study Area

The area surveyed was the oversail and load-bearing areas and immediate surroundings for each node, including drainage features. The survey was carried out in accordance with the guidance document *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road-Schemes* (NRA, 2009).

Two turbine delivery routes for the proposed windfarm at Coom Green Energy Park have been identified. Route 1 will service the western turbine cluster centered around the Bottlehill Landfill site (Bottlehill/Mullenaboree), while Route 2 will service the eastern cluster (Knockdoorty) to the south of the N72 near Ballyhooly. Both routes are shown in Figure 1 below:

- Route 1 passes through Cork City via Tivoli, Mayfield and Blackpool before joining the N20 Cork-Mallow road to travel north as far as Rathduff, where the route turns northeast at Lissavoura Crossroads and continues along local roads to the Bottlehill Landfill site entrance.
- Route 2 follows the M8 motorway north from the Dunkettle interchange as far as Junction 14 north of Fermoy, and then follows the R639 into Fermoy town where it turns west to join the N72 which runs parallel to the Blackwater River towards Mallow. The route leaves the N72 to turn south at Leacht crossroads near Ballyhooly and crosses the River Blackwater via Ballyhooly Bridge. After this the route travels along local roads to the access point for the northern cluster site.



1.2 Methodology

1.2.1 Relevant Guidance

The methodology for this appraisal has been devised in consideration of the following relevant guidance published by the Environmental Protection Agency (EPA) including *'Guidelines on the information to be contained in Environmental Impact Statements'* (2002), reference was also made to the revised draft (July 2017) *'Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)'*, reference was also made to the draft (2015) guidelines and *'Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment'* (DoECLG, 2018).

Additional guidance available from the EU such as *'Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment'* (2013), and *Guidance on the preparation of the EIA Report* (Directive 2011/92/EU as amended by 2014/52/EU)(2017) has also been considered. The appraisal also takes account of *'Guidelines for Ecological Impact Assessment in the UK and Ireland, Freshwater and Coastal'*, 2nd edition CIEEM, (2019). The Heritage Council publication *'Best Practice Guidance for Habitat Survey & Mapping'* (Smith *et al.*, 2011) is also referenced.

Relevant guidance published by the National Roads Authority (NRA) such as *'Guidelines for Assessment of Ecological Impacts of National Road Schemes'* (2009a), and *'Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes'* (2008a) have also been followed.

Documentation and guidance available from Cork County Council (CCC) such as the *'Cork County Development Plan: 2014-2020'*, and the *'County Cork Biodiversity Action Plan 2009-2014'* has been reviewed and utilised where relevant.

Relevant guidance published by the National Roads Authority (NRA), and applicable to assessing watercourses in Ireland, was also followed, including *'Guidelines for the Assessment of Ecological Impacts of National Road Schemes – Revision 2'* (NRA 2009a), *'Ecological surveying techniques for protected flora and fauna during the planning of National Road Schemes – Version 2'* (NRA 2009b), *'Environmental Impact Assessment of National Road Schemes – A practical guide'* (NRA 2008b) and *'Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes'* (NRA 2008a).

1.2.2 Legislative context

A diversity of flora and fauna, rare at a national level, are protected under the provisions of the Wildlife Act 1976, as amended, and the orders and regulations made thereunder, such as the Flora Protection Order (2015). Council Directive 92/43/EEC has been transposed into Irish law, for the purposes of this application for permission by Part XAB of the Planning and Development Act 2000, as inserted. In addition, certain other obligations of the Habitat Directive have been transposed by the European Communities (Birds and Natural Habitats) Regulations 2011, as amended.

Section 171 of the Fisheries (Consolidation) Act 1959 creates the offence of throwing, emptying, permitting or causing to fall into any waters deleterious matter. Deleterious matter is defined as any substance that is liable to injure fish but is also liable to damage their spawning grounds or the food of any fish or to injure fish in their value as human food or to impair the usefulness of the bed and soil of any waters as spawning grounds or other capacity to produce the food of fish. It will be necessary to get written permission from Inland Fisheries Ireland to proceed with the works in any areas where disturbance to the spawning and nursery areas of both salmonids and lampreys will occur as a result of the proposed turbine delivery route. Salmon, all lamprey species and their habitats are further protected under the EU Habitats Directive, 1992.



Under Section 3 of the Local Government (Water Pollution) Act, 1977 (as amended by Sections 3 and 24 of the 1990 Act) it is an offence to cause or permit any polluting matter to enter waters. Suspended solids would be a key parameter here. Likewise, any visual evidence of oil/fuel in the river would constitute an offence.

1.2.3 Consultation

Feedback was received from:

- An Bord Pleanála
- Cork County Council
- Developments Application Unit
- National Parks and Wildlife Service
- Inland Fisheries Ireland.

In addition to the above, the Irish Raptor Study Group (IRSG) was sent a scoping letter and maps in respect of the proposed development in December 2018. On January 14th, 2019, a meeting request was issued to the chairperson of the IRSG to facilitate a discussion on the proposed development – however at that time a date for all parties which was suitable could not be set. Further meeting requests were issued on January 15th, 2019 and on April 8th, 2019 to which no response was received. In May of 2019, the IRSG declined to meet with or provide information or opinion to representatives from the appointed consultant for the Project and offered to provide information and opinion on the proposed CGEP to Coillte – with whom they indicated in writing they had already made contact.

No information was provided by the IRSG – however, a review of available IRSG available online reports was undertaken in the preparation of this chapter.

1.2.4 Desktop study

1.2.4.1 *Designated Nature Conservation Sites*

Nationally designated sites within 10 km of this the turbine delivery route, such as Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) have been identified. European sites within 15km of the proposed turbine delivery route, namely candidate Special Areas of Conservation (cSACs)¹ and Special Protection Areas for birds (SPAs) were identified as part of this ecological assessment using the Map Viewer at www.npws.ie. These designated sites are described in Section 1.3.1. A separate AA Screening Report and Natura Impact Statement (NIS) was prepared to evaluate the potential effect to European sites as a result of the proposed turbine delivery route.

¹ Note: At present many SACs in Ireland are currently ‘candidate’ SACs, and referred to as cSACs however, these “candidate” sites must still be afforded the same level of protection as if they were SACs in accordance with the Habitats Directive.



1.2.4.2 Flora and Fauna

A desk study was carried out to collate and review available information, datasets and documentation sources pertaining to the site’s natural environment. Records available on the NPWS and the National Biodiversity Data Centre websites were reviewed.

Other data sources include Ireland’s Wetlands and their Waterbirds: Status and Distribution (Crowe 2005), the Atlas of Wintering Birds in Britain and Ireland (Lack, 1986), the Atlas of Breeding Birds in Britain and Ireland (Sharrock, 1976) and the Breeding and Winter Birds of Britain and Ireland Bird Atlas 2007-11 (Balmar *et al.*, 2013).

Botanical species were assessed in accordance with their occurrence on the Flora Protection Order 2015 and the Ireland Red List No. 10: Vascular Plants (Wyse *et al.* 2016). Other sources included:

- National Parks and Wildlife Service (NPWS);
- Bat Conservation Ireland (BCI);
- Cork County Council Planning Enquiry System
- Cork County Development Plan 2014
- Environmental Protection Agency (EPA) water quality data
- Geological Survey Ireland (GSI) area maps;
- Inland Fisheries Ireland;
- National Biodiversity Data Centre (NBDC) (on-line map-viewer)
- National Parks and Wildlife Service (NPWS) website and metadata available (www.npws.ie)
- OSI Aerial photography and 1:50000 mapping;
- River Catchment & Sub-catchment WFD datasets
- Teagasc Soil area maps;
- The Ireland Red List No. 10: Vascular Plants (Wyse *et al.* 2016);
- Western River Basin District (WRBD) datasets (Water Framework Directive).

1.2.5 Field study

Ecological surveys were undertaken by Fehily Timoney & Company (FT) on 16th July and 13th August 2019, and 19th August 2020 along the proposed turbine delivery route for the proposed Coom Green Energy Park, Co. Cork.

Weather conditions comprised temperatures of approximately 17°C, a light breeze, no rain and mostly cloudy. These are outlined in Table 1-1 below:

Table 1-1: Survey weather conditions

Date	Temperature	Wind	Rain	Cloud cover
16 th July 2019	17°C	8km/hr	Dry	6/8
13 th August 2019	16°C	9km/hr	Light drizzle	7/8
19 th August 2020	18°C	5km/hr	Dry - light drizzle	8/8



Based on the results of these various studies, FT considered potential direct, indirect and cumulative effects of the proposed turbine delivery route on the existing ecological receptors and proposed appropriate mitigation measures to minimise and avoid these potential effects.

1.2.5.1 Habitats

The habitats along the footprint of the proposed turbine delivery routes were identified and classified, according to 'A Guide to Habitats in Ireland' (Fossitt, 2000), during a walkover survey 16th July and 13th August 2019, and 19th August 2020. The dominant plant species present in each habitat type was recorded. Habitats have been appraised and evaluated according to their occurrence as protected habitats under Annex I of the EU Habitats Directive (92/43/EEC) and for their capacity to support rare, threatened and endangered species. The methodology used to assess the effect on habitats is based on NRA guidelines (2009 a and b), CIEEM guidelines and EPA guidelines. The habitat mapping exercise had regard to the 'Best Practice Guidance for Habitat Survey and Mapping' (Smith *et al.*, 2011) published by the Heritage Council.

Scientific and common names for plants follow Parnell *et al.* (2012) and Blamey *et al.* (1996), respectively. In addition to habitat identification, each habitat was assessed for its ecological significance, based on the National Roads Authority (NRA) Site Evaluation Scheme (NRA, 2009a) (see Table 1-3 below).

Habitat boundaries and associated attribute data were mapped using desk-based GIS software, namely ArcGIS 10.4.1, which was also used to calculate habitat areas and lengths.

Once the baseline ecological survey and mapping was complete, a constraints map highlighting important ecological features and resources was generated, indicating areas for preclusion from the final turbine delivery route layout. The ecological constraints map was used to design a turbine delivery route layout with the least ecological effect.

1.2.5.2 Mammals

The total footprint of the proposed turbine delivery route was traversed by experienced ecologists for potential signs of mammals within the study area following the guidance document *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road-Schemes* (NRA, 2009), and Brown and Lawrence, 1992. As well as direct observations of mammals, features such as tracks, trails, fur, droppings and shelter (setts, dreys and holts) were also recorded using GPS.

The conservation status of mammals within Ireland and Europe is assessed using one or more of the following documents; Wildlife Acts, the Red List of Terrestrial Mammals (Marnell *et al.*, 2019) and NPWS (2019) *The Status of EU Protected Habitats and Species in Ireland*.

1.2.5.3 Birds

Vantage point (VP), hinterland, and transect surveys have been completed during both the winter and summer seasons between 2016 and 2019 for the proposed Coom Green Energy Park. The suitability of habitats for nesting birds at TDR node locations was evaluated in ecological surveys conducted. The survey was carried out in accordance with the guidance document *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road-Schemes* (NRA, 2009).



1.2.5.4 Bats

Each node was surveyed and habitats of potential value to bats were noted and marked on a map. The value of features, including mature trees, were noted according to their potential for use by bats for roosting. The value of habitat features for bats was defined in accordance with Bat Surveys: Good Practice Guidelines publication (Collins, 2016), as shown in Table 1-2.

Table 1-2: Potential Suitability of Habitats for Bats (Collins, 2016)

Suitability	Description of Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	<p>A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).</p> <p>A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.</p>	<p>Habitat that could be used by small numbers of commuting bats such as gappy hedgerow or un-vegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat.</p> <p>Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.</p>
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only- the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	<p>Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens.</p> <p>Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.</p>
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.	<p>Continuous, high quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge.</p> <p>High quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland.</p> <p>Site is close to and connected to known roosts.</p>



1.2.5.5 *Aquatic*

All watercourses which could be affected directly or indirectly by the proposed development were considered as part of the current baseline assessment. This included proposed cable route crossings of riverine watercourses or watercourses in close proximity to/draining the TDR and proposed wind turbine layout. The nomenclature for the watercourses surveyed is as per the Environmental Protection Agency's (EPA) online map viewer.

Site visits of the aquatic survey sites were conducted on the 24th, 25th and the 29th to the 31st of July 2020 by Triturus Environmental Ltd. Survey sites were assessed in light of the proposed project, with survey effort focused on both instream and riparian habitats at each location. Surveys at each aquatic site included a fisheries assessment (electro-fishing), fisheries habitat appraisal and white-clawed crayfish assessment. A freshwater pearl mussel assessment was undertaken across the wider catchment of the proposed project. Additionally, biological water quality (Q-sampling) was undertaken at n=12 sites (Figure 2.2). Rare, protected and or conservation interest aquatic species such as otter were also searched for at each survey site. This holistic approach informed the overall aquatic ecological evaluation of each site in the context of the proposed project.

A broad aquatic habitat assessment was conducted at each site utilising elements of the methodology given in the Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003) and the Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000). All sites were assessed in terms of:

- Stream width and depth and other physical characteristics.
- Substrate type, listing substrate fractions in order of dominance, i.e. bedrock, boulder, cobble, gravel, sand, silt etc.
- Flow type, listing percentage of riffle, glide and pool in the sampling area.
- In-stream macrophyte, bryophytes occurring and their percentage coverage of the stream bottom at the sampling sites.
- Riparian vegetation composition.

The watercourse at each aquatic survey site was described in terms of the important aquatic habitats and species. This helped to evaluate species and habitats of ecological value in the vicinity of the proposed development and watercourse crossings. The aquatic baseline prepared informed mitigation for the Coom Green Energy Park development.

1.2.6 Ecological Resource Evaluation

The value of the ecological resources/receptors at the subject site was evaluated using the ecological evaluation guidance given in the NRA guidance on assessment of ecological effects of National Road Schemes (NRA, 2009a).

This guidance provides ratings for resources based primarily on geographic context and allows for resources at International, National, County and Local (higher and lower value) levels.

Key ecological receptors (for assessment) are those deemed to be above the 'Local Importance (lower value) evaluation. Evaluation criteria are outlined below in Table 1-3.



Table 1-3: Ecological Resource Evaluation Criteria (from NRA, 2009)

Resource Evaluation	Defining Criteria
International Importance	<p>'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA), candidate Special Area of Conservation (cSAC) or proposed Special Protection Area (pSPA).</p> <p>Sites that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). Features essential to maintaining the coherence of the Natura 2000 Network.</p> <p>Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.</p> <p>Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.</p> <p>Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).</p> <p>Biosphere Reserve (UNESCO Man & The Biosphere Programme). Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).</p> <p>Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).</p> <p>Biogenetic Reserve under the Council of Europe. European Diploma Site under the Council of Europe.</p> <p>Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).</p>
National Importance	<p>Site designated or proposed as a Natural Heritage Area (NHA).</p> <p>Statutory Nature Reserve.</p> <p>Refuge for Fauna and Flora protected under the Wildlife Acts.</p> <p>National Park.</p> <p>Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA);</p> <p>Statutory Nature Reserve;</p> <p>Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.</p> <p>Resident or regularly occurring populations (assessed to be important at the national level) of the following: Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive.</p>
County Importance	<p>Area of Special Amenity.</p> <p>Area subject to a Tree Preservation Order.</p> <p>Area of High Amenity, or equivalent, designated under the County Development Plan.</p>



Resource Evaluation	Defining Criteria
	<p>Resident or regularly occurring populations (assessed to be important at the County level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list.</p> <p>Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.</p> <p>County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared.</p> <p>Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.</p> <p>Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.</p>
Local Importance (Higher Value)	<p>Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;</p> <p>Resident or regularly occurring populations (assessed to be important at the Local level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list.</p> <p>Sites containing semi natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;</p> <p>Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.</p>
Local Importance (Lower Value)	<p>Sites containing small areas of semi natural habitat that are of some local importance for wildlife;</p> <p>Sites or features containing non-native species that are of some importance in maintaining habitat links.</p>

1.2.7 EPA EIAR Guidance Definitions of Effects

Table 1-4 to Table 1-9 outline the EPA evaluation criteria utilised in this appraisal of the Environmental Factor, Biodiversity. These criteria are included in the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, August 2017).



Table 1-4: Probability of Effects (EPA, August 2017)

Likely Effects	Unlikely Effects
The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

Table 1-5: Quality of Effects (EPA, August 2017)

Quality of Effect	Description
Positive Effect	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or removing nuisances or improving amenities)
Neutral Effect	No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error.
Negative/Adverse Effect	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Table 1-6: Significance of Effects (EPA, August 2017)

Significance of Effect	Description
Imperceptible	An effect capable of measurement but without significant consequences
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment
Profound	An effect which obliterates sensitive characteristics



Table 1-7: Duration of Effects (EPA, August 2017)

Duration of Effect	Description
Momentary Effects	Effects lasting from seconds to minutes
Brief Effects	Effects lasting less than a day
Temporary Effects	Effects lasting less than a year
Short-term Effects	Effects lasting one to seven years
Medium-term Effects	Effects lasting seven to fifteen years
Long-term Effects	Effects lasting fifteen to sixty years
Permanent Effects	Effects lasting over sixty years

Table 1-8: Types of Effects (EPA, August 2017)

Type of Effect	Description
Effect/Impact	A change resulting from the implementation of a project
Likely Effects	The effects that are specifically predicted to take place – based on an understanding of the interaction of the proposed project and the receiving environment.
Indirect Effects (a.k.a. secondary effects)	Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway
Cumulative Effects	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
‘Do Nothing’ Effects	The environment as it would be in the future should the subject project not be carried out.
‘Worst Case’ Effects	The effects arising from a project in the case where mitigation measures substantially fail
Indeterminable Effects	When the full consequences of a change in the environment cannot be described.
Irreversible Effects	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
Reversible Effects	Effects that can be undone, for example through remediation or restoration
Residual Effects	The degree of environmental change that will occur after the proposed mitigation measures have taken effect
Synergistic Effects	Where the resultant effect is of greater significance than the sum of its constituents (e.g. combination of SO _x and NO _x to produce smog).



Table 1-9: Definition of Terms – Source, Pathway, Receptor (EPA, August 2017)

Term	Description
Source	The activity or place from which an effect originates
Pathway	The route by which an effect is conveyed between a source and a receptor.
Receptor	Any element in the environment which is subject to effects.
Effect/Impact	A change resulting from the implementation of a project

1.3 Description of the Existing Environment

1.3.1 Designated Nature Conservation Sites

1.3.1.1 Sites of International Importance

Special Areas of Conservation (cSACs)

Special Areas of Conservation (SACs) are protected under the European Union (EU) ‘Habitats Directive’ (92/43/EEC). There are three SACs within 15km of the nodes. The full NPWS site synopses for designated areas are available on www.NPWS.ie.

Special Protection Areas (SPAs)

Special Protection Areas (SPAs) were initially designated under Directive 79/409/EEC, The Directive on the Conservation of Wild Birds (‘The Birds Directive’), and are now protected as European (Natura 2000) Sites under the EU ‘Habitats Directive’. There are two SPA within 15km of the nodes.

The following European sites are within 15km of these nodes:

- Blackwater River (Cork/Waterford) SAC* (Site Code 002170) is within 15km of [all] Nodes (closest 10m)
- Blackwater Callows SPA (Site Code 004094) is within 15km of Nodes [2.0 - 2.13] (closest 1.3 km)
- Cork Harbour SPA (Site Code 004030) is within 15km of Nodes [1.3 & 1.4] (closest 1.6 km)
- Great Island Channel SAC (Site Code 001058) is within 15km of Nodes [1.3 & 1.4] (closest 5.6 km)
- Lower River Suir SAC (Site Code 002137) is within 15km of Node [2.0] (14 km)

Table 1-10: Summary of European Sites within 15 km of the Project

Designated Site	Site Code	Features of Interest
Blackwater River (Cork/Waterford) SAC	002170	<ul style="list-style-type: none"> • Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • Perennial vegetation of stony banks [1220]



Designated Site	Site Code	Features of Interest
		<ul style="list-style-type: none"> • <i>Salicornia</i> and other annuals colonising mud and sand [1310] • Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] • Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] • Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation [3260] • Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0] • Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) [91E0] • <i>Margaritifera</i> (Freshwater Pearl Mussel) [1029] • <i>Austropotamobius pallipes</i> (White-clawed Crayfish) [1092] • <i>Petromyzon marinus</i> (Sea Lamprey) [1095] • <i>Lampetra planeri</i> (Brook Lamprey) [1096] • <i>Lampetra fluviatilis</i> (River Lamprey) [1099] • <i>Alosa fallax</i> (Twaite Shad) [1103] • <i>Salmo salar</i> (Salmon) [1106] • <i>Lutra</i> (Otter) [1355] • <i>Trichomanes speciosum</i> (Killarney Fern) [1421]
Blackwater Callows SPA	004094	<ul style="list-style-type: none"> • Whooper Swan (<i>Cygnus cygnus</i>) [A038] • Wigeon (<i>Anas penelope</i>) [A050] • Teal (<i>Anas crecca</i>) [A052] • Black-tailed Godwit (<i>Limosa limosa</i>) [A156] • Wetland and Waterbirds [A999]
Cork Harbour SPA	004030	<ul style="list-style-type: none"> • Little Grebe (<i>Tachybaptus ruficollis</i>) [A004] • Great Crested Grebe (<i>Podiceps cristatus</i>) [A005] • Cormorant (<i>Phalacrocorax carbo</i>) [A017] • Grey Heron (<i>Ardea cinerea</i>) [A028] • Shelduck (<i>Tadorna tadorna</i>) [A048] • Wigeon (<i>Anas penelope</i>) [A050] • Teal (<i>Anas crecca</i>) [A052] • Pintail (<i>Anas acuta</i>) [A054] • Shoveler (<i>Anas clypeata</i>) [A056] • Red-breasted Merganser (<i>Mergus serrator</i>) [A069] • Oystercatcher (<i>Haematopus ostralegus</i>) [A130] • Golden Plover (<i>Pluvialis apricaria</i>) [A140] • Grey Plover (<i>Pluvialis squatarola</i>) [A141] • Lapwing (<i>Vanellus vanellus</i>) [A142] • Dunlin (<i>Calidris alpina</i>) [A149] • Black-tailed Godwit (<i>Limosa limosa</i>) [A156] • Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] • Curlew (<i>Numenius arquata</i>) [A160] • Redshank (<i>Tringa totanus</i>) [A162] • Black-headed Gull (<i>Chroicocephalus ridibundus</i>) [A179] • Common Gull (<i>Larus canus</i>) [A182] • Lesser Black-backed Gull (<i>Larus fuscus</i>) [A183]



Designated Site	Site Code	Features of Interest
		<ul style="list-style-type: none"> Common Tern (<i>Sterna hirundo</i>) [A193] Wetland and Waterbirds [A999]
Great Island Channel SAC	001058	<ul style="list-style-type: none"> Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330]
Lower River Suir SAC	002137	<ul style="list-style-type: none"> Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation [3260] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0] Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) [91E0] <i>Taxus baccata</i> woods of the British Isles [91J0] <i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel) [1029] <i>Austropotamobius pallipes</i> (White-clawed Crayfish) [1092] <i>Petromyzon marinus</i> (Sea Lamprey) [1095] <i>Lampetra planeri</i> (Brook Lamprey) [1096] <i>Lampetra fluviatilis</i> (River Lamprey) [1099] <i>Alosa fallax fallax</i> (Twaite Shad) [1103] <i>Salmo salar</i> (Salmon) [1106] <i>Lutra lutra</i> (Otter) [1355]

An Appropriate Assessment (AA) Screening Report and Natura Impact Statement (NIS) have been completed to examine the likely significant effects of the proposed turbine delivery route either alone or in combination with other plans or project on European Sites (SACs and SPAs); and accompanies this planning application.

1.3.1.2 Sites of National Importance

Sites of National Importance in the Republic of Ireland are termed, Natural Heritage Areas (NHA), and proposed Natural Heritage Areas (pNHA). No NHAs, and 27 pNHAs were recorded within 10 km of the Study Area.

Table 1-11: Summary of Proposed Natural Heritage Areas and Natural Heritage Areas within 10 km of the Project

SITE CODE	SITE NAME	FEATURE OF INTEREST
000073	Blackwater River Callows	See Table 1-10.
000074	Awbeg Valley (Below Doneraile)	The site is of interest because the limestone substrate gives rise to plant communities that are unusual in the south-west. Along this section of the river, below Doneraile, dry broad-leaved woodlands dominate the valley sides, although there are a few patches of conifers. Within the Awbeg Valley as a whole, two local



SITE CODE	SITE NAME	FEATURE OF INTEREST
		<p>plants associated with the woods are Toothwort (<i>Lathraea squamaria</i>) and Ivy Broomrape (<i>Orobancha hederarum</i>). At the edges of the valley thin soils over limestone support an interesting community, including herbs such as Marjorum (<i>Origanum vulgare</i>) and common Calamint (<i>Calamentha sylvatica</i> subsp. <i>ascendens</i>), along with several grasses (<i>Koeleria cristata</i>, <i>Trisetum flavescens</i> and <i>Aira caryophylla</i>).</p> <p>The recent NHA survey recorded abundant frogspawn within a marshy field.</p>
000079	Bride/Bunaglanna Valley	<p>The major features of interest in the site are firstly, the diverse range of comparatively intact habitat type present and, secondly, the microfungi community, some of which have not been recorded elsewhere. Deciduous woodland is a scarce habitat in Ireland.</p>
000085	Glanworth Ponds	<p>The Glanworth Ponds are new records for the occurrence of the Golden Dock in East Cork. Golden Dock is a Red Data Book species where occurrence is apparently declining because often its appearance in a place is only fleeting; it depends on low water levels to provide the right conditions and stimulus for seed germination. This site contains healthy and viable populations of the Golden Dock, as well as, a good species diversity of other aquatic and wetland plants and should therefore be considered for conservation and NHA status.</p>
000094	Lee Valley	<p>Wet broadleaved woodland has developed in a number of places on the river side. Some areas behind the riverbank are frequently flooded and support wet grassland communities.</p> <p>Dry broadleaved woodland exists in other sections of the valley, with the ground flora of many of these woods is relatively species-rich. Unimproved dry grassland occurs on an area of soil that has probable glacial origins. Freshwater marsh fringes the river itself in places. A number of wetland bird species breed here, including Mallard, Heron, Sedge and Grasshopper Warblers and Reed Bunting and two rather locally distributed butterflies, the Small Blue and the Wood White occur.</p>
000103	Shournagh Valley	<p>The woods along the Shournagh Valley included in this site (103) are recommended for conservation and are noted to be of regional importance and deserving of NHA status.</p>
001029	Araglin Valley	<p>The Araglin Valley is of regional importance because of its high diversity of species and ecological interest. The area is predominantly underlain by sandstone, with limestone occurring in the lower reaches near Fermoy. These two contrasting rocky types bring with them differences in the soils and a wide diversity of plant and animal communities.</p>
001046	Douglas River Estuary	<p>The prime importance of this site is its birdlife and it ranks as the second most important area in Cork Harbour (1991-92). It is a valuable area and high tide roost for waterfowl; a typical count, provided by the 1986 An Foras Forbartha County Report, is as</p>



SITE CODE	SITE NAME	FEATURE OF INTEREST
		<p>follows (average and peak winter counts given):- Teal (48; 181), Wigeon (161; 550), Shelduck (168; 577), Red-breasted Merganser (80; 120), Oystercatcher (314; 1,100), Lapwing (948; 5,485), Golden Plover (1,148; 3,400), Curlew (236; 675), Black-tailed Goduit (220;481), Bar-tailed Goduit (220; 474), Redshank (197; 400) and Dunlin (684; 2,543). This gives totals of 412 (1,074) wildfowl and 3,563 (37,355) waders.</p> <p>Based on the above figures, four species occur in nationally important numbers, namely: Shelduck, Red-breasted Merganser, Golden Plover and Black-tailed Goduit. However, the bird populations tend to be mobile and this site must be considered an essential part of Cork Harbour which is of international importance for waterfowl.</p>
001054	Glanmire Wood	<p>The main habitat of interest is mixed broad-leaved woodlands dominated by oak (<i>Quercus</i> sp.), beech (<i>Fagus sylvatica</i>) and sycamore (<i>Acer pseudoplatanus</i>) with a few conifers, especially Silver Fir (<i>Abies alba</i>). The ground flora is particularly rich and includes two grasses, wood fescue (<i>Festuca altissima</i>) and wood millet (<i>Milium effusum</i>), which are thought to indicate ancient woodland. More commonly occurring species include Primrose (<i>Primula vulgaris</i>), violets (<i>Viola riviniana</i>, <i>V.reichen/bachiana</i>), wood anemone (<i>Anemone nemorosa</i>) and Lords-and-ladies (<i>Arum maculatum</i>).</p> <p>The tidal river below the wood adds to the diversity of the site with patches of saltmarsh.</p>
001058	Great Island Channel	See Table 1-10
001074	Rockfarm Quarry, Little Island	The area is of considerable interest botanically because of its species diversity and the presence of 'varieties' for the region, such as the dense-flowered orchid and the Portland spurze.
001080	Blackwater Valley (Killavullen)	10 Areas of Scientific Interest occur along its length. This site is situated just downstream (east) of Killavullen Village within an area of limestone. Large prominent outcrops of limestone and caves can be seen along this section. Other habitats included within this site are broad leaved dry woodland and scrub.
001081	Cork Lough	In 1972 An Foras Forbartha noted it as an important place to observe wildfowl and gulls due to its close proximity to a large human population. It appears, however, that high numbers of birds, attracted by bread-feeding, are causing severe eutrophication which is in need of remedial action. Also, exotic fish have been released over the years. In spite of these factors the lake regularly holds over 100 Mute Swans, a feral flock of over 30 Canada Geese and small numbers (usually under 50) of Mallard, Teal, Tufted Duck and Coot. An increasing flock of wintering Lesser Black-backed Gulls also occurs (460+ in January 1995).



SITE CODE	SITE NAME	FEATURE OF INTEREST
001082	Dunkettle Shore	<p>The site is of value because is mudflats provide an important feeding ground for waterfowl and it acts as a significant roost for birds in the upper harbour. Furthermore, it is an integral part of Cork harbour which is an internationally important wetland, regularly holding flocks of over 20,000 waterfowl.</p> <p>A Heronry occurs to the east of the site.</p>
001169	Brown's Farm, Togher Cross Roads	<p>It is a small site comprising 4 fields, at the intersection of three hedges in the middle, is a small area of exposed mud, whose vegetation is trampled and grazed. Here the Red Data Book species - Golden Dock (<i>Rumex maritimus</i>) is found in association with Nodding bur-marigold (<i>Bidens cernua</i>), Water starworts (<i>Callitriche species</i>) and Water-purslane (<i>Lythrum portula</i>). This is another new record for the Golden Dock in E. Cork found in a rare Plant Survey of the area in 1992/3.</p> <p>Golden Dock is a Red Data Book species whose occurrence is apparently declining, often its appearance is only fleeting as it depends on low water levels to provide the right conditions and stimulus for seed germination. This site contains hundreds of immature plants and should be considered for conservation and NHA status to protect this rare plant, to monitor its growth and health and to protect it in future years from threats such as field drainage.</p>
001561	Awbeg Valley (Castletownroche)	<p>The site is of interest because the limestone substrate gives rise to plant communities that are unusual in the south-west.</p>
001793	Blackwater Valley (Ballincurrig Wood)	<p>The Ballincurrig Wood site is recommended for inclusion in the Blackwater Valley NHA because the area supports the growth of a population of the very rare Starred Woodsedge.</p>
001794	Blackwater Valley (Kilcummer)	<p>Within the site there is wet woodland of Alder (<i>Alnus glutinosa</i>) and Willow (<i>Salix species</i>)</p> <p>This woodland is one of a series of woodlands along the banks of the Blackwater river.</p> <p>The valley sides support the growth of much woodland, but also of ecological interest are the marshes, the river itself and the associated limestone outcrops e.g. inland cliffs and craggs.</p> <p>The river-side trees are Alders (<i>Alnus glutinosa</i>) and Willow (<i>Salix species</i>) including the Almond Willow (<i>Salix triandra</i>). The shallower river water and adjacent marshland are vegetated with Common Bulrush (<i>Scirpus lacustris</i> subsp. <i>lacustris</i>), Bur-reeds (<i>Sparganium species</i>) and Pondweeds (<i>Potamogeton species</i>). The flowering rush (<i>Butomus umbellatus</i>) grows locally in the water and Creeping Yellow-Cress (<i>Ronippa sylvestris</i>) on the river banks.</p> <p>The marshland is often colonized by Willow scrub and amongst the bushes Great Yellow-Cress (<i>Ronippa amphibia</i>), Lesser Pond-sedge (<i>Carex acutiformis</i>) and Wood Club-rush (<i>Scirpus sylvaticus</i>) occur with much Lady's smock (<i>Cardamine pratensis</i>), Meadowsweet (<i>Filipendula ulmaria</i>) and Hemp-agrimony (<i>Eupatorium cannabinum</i>).</p>



SITE CODE	SITE NAME	FEATURE OF INTEREST
001795	Blackwater Valley (Killathy Wood)	Killathy Wood is a small strip of mixed woodland c. 1km long, situated on the north bank of the River Blackwater. The dominant species in this woodland is Ash (<i>Fraxinus excelsior</i>) with some Oak (<i>Quercus petraea</i>) and Scot's pine (<i>Pinus sylvestris</i>). Elm (<i>Ulmus species</i>) were present in the wood but many have been killed by Dutch Elm disease and felled for firewood. Sycamore (<i>Acer pseudoptatanus</i>) is also spreading through the wood; at the moment it is found mainly in the eastern half of the site, but it is seriously damaging the character of the wood. Other non-native species include a line of Spruce (<i>Picea species</i>) on the north-west edge of the wood. Cattle have access to shelter and graze in some parts of the wood from the adjacent fields.
001796	Blackwater Valley (Cregg)	It comprises dry deciduous woodland, lowland dry grassland, the river channel, scrub and mixed woodland. There is very little information on this site; the ranger notes the spread of Rhododendron and Cherry Laurel at the eastern edge of the wood.
001797	Blackwater Valley (The Beech Wood)	It comprises both wet and dry deciduous woodland, the dominant species are Oak (<i>Quercus petraea</i>) and Beech (<i>Fagus sylvatica</i>). There is a good ground flora and many woodland birds, the wood also provides cover and seclusion for otters and other mammals.
001799	Ardamadane Wood	<p>This site comprises mainly dry deciduous woodland of Oak (<i>Quercus petraea</i>) and Birch (<i>Betula pubescens</i>) with some scrub woodland and improved agricultural grassland.</p> <p>Ardamadane Woods consists of a patch of scrub with Hazel (<i>Corylus avellana</i>) and Ash and a linear Oak and Birch Wood stretching northwards along the R. Martin towards Waterloo (the river is also included in this site).</p> <p>The flora of Ardamadane Wood is not as species-rich and includes species of more acid conditions such as Great Wood-rush (<i>Luzula sylvatica</i>).</p>
001829	Ballinaltig Beg Pond	The Golden Dock was found on the south-western margin of the pond in association with species such as Marsh Foxtail (<i>Alopecurus gemiculatus</i>), Jointed Rush (<i>Juncus articulatus</i>), Nodding bur-marigold (<i>Bidens armia</i>), Water pepper (<i>Polygonum hydroper</i>) and Brooklime (<i>Veronica beccabunga</i>).
001857	Blarney Bog	The main habitats of the area are lowland wet grassland, both grazed and ungrazed and freshwater marsh/fen. The dominant species of the wet grassland are Reed grass (Phalan's anundinacea), Soft Rush (<i>Juncus effusus</i>) and grasses such as Creeping Bent (<i>Agrostis stolonifera</i>), Tufted Hair-grass (<i>Deschampsia caespitosa</i>) and Yorkshore Fog (<i>Holcus lanatus</i>). Land to the west is generally wetter with herbs such as Greater Tussock-Sedge (<i>Carex paniculata</i>), Greater pond-sedge (<i>Carex riparia</i>) and Bladder-sedge (<i>C. vesicana</i>); commonly occurring herbs are Meadowsweet (<i>Filipondula almaria</i>) and Common Valenian (<i>Valeniana officinalis</i>), locally distributed in the sward are Yellow Loosestrife (<i>Lysimachia vulgaris</i>) and Purple Loosestrife (<i>Lythrum salicana</i>).



SITE CODE	SITE NAME	FEATURE OF INTEREST
		<p>The land nearer the Blarney road is drier with a mixture of grasses and sedges, the ungrazed areas are more tussocky with herbs such as Common Sand (<i>Rumex acetosa</i>) and Tormentil (<i>Potentilla erecta</i>).</p> <p>The area as a whole is used by a variety of bird species, birds noted to be breeding in the site include: the Sedge and Grasshopper Warblers, Reed Bunting, Stonechab, Meadow Pipet, Snipe and Mallard. In the water Snipe and Mallard are seen feeding in the area and also Teal. Hen Harriers, a species listed in Annex 1 of the EU Bird's Directive and also a Red Data Book species whose status is threatened in Ireland, are regularly seen in this area, hunting over the wetter ground and sometimes nesting in the reed beds.</p>
001979	Monkstown Creek	<p>The mudflats and tidal creeks are fringed by a small amount of saltmarsh vegetation while, above the limestone on the southern shore, two areas of semi-natural woodland occur. The latter contain Spindle (<i>Euonymus europaeus</i>) and a thick carpet of Bluebell (<i>Hyacinthoides non-scripta</i>) and Ramsons (<i>Allium ursinum</i>).</p> <p>The area is of value because its mudflats provide an important feeding area for waterfowl and it is a natural part of Cork Harbour which, as a complete unit, is of international importance for waterfowl.</p>
002050	Cregg Castle	<p>This site is a nursery roost of the Daubenton's Bat (<i>Myotis daubentonii</i>). Approximately 100 bats hang from the ceiling of a domed ground floor room in Cregg Castle, approximately 3 miles east of Fermoy Town.</p> <p>This is a site of national importance because it is the second largest nursery colony of this species in the country. The owners are extremely well disposed towards the bats, this site is completely safe from any adverse human disturbance. The only threat facing this site is the deterioration of the castle roof.</p> <p>This species is dependent on aquatic insects so the proximity of the extensive River Blackwater is of utmost importance to the colony. It is essential that pollution of this river system and its associated tributaries is prevented.</p>
002097	Convamore, Ballyhooly (Near Fermoy)	<p>This site is a male roost of the Daubenton's bat (<i>Myotis daubentonii</i>). Approximately 50 bats hang from the roof of the wine cellars in the ground floor of the ruined Convamore House, near Ballyhooly, Co. Cork. This is a site of national importance because it is the only known male roost of this species in the country. The only threat facing the bats at this site is disturbance from people exploring the ruins and the destruction of parts of the cellars walls by people removing bricks.</p> <p>This bat species is dependent on aquatic insects so the proximity of the extensive River Blackwater is of utmost importance to the colony. It is essential that pollution of this river system and its associated tributaries is prevented.</p>



1.3.1.2.1 Potential Effects

Table 1-12 below shows the distance of the designated sites in relation to each node. The closest designated site to the turbine delivery route is Blackwater Valley (The Beech Wood) pNHA, which is located 0.01km from the closest element of infrastructure (node 2.3).

Table 1-12: Distance of Nationally Designated Sites from each node

NODE	pNHA	Distance from node (km)	Hydrological Connection
1.3	Douglas River Estuary	1.10	No
1.3	Dunkettle Shore	1.79	No
1.3	Glanmire Wood	1.81	No
1.3	Cork Lough	4.47	No
1.3	Rockfarm Quarry, Little Island	4.83	No
1.3	Great Island Channel	4.97	No
1.3	Lee Valley	6.74	No
1.3	Blarney Bog	7.81	No
1.3	Monkstown Creek	8.54	No
1.4	Douglas River Estuary	1.22	No
1.4	Dunkettle Shore	1.87	No
1.4	Glanmire Wood	1.89	No
1.4	Cork Lough	4.39	No
1.4	Rockfarm Quarry, Little Island	4.95	No
1.4	Great Island Channel	5.08	No
1.4	Lee Valley	6.63	No
1.4	Blarney Bog	7.68	No
1.4	Monkstown Creek	8.65	No
1.4	Ardamadane Wood	9.90	No
1.6	Ardamadane Wood	10.18	No
1.6	Shournagh Valley	12.32	No
2.0	Blackwater River Callows	1.66	No
2.0	Blackwater Valley (Cregg)	1.66	No
2.0	Blackwater Valley (The Beech Wood)	3.03	No
2.0	Araglin Valley	3.42	No
2.0	Blackwater Valley (Killathy Wood)	5.16	No
2.0	Cregg Castle	5.31	No



NODE	pNHA	Distance from node (km)	Hydrological Connection
2.0	Glanworth Ponds	8.08	No
2.1	Blackwater River Callows	0.59	Potential connection via road drainage. Surface runoff drains into numerous grates uphill of Blackwater.
2.1	Blackwater Valley (The Beech Wood)	1.02	Potential connection via road drainage. Surface runoff drains into numerous grates uphill of Blackwater. No potential for direct runoff pathway.
2.1	Blackwater Valley (Cregg)	3.75	Potential connection via road drainage. Surface runoff drains into numerous grates uphill of Blackwater. No potential for direct runoff pathway.
2.1	Cregg Castle	4.08	No
2.1	Araglin Valley	5.05	No
2.1	Blackwater Valley (Killathy Wood)	5.50	No
2.1	Glanworth Ponds	8.81	No
2.1	Convamore, Ballyhooly (Near Fermoy)	9.77	No
2.2	Blackwater Valley (The Beech Wood)	0.33	No
2.2	Blackwater River Callows	1.28	No
2.2	Blackwater Valley (Cregg)	3.03	No
2.2	Cregg Castle	3.36	No
2.2	Blackwater Valley (Killathy Wood)	4.78	No
2.2	Araglin Valley	5.69	No
2.2	Glanworth Ponds	8.38	No
2.2	Convamore, Ballyhooly (Near Fermoy)	9.06	No
2.3	Blackwater Valley (The Beech Wood)	0.01	No direct connection (no drainage network). Limited potential for road verge runoff towards Blackwater.
2.3	Blackwater River Callows	2.11	No direct connection (no drainage network). Limited potential for road verge runoff towards Blackwater.



NODE	pNHA	Distance from node (km)	Hydrological Connection
2.3	Blackwater Valley (Cregg)	2.19	No direct connection (no drainage network). Limited potential for road verge runoff towards Blackwater.
2.3	Cregg Castle	2.53	No
2.3	Blackwater Valley (Killathy Wood)	3.95	No
2.3	Araglin Valley	6.44	No
2.3	Glanworth Ponds	7.88	No
2.3	Convamore, Ballyhooly (Near Fermoy)	8.24	No
2.3	Blackwater Valley (Kilcummer)	9.30	No
2.3	Ballinaltig Beg Pond	9.32	No
2.3	Brown's Farm, Togher Cross Roads	9.63	No
2.4	Blackwater Valley (The Beech Wood)	0.26	No direct connection (no drainage network). Limited potential for road verge runoff towards Blackwater.
2.4	Blackwater Valley (Cregg)	2.04	No
2.4	Blackwater River Callows	2.31	No direct connection (no drainage network). Limited potential for road verge runoff towards Blackwater.
2.4	Cregg Castle	2.34	No
2.4	Blackwater Valley (Killathy Wood)	3.76	No
2.4	Araglin Valley	6.51	No
2.4	Glanworth Ponds	7.59	No
2.4	Convamore, Ballyhooly (Near Fermoy)	8.03	No
2.4	Blackwater Valley (Kilcummer)	9.09	No
2.4	Brown's Farm, Togher Cross Roads	9.34	No
2.4	Ballinaltig Beg Pond	9.59	No
2.5	Blackwater Valley (Killathy Wood)	0.80	Limited potential indirect connection (drain inlet in road surface adjacent to wall)
2.5	Convamore, Ballyhooly (Near Fermoy)	2.18	No
2.5	Blackwater Valley (Kilcummer)	3.24	No
2.5	Blackwater Valley (Cregg)	3.34	No
2.5	Cregg Castle	3.50	No
2.5	Blackwater Valley (The Beech Wood)	5.05	No



NODE	pNHA	Distance from node (km)	Hydrological Connection
2.5	Glanworth Ponds	5.36	No
2.5	Ballinaltig Beg Pond	5.68	No
2.5	Brown's Farm, Togher Cross Roads	6.17	No
2.5	Blackwater River Callows	8.17	No
2.5	Araglin Valley	11.90	No
2.6	Blackwater Valley (Killathy Wood)	1.03	No
2.6	Convamore, Ballyhooly (Near Fermoy)	1.93	No
2.6	Blackwater Valley (Kilcummer)	3.00	No
2.6	Blackwater Valley (Cregg)	3.57	No
2.6	Cregg Castle	3.74	No
2.6	Blackwater Valley (Ballincurrig Wood)	4.22	No
2.6	Awbeg Valley (Castletownroche)	4.41	No
2.6	Blackwater Valley (The Beech Wood)	5.28	No
2.6	Glanworth Ponds	5.56	No
2.6	Ballinaltig Beg Pond	5.76	No
2.6	Brown's Farm, Togher Cross Roads	6.30	No
2.6	Bride/Bunaglanna Valley	7.05	No
2.6	Blackwater Valley (Killavullen)	7.58	No
2.6	Blackwater River Callows	8.42	No
2.6	Awbeg Valley (Below Doneraile)	8.57	No
2.7	Awbeg Valley (Below Doneraile)	8.46	No
2.7	Awbeg Valley (Castletownroche)	4.24	No
2.7	Blackwater Valley (Killathy Wood)	1.23	Potential remote indirect connection via surface runoff.
2.7	Convamore, Ballyhooly (Near Fermoy)	1.73	No
2.7	Blackwater Valley (Kilcummer)	2.81	No
2.7	Blackwater Valley (Cregg)	3.77	Potential remote indirect connection via surface runoff.
2.7	Cregg Castle	3.94	No
2.7	Blackwater Valley (Ballincurrig Wood)	4.02	No
2.7	Blackwater Valley (The Beech Wood)	5.48	Potential remote indirect connection via surface runoff.
2.7	Glanworth Ponds	5.62	No



NODE	pNHA	Distance from node (km)	Hydrological Connection
2.7	Ballinaltig Beg Pond	5.72	No
2.7	Brown's Farm, Togher Cross Roads	6.31	No
2.7	Bride/Bunaglanna Valley	6.96	No
2.7	Blackwater Valley (Killavullen)	7.38	No
2.7	Blackwater River Callows	8.62	No
2.8	Convamore, Ballyhooly (Near Fermoy)	1.53	No
2.8	Blackwater Valley (Killathy Wood)	1.69	Potential remote indirect connection via surface runoff.
2.8	Blackwater Valley (Kilcummer)	2.52	No
2.8	Blackwater Valley (Ballincurrig Wood)	3.74	No
2.8	Blackwater Valley (Cregg)	4.13	Potential remote indirect connection via surface runoff.
2.8	Awbeg Valley (Castletownroche)	4.16	No
2.8	Cregg Castle	4.34	No
2.8	Blackwater Valley (The Beech Wood)	5.84	Potential remote indirect connection via surface runoff.
2.8	Ballinaltig Beg Pond	6.15	No
2.8	Glanworth Ponds	6.23	No
2.8	Bride/Bunaglanna Valley	6.33	No
2.8	Brown's Farm, Togher Cross Roads	6.82	No
2.8	Blackwater Valley (Killavullen)	7.03	No
2.8	Awbeg Valley (Below Doneraile)	8.67	No
2.8	Blackwater River Callows	9.01	No
2.9	Blackwater Valley (Killathy Wood)	1.60	No
2.9	Convamore, Ballyhooly (Near Fermoy)	1.76	No
2.9	Blackwater Valley (Kilcummer)	2.73	No
2.9	Blackwater Valley (Ballincurrig Wood)	3.95	No
2.9	Blackwater Valley (Cregg)	3.98	No
2.9	Cregg Castle	4.20	No
2.9	Awbeg Valley (Castletownroche)	4.39	No
2.9	Blackwater Valley (The Beech Wood)	5.68	No
2.9	Bride/Bunaglanna Valley	6.20	No
2.9	Ballinaltig Beg Pond	6.37	No
2.9	Glanworth Ponds	6.38	No



NODE	pNHA	Distance from node (km)	Hydrological Connection
2.9	Brown's Farm, Togher Cross Roads	7.02	No
2.9	Blackwater Valley (Killavullen)	7.22	No
2.9	Blackwater River Callows	8.86	No
2.9	Awbeg Valley (Below Doneraile)	8.91	No
2.10	Blackwater Valley (Killathy Wood)	1.79	Potential remote indirect connection via surface runoff.
2.10	Convamore, Ballyhooly (Near Fermoy)	2.04	No
2.10	Blackwater Valley (Kilcummer)	2.92	No
2.10	Blackwater Valley (Cregg)	4.00	Potential remote indirect connection via surface runoff.
2.10	Blackwater Valley (Ballincurrig Wood)	4.13	No
2.10	Cregg Castle	4.24	No
2.10	Awbeg Valley (Castletownroche)	4.65	No
2.10	Blackwater Valley (The Beech Wood)	5.67	Potential remote indirect connection via surface runoff.
2.10	Bride/Bunaglanna Valley	5.81	No
2.10	Ballinaltig Beg Pond	6.79	No
2.10	Glanworth Ponds	6.79	No
2.10	Blackwater Valley (Killavullen)	7.32	No
2.10	Brown's Farm, Togher Cross Roads	7.44	No
2.10	Blackwater River Callows	8.87	No
2.10	Awbeg Valley (Below Doneraile)	9.28	No
2.11	Convamore, Ballyhooly (Near Fermoy)	1.98	No
2.11	Blackwater Valley (Killathy Wood)	2.51	No
2.11	Blackwater Valley (Kilcummer)	2.62	No
2.11	Blackwater Valley (Ballincurrig Wood)	3.75	No
2.11	Awbeg Valley (Castletownroche)	4.44	No
2.11	Blackwater Valley (Cregg)	4.67	No
2.11	Cregg Castle	4.93	No
2.11	Bride/Bunaglanna Valley	5.25	No
2.11	Blackwater Valley (The Beech Wood)	6.33	No
2.11	Blackwater Valley (Killavullen)	6.83	No
2.11	Ballinaltig Beg Pond	7.07	No



NODE	pNHA	Distance from node (km)	Hydrological Connection
2.11	Glanworth Ponds	7.30	No
2.11	Brown's Farm, Togher Cross Roads	7.83	No
2.11	Awbeg Valley (Below Doneraile)	9.31	No
2.11	Blackwater River Callows	9.52	No
2.12	Convamore, Ballyhooly (Near Fermoy)	3.28	No
2.12	Blackwater Valley (Kilcummer)	3.58	No
2.12	Bride/Bunaglanna Valley	3.73	No
2.12	Blackwater Valley (Killathy Wood)	3.78	Yes; node is at bridge over Lisheen Cross Roads Watercourse, c.
2.12	Blackwater Valley (Ballincurrig Wood)	4.41	No
2.12	Awbeg Valley (Castletownroche)	5.38	No
2.12	Blackwater Valley (Cregg)	5.51	Yes; node is at bridge over Lisheen Cross Roads Watercourse, c.
2.12	Cregg Castle	5.80	No
2.12	Blackwater Valley (The Beech Wood)	7.03	Yes; node is at bridge over Lisheen Cross Roads Watercourse, c.
2.12	Blackwater Valley (Killavullen)	7.07	No
2.12	Ballinaltig Beg Pond	8.51	No
2.12	Glanworth Ponds	8.82	No
2.12	Brown's Farm, Togher Cross Roads	9.33	No
2.13	Bride/Bunaglanna Valley	3.31	No
2.13	Convamore, Ballyhooly (Near Fermoy)	3.80	No
2.13	Blackwater Valley (Kilcummer)	4.09	No
2.13	Blackwater Valley (Killathy Wood)	4.10	No
2.13	Blackwater Valley (Ballincurrig Wood)	4.88	No
2.13	Blackwater Valley (Cregg)	5.64	No
2.13	Awbeg Valley (Castletownroche)	5.88	No
2.13	Cregg Castle	5.93	No
2.13	Blackwater Valley (The Beech Wood)	7.09	No
2.13	Blackwater Valley (Killavullen)	7.44	No
2.13	Ballinaltig Beg Pond	9.02	No
2.13	Glanworth Ponds	9.27	No



NODE	pNHA	Distance from node (km)	Hydrological Connection
2.13	Brown's Farm, Togher Cross Roads	9.82	No
Junction 1	Bride/Bunaglanna Valley	8.10km	No
Junction 1	Ardamadane Wood	9.58km	No
Junction 2	Bride/Bunaglanna Valley	8.13km	No
Junction 2	Ardamadane Wood	9.72km	No
Offsite Turning and Transfer Area	Bride/Bunaglanna Valley	6.72km	No
Offsite Turning and Transfer Area	Ardamadane Wood	8.82km	No

The proposed development is not within the boundary of any designated conservation area. The site has limited potential to be indirectly hydrologically connected to the following:

- Blackwater River Callows pNHA
- Blackwater Valley (The Beech Wood) pNHA
- Blackwater Valley (Cregg)
- Blackwater Valley (Killathy Wood)
- Blackwater Valley (Ballincurrig Wood).

All of these sites overlap with European sites whose designation supersedes that of the national sites. A separate Appropriate Assessment Screening Report has been undertaken to identify any potential significant effects to European sites (SACs and SPAs) resulting from the proposed TDR.

- Blackwater River Callows pNHA overlaps with Blackwater River Callows SPA
- Blackwater Valley (The Beech Wood) pNHA, Blackwater Valley (Cregg), Blackwater Valley (Killathy Wood), Blackwater Valley (Ballincurrig Wood) overlap with Blackwater River (Cork/Waterford) SAC.

1.3.1.2.2 Mitigation Measures

Mitigation measures are outlined in Table 1-13 and Table 1-14, including measures to protect water quality and the spread of invasive species.

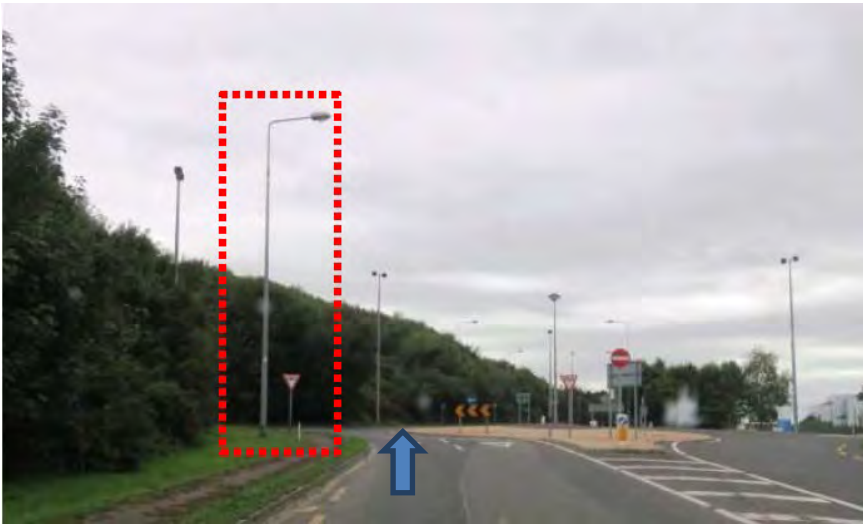



1.3.1.2.3 Residual Effect

With the implementation of these mitigation measures no negative effects are envisaged on these sites.



1.3.2 Description of Existing Habitats, and proposed works at each node

The following outlines the habitats at each node, their ecological value, and the potential effect of the proposed works on these. Any invasive species present are also discussed. Mitigation measures required to alleviate these effects are detailed, as well as any residual effect. All load-bearing will be temporary and will be reinstated upon completion. Thus, potential effects at operational and decommissioning phases have been scoped out.

Node 1.0 (All Routes)	
<p>Photo Reference:</p> 	<p>LEGEND:</p> <p>Direction of Delivery </p> <p>Pinch Points </p> <p>Location Map:</p> 
<p>Upgrade works: Street furniture will be removed to allow rear oversail.</p>	
<p>Habitat Type <i>BL3 Buildings and Artificial Surfaces</i> Man-made artificial surface.</p>	
<p>Ecological Value & Effect This habitat type is of no ecological value. No effect envisaged.</p>	
<p>Mitigation Measures None required.</p>	
<p>Residual Effect No residual effect is envisaged.</p>	



Node 1.1. (All Routes)	
<p>Photo Reference:</p>	<p>LEGEND:</p> <p>Direction of Delivery </p> <p>Pinch Points </p>
<p>Location Map:</p>	
<p>Upgrade works:</p> <p>This roundabout will be travelled by contraflow. Upgrade works have been carried out on this roundabout and may require further investigation.</p>	
<p>Habitat Type</p> <p><i>BL3 Buildings and Artificial Surfaces</i></p> <p>Manmade artificial surface.</p>	
<p>Ecological Value & Effect</p> <p>This habitat type is of no ecological value. No effect envisaged.</p>	
<p>Mitigation Measures</p> <p>None required.</p>	
<p>Residual Effect</p> <p>No residual effect is envisaged.</p>	

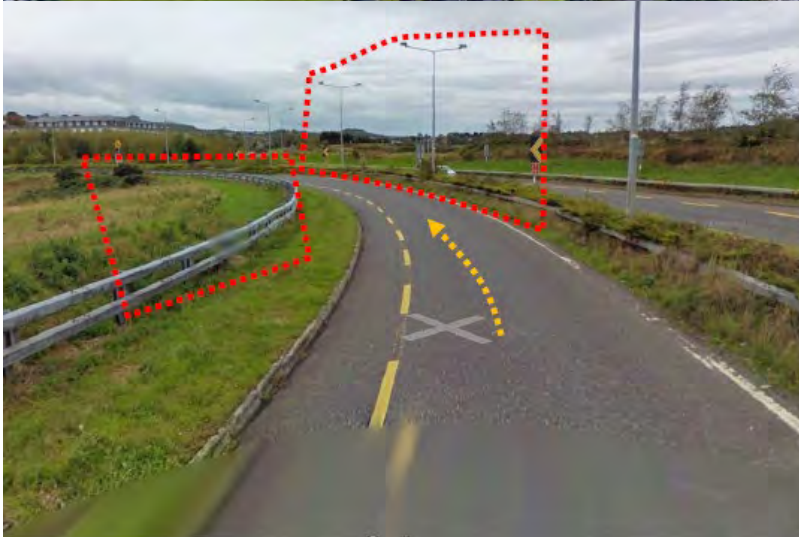


Node 1.2	
<p>Photo Reference:</p>	<p>LEGEND:</p> <p>Direction of Delivery </p> <p>Pinch Points </p> <p>Location Map:</p>
<p>Upgrade works: Yield sign to be removed.</p>	
<p>Habitat Type <i>BL3 Buildings and Artificial Surfaces</i> Manmade artificial surface.</p>	
<p>Ecological Value & Effect This habitat type is of no ecological value. No effect envisaged.</p>	
<p>Mitigation Measures None required.</p>	
<p>Residual Effect No residual effect is envisaged.</p>	



Node 1.2.1

Photo Reference:



LEGEND:

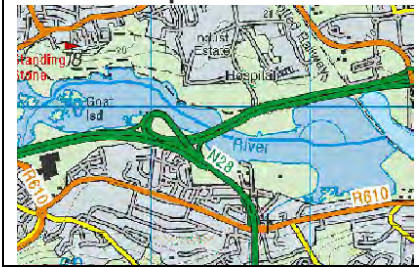
Direction of Delivery



Pinch Points



Location Map:



Upgrade works:

This ramp may need safety barrier on inside of curve (left side) to be removed. Also street lighting on right may need to be removed.

Habitat Type

BL3 Buildings and Artificial Surfaces

Manmade artificial surface.

Ecological Value & Effect

This habitat type is of no ecological value. No effect envisaged.

Mitigation Measures

None required.

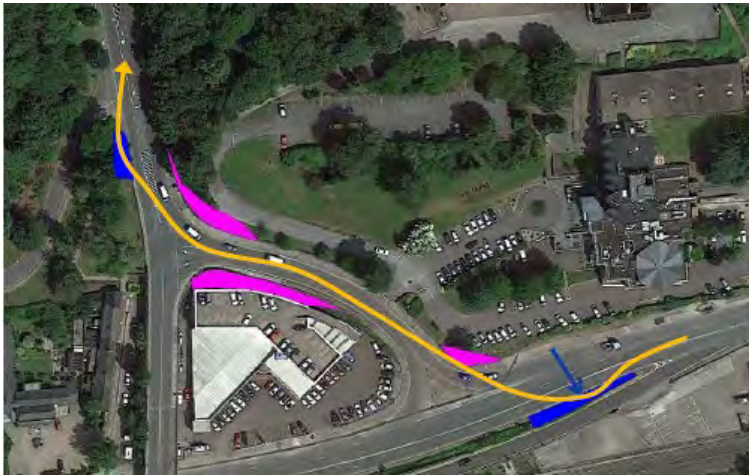
Residual Effect

No residual effect is envisaged.



Node 1.3

Photo Reference:



LEGEND:

Load bearing:



Oversail:



Location Map:



Upgrade works:

Street furniture removal, hedge/tree trimming, ramping of existing traffic splitter island.

Habitat Type

Oversail area – tree trimming

WD5 Scattered trees and parkland

A single Atlantic cedar *Cedrus atlantica*.

GA2 Amenity grassland

Located underneath WD5 area. No bird/bat potential.

Load bearing area

GS2/ED3 Dry meadows and grassy verges x Recolonising bare ground mosaic.

Parts dominated by false-oat grass *Arrhenatherum elatius*; remainder ruderal species.

Scarlet pimpernel *Anagallis arvensis*, pineappleweed *Matricaria discoidea*, common sorrel *Rumex acetosa*, broad leaved dock *Rumex obtusifolius*, knotgrass *Polygonum aviculare*, fat hen *Chenopodium album*, red clover *Trifolium pratense*, white clover *Trifolium repens*, hedge bindweed *Calystegia sepium*, scentless mayweed *Tripleurospermum inodorum*, common poppy *Papaver rhoeas*, creeping thistle *Cirsium arvense*, hairy willowherb *Epilobium hirsutum* and common rampion fumitory *Fumaria muralis*.

There is also a single bay laurel *Laurus nobilis* (small bush) at ITM 570826, 572438.

Old man's beard (also known as Traveller's-joy) *Clematis vitalba* (5 x 2m) at ITM 570843, 572446 within the footprint of the proposed upgrade works.



Ecological Value & Effect

Oversail area

WD5 Scattered trees and parkland

The tree is considered to be of local importance, lower value. It is a non-native species, with low bird-nesting potential, and no/extremely low potential to provide bat roosting habitat. Thus, it a local, reversible, temporary, slight effect is envisaged on the habitat.

GA2 Amenity grassland (improved)

This is considered to be of local importance, lower value. The habitat is species poor and subject to regular mowing. As it is subjected to ongoing trimming the proposed effect will be local, reversible, temporary and imperceptible effect is envisaged on the habitat.

Load bearing area

GS2/ED3 Dry meadows and grassy verges x Recolonising bare ground mosaic.

The species present are widespread and common. There is also the presence of a medium-risk invasive species (*Clematis vitalba*). The habitat is thus considered to be of local importance, lower value. The effect of the proposed upgrade works is considered to be a local, reversible, temporary-term and slight.

Mitigation Measures

To avoid a negative effect on nesting bird species, trimming will take place outside of the nesting season.

To avoid the spread of traveller's-joy *Clematis vitalba*, the mitigation measures outlined in section 1.3.3 and 1.3.4 will be followed.

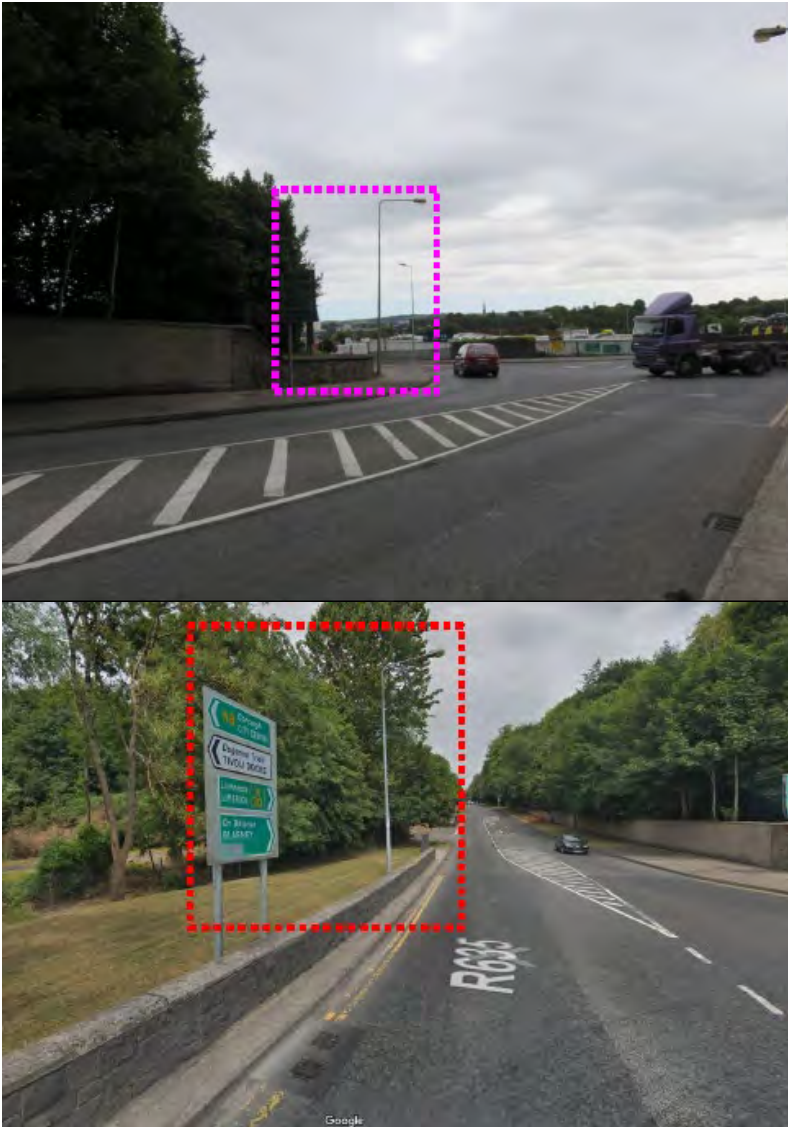
Residual Effect

No residual effect is envisaged.




Node 1.4

Photo Reference:

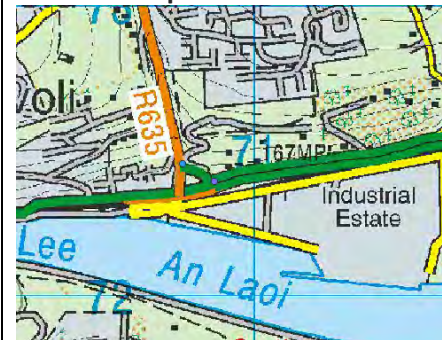


LEGEND:

Direction of Delivery ←

Pinch Points 

Location Map:



Upgrade works:

Removal of street light and possibly extra load bearing along a section of road verge. Minimal vegetation trimming.

Habitat Type

Oversail (south) (remove signs only; no effect on vegetation)

ED3 Recolonising bare ground

Ragwort *Jacobaea vulgaris*, annual sow-thistle *Sonchus arvensis*, *Epilobium* sp., scarlet pimpernel *Anagallis arvensis* (abundant) and plantain *Plantago lanceolate*.

Oversail (north) some tree trimming

GA2 Amenity grassland

Perennial rye grass *Lolium perenne*, herb robert *Geranium robertianum* and selfheal *Prunella vulgaris*.



WD1 (Mixed) broadleaved woodland

Sycamore *Acer pseudoplatanus*, bay laurel *Laurus nobilis*, holly *Ilex aquifolium* and 1 large yew *Taxus baccata* (not in oversail area). Some Traveller's-joy *Clematis vitalba* present. Bushy areas could have nesting potential. No trees have bat roosting potential. The effect on this habitat is envisaged as being local, reversible, temporary-term and slight.

BL3 Buildings and artificial surfaces

Modern pointed stone wall borders footpath.

Load bearing area

GS2 Dry meadows and grassy verges

Cocksfoot *Dactylis glomerata*, common sorrel *Rumex acetosa*, creeping buttercup *Ranunculus repens*, Yorkshire fog *Holcus lanatus*, broad-leaved dock *Rumex obtusifolius*, silverweed *Potentilla anserine*, selfheal *Prunella vulgaris*.

Overhung by young horse chestnut tree *Aesculus hippocastanum* which has not bird-nesting or bat-roosting potential.

Cherry laurel *Prunus laurocerasus* adjacent to GS2 but not within the footprint but immediately adjacent to load bearing footprint.

Japanese knotweed *Fallopia japonica* present but > 7m outside to the footprint of the proposed upgrade works. one 40m² growth, 12.5m south-west of load bearing footprint. Separated by concrete footpath. One 25m² growth, 16m west of load bearing footprint. Separated by road.

Ecological Value & Effect

Oversail (south) (remove signs only; no effect on vegetation)

ED3 Recolonising bare ground

There will be no change to the existing habitat. No negative effect envisaged.

Oversail (north) some tree trimming

GA2 Amenity grassland

This habitat is species-poor, and widespread in the area. This is considered to be of local importance, lower value. The habitat is species poor and subject to regular mowing. As it is subjected to ongoing trimming the proposed effect on this habitat is envisaged as being local, reversible, temporary and imperceptible.

WD1 (Mixed) broadleaved woodland

These trees have no bat-roosting potential. The species are non-native (Sycamore *Acer pseudoplatanus*, bay laurel) and common (holly *Ilex aquifolium*, a single large yew *Taxus baccata*). The habitat is considered to be of local importance, lower value. However, if trimming were to take place during the nesting season there is the risk of effecting nesting birds; in which case the habitat would be considered to be of local importance, higher value. The effect on this habitat is envisaged as being local, reversible, temporary and slight.

BL3 Buildings and artificial surfaces

Artificial, man-made structure of low ecological value. No negative effect envisaged.

Load bearing area

GS2 Dry meadows and grassy verges

This habitat is species-poor and widespread in the area.



A young horse-chestnut tree is present, but offers no bat-roosting or bird-nesting potential. This is also a non-native species.

There are two invasive species present; cherry laurel *Prunus laurocerasus* and Japanese knotweed *Fallopia japonica*. The cherry laurel *Prunus laurocerasus* is adjacent to GS2, but outside the footprint of the proposed upgrade works. The Japanese knotweed is currently >7m outside the footprint of the proposed upgrade works.

This habitat is considered to be of local importance, low value.

The effect of the proposed upgrade works is considered to be local, long-term, reversible, and significant due to the presence of Japanese knotweed.

Mitigation Measures

Oversail (north) some tree trimming

WD1 (Mixed) broadleaved woodland

To avoid a negative effect on nesting bird species, trimming will take place outside of the nesting season.

Load bearing area

GS2 Dry meadows and grassy verges

This area will be surveyed immediately prior to carrying out upgrade works to ensure the Japanese knotweed *Fallopia japonica* has spread into the footprint of the proposed upgrade works in the intervening years between planning and construction.

To avoid the spread of Japanese knotweed, the mitigation measures outlined in section 1.3.3 and 1.3.4 will be followed.

Residual Effect

No residual effect is envisaged following the implementation of the aforementioned mitigation measures.



Node 1.5

Photo Reference:



LEGEND:

Direction of Delivery



Pinch Points



Location Map:

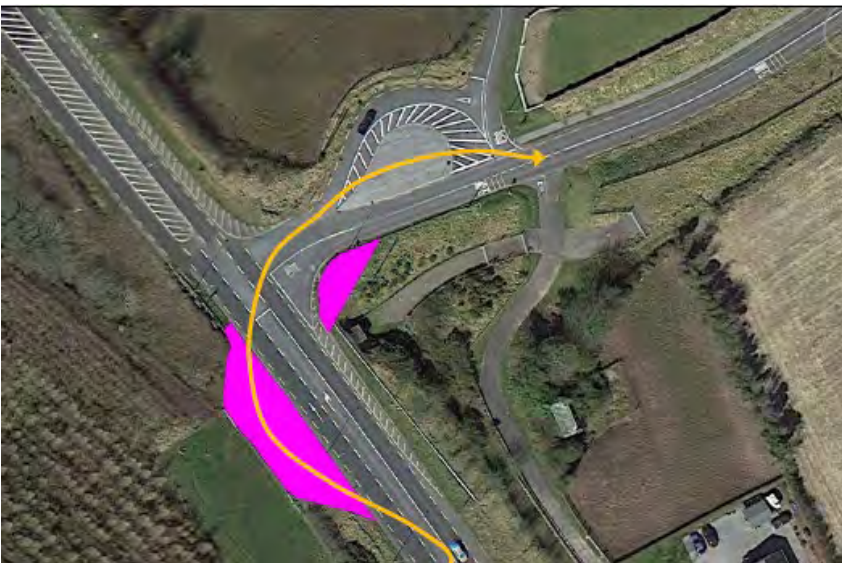
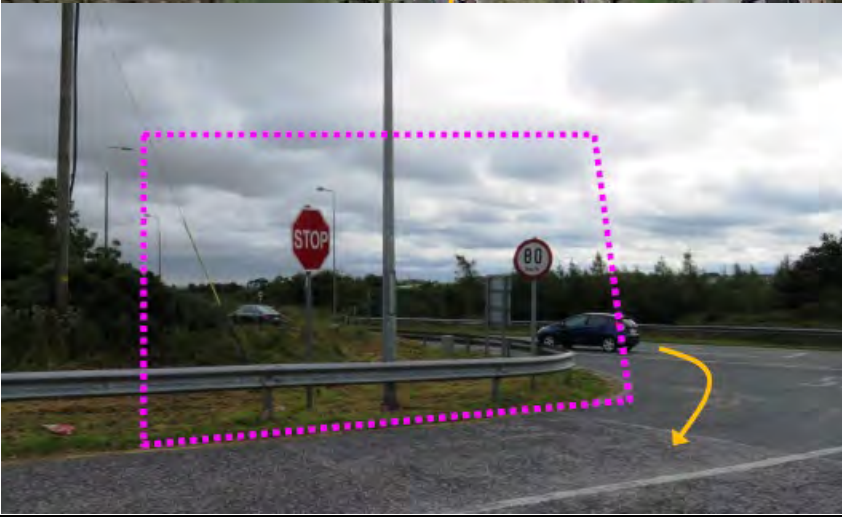


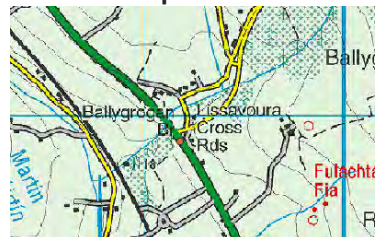


Upgrade works:

This right turn will require travelling in contra flow over the inbound splitter island. Traffic lights should be removed and all kerbing on the splitter island should be ramped with tarmac.



Habitat Type BL3 Buildings and Artificial Surfaces Manmade artificial surface.
Ecological Value & Effect This habitat type is of no ecological value. No impact envisaged.
Mitigation Measures None required.
Residual Effect No residual effect is envisaged.

Node 1.6	
Photo Reference:  	LEGEND: Load bearing:  Oversail:  Location Map: 
Upgrade works: Scrub clearance and street furniture removal.	



Habitat Type

BL3 Buildings and Artificial Surfaces

Manmade artificial surface.

Oversail (east)

GS2/WS1 Dry meadows and grassy verges x Scrub mosaic

Dominated by creeping thistle *Cirsium arvense*; false-oat grass *Arrhenatherum elatius*, Yorkshire fog *Holcus lanatus*, cocksfoot *Dactylis glomerata*, field horsetail *Equisetum arvense* and rosebay willowherb *Epilobium angustifolium* also present.

Scrub element is bramble *Rubus fruticosus* agg. and European gorse *Ulex europaeus*. Vegetation is low, so clearance, if any, will be limited to small amount of gorse.

Oversail (west)

GS2/WS1 Dry meadows and grassy verges x Scrub mosaic

Scrub element is bank dominated by bramble *Rubus fruticosus* agg., with some hedge bindweed *Calystegia sepium*, rosebay willowherb *Epilobium angustifolium* and hogweed *Heracleum sphondylium*. There is also a single, immature *Corylus avellana*.

GS2 Dry meadows and grassy verges

Creeping thistle *Cirsium arvense*, nipplewort *Lapsana communis*, redshank *Persicaria maculosa*, false oat *Arrhenatherum elatius*, oats *Avena sativa*, knotgrass *Polygonum arenastrum*, Annual meadow grass *Poa annua*, Bird vetch *Vicia cracca*, prickly sow-thistle *Sonchus asper*, 1 x Irish spurge *Euphorbia hyberna*, groundsel *Senecio vulgaris*, white clover *Trifolium repens*, creeping cinquefoil *Potentilla reptans* and scarlet pimpernel *Anagallis arvensis*.

Ecological Value & Effect

BL3 Buildings and Artificial Surfaces

This is an artificial surface with no ecological value. No effect is envisaged.

GS2 Dry meadows and grassy verges

This habitat type is comprised of species which are widespread and common. They are also subject to some degree of regular trimming to maintain visibility at roadsides. It is, thus, considered to be of local importance, lower value. The effect on this habitat is envisaged as being local, reversible, temporary and imperceptible.

GS2/WS1 Dry meadows and grassy verges x Scrub mosaic

The effect of the proposed upgrade works is envisaged as being local, temporary, reversible, imperceptible.

Mitigation Measures

None required.

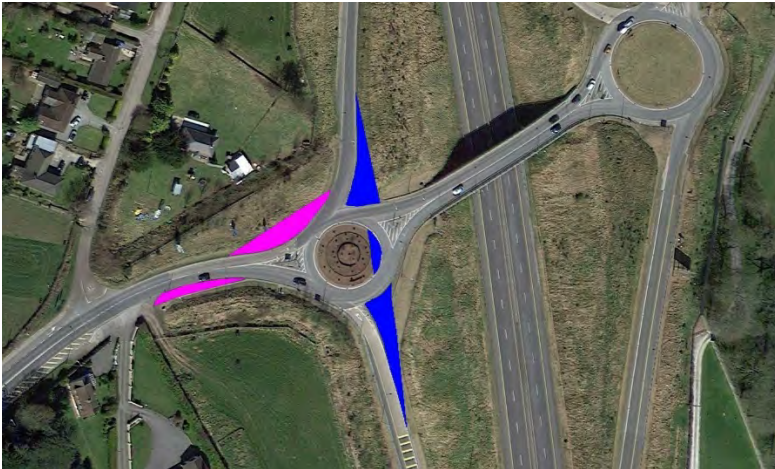
Residual Effect

No residual effect is envisaged.



Node 2.0

Photo Reference:



LEGEND:

Load bearing:



Oversail:



Location Map:



Upgrade works:

Removal of street furniture, hedge trimming, extra load bearing on sections of grassed verges.



Habitat Type

Load bearing areas

South:

GA2 Amenity grassland

Cropped perennial rye grass *Lolium perenne*, creeping cinquefoil *Potentilla reptans*, ragwort *Jacobaea vulgaris*, Yorkshire fog *Holcus lanatus*, common mouse-ear *Cerastium fontanum*, white clover *Trifolium repens*, red clover *Trifolium pratense* and selfheal *Prunella vulgaris*.

Roundabout:

GA2 Amenity grassland

Cropped perennial rye grass *Lolium perenne*, creeping cinquefoil *Potentilla reptans*, ragwort *Jacobaea vulgaris*, Yorkshire fog *Holcus lanatus*, common mouse-ear *Cerastium fontanum*, white clover *Trifolium repens*, red clover *Trifolium pratense* and selfheal *Prunella vulgaris*.

Box hedge *Buxus sempervirens* shrubs also present.

North:

GA2 Amenity grassland

Cropped perennial rye grass *Lolium perenne*, creeping cinquefoil *Potentilla reptans*, ragwort *Jacobaea vulgaris*, Yorkshire fog *Holcus lanatus*, common mouse-ear *Cerastium fontanum*, white clover *Trifolium repens*, red clover *Trifolium pratense* and selfheal *Prunella vulgaris*.

Bordered by GS2/WS1 Amenity grassland x Scrub mosaic.

GS2 x WS1 Dry meadows and grassy verges x Scrub mosaic

(some of this mosaic is within the footprint of the proposed upgrade works).

Species include prickly sow thistle *Sonchus asper*, Broad-leaved plantain *Plantago major*, colt's foot *Tussilago farfara*, bird's-foot trefoil *Lotus corniculatus*, false oat-grass *Arrhenatherum elatius*, cocksfoot *Dactylis glomerata*, Ribwort plantain *Plantago lanceolata*, knapweed *Centaurea nigra*, lesser stitchwort *Stellaria graminea*, dog rose *Rosa arvensis*, bramble *Rubus fruticosus* agg., creeping bentgrass *Agrostis stolonifera*, greater birdsfoot trefoil *Lotus pedunculatus*, tufted vetch *Vicia cracca*, alder *Alnus glutinosa* (dominant), willow *Salix* Sp., oak *Quercus* sp. (occasional), birch *Betula pendula* sp. and hawthorn *Crataegus monogyna*.

Limited bird nesting potential; only edge of GS2/WS1 is within the footprint of the proposed upgrade works.

Oversail areas

GA2 Amenity grassland (improved)

Trimmed grassland, similar to above.

ED3 x GS2 Recolonising bare ground x Dry meadows and grassy verges mosaic, with WS1 Scrub

Young trees (road planting) along the edge. Alder *Alnus glutinosa*, hawthorn *Crataegus monogyna* and willow *Salix* Sp. No bat-roosting potential. Limited bird nesting potential, but birds are active in the immediate area.

An area of the bank within the footprint of the proposed upgrade works is covered in winter heliotrope *Petasites fragrans*. Part of bank will have to be lowered, also resulting in removal of some trees.



Ecological Value & Effect

Load bearing areas

South:

GA2 Amenity grassland

This habitat is widespread in the area. The species of which it is composed are common and widespread in the area. It is of local importance, lower value. No negative effect is envisaged.

Roundabout:

GA2 Amenity grassland

This habitat is widespread in the area. The species of which it is composed are common and widespread in the area. It is of local importance, lower value. No negative effect is envisaged.

North:

GA2 Amenity grassland

This habitat is widespread in the area. The species of which it is composed are common and widespread in the area. It is of local importance, lower value. No negative effect is envisaged.

GS2/WS1 Dry meadows and grassy verges x Scrub

Although this habitat is relatively species-rich, the species are widespread and common in the wider area. There is, however, limited bird-nesting potential. It is of local importance, lower value. The proposed effect will be local, reversible, short-term and imperceptible.

Oversail areas

GA2 Amenity grassland

This habitat is widespread in the area. The species of which it is composed are common and widespread in the area. It is of local importance, lower value. No negative effect is envisaged.

ED3 x GS2 Recolonising bare ground x Dry meadows and grassy verges mosaic, with WS2 Immature Woodland

The tree species comprising this habitat are common and widespread in the area. They are immature, and offer no bat-roosting potential. They do, however, offer limited bird-nesting potential.

There is extensive winter heliotrope along the bank within the footprint of the proposed upgrade works. This is a non-native, invasive species.

Therefore, this habitat is considered to be of local importance, lower value. The proposed effect will be local, reversible, short-term and slight.

Mitigation Measures

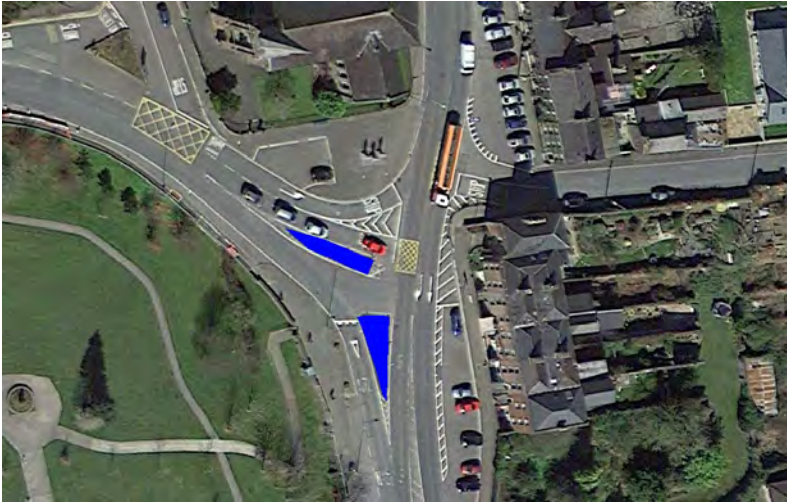



To avoid a negative effect on nesting bird species, trimming will take place outside of the nesting season.

Winter heliotrope spreads vegetatively by its extensive rhizome network. Disturbance can result in the spread of the species. To avoid spreading this species, the mitigation measures outlined in 1.3.3 will be followed.



Residual Effect

No residual effect is envisaged following the aforementioned measures.



Node 2.1	
<p>Photo Reference:</p> 	<p>LEGEND:</p> <p>Load bearing: </p> <p>Oversail: </p>
<p>Location Map:</p> 	
<p>Upgrade works: Removal of street furniture, ramping of two splitter islands (using asphalt wedges).</p>	
<p>Habitat Type <i>BL3 Buildings and artificial surfaces</i></p> <p>One drain grate present beside north island; three present to west and downhill (within 5m) of both islands (2 of these were blocked with earth & debris when observed).</p> <p>Open drain to east/downhill of islands intercepted by drain inlets.</p> <p>Path for direct surface runoff exists via carpark on slope adjacent to Blackwater. Highly unlikely runoff would travel this way, however, due to large number of drain grates/inlets between this area and Blackwater.</p>	
<p>Ecological Value & Effect</p> <p>This habitat type is of no ecological value. There is a hydrological connection to the River Blackwater but the surface water from the road will be intercepted by the road drainage. The effect of the proposed upgrade works will be short-term and imperceptible.</p>	
<p>Mitigation Measures</p> <p>None required.</p>	
<p>Residual Effect</p> <p>No residual effect is envisaged.</p>	



Node 2.2	
Photo Reference:	LEGEND:
	<p>Load bearing: </p> <p>Oversail: </p>
Location Map:	
Upgrade works:	
<p>Hedge trimming; reduce to 3m over road level & 2.5m depth. Pole and street light should be removed/relocated.</p>	
Habitat Type	
<p><u>Oversail (west):</u> street furniture only.</p>	
<p><u>Oversail (east)</u> – bushy trees over wall require trimming</p>	
BL1 Stones walls and other stonework	
<p>High (2m) stone wall with occasional crevices; ivy <i>Hedera helix</i> and ivy-leaved toadflax <i>Cymbalaria muralis</i> grow on the wall. Topped with bushy understory/outer edge of woodland behind.</p>	
WD1 (Mixed) broadleaved woodland	
<p>Part near wall is lower, bushy, and regularly trimmed. Larger trees are set back several metres. Wych elm <i>Ulmus glabra</i>, sycamore <i>Acer pseudoplatanus</i>, ash <i>Fraxinus excelsior</i>, beech <i>Fagus sylvatica</i>, hawthorn <i>Crataegus monogyna</i>. Lower bushy growths of wych elm <i>Ulmus glabra</i>, beech <i>Fagus sylvatica</i> and wild privet <i>Ligustrum vulgare</i> grow over the top of the wall.</p>	
<p>No trees with bat-roosting potential within the footprint of the proposed activities, but there is bird nesting potential.</p>	
<p>A single, small Himalayan honeysuckle <i>Leycesteria formosa</i> (small plant) growing on top of wall at 52.140778, -8.286207</p>	
Ecological Value & Effect	
<u>West oversail:</u>	
<p>No ecological value. No negative effect envisaged.</p>	
<u>East oversail</u> – bushy trees over wall require trimming	
BL1 Stones walls and other stonework	
<p>The species growing on the wall are common and widespread. This habitat is considered to be of local importance, low value. It will not be affected by the proposed upgrade works.</p>	



WD1 (Mixed) broadleaved woodland

The species present are relatively widespread and common. There is bird-nesting potential. The habitat is considered to be of local importance, higher value. The proposed effect will be temporary and imperceptible. The effect to the hedgerow could be greater if undertaken during the bird nesting season. Himalayan honeysuckle is a medium-impact invasive species which is spread by seed dispersal.

Mitigation Measures

To avoid a negative effect on nesting bird species, trimming will take place outside of the nesting season. To avoid the spread of Himalayan honeysuckle, the mitigation measures outlined in section 1.3.3 and 1.3.4 will be followed.

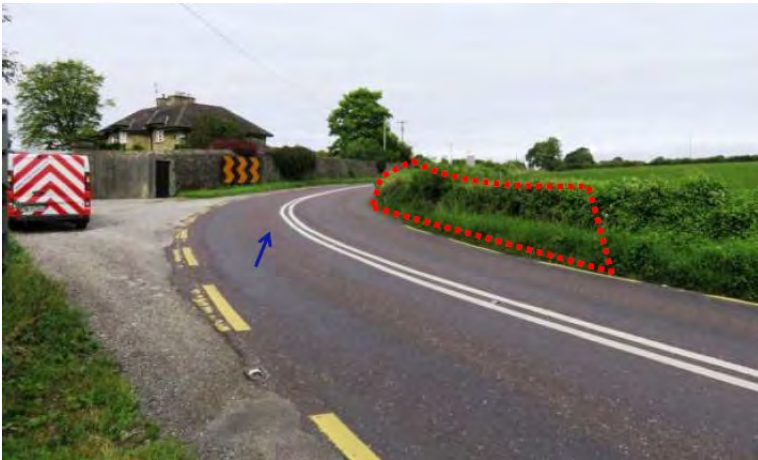
Residual Effects

No residual effect is envisaged following the implementation of the mitigation measures outlined in section 1.3.3 and 1.3.4.



Node 2.3

Photo Reference:



LEGEND:

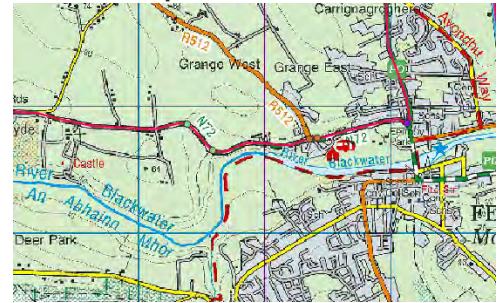
Load bearing:



Oversail:



Location Map:



Upgrade works:

Removal of roadside bank and possibly also load bearing along the road verge.

Habitat Type

Oversail

Trimmed verge (GS2).

WS2 X WL1 Immature woodland x hedgerow mosaic

Ash *Fraxinus excelsior*, ivy *Hedera helix*, bramble *Rubus fruticosus* agg. and old mans beard *Clematis vitalba* present in most sections.

Ecological Value & Effect

WS2 X WL1 mosaic

The existing habitat is subject to regular trimming. The species present are common in the wider area. The habitat is of local importance, lower value. The proposed upgrade works could result in the disturbance of nesting birds. It could also result in the spread of *C. vitalba*.

The effect of the proposed works will be local, reversible, temporary and slight.

No drainage ditches or direct hydrological link to Blackwater; separated by walls, banks, vegetation.

Mitigation Measures

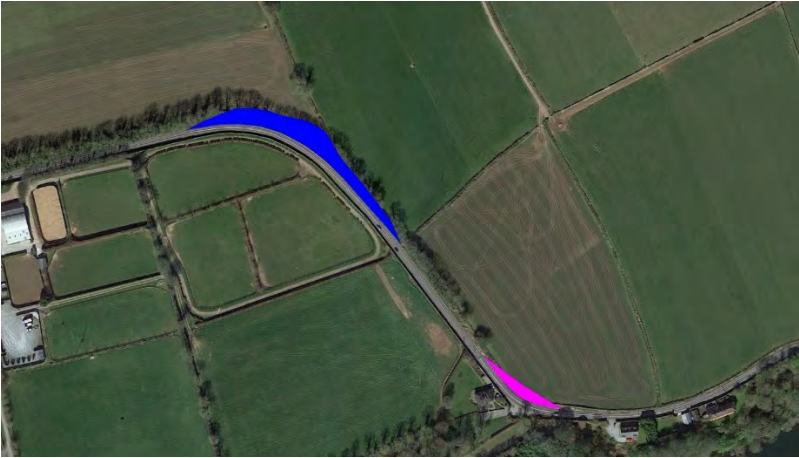



To avoid a negative effect on nesting bird species, trimming will take place outside of the nesting season.

To avoid the spread of *Clematis vitalba*, the mitigation measures outlined in section 1.3.3 will be followed.

Residual Effect

No residual effect is envisaged following the implementation of the mitigation measures outlined in section 1.3.3.

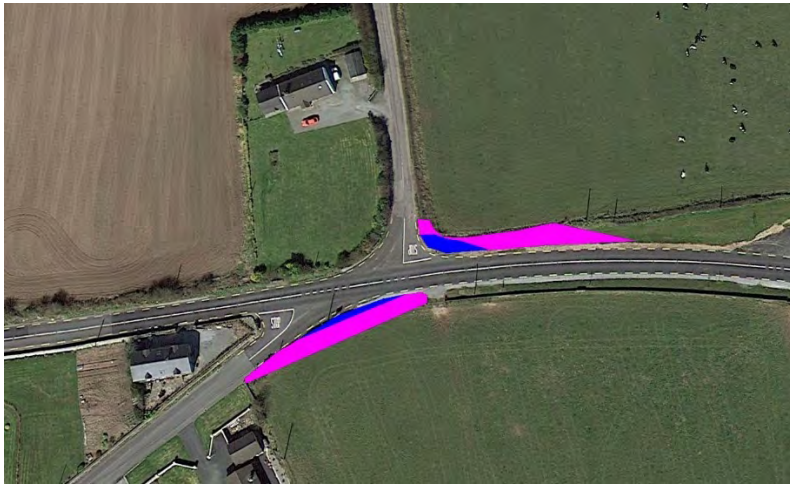


Node 2.4	
<p>Photo Reference:</p> 	<p>LEGEND:</p> <p>Load bearing: </p> <p>Oversail: </p>
<p>Location Map:</p> 	
<p>Upgrade works: Removal of road signs and load bearing along the road verge.</p>	
<p>Habitat Type</p> <p><u>Load bearing</u> GS2 Dry meadows and grassy verges Trimmed verge bordered by bank (also GS2). False oat-grass <i>Arrhenatherum elatius</i>, cleavers <i>Galium aparine</i>, bracken <i>Pteridium aquilinum</i>, hedge woundwort <i>Stachys sylvatica</i> and winter heliotrope <i>Petasites fragrans</i>. There is also a single sessile oak <i>Quercus petraea</i> which has been trimmed.</p> <p>Winter heliotrope is present over large parts of verge and bank within the footprint of the proposed upgrade works.</p>	
<p>Ecological Value & Effect</p> <p>GS2 Dry meadows and grassy verges The verge is subjected to regular trimming and the species present are common and widespread. The verge is above road level so earth will have to be disturbed and moved in order to widen the road. Winter Heliotrope is an invasive species which spreads by rhizomes. Removal of earth could result in the spread of this species. This would have a local, reversible, long-term, significant effect on the habitat. The habitat is of local importance, lower value.</p>	
<p>Mitigation Measures The mitigation measures outlined in section 1.3.3 will be followed to prevent the spread of winter heliotrope.</p>	
<p>Residual Effect No residual effect is envisaged following the implementation of the mitigation measures outlined in section 1.3.3.</p>	



Node 2.5

Photo Reference:



LEGEND:

Load bearing:



Oversail:



Location Map:



Upgrade works:

Removal of pole and road signs, lowering of wall (south side) and bank (north side)

Habitat Type

Oversail/load bearing

North

GA2 Amenity grassland (improved)

Short-cropped grass (*Lolium perenne*) with creeping cinquefoil *Potentilla reptans*, red clover *Trifolium pratense* and white clover *Trifolium repens*.

GS2 Dry meadows and grassy verges x Hedgerow mosaic

One section is bank with false oat grass *Arrhenatherum elatius*, cleavers *Galium aparine*, bramble *Rubus fruticosus* agg., ragwort *Jacobaea vulgaris*, *Calystegia sepium*, dog rose *Rosa arvensis*.

This becomes a trimmed hawthorn *Crataegus monogyna* and bramble *Rubus fruticosus* agg. hedge as the field boundary turns the corner. Some of this hedgerow/bank will be required to be removed. Limited potential for nesting birds.

South

BL1/GS2 Stone walls and other stonework x Dry meadows and grassy verges

Old stone wall covered in ivy *Hedera helix* in parts, bordered by GS2. Part of wall is newer and has been repointed; other section is constructed from larger stones with more gaps in between. Older section also has herb Robert and Silky Wall Feather-moss *Homalothecium sericum*.

A section of this stone wall is required to be removed. A drain grate is present but is outside the footprint of the proposed upgrade works and not immediately adjacent to the wall.



Ecological Value & Effect

Oversail/load bearing

North

GA2 Amenity grassland (improved)

Species-poor habitat, widespread and common. Local importance lower-value. The proposed effect will be local, reversible, temporary and imperceptible.

GS2 Dry meadows and grassy verges x Hedgerow mosaic

Species present are common and widespread. Limited potential for nesting birds. Habitat is considered to be of local importance, lower value, with the effect of the proposed upgrade works being local, reversible, short-term and slight.

South

BL1/GS2 Stone walls and other stonework x Dry meadows and grassy verges

Stone wall is covered with dense ivy in parts. This offers some bird-nesting potential to common passerine species, in which case it is considered to be of local importance, higher value. If the proposed upgrade works are carried out during the bird-nesting season, there is likely to be a local, reversible, long-term, slight effect.

There is a drain grate present adjacent to the wall which may have a hydrological connection to the Blackwater River. However, this is outside of the footprint of the proposed upgrade works, and there is no connection between the node and the Blackwater river.

Mitigation Measures

To avoid a negative effect on nesting bird species, trimming will take place outside of the nesting season.

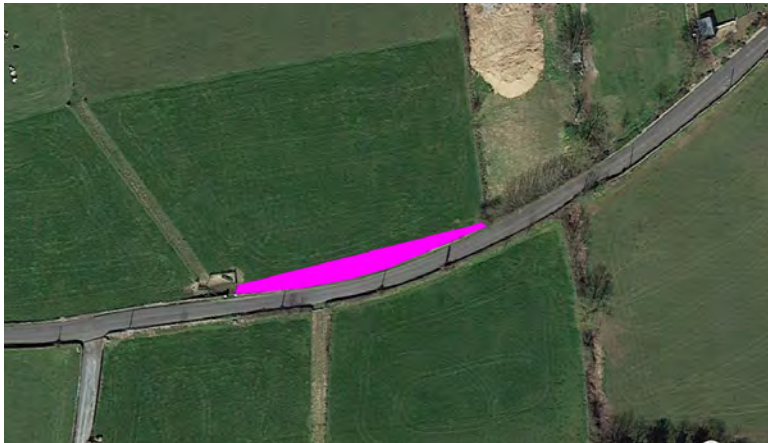
Residual Effect

The residual effect is considered to be long term and not significant. While there will be the removal of potential nesting habitat for birds, the habitat type is common in the wider area. No residual effect is envisaged following the implementation of the aforementioned mitigation measures.



Node 2.6.

Photo Reference:



LEGEND:

Load bearing:



Oversail:



Location Map:



Upgrade works:

Lowering of [retaining] wall and re-grading of slope.

Habitat Type

Oversail- requires wall to be removed and bank behind re-graded
 Densely vegetated retaining wall.

BL1 Stone walls and other stone work

Old stone wall with dense growths of ivy *Hedera helix*. Bramble *Rubus fruticosus* agg., maidenhair spleenwort *Asplenium trichomanes*, Pellitory-of-the-wall *Parietaria officinalis* and herb-robert *Geranium robertianum* also present.

GS2 Dry meadows and grassy verges

On either side of the wall. False oat *Arrhenatherum elatius* abundant. Nettle *Urtica dioica*, sycamore *Acer pseudoplatanus* (sapling) and ragwort *Jacobaea vulgaris*.

GA1 Improved agricultural grassland

Present in the hill behind the wall.

Ecological Value & Effect

The receiving environment consists of habitats (and associated species) which are widespread and common in the area.

They are considered to be of local importance, lower value. However, during the bird-nesting season there is limited potential for smaller species to use this as a nesting site. At this period, it would be considered to be of local importance, higher value.

The effect of the proposed works is envisaged as being local, reversible temporary, and moderate.

Mitigation Measures

To avoid a negative effect on nesting bird species, trimming and levelling of the wall will take place outside of the nesting season.



Residual Effect

No residual effect is envisaged following the implementation of the aforementioned mitigation measures.

Node 2.7

Photo Reference:



LEGEND:

Load bearing:



Oversail:



Location Map:



Upgrade works:

Lowering of a section of wall. Load bearing to verge. Pole and street furniture to be removed/relocated.

Habitat Type

Oversail/load bearing

Old stone wall with heavy growths of ivy, grassy verges.

BL1 Stone walls and other stonework

Dense growths of ivy *Hedera helix* covering the wall, with abundant ivy broomrape *Orobanche hederæ* growing on top (40-50 flowering stems). Dandelion *Taraxacum vulgaria*, nipplewort *Lapsana communis*, herb-robert *Geranium robertianum*, silky wall feather-moss *Homalothecium sericum*, common polypody *Polypodium vulgare*, ribwort plantain *Plantago lanceolata*, maidenhair spleenwort *Asplenium trichomanes*. Additional moss species present are curving feather-moss *Scorpiurium circinatum*, and larger mouse-tail moss *Isothecium alopecuroides*.

GS2 Dry meadows and grassy verges

Along base of wall and also along section where no wall present (wire fence). False oat-grass *Arrhenatherum elatius* dominant.

GA1 Improved agricultural grassland

Field behind wall is GA1.

No direct hydrological connection to Blackwater. The road elevates at the bridge, but there are no direct runoff paths along road.






Road separated from river by walls.

Ecological Value & Effect

Habitats are considered to be of local importance, lower value. No negative effect is envisaged as a result of the proposed upgrade works.



Mitigation Measures None required.
Residual Effect No residual effect is envisaged.

Node 2.8	
Photo Reference: 	LEGEND: Load bearing:  Oversail: 
	Location Map: 

Upgrade works: Laying of temporary hardcore and tree felling
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Habitat Type <u>Load-bearing –</u> GS2 Dry meadows and grassy verges Separates woodland from road, also present along woodland path; dry swale present between road and woodland and road.



GA1 Amenity grassland (Improved)

To south of woodland

WD1 (Mixed) broadleaved woodland

The section of woodland adjacent to the treeline is dominated by fully-grown beech *Fagus sylvatica* and Spanish chestnut trees. Younger trees including pedunculate oak *Quercus robur*, elder *Sambucus nigra* and Scot's pine *Pinus sylvestris* are present in the understory, in clearings and along edges. Western hemlock *Tsuga heterophylla* is also present (1-2 trees).

Wood dock *Luzula sylvatica*, Deer fern *Blechnum spicant* wood avens *Geum urbanum*, bracken *Pteridium aquilinum*, Honeysuckle *Lonicera periclymenum*, pendulous sedge *Carex pendula*, bilberry *Vaccinium myrtillus* are present in the ground and field layers, while rosebay willowherb *Chamerion angustifolium* occurred in clearings and along path edges. Moss species present include Fox-tail Feather-moss *Thamnobryum alopecurum*, Mouse-tail Moss *Isoetecium myosuroides*, and Common Striated Feather-moss *Eurhynchium striatum*.

One mature, ivy-covered beech at the woodland entrance (ITM 572638.0334, 598457.0728) has moderate potential for roosting bats. Some broken limbs, and crevices formed by mature tangled ivy stems.

One chewed cone observed, indicating red squirrel present. There is also a mammal trail leading into the woodland from road.

WL2 Treeline

A section of treeline adjacent to the road. This is comprised of relatively young trees, dominated by beech *Fagus sylvatica*, with Spanish chestnut *Castanea sativa* also present.

No drainage network present providing direct pathway to Blackwater. Limited potential for runoff along road may occur, but similarly to north bank, walls are present along roadsides, so pathway is through field entrances (gaps in the wall) or weepholes at the base of the wall. However, this would only occur during very heavy rainfall / flooding due to the height of the weepholes above ground-level.

Ecological Value & Effect

WD1 (Mixed) broadleaved woodland

There will be no works within this habitat. Thus, no effect will occur.

WL2 Treeline

The tree species present are both native (birch) and non-native (Spanish chestnut; beech). There is moderate bat-roosting potential within the ivy cover, and crevices (beech). These also offer potential habitat to other species including nesting bird species. They are, thus, considered to be of local importance, higher value. The effect of the proposed works is envisaged to be local, irreversible, medium term, and moderate.

Mitigation Measures

Felling will be confined to the treeline, with encroachment into the woodland to be avoided. Where felling is to occur, surveys will be carried out to reconfirm the findings of the Ecological Appraisal.

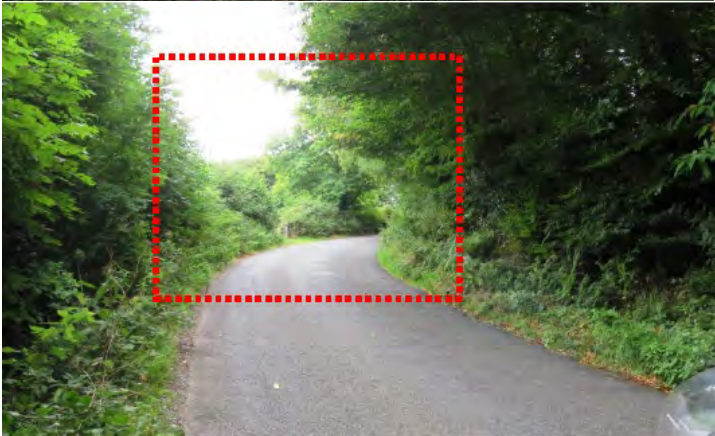
Residual Effect

Following the aforementioned mitigation measures, the felling of an area of WL2 Treeline will yield a short-term and imperceptible effect.



Node 2.9

Photo Reference:



LEGEND:

Load bearing:



Oversail:



Location Map:



Upgrade works:

Laying of temporary hardcore to road verges for load-bearing surface and tree trimming.

Habitat Type

Oversail/load bearing – will require tree felling on bend.

(Same woodland as Node 2.8)

WD1 (Mixed) broadleaved woodland

Fully grown beech *Fagus sylvatica*, birch *Betula pendula*, Spanish chestnut *Castanea sativa* trees.

There are also a group of 4 Spanish chestnut *Castanea sativa* trees with low bat roosting potential at 52.135428, -8.397407. Some bat roosting opportunities in ivy *Hedera helix*. One has a crevice near the base. This is outside the footprint of the proposed upgrade works so will be excluded from felling.

WL2 Treeline

The tree species present are primarily birch *Betula pendula*, Spanish chestnut *Castanea sativa*. These have low bat-roosting potential, and may offer potential habitat to nesting bird species. They are, thus, considered to be of local importance, higher value.



Ecological Value & Effect

WD1 (Mixed) broadleaved woodland

No works will occur within this habitat. Thus, no effect is envisaged.

WL2 Treeline

The habitat is considered to be of local importance, higher value. The effect of the proposed upgrade works will be local, irreversible, medium-term and moderate.

Mitigation Measures

To avoid a negative effect on nesting bird species, trimming will take place outside of the nesting season.

To avoid effecting nesting birds and roosting/hibernating bats, trimming/felling will be carried out in September. A reinspection for roosting bats will be carried out by an ecologist on all effected trees prior to felling to reconfirm the findings of the Ecological Appraisal.

Residual Effect

Following the aforementioned mitigation measures, the felling of an area of WD1 (Mixed) broadleaved woodland will yield a short-term and imperceptible effect.



Node 2.10

Photo Reference:



LEGEND:

Load bearing:



Oversail:



Location Map:



Upgrade works:

Laying of temporary hardcore to road verges for load-bearing surface and tree trimming.

Habitat Type

Oversail/load bearing – will require tree felling on bend.

(Same woodland as Node 2.8)

WD1 (Mixed) broadleaved woodland

Fully grown beech *Fagus sylvatica*, Scots pine *Pinus sylvestris*, holly *Ilex aquifolium* and rowan *Sorbus aucuparia*. Foxglove *Digitalis pupurea* and hogweed *Heracleum sphondylium* along edge, *Blechnum spicant*, broad buckler-fern *Dryopteris dilitata* and soft shield-fern *Polystichum setiferum* in field layer.

Ecological Value & Effect

The habitat is considered to be of local importance, higher value. Some of the trees present have bat-roosting potential, including crevices and peeling bark. The effect of the proposed upgrade works in envisaged as being local, reversible, medium-term and moderate.

Mitigation Measures

To avoid a negative effect on nesting bird species, trimming will take place outside of the nesting season.



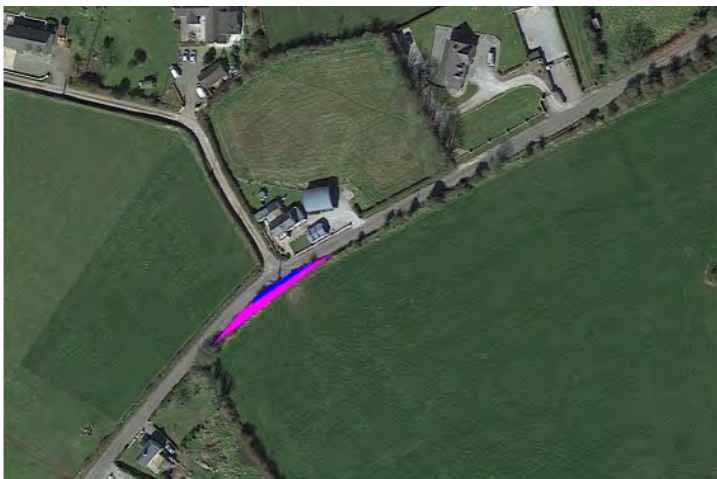
To avoid effecting nesting birds and roosting/hibernating bats, trimming/felling will be carried out in September. A reinspection for roosting bats will be carried out by an ecologist on all effected trees prior to felling to reconfirm the findings of the Ecological Appraisal.

Residual Effect

Following the aforementioned mitigation measures, the felling of an area of WD1 (Mixed) broadleaved woodland will yield a short-term and imperceptible effect.

Node 2.11

Photo Reference:



LEGEND:

Load bearing:



Oversail:



Location Map:



Upgrade works:

Laying of temporary hardcore to road verges for load-bearing and hedgerow trimming. Pole to be removed/relocated.

Habitat Type

Oversail/load bearing

Hedge/bank requires lowering & several small hawthorn trees to be trimmed.

WS1/WL1/BL1 Scrub x Hedgerow X Stone walls and other stone work mosaic

Hedgerow on a bank with bramble *Rubus fruticosus* agg. and occasional hawthorn *Crataegus monogyna* trees. Stone wall covered in vegetation.

Potential for nesting birds.




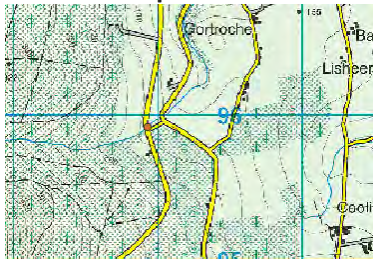
False-oat grass *Arrhenatherum elatius*, soft shield-fern *Polysticum setiferum*, bramble *Rubus fruticosus* agg., wild privet *Ligustrum vulgare*, foxglove *Digitalis purpurea*, bush vetch *Vicia sepium*, wall pennywort *Umbilicus rupestris*, holly *Ilex aquifolium*, honeysuckle *Lonicera periclymenum*, nipplewort *Lapsana communis*, European gorse *Ulex europaeus*, Yorkshire fog *Holcus lanatus*, blackthorn *Prunus spinosa*, ivy *Hedera helix*, creeping buttercup *Ranunculus repens*, cow parsley *Anthriscus sylvestris*, cleavers *Galium aparine* and wild angelica *Angelica sylvestris*.

Ecological Value & Effect

Habitat is of local importance, lower value as the species and habitat are common in the wider area. However, this will increase to local importance, higher value during the bird nesting season.







<p>The effect of the proposed upgrade works will be local, reversible, temporary and slight.</p> <p>A hen harrier nest was recorded 1.78km from this node in 2014. However, the habitats recorded at the site are of low value to hen harrier, and adjacent to an existing road. Thus, no effect is envisaged to the species.</p>
<p>Mitigation Measures</p> <p>To avoid a negative effect on nesting bird species, trimming will take place outside of the nesting season.</p>
<p>Residual Effect</p> <p>No residual effect is envisaged.</p>

<p>Node 2.12</p>	
<p>Photo Reference:</p> 	<p>LEGEND:</p> <p>Load bearing: </p> <p>Oversail: </p>
	<p>Location Map:</p> 
<p>Upgrade works:</p> <p>Vegetation trimming. Street furniture to be removed/relocated.</p>	
<p>Habitat Type</p> <p><u>Oversail</u> European/hybrid larch <i>Larix</i> sp. limbs require trimming.</p> <p>WS1 Scrub Made up of goat willow <i>Salix caprea</i> and rowan <i>Sorbus aucuparia</i>. Also a single European/hybrid larch <i>Larix</i> sp. present. Bird-nesting potential.</p> <p>GS2 Dry Meadows and grassy verges Yorkshire fog <i>Holcus lanatus</i>, ribwort plantain <i>Plantago lanceolata</i>, feather moss <i>Thuidium tamariscum</i>, bramble <i>Rubus fruticosus</i> agg., yarrow <i>Achillea millefolium</i> and big shaggy moss <i>Rhytidiadelphus triquetrus</i>.</p> <p>An otter survey covering the Lisheen crossroads watercourse 150m up and down-stream of Node 2.12 was carried out on 13th August 2019. This was carried out to ensure that no breeding or resting areas were recorded within 150m upstream or downstream of the crossing.</p>	



Signs of otter such as prints, spraints, feeding remains and slides, in addition to holts and couching sites were searched for. No evidence of otters was recorded.
<p>Ecological Value & Effect</p> <p>A hen harrier nest was recorded 403m, and 588m (2014), and 1.99km (2019) from this node. Scrub WS1 offers foraging potential to the species. However, the works required are minimal and the site is adjacent to an existing road, and thus of lower value.</p> <p>The habitats are widespread and local in the area. They do, however, offer nesting potential for passerine birds. Thus, these are considered to be of local importance, higher value. The effects is envisaged as local, irreversible, short-term, slight.</p>
<p>Mitigation Measures</p> <p>To avoid a negative effect on nesting bird species, trimming will take place outside of the nesting season.</p>
<p>Residual Effect</p> <p>No residual effect is envisaged.</p>

Node 2.13	
<p>Photo Reference:</p> 	<p>LEGEND:</p> <p>Load bearing: </p> <p>Oversail: </p> <p>Location Map:</p> 
<p>Upgrade works:</p> <p>Laying of temporary hardcore to road verges for load-bearing and hedgerow trimming.</p>	
<p>Habitat Type</p> <p><u>Oversail</u> - scrub requires trimming.</p> <p>WS1 Scrub</p> <p>Goat willow <i>Salix caprea</i>, downy birch <i>Betula pubescens</i>, rowan <i>Sorbus aucuparia</i>, sycamore <i>Acer pseudoplatanus</i>, bramble <i>Rubus fruticosus</i> agg. with occasional sitka spruce <i>Picea sitchensis</i>. Adjacent to conifer plantation dominated by sitka spruce <i>P. sitchensis</i>.</p>	



HH1/GS2 Dry siliceous heath x Dry meadows and grassy verges

The road verge supports dry heath species including tormentil *Potentilla erecta*, bilberry *Vaccinium myrtillus*, gorse *Ulex europaeus*, ling heather *Calluna vulgaris* and bell heather *Erica cinerea*. While a number of species commonly found in roadside verges including silverweed *Potentilla anserina* lesser stitchwort *Stellaria graminea*, herb-robert *Geranium robertianum*, greater bird's-foot trefoil *Lotus pedunculatus*, selfheal *Prunella vulgaris*, creeping buttercup *Ranunculus repens*, red clover *Trifolium pratense*, knapweed and tufted vetch *Vicia cracca* are also present. A number of woodland and woodland-edge associated plants including woodrush *Luzula sylvatica*, foxglove *Digitalis purpurea* and deer fern *Blechnum spicant* are also present.

A drainage channel carrying flowing water is present along the western side of the road from 52.110507, -8.408371, flowing in a northerly direction into the Lisheen crossroads stream, c. 480m north which is a tributary of the Blackwater.

Ecological Value & Effect

Scrub (WS1) is widespread and common in the area. While HH1/GS2 is relatively species-rich, it too is common in the immediate area. Proportionally, the area to be effected by the proposed upgrade works is minimal. There is, however, the potential for birds to use the habitats for nesting. A hen harrier nest was recorded 190m east and 610m west (2014) and 1.69km south (2019) of the node. This node is adjacent to an existing road, and there will be minimal land take. The site is considered to be of local importance, higher value. The effect is envisaged as local, reversible, temporary, and slight.

Mitigation Measures

To avoid a negative effect on nesting bird species, trimming will take place outside of the nesting season.

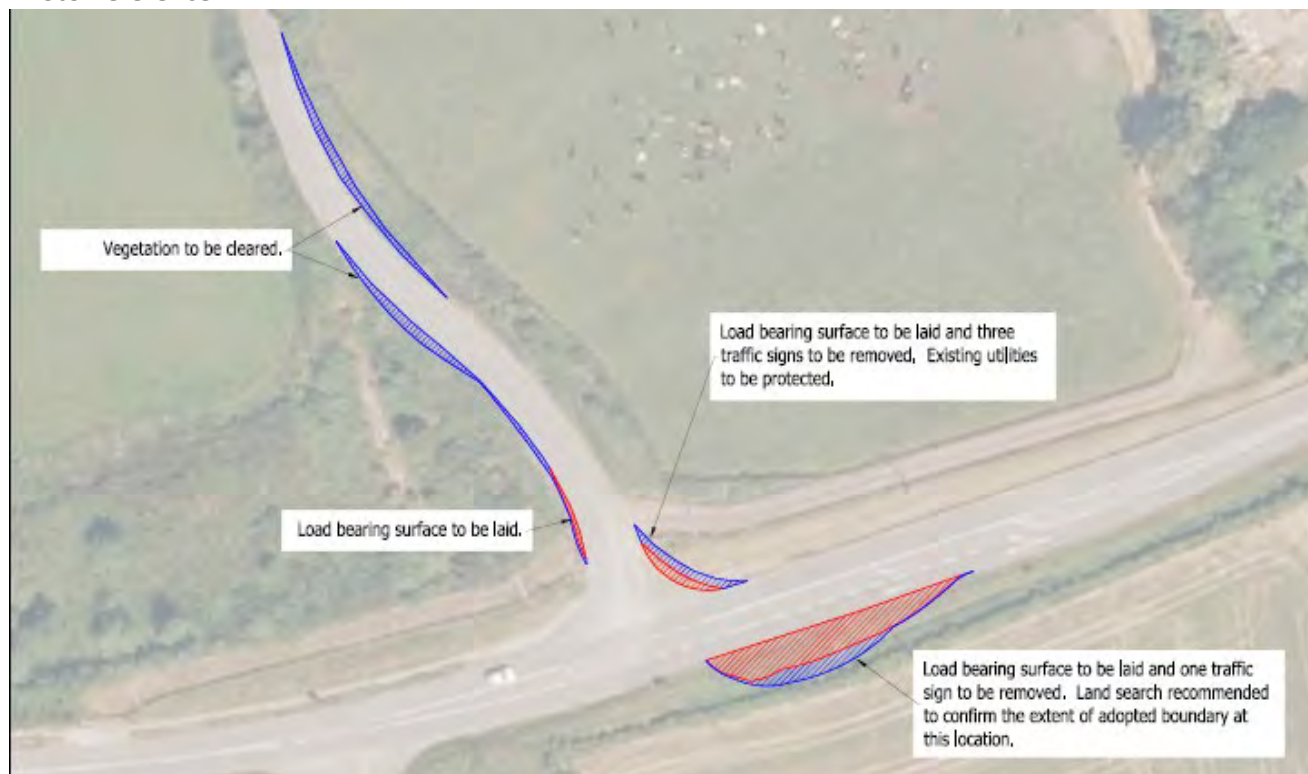
Residual Effect

No residual effect is envisaged.



Junction 1

Photo Reference:



Location Map:



Upgrade works:

Removal of road signage and street furniture within footprint of vehicle swept path.

Removal of pole within footprint of vehicle swept path on south side of main road.

Load bearing surface to be constructed in verges on south side of main road within wheel extents. Will consist of stripping and removal of topsoil, laying and compacting suitable aggregate to create running surface.

Load bearing surface to be constructed in verge on NE side of junction within wheel extents.

Habitat Type

Load bearing area

Hedgerow (WL1) (GS2)

Hedgerow is comprised of an ornamental species of beech *Fagus* sp., with intermittent immature elder *Sambucus nigra* trees.



Dry meadows and grassy verges (GS2)

Common sorrel *Rumex acetosa*, creeping buttercup *Ranunculus repens*, annual meadow-grass *Poa annua*, broad-leaved dock *Rumex obtusifolius* and yarrow *Achillea millefolium*. One patch of non-native invasive species montbretia *Crocsmia x crocosmiiflora* (1m²) at 52.040251, -8.566234.

An order 1st order stream, Slievedotia_19 (IE_SW_19M010300) was visible on EPA map viewer. However, this was not observed on site as it has since been culverted underground during previous roadworks. As such, there is no hydrological connection to designated sites or watercourses.

Ecological Value & Effect

Load bearing area

Hedgerow (WL1)

The hedgerow is comprised largely of a single ornamental species, and thus is low in diversity. It is therefore assessed as being of local importance (lower value). However, it would offer potential bird nesting habitat, as well as commuting/foraging habitat for bat species. Thus the habitat would be considered of *local importance (higher value)*. The proposed effect will be local, reversible, short-term and slight.

(GS2) Dry meadows and grassy verges

The habitat is widespread and common in the area. There is a single stand of montbretia *Crocsmia x crocosmiiflora* (1m²) at 52.040251, -8.566234 which could have a negative impact on surrounding habitats. Therefore, the habitat is assessed as being of *local importance (lower value)*. The proposed effect will be local, reversible, temporary and imperceptible.

Mitigation Measures

Load bearing area

Hedgerow (WL1)

To avoid a negative effect on nesting bird species, any trimming/removal of vegetation will take place outside of the nesting season.

(GS2) dry meadows and grassy verges

The mitigation measures outlined in section 1.3.3 and 1.3.4 will be followed to control the spread of montbretia *Crocsmia x crocosmiiflora*.

Residual Effect

No residual effect is envisaged following the implementation of the mitigation measures outlined above and in section 1.3.3 and 1.3.4.



Junction 2

Photo Reference:



LEGEND:

Legend	
	Wheel Extents
	Truck Extents
	Blade Tip Extents
	Wheel Extents Reverse
	Truck Extents Reverse
	Blade Tip Extents Reverse

Location Map:



Upgrade works:

- Minor vegetation trimming on east side of public road where oversail interacts with existing hedgerow at one location. Utility pole to be removed/relocated.

Habitat Type

Oversail area

Hedgerow (WL1) x Treeline (WL2)

This habitat is dominated by hawthorn *Crataegus monogyna*, and abundant ash *Fraxinus excelsior*.

Dry meadows and grassy verges (GS2)

There is an area of this habitat at the junction. It is comprised of common species, such as creeping buttercup *Ranunculus repens*, annual meadow grass *Poa annua*, broad-leaved dock *Rumex obtusifolius*, and yarrow *Achillea millefolium*.

No invasive species were recorded.



Ecological Value & Effect

Hedgerow (WL1) x Treeline (WL2)

It is widespread and abundant in the surrounding environment. However, it could offer potential passerine bird nesting habitat during the nesting season, as well as foraging/commuting habitat for bats. However, the proposed works will be minimal, and thus, it is considered to be of *local importance (higher value)*. The proposed effect will be local, reversible, short-term and slight.

Dry meadows and grassy verges (GS2)

This habitat is of low diversity, and is widespread in the surrounding environment. Thus, it is considered to be of local importance (lower value). The proposed effect will be local, reversible, temporary and imperceptible.

A hen harrier nest was recorded 1.65km north of this node in 2014. However, the habitats at Junction 2 are of low-value and adjacent to an existing road. The work here will be minimal also.

Mitigation Measures

To avoid effecting nesting birds, trimming of (WL1) hedgerow will be avoided during the nesting season.

Residual Effect

No residual effect is envisaged following the implementation of the mitigation measures outlined above and in section 1.3.3.



Offsite Turning and Transfer Area

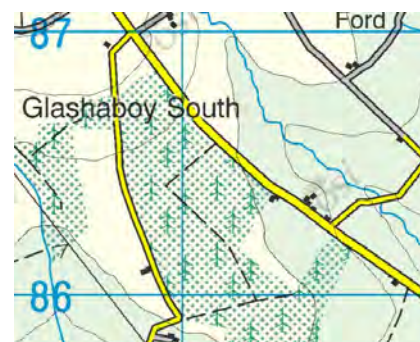
Photo Reference:



LEGEND

Legend
 Wheel Extents

Location Map:



Upgrade works:

- Tree felling and widening of existing bellmouth and upgrade and widening of existing aggregate access tracks.
- Tree felling and construction of aggregate hard standing.

Habitat Type

Result:

Scrub (WS1) x dry meadows and grassy verges (GS2) mosaic

This habitat is present as narrow strips at the entrance of the turning area, and either side of the forestry track. The scrub is dominated by willow *Salix caprea*, and willowherb *Epilobium hirsutum*. Alder *Alnus glutinosa* is also abundant. Lower vegetation is dominated by knapweed *Centaurea nigra* and ribwort plantain *Plantago lanceolata*. There is abundant hogweed is the main species recolonising the bare ground. Nettles *Urtica dioica*, dock *Rumex acetosa*, and hogweed *Heracleum sphondylium* are also frequent.



Drainage ditch (FW4)

Narrow drainage ditches (c.a. 1m wide) run along either side of the forestry track. These were wet during the survey, though not flowing.

Buildings and artificial surfaces (BL3)

The access track and forestry road is comprised of an artificial surface. No effect is envisaged.

Conifer plantation (WD4)

A dense, mature conifer plantation (c.a. 15-20m high) comprised mainly of sitka spruce *Picea sitchensis* is present.

No invasive species were recorded.

Ecological Value & Effect

Oversail/load bearing

Scrub (WS1) x dry meadows and grassy verges (GS2) mosaic

The area covered by this habitat was small, and comprised only a narrow strip along the site entrance and forestry track. It is also adjacent to mature forestry and an existing road. Thus, it is assessed as being unsuitable for hen harrier foraging.

It may provide foraging for pollinators, and birds (seeds). However, the habitat is widespread and common in the surrounding environment. It is therefore assessed as being of lower importance (higher value). The proposed effect will be local, irreversible, short-term, and slight.

Drainage ditch (FW4)

The drainage ditch is narrow, with a low volume of water. They are degraded and unlikely to support aquatic fauna. The proposed effect will be local, reversible, temporary and imperceptible.

Buildings and artificial surfaces (BL3)

The tracks and road surface are artificial in nature, and of no ecological value. No effect is envisaged.

Conifer plantation (WD4)

Due to the height and dense, enclosed nature of the plantation, it is deemed unsuitable habitat for hen harrier. While they can use young conifer plantations for nesting and foraging, as plantations mature and the forest canopy closes, this habitat becomes unsuitable for nesting and hunting.

The turning area is located within the study area for the hinterland surveys for hen harrier, and no records of breeding hen harrier were yielded during the survey period 2014-2019. The surveys also confirmed the forestry to be of low-value for foraging due to its mature, and therefore dense, nature.

Thus, it is deemed as being of local importance (higher value). The proposed effect will be local, irreversible, long-term, and slight.

Mitigation Measures

To avoid a negative effect on nesting bird species, trimming will take place outside of the nesting season (March – August). Where felling is to occur, surveys will be carried out to reconfirm the conditions predicted in the EIAR.

Residual Effect

Following the aforementioned mitigation measures, the felling of WD4 will yield a short-term and imperceptible effect.



1.3.3 Mitigation Measures for Invasive Species

1.3.3.1 *General Measures for Preventing the Spread of Non-Native Invasive Species*

1.3.3.1.1 Communication

- Informing all site staff through toolbox talks as part of site inductions;
- Raising awareness of site workers through tool box talks given by a suitably qualified person as part of site introduction; informing workers what to look out for and the what procedure to follow if they observe an invasive species.

1.3.3.1.2 Advance planning and incorporation into works schedule

- Constraints and invasive species mapping will be consulted at the planning stage for works to be undertaken in each area, to ensure all parties are aware of the species present, their locations and extents and the measures required to eradicate, control and/or prevent the spread of each species as applicable.
- Treatment measures will be incorporated into the construction programme where treatment will progress in conjunction with works.
- Where treatment will progress independent of other works, the same consultation and advance planning will also be required.

1.3.3.1.3 Pre-works survey and establishment of exclusion zones

- A preconstruction/pre-treatment survey of each area will be undertaken prior to implementation of treatment measures and/or construction works to confirm the locations of invasive species and communicate these to supervisors and operatives involved in treatment and works.
- Exclusion zones will be established where necessary at this stage. Fencing, clear signage and good housekeeping within the site to prevent spread.
- No machinery or personnel will be allowed within exclusion zones, other than where necessary to undertake treatment measures. Similarly, there will be no storage of materials within or adjacent to exclusion zones.

1.3.3.1.4 Disposal of cut material

- Where mechanical control by cutting has been undertaken, it may be possible to mulch wood where re-growth from vegetative material will not take place.
- All other plant material arising from mechanical control may be stored in a controlled manner on-site, or disposed of appropriately off-site,
- If retention on-site is required, material will be kept in a secure area onsite for composting and herbicide treatment where necessary.
- This material will be monitored for re-growth, which will trigger targeted herbicide application where necessary. No vehicles or operatives other than those involved in invasive species management will enter this area and no other materials will be stored here.



- Where off-site disposal is used, material will be transported off site by an appropriately licensed waste contractor and disposed of properly at a suitably licenced facility.

1.3.3.1.4.1 Re-vegetation

- Where invasive species have been physically removed and disturbed soil, this soil will be seeded or replanted (including 5cm deep mulch) with native plant species. This will prevent the easy colonisation of bare soil by invasive species in the area.

1.3.3.1.4.2 Good hygiene

- Ensure good hygiene practices when working with invasive species:
 - Remove the build-up of soil on equipment
 - Keep equipment clean
 - Do not move fouled equipment from one site to another.
- Where necessary a pressure washer will be used to wash the build-up of soil, clean equipment and vehicles. The water arising from washing will be contained to avoid the further spread of species within the site.
- Biosecurity measures required for working near water (intertidal areas) and protected species within the site e.g. receptor sites for rare plants, the pNHA, etc.

Table 1-13: Species-specific invasive species

Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
Japanese Knotweed (<i>Fallopia japonica</i>)	<p>A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey.</p> <p>While the stand is >7m outside of the proposed works footprint and will not be interfered with, a buffer of 7m around the stand will be put in place to demarcate this and ensure there is no interference with the area.</p> <p>This will be put in place prior to construction. Roots 1-3 m deep and up to 7 m lateral spread.</p>	<p>By clearly marking the area to avoid, it will avoid accidental interference with the area, and the risk of spreading the species along the TDR route</p>	<p>A suitably qualified person will be appointed by the Client to ensure the effective implementation of this buffer.</p>



Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
<p>Winter Heliotrope (<i>Petasites fragrans</i>)</p>	<p>A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey.</p> <p>As this species spreads vegetatively via rhizomes, the risk of spread through unregulated soil movements is high. Where the infested area can be retained in situ, burial under minimum 1.5m of soil is sufficient.</p> <p>Areas which will be required to be excavated will require treatment with herbicide prior to movement. Following treatment, soil from these areas can be re-used, but not as topsoil and will be required to be buried at a depth of minimum 1.5m.</p> <p>Spraying will be carried out using glyphosate-based herbicide after flowering in February to March or midsummer or later but before the foliage begins to die back (NRA, 2010).</p> <p>The following general recommendations will be adhered to:</p> <ul style="list-style-type: none"> • Establishment of a 1m buffer zone around all growths prior to operations; staff shall be made aware of this buffer zone when working within infested areas. • Construction works will not be allowed within exclusion zones until treatment procedures have been followed. 	<p>The species covers a bank at node 2.0 and 2.4 and is within the bank regrading footprint and load-bearing footprint of these nodes. Implementing this mitigation will prevent the spread of the species along the TDR route</p>	<p>A suitably qualified person will be appointed by the Client to ensure the effective implementation of this mitigation.</p>



Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	<ul style="list-style-type: none"> • No treatment measures to take place in these areas without supervision and agreement by appointed ecologist/eradication specialist. • All machinery and vehicles operating within areas of infestation will be thoroughly checked and if necessary, cleaned prior to leaving the area to protect against further spreading of Winter Heliotrope. • No material shall be taken from areas of infestation except in accordance with the measures outlined above. All material will be either deep buried (1.5m) or transported by an appropriately licensed waste contractor and received by an appropriately licensed facility. • Wheel washes shall be put in place at infected areas. Waste water from these facilities will need to be stored and treated to avoid further spread. • If operating within an area of known infestation all machinery, vehicles, equipment, foot ware and clothing will need to be cleaned thoroughly (if necessary using steam cleaners) in a contained area to avoid further contamination. • The contractor must appropriately dispose of winter heliotrope plant 		



Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	<p>material and soil containing plant material in accordance with the NRA (2010) guidelines, where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains flower heads or seeds will be disposed of either by composting or burial at a depth of no less than 1.5m, or by incineration (having regard to relevant legislation, including: Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; and relevant local authority byelaws) or disposal to licensed landfill in the case of non-native invasive species. All disposals will be carried out in accordance with the Waste Management Acts.</p>		
<p>Old Man's Beard /Traveller's Joy (<i>Clematis vitalba</i>)</p>	<p>A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey. Two options for the treatment of Old Man's Beard at the site have been proposed. These options shall be used to eradicate Old Man's Beard</p>	<p>The species is present in a 5x2m patch within the load-bearing and vegetation clearance footprint at node 1.3, as well as within sections of hedge at node 2.3 adjacent to the vegetation clearance footprint.</p>	<p>A suitably qualified person will be appointed by the Client to ensure the effective implementation of this mitigation.</p>



Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	<p>from the site and avoid the spread of the species. The following general recommendations will be adhered to as part of the plan:</p> <p>Option 1 – Physical removal</p> <p>Seedlings can be pulled out of the ground and larger plants can be cut to the stem (and foliage will die) and roots and stem removed. Roots can then be grubbed out with material stored above the ground, so plants cannot take root again.</p> <p>For more mature plants, the stem can be cut near ground level and herbicide applied to the outer rim of the stem.</p> <p>The stem is likely to produce regrowth in the next growing season and herbicide will need to be applied to this growth. Glyphosate can be used in late spring and summer and Triclopyr can be applied in summer. This is the preferred option where plants infest the crowns of trees.</p> <p>Option 2 – Chemical control</p> <p>Growths at ground level can be treated with herbicide, using spray application where native species are not present, or targeted application using a weed wiper where there is a risk of damage to non-target species.</p>	<p>Implementing this mitigation will prevent the spread of the species along the TDR route</p>	



Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	<p>Re-survey to check for re-growth will be required in both cases.</p> <p>The contractor must appropriately dispose of Old Man's Beard plant material and soil containing plant material in accordance with the NRA (2010) guidelines, where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains flower heads or seeds will be disposed of either by composting or burial at a depth of 2m, or by incineration (having regard to relevant legislation, including: Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; and relevant local authority byelaws) or disposal to licensed landfill in the case of non-native invasive species. All disposals will be carried out in accordance with the Waste Management Acts.</p>		
<p>Himalayan honeysuckle (<i>Leycesteria formosa</i>)</p>	<p>A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey.</p> <p>Two options for the treatment of Himalayan honeysuckle at the site are proposed. These options can be used to eradicate</p>	<p>There is a single plant growing on top of a wall at node 2.2. While the latest swept-path analysis shows it is unlikely to be interfered with, the aforementioned mitigation will be included</p>	<p>A suitably qualified person will be appointed by the Client to ensure the effective implementation of this mitigation.</p>



Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	<p>Himalayan honeysuckle from the site and avoid the spread of the species:</p> <p>Option 1 – hand pulling of seedlings</p> <p>Seedlings and/or small plants can be pulled out of the ground along with the root system (BMCC, 2015).</p> <p>Option 2 – cut to base and treated with herbicide. More established plants can be cut to near ground level and the freshly cut wound immediately painted with herbicide (BMCC, 2015).</p>	<p>to prevent the spread of the species along the TDR route</p>	
<p>Cherry laurel (<i>Prunus laurocerasus</i>)</p>	<p>A survey will be carried out prior to construction to confirm if the extent of the species has changed since the previous survey.</p> <p>Cherry laurel is spread vegetatively only and a buffer of 1m will be left to prevent damage to the plant which can result in the production of new stems which can make the plant more difficult to treat. Staff shall be made aware of this buffer zone when working within areas of infestation.</p> <p>Where the plant cannot be avoided, one of the following methods will be implemented:</p> <p>Option 1 – Cut to stump and digging out stump</p> <p>This method involves cutting the main stem of the plant down near ground level and digging out the stump and any visible roots. This option is</p>	<p>There are three young bushes present within the vegetation-clearance footprint at node 1.7. The species spreads vegetatively by suckering, or by seed.</p>	



Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	<p>not practical in areas where there are other invasive plants present as the disturbed soil can allow for the setting of seeds or the spread of rhizomes of adjacent species (ISI, 2012b).</p> <p>Option 2 – Cut to stump and treat stump with herbicide</p> <p>This method involves cutting the main stem of the plant down near ground level and applying herbicide to the freshly cut wound.</p> <p>The herbicide concentrations used, and timings of applications vary according to which chemical is used. When treating many stems, vegetable dye added to herbicide is useful for highlighting the stems that have and haven't been treated. The use of a brush or other such applicator will provide an accurate application and prevent damaging adjacent non-target plants via spray drift. Please see table below for best treatment time (ISI, 2012b).</p> <p>Option 3 – Cut to main stem and inject stem with glyphosate</p> <p>This method involves the 'drill and drop' method where the main stem is cut, and a hole drilled into the cut. This provides a targeted application of glyphosate (25% solution). The main drawback to this technique is that the plant</p>		



Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	<p>is left in place to rot away; which can take a decade or more. Please see table below for best treatment time (ISI, 2012b).</p> <p>Option 4 – Cut back to stump and spray regrowth with chemicals</p> <p>This application involves cutting a main stem down near ground level and then treating the new stems with herbicide. This method is the least effective as some stems may be missed and not treated. Also, the application of herbicide is generally via spraying which can result in adjacent non-target plants being killed off.</p> <p>The contractor must appropriately dispose of excavated waste, including soils containing cherry laurel plant material in accordance with the NRA (2010) guidelines, where cut, pulled or mown non-native invasive plant material arises, its disposal will not lead to a risk of further spread of the plants. Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. Material that contains flower heads or seeds will be disposed of either by composting or burial at a depth of no less than 2m, or by incineration (having regard to relevant legislation, including: Section 32 of the Waste Management Act, 1996 to</p>		



Invasive species	Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success
	2008; Section 4 of the Air Pollution Act, 1987; and relevant local authority byelaws) or disposal to licensed landfill in the case of non-native invasive species. All disposals will be carried out in accordance with the Waste Management Acts.		

1.3.4 Mitigation measures for the protection of watercourses

The following mitigation measures are proposed for the protection of watercourses:

Table 1-14: Mitigation Measures for the Protection of Watercourses

Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring Scheme to Prevent Mitigation Failure
All personnel working on site will be trained in pollution incident control response. Emergency Silt Control and Spillage Response Procedures contained within the Construction Environmental Management Plan (CEMP) will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt.	Ensure site operatives are informed and equipped to deal pollution incidents such as spillages or silt containment failures.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.



Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring Scheme to Prevent Mitigation Failure
A regular review of weather forecasts of heavy rainfall will be undertaken, and a contingency plan will be prepared for before and after such events.	Ensure works are not carried out during periods of heavy rainfall and ensure potential sources of siltation are secured in advance of heavy rainfall.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.
Silt traps and silt fencing will be put in place in advance of excavation works at each node.	Ensure erosion control and silt arrest measures are in place in advance of works.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.
Nodes requiring temporary hardcore shall be capped as soon as practicably possible.	Cover exposed subsoils, thereby reducing the concentration of suspended solids in any run-off.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor.	A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.
Mitigation Measure	How Measure Will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring Scheme to Prevent Mitigation Failure



<p>Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off.</p>	<p>Allow repair and strengthening of silt interception measures if and where necessary.</p>	<p>Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor.</p> <p>All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.</p>	<p>A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.</p>
<p>Refuelling of plant & machinery during planting will only be carried out at designated refuelling station locations within the wind farm site. Each station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Only emergency breakdown maintenance will be carried out on site.</p>	<p>Prevent fuels, oils or other contaminants from entering the drainage network.</p>	<p>Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor.</p> <p>All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.</p>	<p>A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.</p>
<p>Mitigation Measure</p>	<p>How Measure Will Avoid/Reduce Adverse Effects</p>	<p>Implementation of Mitigation Measure and Likely Success</p>	<p>Monitoring Scheme to Prevent Mitigation Failure</p>



<p>Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site.</p>	<p>Prevent fuels, oils or other contaminants from entering the drainage network.</p>	<p>Mitigation measures will be implemented by the developer through the mechanism of its contract with the contractor.</p> <p>All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.</p>	<p>A suitably qualified Ecological Clerk of Works (ECoW) or Environmental Manager will be appointed by the Client to ensure the effective operation and maintenance of drainage and other mitigation measures during the planting process.</p>
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1.3.4.1 Aquatic Ecology

1.3.4.1.1 Desktop review

A sensitive species data request for terrestrial and aquatic flora and fauna covering 10km grid squares adjoining the proposed development (i.e. W58, W59, W68, W69, W78, W79 and W89) revealed records for a number of protected (freshwater) aquatic species in the vicinity of the proposed watercourses crossings, as did data from the National Biodiversity Data Centre (NBDC, 2020).

Numerous records for freshwater pearl mussel (*Margaritifera margaritifera*) were available for the respective grid squares but all were confined to the River Blackwater. No records overlapped with the survey area. Similarly, white-clawed crayfish (*Austropotamobius pallipes*) records were available for the River Blackwater and the Ballyclogh Stream (upper tributary upstream of Mallow, W59) but no records overlapped with the survey area.

Numerous sea lamprey (*Petromyzon marinus*) records were available for the Munster Blackwater catchment (e.g. River Blackwater, Clyda River) but no records overlapped with the survey area. River lamprey (*Lampetra fluviatilis*) records were available for the River Blackwater and River Bride at Rathcormack Bridge (not within survey area).

A catchment-wide electro-fishing survey was undertaken by Triturus in 2017 for an early precursor to the Coom Green Energy Park development (Triturus, 2017). The wider catchment was found to support brown trout, European eel, *Lampetra* sp. ammocoetes and low numbers of Atlantic salmon in 2017.

1.3.4.1.2 Field Study

No white-clawed crayfish were recorded from the $n=25$ riverine survey sites. Furthermore, no crayfish remains were identified in mustelid spraint, where encountered, in the vicinity of the survey sites.

There were no historical or contemporary records for the species within the survey area, although crayfish are known from the wider River Blackwater SAC (002170) site (i.e. Blackwater main channel).

No freshwater pearl mussel were recorded from wider catchment of the proposed development, including sites on the River Bride, Martin and Clyda. This was despite some physical habitat suitability (e.g. River Bride).



There were no freshwater pearl mussels records farther downstream of the stretches surveyed in the Rivers Bride and Martin. Freshwater pearl mussels are known to occur in the Munster River Blackwater, downstream of the Clyda River confluence. The current absence of mussels from the lower reaches of the Clyda River was considered likely as a result of land use practices.

Q-samples were collected and analysed from $n=12$ riverine sites in the footprint of the proposed Coom Green Energy Park development and associated cable route. A total of $n=46$ species across $n=33$ families were recorded in the kick samples. No invertebrate species of higher conservation value than 'least concern' were recorded in the invertebrate assemblage when compared to national red lists (Feely et al. 2020; Kelly-Quinn & Regan, 2012; Byrne et al. 2009; Foster et al. 2009).

1.4 Conclusion

Nodes 1.0, 1.1, 1.2, 1.2.1 and 1.5 are comprised of artificial and man-made habitats. Upgrade works at these nodes consist of the removal of street furniture and, thus, there will be no ecological effect.

Load-bearing will be temporary and will be reinstated upon completion. Therefore, effects at operational and decommissioning phases have been scoped out.

Where trimming is required for oversail areas, it will be done outside of the nesting season to avoid negative effects on birds and red squirrel in dreys. While no bat roosts were recorded, trees offering low to moderate potential roosting habitat were recorded at nodes 2.8, 2.9, 2.10. Due to the potential lag period between the preplanning surveys and construction (potentially years) it is prudent to resurvey these features prior to construction to reconfirm the findings of the Ecological Appraisal.

An invasive species management plan has been prepared and includes the measures required to control the spread of invasive species during the implementation of upgrade works. These measures are outlined in section 1.3.3.

With the implementation of the aforementioned mitigation measures, no significant effects is not envisaged as a result of the works required for the TDR.



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Appendix 8-D: Habitats and Flora Data

Appendix 8-D: Habitats and Flora Data

List of Tables:

Table 1: Habitats recorded within the wind farm and Grid connection study Area.

Table 1: Habitats recorded within the wind farm and Grid connection study Area.







	
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Plate 1.3: Wet Grassland (GS4)	Plate 1.4: Wet heath (HH3)
	
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Plate 1.20: Treelines (WL2)



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Appendix 8-E: European Sites Data

Appendix 8-E: European Sites Data

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Table 1: European Designated Sites (SAC and SPA) sites within 15km of CGEP and Grid Connection Route

Table 2: European Designated Sites (SAC and SPA) sites within 15km of the Turbine Delivery Route

Table 1: European Designated Sites (SAC and SPA) sites within 15km of CGEP and Grid Connection Route

Site	Code	Features of Interest	Summary Description	Distance (CGEP development boundary or GCR nearest works location)
Blackwater Callows SPA	004094	Whooper Swan (<i>Cygnus Cygnus</i>) Wigeon (<i>Anas Penelope</i>) Teal (<i>Anas crecca</i>) Black-tailed Godwit (<i>Limosa limosa</i>) Wetland and Waterbirds	Contains a stretch of the River Blackwater, running west to east for a 25km distance between Fermoy, Co. Cork and Lismore, Co. Waterford. Site is comprised of the river channel and a flood plain containing areas of seasonally-flooded grassland.	4.17km
Blackwater River (Cork/Waterford) SAC	002170	Estuaries, Mudflats, Sandflats, Perennial vegetation of stony banks, Atlantic salt meadows, Mediterranean salt meadows, Freshwater Pearl Mussel (<i>Margaritifera margaritifera</i>), Salmon (<i>Salmo salar</i>), Otter (<i>Lutra lutra</i>), Killarney Fern (<i>Trichomanes speciosum</i>)	One of Ireland's largest rivers, the River Blackwater drains a major part of Co. Cork and five mountain ranges. The river's surrounding peaty terrain give it a distinctively dark appearance. The river is surrounded by areas of hollows, wetlands, species-rich wet grasslands and woodlands.	0.6km

Table 2: European Designated Sites (SAC and SPA) sites within 15km of the Turbine Delivery Route

Site	Code	Features of Interest	Summary Description	Distance (nearest works or activity location)
Blackwater River Callows SPA	004094	Whooper Swan (<i>Cygnus Cygnus</i>) Wigeon (<i>Anas Penelope</i>) Teal (<i>Anas crecca</i>) Black-tailed Godwit (<i>Limosa limosa</i>) Wetland and Waterbirds	Contains a stretch of the River Blackwater, running west to east for a 25km distance between Fermoy, Co. Cork and Lismore, Co. Waterford. Site is comprised of the river channel and a flood plain containing areas of seasonally-flooded grassland.	within 15km of Nodes [2.0 - 2.14] (closest 1.3 km)
Blackwater River (Cork/Waterford) SAC	002170	Estuaries, Mudflats, Sandflats, Perennial vegetation of stony banks, Atlantic salt meadows, Mediterranean salt meadows, Freshwater Pearl Mussel (<i>Margaritifera margaritifera</i>), Salmon (<i>Salmo salar</i>), Otter (<i>Lutra lutra</i>), Killarney Fern (<i>Trichomanes speciosum</i>)	One of Ireland's largest rivers, the River Blackwater drains a major part of Co. Cork and five mountain ranges. The river's surrounding peaty terrain give it a distinctively dark appearance. The river is surrounded by areas of hollows, wetlands, species-rich wet grasslands and woodlands.	within 15km of [all] Nodes (closest 10m)
Cork Harbour SPA	004030	Little Grebe (<i>Tachybaptus ruficollis</i>) [A004] Great Crested Grebe (<i>Podiceps cristatus</i>) [A005] Cormorant (<i>Phalacrocorax carbo</i>) [A017] Grey Heron (<i>Ardea cinerea</i>) [A028] Shelduck (<i>Tadorna tadorna</i>) [A048] Wigeon (<i>Anas penelope</i>) [A050] Teal (<i>Anas crecca</i>) [A052] Pintail (<i>Anas acuta</i>) [A054] Shoveler (<i>Anas clypeata</i>) [A056] Red-breasted Merganser (<i>Mergus serrator</i>) [A069] Oystercatcher (<i>Haematopus ostralegus</i>) [A130] Golden Plover (<i>Pluvialis apricaria</i>) [A140] Grey Plover (<i>Pluvialis squatarola</i>) [A141] Lapwing (<i>Vanellus vanellus</i>) [A142] Dunlin (<i>Calidris alpina</i>) [A149] Black-tailed Godwit (<i>Limosa limosa</i>) [A156] Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157]	The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Mallard, Pintail, Shoveler, Redbreasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank, Blackheaded Gull, Common Gull, Lesser Black-backed Gull and Common Tern. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.	Within 15km of Nodes [1.3 & 1.4] (closest 1.6 km)

Site	Code	Features of Interest	Summary Description	Distance (nearest works or activity location)
		<p>Curlew (<i>Numenius arquata</i>) [A160] Redshank (<i>Tringa totanus</i>) [A162] Black-headed Gull (<i>Chroicocephalus ridibundus</i>) [A179] Common Gull (<i>Larus canus</i>) [A182] Lesser Black-backed Gull (<i>Larus fuscus</i>) [A183] Common Tern (<i>Sterna hirundo</i>) [A193] Wetland and Waterbirds [A999]</p>		
Great Island Channel SAC	001058	<p>Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330]</p>	<p>The Great Island Channel stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. It is an integral part of Cork Harbour which contains several other sites of conservation interest.</p>	<p>within 15km of Nodes [1.3 & 1.4] (closest 5.6 km)</p>
Lower River Suir SAC	002137	<p>Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation [3260] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0] Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) [91E0] <i>Taxus baccata</i> woods of the British Isles [91J0] <i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel) [1029] <i>Austropotamobius pallipes</i> (White-clawed Crayfish) [1092]</p>	<p>The Lower River Suir contains excellent examples of a number of Annex I habitats, including the priority habitats alluvial forest and Yew woodland. The site also supports populations of several important animal species, some listed on Annex II of the Habitats Directive or listed in the Irish Red Data Book. The presence of two legally protected plants (Flora (Protection) Order, 1999) and the ornithological importance of the site adds further to the ecological interest and importance.</p>	<p>within 15km of Node [2.0] (14 km)</p>

Site	Code	Features of Interest	Summary Description	Distance (nearest works or activity location)
		<i>Petromyzon marinus</i> (Sea Lamprey) [1095] <i>Lampetra planeri</i> (Brook Lamprey) [1096] <i>Lampetra fluviatilis</i> (River Lamprey) [1099] <i>Alosa fallax fallax</i> (Twaité Shad) [1103] <i>Salmo salar</i> (Salmon) [1106] <i>Lutra lutra</i> (Otter) [1355]		

Appendix 8-F: National Sites Data

Appendix 8-F: National Sites Data

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Table 5: pNHA's and NHA's within 10 km of the Project

Table 1: pNHA's and NHA's within 15km of CGEP and Grid Connection Route.

Site Code	Site Name	Feature of Interest	Distance km (development boundary or nearest works or activity location)
000079	Bride/Bunaglanna Valley	The major features of interest in the site are firstly, the diverse range of comparatively intact habitat type present and, secondly, the microfungi community, some of which have not been recorded elsewhere. Deciduous woodland is a scarce habitat in Ireland.	1.25
001797	Blackwater Valley (The Beech Wood)	It comprises both wet and dry deciduous woodland, the dominant species are Oak (<i>Quercus petraea</i>) and Beech (<i>Fagus sylvatica</i>). There is a good ground flora and many woodland birds, the wood also provides cover and seclusion for otters and other mammals.	2.30
001796	Blackwater Valley (Cregg)	It comprises dry deciduous woodland, lowland dry grassland, the river channel, scrub and mixed woodland. There is very little information on this site; the ranger notes the spread of Rhododendron and Cherry Laurel at the eastern edge of the wood.	3.04
000073	Blackwater River Callows	No information available	3.38
001795	Blackwater Valley (Killathy Wood)	Killathy Wood is a small strip of mixed woodland c. 1km long, situated on the north bank of the River Blackwater. The dominant species in this woodland is Ash (<i>Fraxinus excelsior</i>) with some Oak (<i>Quercus petraea</i>) and Scot's pine (<i>Pinus sylvestris</i>). Elm (<i>Ulmus species</i>) were present in the wood but many have been killed by Dutch Elm disease and felled for firewood. Sycamore (<i>Acer pseudoatanus</i>) is also spreading through the wood; at the moment it is found mainly in the eastern half of the site, but it is seriously damaging the character of the wood. Other non-native species include a line of Spruce (<i>Picea species</i>) on the north-west edge of the wood. Cattle have access to shelter and graze in some parts of the wood from the adjacent fields.	3.50
002050	Cregg Castle	This site is a nursery roost of the Daubenton's Bat (<i>Myotis daubentonii</i>). Approximately 100 bats hang from the ceiling of a domed ground floor room in Cregg Castle, approximately 3 miles east of Fermoy Town. This is a site of national	3.53

Site Code	Site Name	Feature of Interest	Distance km (development boundary or nearest works or activity location)
		<p>importance because it is the second largest nursery colony of this species in the country. The owners are extremely well disposed towards the bats, this site is completely safe from any adverse human disturbance. The only threat facing this site is the deterioration of the castle roof.</p> <p>This species is dependent on aquatic insects so the proximity of the extensive River Blackwater is of utmost importance to the colony. It is essential that pollution of this river system and its associated tributaries is prevented.</p>	
001080	Blackwater Valley (Killavullen)	<p>10 Areas of Scientific Interest occur along its length. This site is situated just downstream (east) of Killavuller Village within an area of limestone. Large prominent outcrops of limestone and caves can be seen along this section. Other habitats included within this site are broad leaved dry woodland and scrub.</p> <p>Within the site there is wet woodland of Alder (<i>Alnus glutinosa</i>) and Willow (<i>Salix species</i>). This woodland is one of a series of woodlands along the banks of the Blackwater river.</p> <p>The valley sides support the growth of much woodland, but also of ecological interest are the marshes, the river itself and the associated limestone outcrops e.g. inland cliffs and craggs.</p>	4.59
001794	Blackwater Valley (Kilcummer)	<p>The river-side trees are Alders (<i>Alnus glutinosa</i>) and Willow (<i>Salix species</i>) including the Almond Willow (<i>Salix triandra</i>). The shallower river water and adjacent marshland are vegetated with Common Bulrush (<i>Scirpus lacustris</i> subsp. <i>lacustris</i>), Bur-reeds (<i>Sparganium species</i>) and Pondweeds (<i>Potamogeton species</i>). The flowering rush (<i>Butomus umbellatus</i>) grows locally in the water and Creeping Yellow-Cress (<i>Ronippa sylvestris</i>) on the river banks.</p> <p>The marshland is often colonized by Willow scrub and amongst the bushes Great Yellow-Cress (<i>Ronippa amphibia</i>), Lesser Pond-sedge (<i>Carex acutiformis</i>) and Wood</p>	4.67

Site Code	Site Name	Feature of Interest	Distance km (development boundary or nearest works or activity location)
002097	Convamore, Ballyhooly (Near Fermoy)	<p>Club-rush (<i>Scirpus sylvaticus</i>) occur with much Lady's smock (<i>Cardamine pratensis</i>), Meadowsweet (<i>Filipendula ulmaria</i>) and Hemp-agrimony (<i>Eupatorium cannabinum</i>).</p> <p>This site is a male roost of the Daubenton's bat (<i>Myotis daubentonii</i>). Approximately 50 bats hang from the roof of the wine cellars in the ground floor of the ruined Convamore House, near Ballyhooly, Co. Cork. This is a site of national importance because it is the only known male roost of this species in the country. The only threat facing the bats at this site is disturbance from people exploring the ruins and the destruction of parts of the cellars walls by people removing bricks.</p> <p>This bat species is dependent on aquatic insects so the proximity of the extensive River Blackwater is of utmost importance to the colony. It is essential that pollution of this river system and its associated tributaries is prevented.</p>	4.77
001793	Blackwater Valley (Ballincurragh Wood)	<p>The Ballincurragh Wood site is recommended for inclusion in the Blackwater Valley NHA because the area supports the growth of a population of the very rare Starred Wood sedge.</p>	4.83
001561	Awbeg Valley (Castletownroche)	<p>The site is of interest because the limestone substrate gives rise to plant communities that are unusual in the south-west.</p>	6.17
001029	Araglin Valley	<p>The Araglin Valley is of regional importance because of its high diversity of species and ecological interest. The area is predominantly underlain by sandstone, with limestone occurring in the lower reaches near Fermoy. These two contrasting rocky types bring with them differences in the soils and a wide diversity of plant and animal communities.</p>	7.81
000073	Blackwater River Callows	<p>No information available</p>	7.99
000085	Glanworth Ponds	<p>The Glanworth Ponds are new records for the occurrence of the Golden Dock in East Cork. Golden Dock is a Red Data Book species where occurrence is apparently declining because often its appearance in a place is only fleeting; it depends on low water levels to provide the right conditions and stimulus for seed germination. This</p>	9.49

Site Code	Site Name	Feature of Interest	Distance km (development boundary or nearest works or activity location)
		<p>site contains healthy and viable populations of the Golden Dock, as well as, a good species diversity of other aquatic and wetland plants and should therefore be considered for conservation and NHA status.</p>	
001829	Ballinaltig Beg Pond	<p>The Golden Dock was found on the south-western margin of the pond in association with species such as Marsh Foxtail (<i>Alopecurus gemiculatus</i>), Jointed Rush (<i>Juncus articulatus</i>), Nodding bur-marigold (<i>Bidens armia</i>), Water pepper (<i>Polygonum hydropyer</i>) and Brooklime (<i>Veronica beccabunga</i>).</p>	10.02
001169	Brown's Farm, Togher Cross Roads	<p>It is a small site comprising 4 fields, at the intersection of three hedges in the middle, is a small area of exposed mud, whose vegetation is trampled and grazed. Here the Red Data Book species - Golden Dock (<i>Rumex maritimus</i>) is found in association with Nodding bur-marigold (<i>Bidens cernua</i>), Water starworts (<i>Callitriche species</i>) and Water-purslane (<i>Lythrum portula</i>). This is another new record for the Golden Dock in E. Cork found in a rare Plant Survey of the area in 1992/3.</p> <p>Golden Dock is a Red Data Book species whose occurrence is apparently declining, often its appearance is only fleeting as it depends on low water levels to provide the right conditions and stimulus for seed germination. This site contains hundreds of immature plants and should be considered for conservation and NHA status to protect this rare plant, to monitor its growth and health and to protect it in future years from threats such as field drainage.</p>	10.69
000074	Awbeg Valley (Below Doneraile)	<p>The site is of interest because the limestone substrate gives rise to plant communities that are unusual in the south-west.</p> <p>Along this section of the river, below Doneraile, dry broad-leaved woodlands dominate the valley sides, although there are a few patches of conifers. Within the Awbeg Valley as a whole, two local plants associated with the woods are Toothwort (<i>Lathraea squamaria</i>) and Ivy Broomrape (<i>Orobanche hederæ</i>). At the edges of the</p>	11.17

Site Code	Site Name	Feature of Interest	Distance km (development boundary or nearest works or activity location)
		<p>valley thin soils over limestone support an interesting community, including herbs such as Marjorum (<i>Origanum vulgare</i>) and common Calamint (<i>Calamentha sylvatica</i> subsp. <i>ascendens</i>), along with several grasses (<i>Koeleria cristata</i>, <i>Trisetum flavescens</i> and <i>Aira caryophyllaea</i>).</p> <p>The recent NHA survey recorded abundant frogspawn within a marshy field.</p>	

Table 2: pNHA's and NHA's within 15km of the Turbine Delivery Route.

Site Code	Site Name	Feature of Interest
000073	Blackwater River Callows	No information available
000074	Awbeg Valley (Below Doneraile)	<p>The site is of interest because the limestone substrate gives rise to plant communities that are unusual in the south-west.</p> <p>Along this section of the river, below Doneraile, dry broad-leaved woodlands dominate the valley sides, although there are a few patches of conifers. Within the Awbeg Valley as a whole, two local plants associated with the woods are Toothwort (<i>Lathraea squamaria</i>) and Ivy Broomrape (<i>Orobancha hederaceae</i>). At the edges of the valley thin soils over limestone support an interesting community, including herbs such as Marjorum (<i>Origanum vulgare</i>) and common Calamint (<i>Calamentha sylvatica</i> subsp. <i>ascendens</i>), along with several grasses (<i>Koeleria cristata</i>, <i>Trisetum flavescens</i> and <i>Aira caryophyllaea</i>).</p> <p>The recent NHA survey recorded abundant frogspawn within a marshy field.</p>

Site Code	Site Name	Feature of Interest
000079	Bride/Bunaglanna Valley	The major features of interest in the site are firstly, the diverse range of comparatively intact habitat type present and, secondly, the microfungi community, some of which have not been recorded elsewhere. Deciduous woodland is a scarce habitat in Ireland.
000085	Glanworth Ponds	The Glanworth Ponds are new records for the occurrence of the Golden Dock in East Cork. Golden Dock is a Red Data Book species where occurrence is apparently declining because often its appearance in a place is only fleeting; it depends on low water levels to provide the right conditions and stimulus for seed germination. This site contains healthy and viable populations of the Golden Dock, as well as, a good species diversity of other aquatic and wetland plants and should therefore be considered for conservation and NHA status.
000094	Lee Valley	Wet broadleaved woodland has developed in a number of places on the river side. Some areas behind the riverbank are frequently flooded and support wet grassland communities. Dry broadleaved woodland exists in other sections of the valley, with the ground flora of many of these woods is relatively species-rich. Unimproved dry grassland occurs on an area of soil that has probable glacial origins. Freshwater marsh fringes the river itself in places. A number of wetland bird species breed here, including Mallard, Heron, Sedge and Grasshopper Warblers and Reed Bunting and two rather locally distributed butterflies, the Small Blue and the Wood White occur.
000103	Shournagh Valley	The woods along the Shournagh Valley included in this site (103) are recommended for conservation and are noted to be of regional importance and deserving of NHA status.
001029	Araglin Valley	The Araglin Valley is of regional importance because of its high diversity of species and ecological interest. The area is predominantly underlain by sandstone, with limestone occurring in the lower reaches near Fermoy. These two contrasting rocky types bring with them differences in the soils and a wide diversity of plant and animal communities.
001046	Douglas River Estuary	The prime importance of this site is its birdlife and it ranks as the second most important area in Cork Harbour (1991-92). It is a valuable area and high tide roost for waterfowl; a typical count, provided by the 1986 An Foras Forbartha County Report, is as follows (average and peak winter counts given):- Teal (48; 181), Wigeon (161; 550), Shelduck (168; 577), Red-breasted Merganser (80; 120), Oystercatcher (314; 1,100), Lapwing (948; 5,485), Golden Plover (1,148; 3,400), Curlew (236; 675),

Site Code	Site Name	Feature of Interest
		<p>Black-tailed Godwit (220;481), Bar-tailed Godwit (220; 474), Redshank (197; 400) and Dunlin (684; 2,543). This gives totals of 412 (1,074) wildfowl and 3,563 (37,355) waders.</p> <p>Based on the above figures, four species occur in nationally important numbers, namely: Shelduck, Red-breasted Merganser, Golden Plover and Black-tailed Godwit. However, the bird populations tend to be mobile and this site must be considered an essential part of Cork Harbour which is of international importance for waterfowl.</p>
001054	Glanmire Wood	<p>The main habitat of interest is mixed broad-leaved woodlands dominated by oak (<i>Quercus</i> sp.), beech (<i>Fagus sylvatica</i>) and sycamore (<i>Acer pseudoplatanus</i>) with a few conifers, especially Silver Fir (<i>Abies alba</i>). The ground flora is particularly rich and includes two grasses, wood fescue (<i>Festuca altissima</i>) and wood millet (<i>Milium effusum</i>), which are thought to indicate ancient woodland. More commonly occurring species include Primrose (<i>Primula vulgaris</i>), violets (<i>Viola riviniana</i>, <i>V.reichen/bachiana</i>), wood anemone (<i>Anemone nemorosa</i>) and Lords-and-ladies (<i>Arum maculatum</i>).</p>
001058	Great Island Channel	<p>The tidal river below the wood adds to the diversity of the site with patches of saltmarsh.</p> <p>No information available</p>
001074	Rockfarm Quarry, Little Island	<p>The area is of considerable interest botanically because of its species diversity and the presence of 'varieties' for the region, such as the dense-flowered orchid and the Portland spurge.</p>
001080	Blackwater Valley (Killavullen)	<p>10 Areas of Scientific Interest occur along its length. This site is situated just downstream (east) of Killavuller Village within an area of limestone. Large prominent outcrops of limestone and caves can be seen along this section. Other habitats included within this site are broad leaved dry woodland and scrub.</p>
001081	Cork Lough	<p>In 1972 An Foras Forbartha noted it as an important place to observe wildfowl and gulls due to its close proximity to a large human population. It appears, however, that high numbers of birds, attracted by bread-feeding, are causing severe eutrophication which is in need of remedial action. Also, exotic fish have been released over the years. In spite of these factors the lake regularly holds over 100 Mute Swans, a feral flock of over 30 Canada Geese and small numbers (usually under 50) of Mallard, Teal, Tufted Duck and Coot. An increasing flock of wintering Lesser Black-backed Gulls also occurs (460+ in January 1995).</p>

Site Code	Site Name	Feature of Interest
001082	Dunkettle Shore	The site is of value because mudflats provide an important feeding ground for waterfowl and it acts as a significant roost for birds in the upper harbour. Furthermore, it is an integral part of Cork harbour which is an internationally important wetland, regularly holding flocks of over 20,000 waterfowl. A Heronry occurs to the east of the site.
001169	Brown's Farm, Togher Cross Roads	It is a small site comprising 4 fields, at the intersection of three hedges in the middle, is a small area of exposed mud, whose vegetation is trampled and grazed. Here the Red Data Book species - Golden Dock (<i>Rumex maritimus</i>) is found in association with Nodding bur-marigold (<i>Bidens cernua</i>), Water starworts (<i>Callitriche species</i>) and Water-purslane (<i>Lythrum portula</i>). This is another new record for the Golden Dock in E. Cork found in a rare Plant Survey of the area in 1992/3. Golden Dock is a Red Data Book species whose occurrence is apparently declining, often its appearance is only fleeting as it depends on low water levels to provide the right conditions and stimulus for seed germination. This site contains hundreds of immature plants and should be considered for conservation and NHA status to protect this rare plant, to monitor its growth and health and to protect it in future years from threats such as field drainage.
001561	Awbeg Valley (Castletownroche)	The site is of interest because the limestone substrate gives rise to plant communities that are unusual in the south-west.
001793	Blackwater Valley (Ballincurrig Wood)	The Ballincurrig Wood site is recommended for inclusion in the Blackwater Valley NHA because the area supports the growth of a population of the very rare Starred Wood sedge.
001796	Blackwater Valley (Cregg)	It comprises dry deciduous woodland, lowland dry grassland, the river channel, scrub and mixed woodland. There is very little information on this site; the ranger notes the spread of Rhododendron and Cherry Laurel at the eastern edge of the wood.
001797	Blackwater Valley (The Beech Wood)	It comprises both wet and dry deciduous woodland, the dominant species are Oak (<i>Quercus petraea</i>) and Beech (<i>Fagus sylvatica</i>). There is a good ground flora and many woodland birds, the wood also provides cover and seclusion for otters and other mammals.
001799	Ardamadane Wood	This site comprises mainly dry deciduous woodland of Oak (<i>Quercus petraea</i>) and Birch (<i>Betula pubescens</i>) with some scrub woodland and improved agricultural grassland.

Site Code	Site Name	Feature of Interest
		<p>Ardamadare Woods consists of a patch of scrub with Hazel (<i>Corylus avellana</i>) and Ash and a linear Oak and Birch Wood stretching northwards along the R. Martin towards Waterloo (the river is also included in this site).</p> <p>The flora of Ardamadare Wood is not as species-rich and includes species of more acid conditions such as Great Wood-rush (<i>Luzula sylvatica</i>).</p>
001829	Ballinaltig Beg Pond	<p>The Golden Dock was found on the south-western margin of the pond in association with species such as Marsh Foxtail (<i>Alopecurus gemiculatus</i>), Jointed Rush (<i>Juncus articulatus</i>), Nodding bur-marigold (<i>Bidens armia</i>), Water pepper (<i>Polygonum hydropyer</i>) and Brooklime (<i>Veronica beccabunga</i>).</p>
001857	Blarney Bog	<p>The main habitats of the area are lowland wet grassland, both grazed and ungrazed and freshwater marsh/fen. The dominant species of the wet grassland are Reed grass (<i>Phalaris anundinacea</i>), Soft Rush (<i>Juncus effusus</i>) and grasses such as Creeping Bent (<i>Agrostis stolonifera</i>), Tufted Hair-grass (<i>Deschampsia caespitosa</i>) and Yorkshore Fog (<i>Holcus lanatus</i>). Land to the west is generally wetter with herbs such as Greater Tussock-Sedge (<i>Carex paniculata</i>), Greater pond-sedge (<i>Carex riparia</i>) and Bladder-sedge (<i>C. vesicana</i>); commonly occurring herbs are Meadowsweet (<i>Filipondula almaria</i>) and Common Valenian (<i>Valeniana effinalis</i>), locally distributed in the sward are Yellow Loosestrife (<i>Lysimachia vulgaris</i>) and Purple Loosestrife (<i>Lythrum salicaria</i>). The land nearer the Blarney road is drier with a mixture of grasses and sedges, the ungrazed areas are more tussocky with herbs such as Common Sand (<i>Rumex acetosa</i>) and Tormentil (<i>Potentilla erecta</i>).</p> <p>The area as a whole is used by a variety of bird species, birds noted to be breeding in the site include: The Sedge and Grasshopper Warblers, Reed Bunting, Stonechat, Meadow Pipet, Snipe and Mallard. In the water Snipe and Mallard are seen feeding in the area and also Teal. Hen Harriers, a species listed in Annex 1 of the EU Bird's Directive and also a Red Data Book species whose status is threatened in Ireland, are regularly seen in this area, hunting over the wetter ground and sometimes nesting in the reed beds.</p>
001979	Monkstown Creek	<p>The mudflats and tidal creeks are fringed by a small amount of saltmarsh vegetation while, above the limestone on the southern shore, two areas of semi-natural woodland occur. The latter contain</p>

Site Code	Site Name	Feature of Interest
		<p>Spindle (<i>Euonymus europaeus</i>) and a thick carpet of Bluebell (<i>Hyacinthoides non-scripta</i>) and Ramsons (<i>Allium ursinum</i>).</p> <p>The area is of value because its mudflats provide an important feeding area for waterfowl and it is a natural part of Cork Harbour which, as a complete unit, is of international importance for waterfowl.</p>
002050	Cregg Castle	<p>This site is a nursery roost of the Daubenton's Bat (<i>Myotis daubentonii</i>). Approximately 100 bats hang from the ceiling of a domed ground floor room in Cregg Castle, approximately 3 miles east of Fermoy Town. This is a site of national importance because it is the second largest nursery colony of this species in the country. The owners are extremely well disposed towards the bats, this site is completely safe from any adverse human disturbance. The only threat facing this site is the deterioration of the castle roof.</p> <p>This species is dependent on aquatic insects so the proximity of the extensive River Blackwater is of utmost importance to the colony. It is essential that pollution of this river system and its associated tributaries is prevented.</p>
002097	Convamore, Ballyhooly (Near Fermoy)	<p>This site is a male roost of the Daubenton's bat (<i>Myotis daubentonii</i>). Approximately 50 bats hang from the roof of the wine cellars in the ground floor of the ruined Convamore House, near Ballyhooly, Co. Cork. This is a site of national importance because it is the only known male roost of this species in the country. The only threat facing the bats at this site is disturbance from people exploring the ruins and the destruction of parts of the cellars walls by people removing bricks.</p> <p>This bat species is dependent on aquatic insects so the proximity of the extensive River Blackwater is of utmost importance to the colony. It is essential that pollution of this river system and its associated tributaries is prevented.</p>

Table 3: pNHA's and NHA'S within 15km of Replant Lands

Site Code	Site Name	Feature of Interest	Distance km from Replant Lands
000079	Bride/Bunaglanna Valley	<p>The major features of interest in the site are firstly, the diverse range of comparatively intact habitat type present and, secondly, the microfungi community, some of which have not been recorded elsewhere. Deciduous woodland is a scarce habitat in Ireland.</p>	0.36
001794	Blackwater Valley (Kilcummer)	<p>Within the site there is wet woodland of Alder (<i>Alnus glutinosa</i>) and Willow (<i>Salix species</i>). This woodland is one of a series of woodlands along the banks of the Blackwater river.</p> <p>The valley sides support the growth of much woodland, but also of ecological interest are the marshes, the river itself and the associated limestone outcrops e.g. inland cliffs and crags.</p> <p>The river-side trees are Alders (<i>Alnus glutinosa</i>) and Willow (<i>Salix species</i>) including the Almond Willow (<i>Salix triandra</i>). The shallower river water and adjacent marshland are vegetated with Common Bulrush (<i>Scirpus lacustris</i> subsp. <i>lacustris</i>), Bur-reeds (<i>Sparganium species</i>) and Pondweeds (<i>Potamogeton species</i>). The flowering rush (<i>Butomus umbellatus</i>) grows locally in the water and Creeping Yellow-Cress (<i>Ronippa sylvestris</i>) on the river banks.</p> <p>The marshland is often colonized by Willow scrub and amongst the bushes Great Yellow-Cress (<i>Ronippa amphibia</i>), Lesser Pond-sedge (<i>Carex acutiformis</i>) and Wood Club-rush (<i>Scirpus sylvaticus</i>) occur with much Lady's smock (<i>Cardamine pratensis</i>), Meadowsweet (<i>Filipendula ulmaria</i>) and Hemp-agrimony (<i>Eupatorium cannabinum</i>).</p>	6.63
001793	Blackwater Valley (Ballincurrag Wood)	<p>The Ballincurrag Wood site is recommended for inclusion in the Blackwater Valley NHA because the area supports the growth of a population of the very rare Starred Wood sedge.</p>	6.72
002097	Convamore, Ballyhooly (Near Fermoy)	<p>This site is a male roost of the Daubenton's bat (<i>Myotis daubentonii</i>). Approximately 50 bats hang from the roof of the wine cellars in the ground floor of the ruined Convamore House, near Ballyhooly, Co. Cork. This is a site of national importance because it is the only known male roost of this species in the country. The only threat</p>	6.78

Site Code	Site Name	Feature of Interest	Distance km from Replant Lands
		<p>facing the bats at this site is disturbance from people exploring the ruins and the destruction of parts of the cellars walls by people removing bricks.</p> <p>This bat species is dependent on aquatic insects so the proximity of the extensive River Blackwater is of utmost importance to the colony. It is essential that pollution of this river system and its associated tributaries is prevented.</p>	
001795	Blackwater Valley (Killathy Wood)	<p>Killathy Wood is a small strip of mixed woodland c. 1km long, situated on the north bank of the River Blackwater. The dominant species in this woodland is Ash (<i>Fraximus excelsior</i>) with some Oak (<i>Quercus petraea</i>) and Scot's pine (<i>Pinus sylvestris</i>). Elm (<i>Ulmus species</i>) were present in the wood but many have been killed by Dutch Elm disease and felled for firewood. Sycamore (<i>Acer pseudopatanus</i>) is also spreading through the wood; at the moment it is found mainly in the eastern half of the site, but it is seriously damaging the character of the wood. Other non-native species include a line of Spruce (<i>Picea species</i>) on the north-west edge of the wood. Cattle have access to shelter and graze in some parts of the wood from the adjacent fields.</p>	7.61
001080	Blackwater Valley (Killavullen)	<p>10 Areas of Scientific Interest occur along its length. This site is situated just downstream (east) of Killavuller Village within an area of limestone. Large prominent outcrops of limestone and caves can be seen along this section. Other habitats included within this site are broad leaved dry woodland and scrub.</p>	7.94
001561	Awbeg Valley (Castletownroche)	<p>The site is of interest because the limestone substrate gives rise to plant communities that are unusual in the south-west.</p>	8.03
001796	Blackwater Valley (Cregg)	<p>It comprises dry deciduous woodland, lowland dry grassland, the river channel, scrub and mixed woodland. There is very little information on this site; the ranger notes the spread of Rhododendron and Cherry Laurel at the eastern edge of the wood.</p>	8.93
002050	Cregg Castle	<p>This site is a nursery roost of the Daubenton's Bat (<i>Myotis daubentonii</i>). Approximately 100 bats hang from the ceiling of a domed ground floor room in Cregg Castle, approximately 3 miles east of Fermoy Town. This is a site of national importance because it is the second largest nursery colony of this species in the country. The owners are extremely well disposed towards the bats, this site is</p>	9.24

Site Code	Site Name	Feature of Interest	Distance km from Replant Lands
		<p>completely safe from any adverse human disturbance. The only threat facing this site is the deterioration of the castle roof.</p> <p>This species is dependent on aquatic insects so the proximity of the extensive River Blackwater is of utmost importance to the colony. It is essential that pollution of this river system and its associated tributaries is prevented.</p>	
000948	Aughnaglanny Valley	<p>Aughnaglanny Valley is a semi-natural woodland in a steep-sided river valley situated 15km north-west of Cashel, Co. Tipperary. The site is approximately 4km long and follows the Aughnaglanny River, a tributary of the Multeen.</p> <p>The main habitats present in the site are dry and wet broad-leaved woodland, humid grassland and scrub. Patches of marshland with Wood Horsetail (<i>Equisetum sylvaticum</i>), Meadowsweet (<i>Filipendula ulmaria</i>), Greater Tussock-sedge (<i>Carex paniculata</i>), Yorkshire-fog (<i>Holcus lanatus</i>) and Bramble (<i>Rubus fruticosus agg.</i>), are also present. The woodland is dominated by Rowan (<i>Sorbus aucuparia</i>), birch (<i>Betula spp.</i>) and willow (<i>Salix spp.</i>); some oak (<i>Quercus spp.</i>) also occurs. Hawthorn (<i>Crataegus monogyna</i>) and Holly (<i>Ilex aquifolium</i>) form the understorey. Gorse (<i>Ulex europaeus</i>) occurs in places.</p> <p>Both Red Squirrel and Fox are present in the woodland and the stream provides suitable habitat for the Otter. The site is also of ornithological interest and supports a range of woodland bird species.</p> <p>Much of the surrounding land is improved or semi-improved pasture and the stream ecosystem is particularly vulnerable to agricultural pollution. The other main threats to the site are scrub clearance and coniferous afforestation.</p> <p>Aughnaglanny Valley is a good example of semi-natural woodland in a river valley. The site supports elements of ecological, botanical, zoological and ornithological interest.</p>	3.3
000956	Inchinquilib and Dowlings Woods	No information available	7.6
002096	Dundrum	Approximately 20 Whiskered Bats (<i>Myotis mystacinus</i>) share a roof of a small stone building with a colony of pipistrelle bats (<i>Pipistrellus spp.</i>). The building, situated north	9.3

Site Code	Site Name	Feature of Interest	Distance km from Replant Lands
		of Dundrum, is owned by Coillte but is leased to a local scout group. The group is aware of the bats and took precautions to prevent disturbance during recent renovations. As the national population of this species is only several hundred, all colonies containing >20 animals are of national importance.	

Table 4: Impact Pathways identified for pNHA sites within 15km of the proposed CGEP and CGEP Grid Connection Route

Site Code	Site Name	Nearest distance to CGEP and CGEP Grid Connection Route	Impact Pathway to National Site Identified
000079	Bride/Bunaglanna Valley	1.25	Downstream hydrological connectivity
001797	Blackwater Valley (The Beech Wood)	2.30	Downstream hydrological connectivity
001796	Blackwater Valley (Cregg)	3.04	Downstream hydrological connectivity
000073	Blackwater River Callows	3.38	Downstream hydrological connectivity
001795	Blackwater Valley (Killathy Wood)	3.50	Downstream hydrological connectivity
002050	Cregg Castle	3.53	No pathway identified
001080	Blackwater Valley (Killavullen)	4.59	Downstream hydrological connectivity
001794	Blackwater Valley (Kilcummer)	4.67	Downstream hydrological connectivity
002097	Convamore, Ballyhooly (Near Fermoy)	4.77	Downstream hydrological connectivity
001793	Blackwater Valley (Ballincurrag Wood)	4.83	Downstream hydrological connectivity
001561	Awbeg Valley (Castletownroche)	6.17	No downstream hydrological connectivity
001029	Araglin Valley	7.81	No downstream hydrological connectivity
000085	Glanworth Ponds	9.49	No downstream hydrological connectivity
001829	Ballinaltig Beg Pond	10.02	No downstream hydrological connectivity
001169	Brown's Farm, Toghher Cross Roads	10.69	No downstream hydrological connectivity
000074	Awbeg Valley (Below Doneraile)	11.17	No downstream hydrological connectivity
000899	Ballindangan Marsh	13.99	No downstream hydrological connectivity
000075	Awbeg Valley (Above Doneraile)	14.29	No downstream hydrological connectivity

Site Code	Site Name	Nearest distance to CGEP and CGEP Grid Connection Route	Impact Pathway to National Site Identified
001799	Ardamadane Wood	9.66	No downstream hydrological connectivity
001857	Blarney Bog	12.10	No downstream hydrological connectivity
000103	Shournagh Valley	11.37	No downstream hydrological connectivity
001039	Blarney Castle Woods	12.37	No impact pathways identified
001798	Blarney Lake	12.91	No downstream hydrological connectivity

Table 5: pNHA's and NHA's within 10 km of the Project

Site Code	Site Name	Feature of Interest
000073	Blackwater River Callows	No information available
000074	Awbeg Valley (Below Doneraile)	The site is of interest because the limestone substrate gives rise to plant communities that are unusual in the south-west.
000079	Bride/Bunaglanna Valley	The major features of interest in the site are firstly, the diverse range of comparatively intact habitat type present and, secondly, the microfungi community, some of which have not been recorded elsewhere. Deciduous woodland is a scarce habitat in Ireland.
000085	Glanworth Ponds	The Glanworth Ponds are new records for the occurrence of the Golden Dock in East Cork. Golden Dock is a Red Data Book species where occurrence is apparently declining because often its appearance in a place is only fleeting; it depends on low water levels to provide the right conditions and stimulus for seed germination. This site contains healthy and viable populations of the Golden Dock, as well as, a good species diversity of other aquatic and wetland plants and should therefore be considered for conservation and NHA status.
000094	Lee Valley	Wet broadleaved woodland has developed in a number of places on the river side. Some areas behind the riverbank are frequently flooded and support wet grassland communities. Dry broadleaved woodland exists in other sections of the valley, with the ground flora of many of these woods is relatively species-rich. Unimproved dry grassland occurs on an area of soil that has probable glacial origins. Freshwater marsh fringes

Site Code	Site Name	Feature of Interest
		<p>the river itself in places. A number of wetland bird species breed here, including Mallard, Heron, Sedge and Grasshopper Warblers and Reed Bunting and two rather locally distributed butterflies, the Small Blue and the Wood White occur.</p>
000103	Shournagh Valley	<p>The woods along the Shournagh Valley included in this site (103) are recommended for conservation and are noted to be of regional importance and deserving of NHA status.</p>
001029	Araglin Valley	<p>The Araglin Valley is of regional importance because of its high diversity of species and ecological interest. The area is predominantly underlain by sandstone, with limestone occurring in the lower reaches near Fermoy. These two contrasting rocky types bring with them differences in the soils and a wide diversity of plant and animal communities.</p>
001046	Douglas River Estuary	<p>The prime importance of this site is its birdlife and it ranks as the second most important area in Cork Harbour (1991-92). It is a valuable area and high tide roost for waterfowl; a typical count, provided by the 1986 An Foras Forbartha County Report, is as follows (average and peak winter counts given):- Teal (48; 181), Wigeon (16; 550), Shelduck (168; 577), Red-breasted Merganser (80; 120), Oystercatcher (314; 1,100), Lapwing (948; 5,485), Golden Plover (1,148; 3,400), Curlew (236; 675), Black-tailed Godwit (220;481), Bar-tailed Godwit (220; 474), Redshank (197; 400) and Dunlin (684; 2,543). This gives totals of 412 (1,074) wildfowl and 3,563 (37,355) waders.</p> <p>Based on the above figures, four species occur in nationally important numbers, namely: Shelduck, Red-breasted Merganser, Golden Plover and Black-tailed Godwit. However, the bird populations tend to be mobile and this site must be considered an essential part of Cork Harbour which is of international importance for waterfowl.</p>
001054	Glanmire Wood	<p>The main habitat of interest is mixed broad-leaved woodlands dominated by oak (<i>Quercus</i> sp.), beech (<i>Fagus sylvatica</i>) and sycamore (<i>Acer pseudoplatanus</i>) with a few conifers, especially Silver Fir (<i>Abies alba</i>). The ground flora is particularly rich and includes two grasses, wood fescue (<i>Festuca altissima</i>) and wood millet (<i>Milium effusum</i>), which are thought to indicate ancient woodland. More commonly occurring species include Primrose (<i>Primula vulgaris</i>), violets (<i>Viola riviniana</i>, <i>V.reichenbachiana</i>), wood anemone (<i>Anemone nemorosa</i>) and Lords-and-ladies (<i>Arum maculatum</i>).</p> <p>The tidal river below the wood adds to the diversity of the site with patches of saltmarsh.</p>
001058	Great Island Channel	<p>No information available</p>

Site Code	Site Name	Feature of Interest
001074	Rockfarm Quarry, Little Island	The area is of considerable interest botanically because of its species diversity and the presence of 'varieties' for the region, such as the dense-flowered orchid and the Portland spurge.
001080	Blackwater Valley (Killavullen)	10 Areas of Scientific Interest occur along its length. This site is situated just downstream (east) of Killavullen Village within an area of limestone. Large prominent outcrops of limestone and caves can be seen along this section. Other habitats included within this site are broad leaved dry woodland and scrub.
001081	Cork Lough	In 1972 An Foras Forbartha noted it as an important place to observe wildfowl and gulls due to its close proximity to a large human population. It appears, however, that high numbers of birds, attracted by bread-feeding, are causing severe eutrophication which is in need of remedial action. Also, exotic fish have been released over the years. In spite of these factors the lake regularly holds over 100 Mute Swans, a feral flock of over 30 Canada Geese and small numbers (usually under 50) of Mallard, Teal, Tufted Duck and Coot. An increasing flock of wintering Lesser Black-backed Gulls also occurs (460+ in January 1995).
001082	Dunkettle Shore	The site is of value because is mudflats provide an important feeding ground for waterfowl and it acts as a significant roost for birds in the upper harbour. Furthermore, it is an integral part of Cork harbour which is an internationally important wetland, regularly holding flocks of over 20,000 waterfowl. A Heronry occurs to the east of the site.
001169	Brown's Farm, Togher Cross Roads	It is a small site comprising 4 fields, at the intersection of three hedges in the middle, is a small area of exposed mud, whose vegetation is trampled and grazed. Here the Red Data Book species - Golden Dock (<i>Rumex maritimus</i>) is found in association with Nodding bur-marigold (<i>Bidens cernua</i>), Water starworts (<i>Callitriche species</i>) and Water-purslane (<i>Lythrum portula</i>). This is another new record for the Golden Dock in E. Cork found in a rare Plant Survey of the area in 1992/3. Golden Dock is a Red Data Book species whose occurrence is apparently declining, often its appearance is only fleeting as it depends on low water levels to provide the right conditions and stimulus for seed germination. This site contains hundreds of immature plants and should be considered for conservation and NHA status to protect this rare plant, to monitor its growth and health and to protect it in future years from threats such as field drainage.
001561	Awbeg Valley (Castletownroche)	The site is of interest because the limestone substrate gives rise to plant communities that are unusual in the south-west.

Site Code	Site Name	Feature of Interest
001793	Blackwater Valley (Ballincurrig Wood)	<p>The Ballincurrig Wood site is recommended for inclusion in the Blackwater Valley NHA because the area supports the growth of a population of the very rare Starred Wood sedge.</p>
001794	Blackwater Valley (Kilcummer)	<p>Within the site there is wet woodland of Alder (<i>Alnus glutinosa</i>) and Willow (<i>Salix species</i>). This woodland is one of a series of woodlands along the banks of the Blackwater river.</p> <p>The valley sides support the growth of much woodland, but also of ecological interest are the marshes, the river itself and the associated limestone outcrops e.g. inland cliffs and craggs.</p> <p>The river-side trees are Alders (<i>Alnus glutinosa</i>) and Willow (<i>Salix species</i>) including the Almond Willow (<i>Salix triandra</i>). The shallower river water and adjacent marshland are vegetated with Common Bulrush (<i>Scirpus lacustris</i> subsp. <i>lacustris</i>), Bur-reeds (<i>Sparganium species</i>) and Pondweeds (<i>Potamogeton species</i>). The flowering rush (<i>Butomus umbellatus</i>) grows locally in the water and Creeping Yellow-Cress (<i>Ronippa sylvestris</i>) on the river banks.</p> <p>The marshland is often colonized by Willow scrub and amongst the bushes Great Yellow-Cress (<i>Ronippa amphibia</i>), Lesser Pond-sedge (<i>Carex acutiformis</i>) and Wood Club-rush (<i>Scirpus sylvaticus</i>) occur with much Lady's smock (<i>Cardamine pratensis</i>), Meadowsweet (<i>Filipendula ulmaria</i>) and Hemp-agrimony (<i>Eupatorium cannabinum</i>).</p>
001795	Blackwater Valley (Killathy Wood)	<p>Killathy Wood is a small strip of mixed woodland c. 1km long, situated on the north bank of the River Blackwater. The dominant species in this woodland is Ash (<i>Fraxinus excelsior</i>) with some Oak (<i>Quercus petraea</i>) and Scot's pine (<i>Pinus sylvestris</i>). Elm (<i>Ulmus species</i>) were present in the wood but many have been killed by Dutch Elm disease and felled for firewood. Sycamore (<i>Acer pseudoplatanus</i>) is also spreading through the wood; at the moment it is found mainly in the eastern half of the site, but it is seriously damaging the character of the wood. Other non-native species include a line of Spruce (<i>Picea species</i>) on the north-west edge of the wood. Cattle have access to shelter and graze in some parts of the wood from the adjacent fields.</p>
001796	Blackwater Valley (Cregg)	<p>It comprises dry deciduous woodland, lowland dry grassland, the river channel, scrub and mixed woodland. There is very little information on this site; the ranger notes the spread of Rhododendron and Cherry Laurel at the eastern edge of the wood.</p>

Site Code	Site Name	Feature of Interest
001797	Blackwater Valley (The Beech Wood)	<p>It comprises both wet and dry deciduous woodland, the dominant species are Oak (<i>Quercus petraea</i>) and Beech (<i>Fagus sylvatica</i>). There is a good ground flora and many woodland birds, the wood also provides cover and seclusion for otters and other mammals.</p> <p>This site comprises mainly dry deciduous woodland of Oak (<i>Quercus petraea</i>) and Birch (<i>Betula pubescens</i>) with some scrub woodland and improved agricultural grassland.</p> <p>Ardamadare Woods consists of a patch of scrub with Hazel (<i>Corylus avellana</i>) and Ash and a linear Oak and Birch Wood stretching northwards along the R. Martin towards Waterloo (the river is also included in this site).</p> <p>The flora of Ardamadare Wood is not as species-rich and includes species of more acid conditions such as Great Wood-rush (<i>Luzula sylvatica</i>).</p>
001799	Ardamadane Wood	<p>The Golden Dock was found on the south-western margin of the pond in association with species such as Marsh Foxtail (<i>Alopecurus gemiculatus</i>), Jointed Rush (<i>Juncus articulatus</i>), Nodding bur-marigold (<i>Bidens armia</i>), Water pepper (<i>Polygonum hydropyrum</i>) and Brooklime (<i>Veronica beccabunga</i>).</p> <p>The main habitats of the area are lowland wet grassland, both grazed and ungrazed and freshwater marsh/fen. The dominant species of the wet grassland are Reed grass (<i>Phalaris anundinacea</i>), Soft Rush (<i>Juncus effusus</i>) and grasses such as Creeping Bent (<i>Agrostis stolonifera</i>), Tufted Hair-grass (<i>Deschampsia caespitosa</i>) and Yorkshore Fog (<i>Holcus lanatus</i>). Land to the west is generally wetter with herbs such as Greater Tussock-Sedge (<i>Carex paniculata</i>), Greater pond-sedge (<i>Carex riparia</i>) and Bladder-sedge (<i>C. vesicana</i>); commonly occurring herbs are Meadowsweet (<i>Filipondula almaria</i>) and Common Valenian (<i>Valeniana effinalis</i>), locally distributed in the sward are Yellow Loosestrife (<i>Lysimachia vulgaris</i>) and Purple Loosestrife (<i>Lythrum salicaria</i>). The land nearer the Blarney road is drier with a mixture of grasses and sedges, the ungrazed areas are more tussocky with herbs such as Common Sand (<i>Rumex acetosa</i>) and Tormentil (<i>Potentilla erecta</i>).</p> <p>The area as a whole is used by a variety of bird species, birds noted to be breeding in the site include: The Sedge and Grasshopper Warblers, Reed Bunting, Stonechat, Meadow Pipet, Snipe and Mallard. In the water Snipe and Mallard are seen feeding in the area and also Teal. Hen Harriers, a species listed in Annex 1 of the EU Bird's Directive and also a Red Data Book species whose status is threatened in Ireland, are regularly seen in this area, hunting over the wetter ground and sometimes nesting in the reed beds.</p>
001829	Ballinaltig Beg Pond	<p>The mudflats and tidal creeks are fringed by a small amount of saltmarsh vegetation while, above the limestone on the southern shore, two areas of semi-natural woodland occur. The latter contain Spindle</p>
001857	Blarney Bog	<p>The mudflats and tidal creeks are fringed by a small amount of saltmarsh vegetation while, above the limestone on the southern shore, two areas of semi-natural woodland occur. The latter contain Spindle</p>
001979	Monkstown Creek	<p>The mudflats and tidal creeks are fringed by a small amount of saltmarsh vegetation while, above the limestone on the southern shore, two areas of semi-natural woodland occur. The latter contain Spindle</p>

Feature of Interest		
Site Code	Site Name	
		<p>(<i>Euonymus europaeus</i>) and a thick carpet of Bluebell (<i>Hyacinthoides non-scripta</i>) and Ramsons (<i>Allium ursinum</i>).</p> <p>The area is of value because its mudflats provide an important feeding area for waterfowl and it is a natural part of Cork Harbour which, as a complete unit, is of international importance for waterfowl.</p>
002050	Cregg Castle	<p>This site is a nursery roost of the Daubenton's Bat (<i>Myotis daubentonii</i>). Approximately 100 bats hang from the ceiling of a domed ground floor room in Cregg Castle, approximately 3 miles east of Fermoy Town. This is a site of national importance because it is the second largest nursery colony of this species in the country. The owners are extremely well disposed towards the bats, this site is completely safe from any adverse human disturbance. The only threat facing this site is the deterioration of the castle roof.</p> <p>This species is dependent on aquatic insects so the proximity of the extensive River Blackwater is of utmost importance to the colony. It is essential that pollution of this river system and its associated tributaries is prevented.</p>
002097	Convamore, Ballyhooly (Near Fermoy)	<p>This site is a male roost of the Daubenton's bat (<i>Myotis daubentonii</i>). Approximately 50 bats hang from the roof of the wine cellars in the ground floor of the ruined Convamore House, near Ballyhooly, Co. Cork. This is a site of national importance because it is the only known male roost of this species in the country. The only threat facing the bats at this site is disturbance from people exploring the ruins and the destruction of parts of the cellars walls by people removing bricks.</p> <p>This bat species is dependent on aquatic insects so the proximity of the extensive River Blackwater is of utmost importance to the colony. It is essential that pollution of this river system and its associated tributaries is prevented.</p>





Appendix 8-G: Non-volant Mammal Data

Appendix 8-G: Non-volant Mammal Data

List of Tables:

Table 1: Mammal photographic records 2017-2019

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 <p>01-31-2014 18:10:45 35F1C Bosnell</p>	 <p>11P-C 01-18-2017 09:46:21 Bosnell</p>
<p>Plate 1.1: Fallow deer Winter '16/'17 Site 2 (ITM 568556 591720)</p>	<p>Plate 1.2: Fox Winter '16/'17 Site 3 (ITM 564763 593058)</p>
 <p>03-09-2017 13:26:47 44F5C Bosnell</p>	 <p>44F5C 06-15-2018 08:34:1 Bosnell</p>
<p>Plate 1.3 Red squirrel Winter '17/'17 Site 4 (ITM 56473 592451)</p>	<p>Plate 1.4: Stoat 15/06/18 camera location 11 (ITM 570287 593721).</p>



05-19-2018 00:14:02
37.12 °C
Camera Name

Plate 1.5: Otter 19/05/18 camera location 9 (571897 588806).



04-05-2018 09:30:45
23.5 °C
Camera Name

Plate 1.6: Hare 05/04/18 camera location 5 (ITM 562159 590219).



03-30-2018 04:41:05
29.15 °C
Camera Name

Plate 1.7: Badger 30/03/18 camera location 5. Also, on 31/03/18 and 09/04/18 (ITM 562159 590219).



Plate 1.7: Fox print 28/03/18 (ITM 562175 589259)



Plate 1.9: Squirrel feeding station 18/04/19 (ITM 563280 590075.



Plate 1.10: White toothed shrew 28/03/19 (ITM 562175 589259.



Plate 1.11: Small mammal burrow 29/03/19 (ITM 570090 544302).



Plate 1.12: Mammal track 29/03/19 (ITM 569927 593880).

Appendix 8-H: Bat Survey Data

Appendix 8-H: Bat Survey Data

List of Tables:

Table 1: Breakdown of results from the preliminary automated detector surveys in 2017.

Table 2: Breakdown of results from the automated detector surveys along the grid connection route (2018).

Table 3. Breakdown of results from the automated detector surveys in 2019.

Table 4. Breakdown of results from the automated detector surveys in 2020

Table 1: Breakdown of results from the preliminary automated detector surveys in 2017.

Location	Species	June	July										Total
		30	1	2	3	4	5	6	7	8	9	10	
A1	L	2		11		13	19	11	72	35	6	10	179
	CP	1	2	6		13	25	12	54	20		2	135
	SP			5		7	7	5	11	10			45
	MY	2	6	4	1	10	3	3	4	8		1	42
	UnID	1			1		2		3	2			9
	Total	6	8	26	2	43	56	31	144	75	6	13	410
A2	L	2	5	23	8	7	8	6	16	5	5	6	91
	CP	344	423	152	124	293	400	393	334	378	403	219	3,463
	SP	2	7	1	3	3	4	3	4	13	7	7	54
	MY	6	3	3	11	4	4	3	4	7	1	8	54
	UnID			1	1		1	1		1		1	6
	Total	354	438	180	147	307	417	406	358	404	416	241	3,668
A3	L	1	9	14	4	27	18	18	18	22	20		151
	CP	5	17	32	11	40	52	48	48	17	3	2	275
	SP	4	24	11	3	33	16	21	18	23	10	2	165
	MY	6	6	2	5	9	12	12	17	30	12	1	112
	UnID						2	2	1	1	1		7
	Total	16	56	59	23	109	100	101	102	93	46	5	710
A4	L		6	10	7	22	38	29	25	28	21	24	210
	CP	18	29	24	9	19	18	14	18	15	24	24	212
	SP	7	3	3	2	7	2	8	14	19	4	2	71
	MY		1	3		2		2	2	2		5	17
	UnID				2					1			3
	Total	25	39	40	20	50	58	53	59	65	49	55	513
A5	L	1	5	36	11	20	23	28	20	36		79	259
	CP	3	2	23	72	7	43	25	12	5		39	231
	SP	3		11	7	4	11	4	1	5		13	59
	MY	6	3	9	3	6	15	13	6	8		6	75
	UnID			2			2	3	1	1			9
	Total	13	10	81	93	37	94	73	40	55		137	633
A6	L	1	1	1	1	10	17	38	9	2	1	42	123
	CP	1	1	5	2	8	40	23	19			28	127
	SP								2				2
	MY	1										1	2
	UnID							1					1
	Total	3	2	6	3	18	57	62	30	2	1	71	255
Overall Total		417	553	392	288	564	782	726	733	694	518	522	6,189

Location	Species	Aug										Total
		5	6	7	8	9	10	11	12	13		
A1	L	7	7	2	2	1		2		1		22
	CP	117	53	2		10		1	1	3		187
	SP	37	52			4			1			94
	MY	50	54	2	5	39	1	26	4	7		188
	UnID	1	2			4			1	2		10
	Total	212	168	6	7	58	1	29	7	13		501
A2	L	1	1	2		1	1	1		1		8
	CP	250	128	10	7	75		3	1	1		475
	SP	42	10		2	6		2				62
	MY	6	6	3	4	4	2	3				28
	UnID		1	1	1	1	1			2		7
	Total	299	146	16	14	87	4	9	1	4		580
A3	L	3	11	4	2	6		3	1	1		31
	CP	36	69	7	10	33	4	9	1	5		174
	SP	44	81	10	13	24	6	12	8	2		200
	MY	23	33	10	7	32	1	23	4	11		144
	UnID	5	3	1	1	5		1	1			17
	Total	111	197	32	33	100	11	48	15	19		566
A4	L	3	1	2		5		1				12

	CP	60	144	7	5	45	3	6	2		272
	SP	69	46	2	6	23	4	19	7	3	179
	MY	11	12	1	5	5		10	1		45
	UnID	2		1						1	4
	Total	145	203	13	16	78	7	36	10	4	512
A5	L	6	16	2		8	2		3	1	38
	CP	187	213	9	1	159		11			580
	SP	44	29			152	1	9	3		238
	MY	7	14		2	6	1	1	2		33
	UnID	1	2		1	2		2	3	2	13
	Total	245	274	11	4	327	4	23	11	3	902
A6	L	1				1					2
	CP	5	39	1		11		26			82
	SP	1	3			1					5
	MY		1	1							2
	UnID		1			2					3
	Total	7	44	2		15		26			94
Overall Total		1,019	1,032	80	74	665	27	171	44	43	3,155

Location	Species	Oct								Total	
		18	19	20	21	22	23	24	25		
A1	L						2				2
	CP	2					76				78
	SP	11					10				21
	MY	1					4				5
	UnID						2				2
	Total	14					94				108
A2	CP		43		7		60				110
	SP	1	20		2		6				29
	MY	3					4				7
	Total	4	63		9		70				146
A3	CP	1					197	1			199
	SP						57	9			66
	MY						3	2			5
	UnID							1			1
	Total	1					257	13			271
A4	L						1				1
	CP	9	4				237	1			251
	SP	2	37				148				187
	MY		1				5				6
	UnID	1									1
	Total	12	42				391	1			446
A5	L	1					7		3		11
	CP	6					38	11	3		58
	SP	3	15			4	21	8	2		53
	MY	4			3	7			3		17
	UnID		2				3		1		6
	Total	14	17		3	11	69	19	12		145
A6	L	1									1
	CP	40	1	3		5	401	8	277		735
	UnID					1					1
	Total	41	1	3		6	401	8	277		737
Overall Total		86	123	3	12	17	1,282	41	289		1,853

Table 3. Breakdown of results from the automated detector surveys in 2019.

Location	Species	May										Total	
		22	23	24	25	26	27	28	29	30	31		
T2	L	37	28	127	5	2			4				203
	CP	3	1	12	1								17
	MY		3										3
	Total	40	32	139	6	2			4				223
T3	L	43	20	38	4			1	3		3	112	
	CP	10	7	5	2	5		1	1		1	32	
	SP						1					1	
	MY						1					1	
	UnID	1										1	
	Total	54	27	43	6	5	2	2	4		4	147	
T4	L	162	67	199	41	53	1	1	11	1	5	541	
	CP	75	83	139	303	165	85	3	150	278	117	1,398	
	SP	5	4		4	4	1		1	1	4	24	
	MY	7	13	11	54	13	6	2	40	57	22	225	
	UnID	3	3		1	5				3		15	
	Total	252	170	349	403	240	93	6	202	340	148	2,203	
T8	L	24	5	11	2	2		3	5		1	53	
	CP	789	656	1,038	199	573	316	47	376	112	597	5,129	
	SP	35	115	55	59	80	7	1	24	30	19	425	
	MY	49	21	73	23	213	328	92	14	45	190	1,048	
	NP				1							1	
	UnID	8	6	5	2	1	4	3	4	4	5	42	
Total	905	803	1,182	286	869	655	57	423	191	812	6,698		
T10	L	7	32	13	18	9	11		17		4	111	
	CP	155	200	234	128	215	111	7	142	70	75	1,337	
	SP	30	7	32	33	14	9	1	23	12	13	174	
	MY	7	14	6	6	11	4		3	4	11	66	
	UnID		1		1	1			1	1	2	7	
	Total	199	254	285	186	250	135	8	186	87	105	1,695	
T11	L	49	511	395	615	353	120		772	502	181	3,498	
	CP	414	362	242	137	246	189	2	84	13	16	1,705	
	SP	25	31	17	8	24	2		1		2	110	
	MY	1	1	7		1	1	1	1	1	3	17	
	UnID	13	17	10	7	12	8	1	5		6	79	
	Total	502	922	671	767	636	320	4	863	516	208	5,409	
T12	L	39		341	32	2			8			422	
	CP	119		296	119	105	1		70	47		757	
	SP	2		3	1	1						7	
	MY	15		23	22	29	1		7	6		103	
	UnID				2	2			2			6	
	Total	175		663	176	139	2		87	53		1,295	
T13	L	2		4		1			1	1	1	10	
	CP	15		8		2	2		3	3	5	38	
	SP	3										3	
	MY										1	1	
	Total	20		12		3	2		4	4	7	52	

Location	Species	May										Total
		22	23	24	25	26	27	28	29	30	31	
T15	L	61	60	62	21	5			9	1	15	234
	CP	11	5	9	7	6			7	2	9	56
	SP	2	2	3	1	1				4	3	16
	MY		1		1							2
	UnID		1	1						2		4
	Total		74	69	75	30	12		16	9	27	312
T17	L	71	66	76	55	36		4	42	25	8	383
	CP	3	2	26		22	2	1	23	21	23	123
	SP		6	1	3		1			16		27
	MY	2	3	2		5	2		1	3	5	23
	UnID	1		1			1				3	6
	Total		77	77	106	58	63	6	5	66	65	39
T18	L	184	137	166	250	112		10	183	86	51	1,281
	CP	28	18	55	4	3	5	3	2	1	12	131
	SP		1	1						1		3
	MY	3	14		1	2	1		2	1	1	25
	UnID		3	2			1		1	1		8
	Total		215	173	224	255	117	18	4	188	90	64
T19	L	105	136	223	145	71		26	57	32	97	892
	CP	31	123	83	35	55	16	3	16	21	339	722
	SP	29	49	32	37	43	5	29	42	40	132	438
	MY	56	17	26	15	14	10	3	16	7	12	176
	NP										5	5
	UnID	6	4	5	3	6	4		5	3	17	53
Total		227	329	369	235	189	35	61	136	103	602	2,286
T20	L	193		136	160	12		3	17	49	29	599
	CP	28		47	24	72			59	16	77	323
	SP	1		1						2	1	5
	MY	12		29	14	5			8	6	13	87
	UnID	19		10	1	6		2	10	2	6	56
	Total		253	223	199	95		5	94	75	126	1,070
T23	L	38			55	67			1		3	164
	CP	9			2	2	21				47	81
	SP				2						2	4
	MY	8			1	7				1	9	26
	UnID	1					1				8	10
	Total		56		60	76	22		1	1	69	285
Overall Total		3,049	2,856	4,341	2,667	2,696	1,290	767	2,274	1,534	2,211	23,685

Location	Species	Aug										Total	
		16	17	18	19	20	21	22	23	24	25		
T2	L			3								1	4
	CP	1		5								10	16
	SP			6								4	10
	MY			4								2	6
	Total		1	18	0	0	0	0	0	0	0	0	17
T3	L	9	5		2	17			8	15	4	3	63
	CP	2	1			5				1		5	14
	SP	1	1			3			3	2		2	12
	MY								1			1	2
	UnID									1		3	4
Total		12	7	0	2	25	0	12	19	4	14	95	
T4	L	99	17	7	14		13	338	67	84	21	660	
	CP	621	344	77	66		196	283	48	33	186	1,854	

Location	Species	Aug										Total
		16	17	18	19	20	21	22	23	24	25	
	SP	10	22	47	8		7	9	9	10	42	164
	MY	66	96	16	9		1	6	7	7	15	223
	UnID	4	4	1	4		2	5	6	6	47	79
	Total	800	483	148	101	0	219	641	137	140	311	2,980
T8	L	2			3	5	1	4	5	2	2	24
	CP	60	192	18	83	153		19	77	21	86	709
	SP		1		14	7	1	3	1			27
	MY	54	173	2	8	38	12	83	17		8	395
	UnID		2	1	1	8	2	5	5			24
	Total	116	368	21	109	211	16	114	105	23	96	1,179
T10	L	14	17	9	17	31	2	30	44	19	16	199
	CP	60	72	59	273	78	11	37	8	343	567	1,508
	SP	10	28	19	52	53	7	15	6	211	127	528
	MY	34	14	11	27	16	10	16	11	16	28	183
	UnID	2	2	1	1	5	1	1	6	13		32
	Total	120	133	99	370	183	31	99	75	602	738	2,450
T11	L				14				59		19	92
	CP				5				10		5	20
	SP				3				3		9	15
	MY				2				6		2	10
	UnID				1				3		3	7
	Total	0	0	0	25	0	0	0	81	0	38	144
T12	L	4	10								27	41
	UnID										1	1
	Total	4	10								28	42
T13	L	4	9	3	4	11	2	15	9	5	9	71
	CP	2	4	1	4	11		2	1	3	6	34
	SP	2	3	1	3	10		1	1	1	3	25
	MY		1	1		5		1	1		3	12
	UnID					1						1
	Total	8	17	6	11	38	2	19	12	9	21	143
T15	L										10	10
	UnID										6	6
	Total	0	0	0	0	0	0	0	0	0	16	16
T17	L	1	15	6	7	4	2	16	2	2	3	58
	CP	5	2		3	3	5	3	3	1		25
	MY	6	7	3	11	4	4	10	8	9	7	69
	UnID						1				1	2
	Total	12	24	9	21	11	12	29	13	12	11	154
T18	L	11	20		8	6		29	13	11	11	109
	CP		1		5	4		5	1	2	10	28
	SP					2		1	4	4	5	16
	MY	1	3					5		2	2	13
	UnID	3	2		2	1		1	2	2	3	16
	Total	15	26	0	15	13	0	41	20	21	31	182
T19	L	20	11	8	5	26	3	20	17	2	16	128
	CP	79	124	36	258	429	19	183	15	262	739	2,144
	SP	27	89	15	47	269	24	87	38	165	204	965
	MY	5	11	9	12	7	3	9	6	13	12	87
	NP							1				1
	UnID	3	3		4	5	1	12	31	6	5	70
	Total	134	238	68	326	736	50	312	107	448	976	3,395
T20	L	16	21	12	10	33	4	65	10	18	20	209
	CP	183	316	41	155	67	5	25	262	82	217	1,353
	SP	114	46	32	32	33	4	12	4	64	97	438
	MY	15	13	30	16	16	22	17	17	34	33	213
	UnID	9	4	2	3	4		7	4	8	6	47
	Total	337	400	117	216	153	35	126	297	206	373	2,260
T23	Total	0	0	0	0	0	0	0	0	0	0	0
Overall Total		1,559	1,724	468	1,196	1,370	365	1,393	866	1,465	2,670	13,076

Location	Species	Sept										Total		
		17	18	19	20	21	22	23	24	25	26			
T2	L	1			1									2
	CP	11	8	1										20
	SP	1	1											2
	MY	1	3	1			2							7
	UnID		1											1
	Total	14	13	2	1	0	2	0	0	0	0			32
T3	L	5	3	3	3									14
	CP	4	5	4			4							17
	SP	1		1				8						10
	MY	1	2											3
	UnID													
	Total	11	10	8	3	0	4	8	0	0	0			44
T4	L	13	6				9							28
	CP	98	138	128			127				8			499
	SP	13	10	4	3		10	6			6			52
	MY	28	27	14	1		30							100
	UnID	4	3	1	2		1							11
	Total	156	184	147	6	0	177	6	0	0	14			690
T8	L		1	1										2
	CP	32	44	48	2									126
	SP	3	1	1										5
	MY	6	2	1										9
	UnID		1	1										2
	Total	41	49	52	2	0	0	0	0	0	0			144
T10	L	1	2	3	2		5							13
	CP	63	101	25	4		163							356
	SP	32	84	6	2		69							193
	MY	14	11	2	6		17							50
	UnID	2	6	4	1		1							14
	Total	112	204	40	15	0	255	0	0	0	0			626
T11	L	28	5	11	8		32	2						86
	CP	5	10	12			10							37
	SP	4	3	3	2		1							13
	MY	4	2				2							8
	UnID						1							1
	Total	41	20	26	10	0	46	2	0	0	0			145
T12	L	15	9	1	1		12							38
	CP	24	99	83	1		135							342
	SP	5	12	2			5							24
	MY	7	2	2	2		3							16
	UnID				1		1							2
	Total	51	122	88	5	0	156	0	0	0	0			422
T13	L	33	13	2	2		3							53
	CP	12	13	16	10		11							62
	SP	6	11	8	11		3							39
	MY	1			1		2							4
	UnID	48	23	15	29									115
	Total	100	60	41	53	0	19	0	0	0	0			273
T15	Total	0	0	0	0	0	0	0	0	0			0	
T17	L	2	1											3
	CP	4	3	2	3									12
	SP	1		1			1							3
	MY	19	20	50	6		23							118
	UnID	1		1			1							3
	Total	27	24	54	9	0	25	0	0	0	0			139
T18	L	8	2		1									11
	CP		4	3										7
	SP		4	3										7
	MY	2	1	1	5									9
	UnID			1										1
	Total	10	11	8	6	0	0	0	0	0	0			35
T19	L	15	16	6	3	0	14	1	0	0	0		55	

	CP	202	525	182	74	1	358	122	16	8	55	1,543
	SP	165	122	202	121	31	242	47	9	44	197	1,180
	MY	61	21	11	1	0	28	0	1	0	6	129
	Total	428	668	395	196	32	628	169	26	52	258	2,852
T20	Total	0	0	0	0	0	0	0	0	0	0	0
T23	Total	0	0	0	0	0	0	0	0	0	0	0
Overall Total		991	1,365	861	306	32	1,312	185	26	52	272	5,402

Appendix 8-I: Ecological Appraisal Replant Lands 2020

COOM GREEN ENERGY PARK

ECOLOGICAL APPRAISAL OF REPLANT LANDS AT MONEYGORM AND BALLARD

Prepared for: Coom Green Energy Park Ltd.



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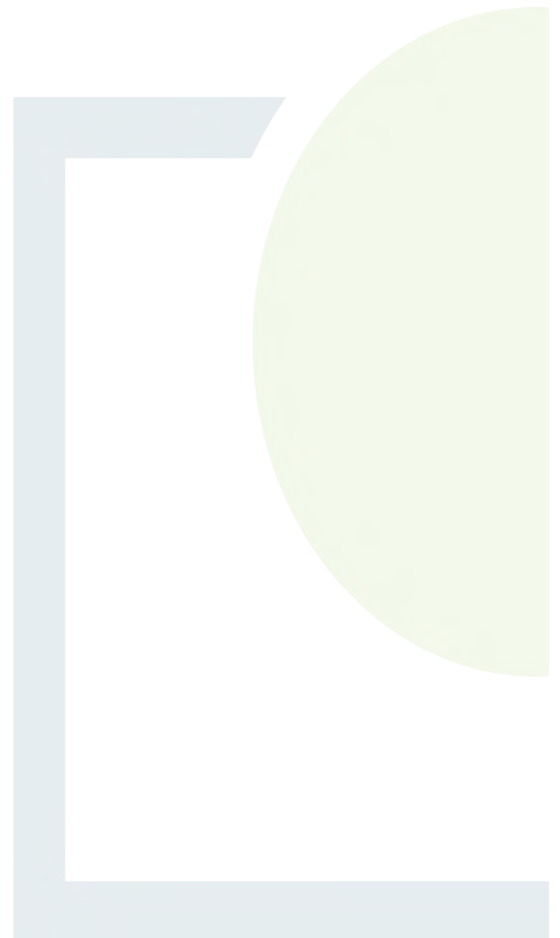


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1. INTRODUCTION

The ecological appraisal for the project was carried out by Fehily Timoney & Company (FT) on 17th June 2019 (Moneygorm, Co. Cork) as well as 29th and 30th January 2020 (Ballard, Co. Wicklow). The Ballard site was previously assessed by Malachy Walsh and Partners on the 29th October 2018 in an assessment of ecological features within the site. An ecological appraisal was carried out at both sites proposed as replant lands for the proposed Coom Green Energy Park. The ecological surveys undertaken included habitat and botanical surveys, and the recording of fauna including birds and mammals. Based on the results of these studies, FT considered potential direct, indirect and cumulative effects of the replant lands on the existing ecological receptors and proposed appropriate mitigation measures to minimise these potential effects.

The purpose of this evaluation was to:

- Undertake a desktop review of available ecological data for both the receiving environment and greater area, including a review of designated sites within 15 km of each project site;
- Undertake ecological field surveys of the receiving environments;
- Identify flora and fauna present within the footprint of the replant lands;
- Evaluate the ecological significance of the receiving environments;
- Appraise the potential effects of the project on the ecology of the receiving environment;
- Consider measures to mitigate the potential negative effect(s) of the project on the ecology of the receiving environments.

1.1 Background to the Report

Replacement replanting of forestry can occur in Ireland subject to licence in compliance with the Forestry Act 2014 as amended. The consent for such replanting is covered by S.I. No. 191/2017 Forestry Regulations 2017. This legislation provides for afforestation and forest road construction project's compliance with the EIA Directive as amended (Directive 2011/92/EU as amended by 2014/52/EU) insofar as it applies to forestry development.

As described in EIS Volume 2 Chapter 3 'Description of the Replant lands', Felling of approximately 64.3ha of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbines, hardstands, crane pads, access tracks and the proposed onsite substation, with a requirement of the felling licence application to replant the same area.

1.1.1 Brief Description of Existing Site

1.1.1.1 *Moneygorm, Co. Cork*

The proposed replant lands are made up of a large (c.40 Ha) open expanse of Improved Agricultural Grassland (GA1) bordered by Scrub (WS1) and Grassy Verges (GS2) in the townland of Moneygorm on the southern side of Nagle's Mountains on a flat spur overlooking the Bride valley, accessed via the R614, un-named local roads, and farm/forestry access tracks.



The surrounding landscape is both mountainous and rural in character, with pasture and commercial forestry being the dominant land uses; the replant lands site is surrounded to the west and north-east by conifer plantations, and to the north, south and south-east by agricultural land.

The site is at an elevation of 210-230m OD. The bedrock geology is purple mudstone and sandstone of the Ballytrasna Formation; the soils are made up of fine loamy drift with siliceous stones. The surrounding land drops off on three sides and the land at the site was observed to be dry, with no associated drainage network.

The Bunnaglanna watercourse is located c. 450m east of the proposed replant lands; drainage channels carrying flowing water are present: one flowing north-south along the eastern replant lands boundary which joins another channel flowing west-east from within the replant lands site exit the site to join a drainage channel flowing downhill (west-east) along the edge of the adjacent conifer plantation towards the Bunaglanna. Assessment of satellite imagery indicates this drainage channel connects with the Bunaglanna c. 565m downstream of the replant lands site.

The Bunnaglanna is a tributary of the Bride River, which it joins c. 2.5 km to the south of the replant lands site. The Bride is a tributary of the Blackwater River, flowing east from the Bunnaglanna/Bride confluence for c. 52 km before joining the Blackwater south of Villierstown in Co. Waterford.

The Bunaglanna and Bride are within the Blackwater River (Cork/Waterford) SAC (002170); the SAC boundary is c. 380m east of the replant lands site at its closest point. The in-stream distance between the replant lands and Blackwater River (Cork/Waterford) SAC is also c. 565m.



Plate 1-1: Overview of the existing landscape in the proposed fields (fox cub in the middle-ground)



1.1.1.2 Ballard, Co. Wicklow

The proposed replant land is divided into two sections by a private road. The proposed footprint is 37.1 Ha in area and is largely composed of open expanse of mosaic of scrub (WS1), recently felled woodland (WS5) and dry-humid acid grassland (GS3), dense bracken (HD1), recolonising bare ground (ED3), hedgerow (WL1), treeline (WL2), immature woodland (WS2), species poor wet grassland (GS4), drainage ditches (FW4), species poor bog woodland (WN7), a mosaic of immature woodland (WS2) and scrub (WS1), and conifer plantation (WD4), buildings and artificial surfaces (BL3) and a mosaic of scrub (WS1) and recently felled woodland (WS5).

The surrounding landscape is both mountainous and rural in character, with pasture and commercial forestry being the dominant land uses; the replant lands site is surrounded to the west and south by conifer plantations, and to the north, by semi-natural woodland, rivers and then further to agricultural land.

The site is divided into two sections by a private road, the westerly and easterly sections. The total area of the replant land at Ballard is 37.1 Ha. Both sites are at elevations of 160-207m OD.

The bedrock geology is sandstone and shale till (Lower Paleozoic); the soils are clayey and classed as Tills (diamictons). The surrounding gently slopes in a north-westerly direction and the land at the site was observed to be dry at higher altitudes, becoming increasingly wetter as the westerly block sloped downhill eventually ending in standing pools. The easterly block was observed as dry. Drainage throughout the site is typical of conifer plantation, with small drains every 2-3 metres typically dry, larger drains contained quantities of standing water.

Both the easterly and westerly aspects of the replant lands site are drained by the Ballyeustace Stream (EPA Code: 10B05). A 1st order watercourse, the Ballyeustace Stream flows in a north-easterly direction for ca. 3km before its confluence with the Avonbeg River (EPA Code: 10A04). Along the northerly section of the easterly aspect of the replant lands, a section of the Ballyeustace Stream has been split from the natural course through an artificial course to the south. It was previously noted in 2018 ecological surveys (undertaken by Malachy Walsh and Partners) completed within the site, that the stream bed of the Ballyeustace Stream that flow to the north of the western portion of Ballard replacement lands, was laden with sediment. It was thought in 2018 to have originated from recently re-seeded agricultural land. This was found to also be the case during surveys in January 2020.

The Ballyeustace Stream (EPA Code: 10B05) flows into the Avonbeg River (EPA Code: 10A04), a 4th order watercourse, at the edge of the Ballinatone Lower and Ballard townlands. From here The Avonbeg River flows for approximately 5.6km in a southerly direction before entering the Avoca River (EPA Code: 10A03). The Avoca River travels for approximately 15.48km until entering the Irish Sea at Arklow.



Plate 1-2: Displaying the array of habitats within the western block of the proposed replant lands site



Plate 1-3: Displaying the array of habitats within the eastern block of the proposed replant lands site

Table 1-1: Proposed Replant Lands and Replant Areas

Site	County	Available Replant Area, ha
Moneygorm	Cork	c.40 Ha
Ballard	Wicklow	C.34 Ha



1.2 Contributors to the Report

FT was commissioned by Coom Green Energy Park Ltd to prepare an Ecological Assessment of the replant lands.

1.3 Methodology

The baseline environmental conditions at each site were determined following a desktop review of publicly available information including aerial photograph and geospatial datasets. A site walkover was also carried out.

The effect of the proposed replanting before recommended mitigation measures are introduced is described under each topic. Interactions and in-combination effects with other environmental topics are also included in this evaluation.

The evaluation of the significance of the effect is also undertaken. Where possible, pre-existing standardised criteria for the significance of effects will be used. Such criteria include Irish legislation, international standards, European Commission and Environmental Protection Agency (EPA) guidelines or good practice guidelines (see section 1.3.1). Where appropriate criteria do not exist the assessment methodology section states the criteria used to evaluate the significance.

If effects are anticipated, mitigation measures are devised to minimise effects on the environment through avoidance, by reduction and by remedy.

The lands identified for consideration as replant lands had to meet a set of stringent criteria. The commitments applied to the identification of the replant lands included in this assessment are:

- Not located within an environmentally designated area.
- Not within high ecological value habitat;
- To be replanted in accordance with Forest Service Guidelines e.g. 'no-plant' buffers from aquatic zones to be implemented.
- Fertilisation will be carried out in accordance with forest service guidelines (outlined in section 2.2).

The replant land selection process was designed to identify sites less likely to have significant constraints on replanting – mitigation by design.

The detailed desktop and field assessments were then carried out to establish any potential for adverse effects upon high-value habitat and species. This process was designed to identify areas of the potential replant sites that should be excluded or subject to additional environmental controls before replanting could proceed.

1.3.1 Relevant Guidance

The methodology for this appraisal has been devised in consideration of the following relevant guidance published by the Environmental Protection Agency (EPA) including '*Guidelines on the information to be contained in Environmental Impact Statements* (2002), reference was also made to the revised draft (July 2017) '*Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)*' (2003), reference was also made to the draft (2015) guidelines and '*Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*' (DoECLG, 2018).



Additional guidance available from the EU such as ‘*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*’ (2013) and ‘*Guidance on the preparation of Environmental Impact Assessment of Report*’ (EC, 2017) has also been considered. The appraisal also takes account of ‘*Guidelines for Ecological Impact Assessment in the UK and Ireland, Freshwater and Coastal*’, 2nd edition (CIEEM, 2018). The Heritage Council publication ‘*Best Practice Guidance for Habitat Survey & Mapping*’ (Smith *et al.*, 2011) is also referenced.

Relevant guidance published by the National Roads Authority (NRA) such as ‘*Guidelines for Assessment of Ecological Impacts of National Road Schemes*’ (2009a), and ‘*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*’ (2008a) have also been followed.

Documentation and guidance available from Wicklow County Council (WCC), such as the ‘*Wicklow County Development Plan: 2016-2022*’, the ‘*County Wicklow Biodiversity Action Plan 2010-2015*’, along with Documents and guidance available from Cork County Council (CCC), such as ‘*Regional Planning Guidelines for County Cork 2010 to 2022*’ and the ‘*Cork County Development Plan: 2014-2020*’, were assessed.

Relevant guidance published by the National Roads Authority (NRA), and applicable to assessing watercourses in Ireland, was also followed, including ‘*Guidelines for the Assessment of Ecological Impacts of National Road Schemes – Revision 2*’ (NRA 2009a), ‘*Ecological surveying techniques for protected flora and fauna during the planning of National Road Schemes – Version 2*’ (NRA 2009b), ‘*Environmental Impact Assessment of National Road Schemes – A practical guide*’ (NRA 2008b) and ‘*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*’ (NRA 2008a).

1.3.2 Legislative context

A diversity of flora and fauna, rare at a national level, are protected under the provisions of the Wildlife Act 1976, as amended, and the orders and regulations made thereunder, such as the Flora Protection Order (2015). The Habitats Directive (92/43/EEC) has been transposed into Irish law, for the purposes of this application for permission by Part XAB of the Planning and Development Act 2000, as inserted. In addition, certain other obligations of the Habitat Directive have been transposed by the European Communities (Birds and Natural Habitats) Regulations 2011, as amended.

Section 171 of the Fisheries (Consolidation) Act 1959 creates the offence of throwing, emptying, permitting or causing to fall onto any waters deleterious matter. Deleterious matter is defined as not only as any substance that is liable to injure fish but is also liable to damage their spawning grounds or the food of any fish or to injure fish in their value as human food or to impair the usefulness of the bed and soil of any waters as spawning grounds or other capacity to produce the food of fish. It will be necessary to get written permission from Inland Fisheries Ireland to proceed with the works in any areas where disturbance to the spawning and nursery areas of both salmonids and lampreys will occur as a result of the proposed grid connection route. Salmon, all lamprey species and their habitats are further protected under the Habitats Directive (92/43/EEC).

Under Section 3 of the Local Government (Water Pollution) Act, 1977 (as amended by Sections 3 and 24 of the 1990 Act) it is an offence to cause or permit any polluting matter to enter waters. Suspended solids would be a key parameter here. Likewise, any visual evidence of oil/fuel in the river would constitute an offence.



1.3.3 Consultation

The details of consultation undertaken as part of the proposed Coom Green Energy Park are outlined in Chapter 5, Volume 2 of the EIAR.

1.3.4 Desktop study

1.3.4.1 *Designated Nature Conservation Sites*

Nationally designated sites within 10 km of the replant lands, such as Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) have been identified. European sites within 15km of the proposed grid connection route namely candidate Special Areas of Conservation (cSACs)¹ and Special Protection Areas for birds (SPAs) were identified as part of this ecological assessment using the Map Viewer at www.npws.ie. A separate AA Screening Report and Natura Impact Statement (NIS) was prepared to evaluate the potential effect to European sites as a result of the proposed replant lands.

1.3.4.2 *Flora and Fauna*

A desk study was carried out to collate and review available information, datasets and documentation sources pertaining to the site's natural environment. Records available on the NPWS and the National Biodiversity Data Centre websites were reviewed.

Other data sources include Ireland's Wetlands and their Waterbirds: Status and Distribution (Crowe 2005), the Atlas of Wintering Birds in Britain and Ireland (Lack, 1986), the Atlas of Breeding Birds in Britain and Ireland (Sharrock, 1976) and the Breeding and Winter Birds of Britain and Ireland Bird Atlas 2007-11 (Balmar *et al.*, 2013).

Botanical species were assessed in accordance with their occurrence on the Flora Protection Order 2015 and the Ireland Red List No. 10: Vascular Plants (Wyse *et al.* 2016). Other sources included:

- OSI Aerial photography and 1:50000 mapping;
- National Parks and Wildlife Service (NPWS);
- NPWS; Checklists of Protected and Threatened Species in Ireland (Nelson *et al.* 2019);
- The Ireland Red List No. 10: Vascular Plants (Wyse *et al.* 2016);
- Teagasc Soil area maps;
- Bat Conservation Ireland (BCI);
- Geological Survey Ireland (GSI) area maps;
- Environmental Protection Agency (EPA) water quality data;
- Inland Fisheries Ireland; and
- South Western River Basin District (SWRBD) and Eastern River Basin District (ERBD) datasets (Water Framework Directive).

¹ Note: At present many SACs in Ireland are currently 'candidate' SACs, and referred to as cSACs. The relevant Statutory Instruments for the SACs in Ireland have not yet been made, however, these "candidate" sites must still be afforded the same level of protection as if they were SACs in accordance with the Habitats Directive.



1.3.5 Field study

1.3.5.1 *Habitats / Flora*

Table 1-2: Survey Details

Site	Date:	Weather Conditions:
Moneygorm	17/07/2019	Precipitation: Dry, Cloud: 4/8-8/8, Wind: F3-4 Visibility: Excellent
Ballard	29/01/2020	Precipitation: Dry, Cloud: 2/8-7/8, Wind: F0-1, F4 at times Visibility: Excellent
Ballard	30/01/2020	Precipitation: Light rain, Cloud: 8/8, Wind: F0-2 Visibility: Ok

Both sites were walked, and all plant species were identified and recorded, and structural and compositional data relating to vegetation within the site were also recorded. The site was also checked for drainage ditches to ascertain and map any hydrological connections between the site and European sites.

The Ballard proposed replant lands site has previously been surveyed by MWP in 2018. During this site visit ecologists described the site area, habitats and ecological features. This report was also used to provide further details of the existing environment for FT site visits in 2020.

The habitats within the footprint of the proposed replant lands were identified and classified, according to 'A Guide to Habitats in Ireland' (Fossitt, 2000), during a walkover survey. The dominant plant species present in each habitat type was recorded. Habitats have been appraised and evaluated according to their occurrence as protected habitats under Annex I of the EU Habitats Directive (92/43/EEC) and for their capacity to support rare, threatened and endangered species. The methodology used to assess the effect on habitats is based on NRA guidelines (2009 a and b), CIEEM guidelines and EPA guidelines. The habitat mapping exercise had regard to the 'Best Practice Guidance for Habitat Survey and Mapping' (Smith *et al.*, 2011) published by the Heritage Council.

Scientific and common names for plants follow Parnell *et al.* (2012) and Blamey *et al.* (1996), respectively. In addition to habitat identification, each habitat was assessed for its ecological significance, based on the National Roads Authority (NRA) Site Evaluation Scheme (NRA, 2009a) (see Table 1-3 below).

Habitat boundaries and associated attribute data were mapped using desk-based GIS software, namely ArcGIS 10.4.1, which was also used to calculate habitat areas and lengths.

Once the baseline ecological survey and mapping was complete, a constraints map highlighting important ecological features and resources was generated, indicating areas for preclusion from the final planting layout. The ecological constraints map was used to design a planting layout with the least ecological effect.



1.3.5.2 Mammals

The total footprint of the proposed planting area was walked by experienced ecologists for potential signs of mammals within the study area. As well as direct observations of mammal features such as tracks, trails, fur, droppings and shelter (setts, dreys and holts) were also recorded using GPS. Watercourse crossings within and connected to the proposed replant lands were surveyed for evidence of otter.

The conservation status of mammals within Ireland and Europe is assessed using one or more of the following documents; Wildlife Acts (1976 - 2019), the Red List of Terrestrial Mammals (Marnell *et al.*, 2019) and NPWS (2019) *The Status of EU Protected Habitats and Species in Ireland*.

1.3.5.3 Bats

Trees within treelines and hedgerows were examined for their potential to offer roosting habitat to bats. The conservation status of bats within Ireland and Europe is assessed using one or more of the following documents: Wildlife Acts (1976 - 2019), *The Status of EU Protected Habitats and Species in Ireland* (NPWS, 2019) and the Red List of Terrestrial Mammals (Marnell *et al.*, 2019).

1.3.5.4 Avifauna

All bird species observed and heard within the study area boundary were noted during the field study of the site. Habitats within the study area were also assessed for the value to bird species noted during the desktop study.

1.3.5.5 Other Taxa

During ecological surveys at the proposed site, other species of fauna were noted and included in the report. The conservation status of other taxa within Ireland and Europe was assessed using one or more of the following documents: Wildlife Acts (1976 - 2019), NPWS (2019), *The Status of EU Protected Habitats and Species in Ireland*, Irish Red Lists (Byrne *et al.*, 2009; Regan *et al.*, 2010; King *et al.*, 2011).

1.3.6 Ecological Resource Evaluation

The value of the ecological resources/receptors at the subject site was evaluated using the ecological evaluation guidance given in the NRA guidance on assessment of ecological effects of National Road Schemes (NRA, 2009a).

This guidance provides ratings for resources based primarily on geographic context and allows for resources at International, National, County and Local (higher and lower value) levels. Key ecological receptors (for assessment) are those deemed to be above the 'Local Importance (lower value) evaluation. Evaluation criteria are outlined below in Table 1-3 over.



Table 1-3: Ecological Resource Evaluation Criteria (from NRA, 2009)

International Importance	<p>‘European Site’ including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.</p> <p>Proposed Special Protection Area (pSPA).</p> <p>Site that fulfils the criteria for designation as a ‘European Site’ (see Annex III of the Habitats Directive, as amended).</p> <p>Features essential to maintaining the coherence of the Natura 2000 Network.¹</p> <p>Site containing ‘best examples’ of the habitat types listed in Annex I of the Habitats Directive.</p> <p>Resident or regularly occurring populations (assessed to be important at the national level)² of the following:</p> <p>Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or</p> <p>Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.</p> <p>Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).</p> <p>World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).</p> <p>Biosphere Reserve (UNESCO Man & The Biosphere Programme).</p> <p>Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).</p> <p>Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).</p> <p>Biogenetic Reserve under the Council of Europe.</p> <p>European Diploma Site under the Council of Europe.</p> <p>Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).³</p>
National Importance	<p>Site designated or proposed as a Natural Heritage Area (NHA).</p> <p>Statutory Nature Reserve.</p> <p>Refuge for Fauna and Flora protected under the Wildlife Acts.</p> <p>National Park.</p> <p>Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.</p> <p>Resident or regularly occurring populations (assessed to be important at the national level)⁴ of the following:</p> <p>Species protected under the Wildlife Acts; and/or</p> <p>Species listed on the relevant Red Data list.</p> <p>Site containing ‘viable areas’⁵ of the habitat types listed in Annex I of the Habitats Directive.</p>

¹ See Articles 3 and 10 of the Habitats Directive.

² It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

³ Note that such waters are designated based on these waters’ capabilities of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*).



⁴ It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

⁵ A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).

County Importance	<p>Area of Special Amenity.⁶</p> <p>Area subject to a Tree Preservation Order.</p> <p>Area of High Amenity, or equivalent, designated under the County Development Plan.</p> <p>Resident or regularly occurring populations (assessed to be important at the County level)⁷ of the following:</p> <ul style="list-style-type: none"> Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list; <p>Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance;</p> <p>County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP,⁸ if this has been prepared;</p> <p>Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county;</p> <p>Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.</p>
Locally Important (higher level)	<p>Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;</p> <p>Resident or regularly occurring populations (assessed to be important at the Local level)⁹ of the following:</p> <ul style="list-style-type: none"> Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list; <p>Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;</p> <p>Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.</p>
Locally Important (lower level)	<p>Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;</p> <p>Sites or features containing non-native species that are of some importance in maintaining habitat links.</p>

⁶ It should be noted that whilst areas such as Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity are often designated on the basis of their ecological value, they may also be designated for other reasons, such as their amenity or recreational value. Therefore, it should not be automatically assumed that such sites are of County importance from an ecological perspective.

⁷ It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.



⁸ BAP: Biodiversity Action Plan.

⁹ It is suggested that, in general, 1% of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

1.3.7 Assessing Effect Significance

Once the value of the identified ecological receptors (features and resources) was determined, the next step was to assess the potential effect or impact of the proposed replant lands on the identified key ecological receptors.

Table 1-4 to Table 1-9 outline the EPA evaluation criteria utilised in this appraisal of the Environmental Factor, Biodiversity. This criteria is included in the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, August 2017).

Table 1-4: Probability of Effects (EPA, August 2017)

Likely Effects	Unlikely Effects
The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

Table 1-5: Quality of Effects (EPA, August 2017)

Quality of Effect	Description
Positive Effect	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or removing nuisances or improving amenities)
Neutral Effect	No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error.
Negative/Adverse Effect	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).



Table 1-6: Significance of Effects (EPA, August 2017)

Significance of Effect	Description
Imperceptible	An effect capable of measurement but without significant consequences
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment
Profound	An effect which obliterates sensitive characteristics

Table 1-7: Duration of Effects (EPA, August 2017)

Duration of Effect	Description
Momentary Effects	Effects lasting from seconds to minutes
Brief Effects	Effects lasting less than a day
Temporary Effects	Effects lasting less than a year
Short-term Effects	Effects lasting one to seven years
Medium-term Effects	Effects lasting seven to fifteen years
Long-term Effects	Effects lasting fifteen to sixty years
Permanent Effects	Effects lasting over sixty years

Table 1-8: Types of Effects (EPA, August 2017)

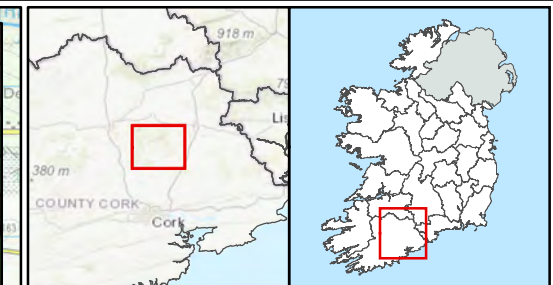
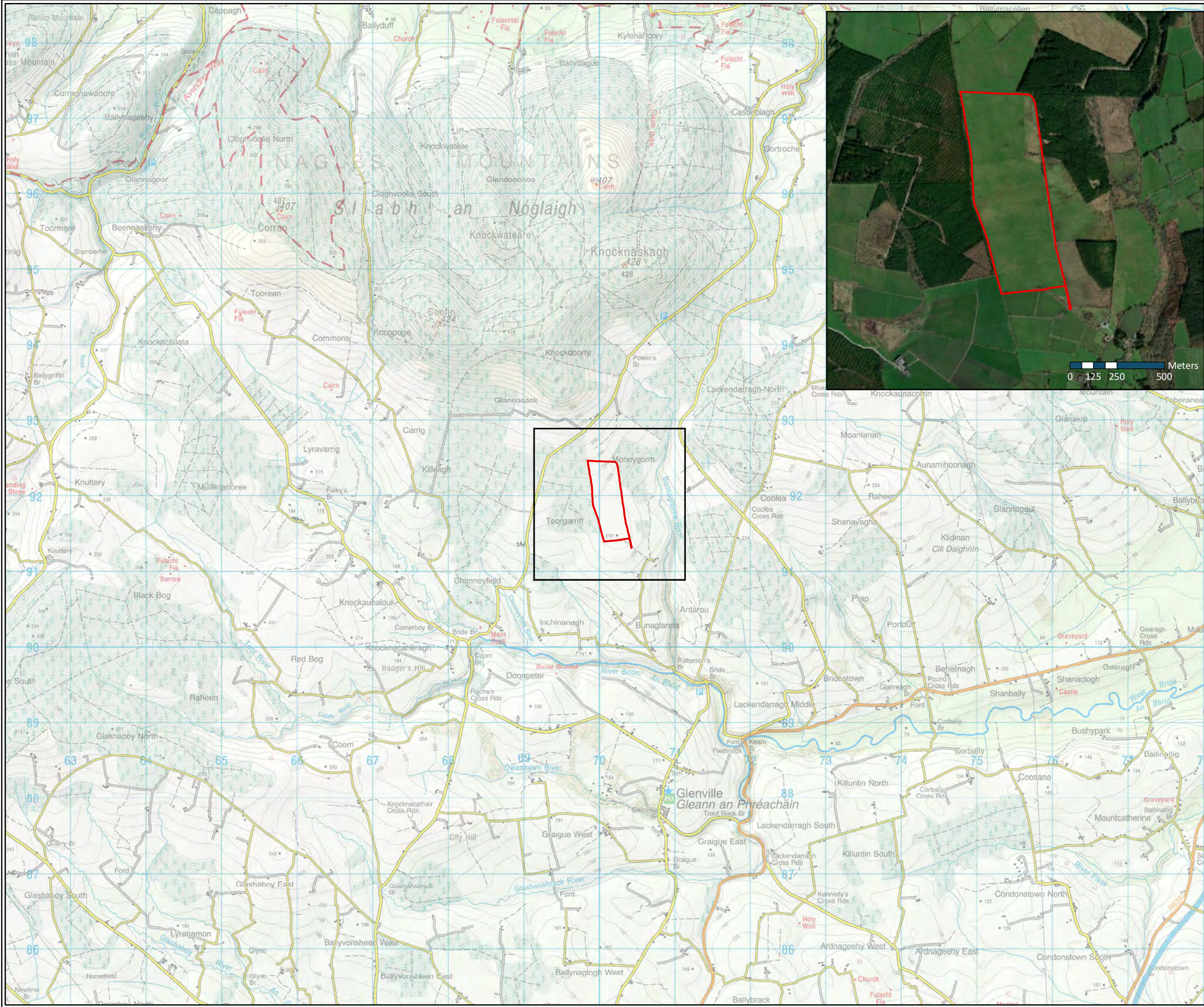
Type of Effect	Description
Effect/Impact	A change resulting from the implementation of a project
Likely Effects	The effects that are specifically predicted to take place – based on an understanding of the interaction of the proposed project and the receiving environment.
Indirect Effects (a.k.a. secondary effects)	Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway



Type of Effect	Description
Cumulative Effects	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
'Do Nothing' Effects	The environment as it would be in the future should the subject project not be carried out.
'Worst Case' Effects	The effects arising from a project in the case where mitigation measures substantially fail
Indeterminable Effects	When the full consequences of a change in the environment cannot be described.
Irreversible Effects	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
Reversible Effects	Effects that can be undone, for example through remediation or restoration
Residual Effects	The degree of environmental change that will occur after the proposed mitigation measures have taken effect
Synergistic Effects	Where the resultant effect is of greater significance than the sum of its constituents (e.g. combination of SOx and NOx to produce smog).

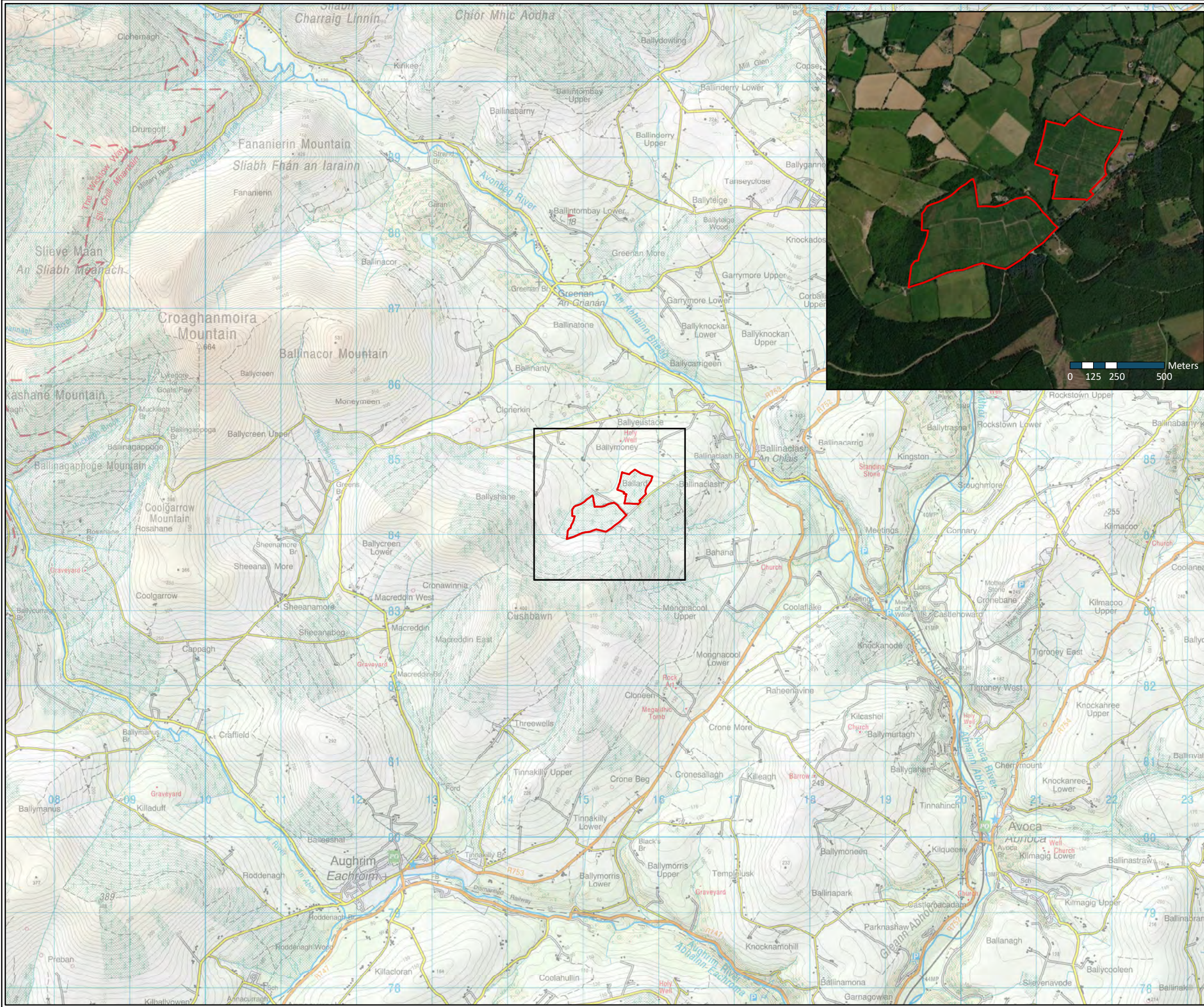
Table 1-9: Definition of Terms – Source, Pathway, Receptor (EPA, August 2017)

Term	Description
Source	The activity or place from which an effect originates
Pathway	The route by which an effect is conveyed between a source and a receptor.
Receptor	Any element in the environment which is subject to effects.
Effect/Impact	A change resulting from the implementation of a project

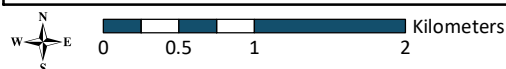


TITLE: Location of Replant Lands at Moneygorm, Co. Cork	
PROJECT: Coom Green Energy Park, Co. Cork	
FIGURE NO: 1.1	
CLIENT: Coom Green Energy Park Ltd.	
SCALE: 1:50000	REVISION: 0
DATE: 25/09/2020	PAGE SIZE: A3





TITLE: Location of Replant Lands at Ballard, Co. Wicklow	
PROJECT: Coom Green Energy Park, Co. Cork	
FIGURE NO: 1.2	
CLIENT: Coom Green Energy Park Ltd.	
SCALE: 1:50000	REVISION: 0
DATE: 25/09/2020	PAGE SIZE: A3





2. REPLANTING REQUIREMENTS AND LANDS

The felling of approximately 61ha of coniferous forestry at the Coom Green Energy Park site is fully described and appraised in EIS Volume 2 Chapter 3 'Description of the Replant lands' and the EIAR submitted with the planning application. This report is concerned with replanting of lands and assessment of same.

2.1 Replanting Requirements

Replacement replanting of forestry can occur in Ireland subject to licence in compliance with the Forestry Act 2014 as amended. The consent for such replanting is covered by statutory instrument S.I. No. 191/2017 Forestry Regulations 2017 as amended. This legislation provides for afforestation and forest road construction projects which require adherence to and compliance with the EIA Directive as amended (Directive 2011/92/EU as amended by Directive 2014/52/EU).

The lands assessed in this report have been granted Technical approval by the Forest Service for afforestation. To afforest any land where the area involved is greater than 0.1Ha requires the approval of the Minister under the Forestry Regulations 2017 as amended.

2.2 Proposed Afforestation Techniques

Planting of the proposed replant lands will be carried out in accordance with the Forest Service best practice guidance. Adherence to these guidelines, described below, will minimise potential impacts on the environment.

- 'Code of Best Forest Practice – Ireland'
- 'Forestry and Water Quality Guidelines' (2000)
- 'Forestry and the Landscape Guidelines' (2000)
- 'Forestry and Archaeology Guidelines' (2000)
- 'Forestry Biodiversity Guidelines' (2000)
- 'Forestry Protection Guidelines' (2002)
- 'Forestry Harvesting and Environmental Guidelines' (2000)
- 'Environmental Requirements for Afforestation' (2016)
- 'Forestry Standards Manual' (2015).

Planting will be carried out as described in 'Forestry Schemes Manual' (Forest Service, 2011), which provides guidance in relation to cultivation, stocking, spacing, plant handling, planting dates, fertiliser application, fencing, fire, and weed control. Specific conditions set out in the Forest Service Technical Approvals for each site will also be adhered to.



Drainage systems will be developed for each site comprising collector, interceptor and cut-off drains in accordance with Forestry Schemes Manual. A description of each drain type is set out below.

Collector Drains

Collector drains collect water from mound drains, plough furrows, mole drains, etc. and discharge via sediment traps and/or an interceptor drain. Collector drains are excavated to a depth not greater than 10-15cm below the depth of mound drains. Where collector drains have to be extended into erodible material, 'mini' silt traps are placed appropriately by deepening the drains in places.

Interceptor Drains

Interceptor Drains are constructed along the edges of aquatic buffer zones, i.e. areas where forest operations are curtailed and which are managed for environmental protection and enhancement. Interceptor drains collect the discharge channels from the drainage sub-catchment and allow it to overflow into the buffer zone. In most cases, slope will allow for drainage channels to taper out or be connected to an interceptor drain rather than enter the buffer zone. However, on flat sites, or those with low slopes, it will be necessary to connect drains into the aquatic zone. This may be done only where it will not result in sediment or any pollutants entering the aquatic zone.

Cut off drains

Cut off drains are constructed immediately up slope of a site and are designed to direct water away from the site.

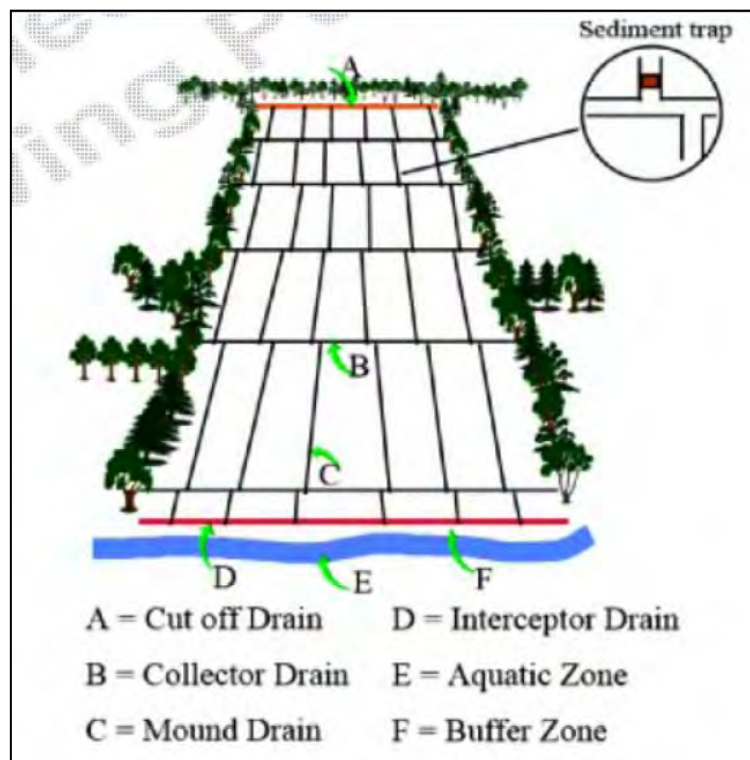


Figure 2-1: Standard forestry Drainage (Forestry Schemes Manual)



2.2.1 Moneygorm

Technical approval has been granted by the Department of Food, Agriculture and the Marine for the following planting at Moneygorm, Co. Cork (Forest Owner No: FOI35956U, Contract No: CN82229):

Tree Planting:

- Sitka Spruce (34.02 ha)
- Additional Broadleaved Species (6 ha).

Additional Details:

- Drainage
- Ground preparation: Mounding
- Planting Method: Angle Notch
- Access: Existing Track
- Fertilizer [Zero Phosphate]
- Herbicide Control (years 0 – 2)
- Manual Control (years 3 - 4)
- Upgrade existing fence to deer & sheep-proof specification.

The technical approval document (included in Appendix 1) states that all applications must be developed in accordance with detailed procedures & standards as described in the current Forestry Schemes Manual, and also requires Adherence to Forestry & Water Quality Guidelines (included in Appendix 2).

2.2.2 Ballard

Technical approval has been granted by the Department of Agriculture, Food and the Marine for the following planting at Ballard, Co. Wicklow (Forest Owner No: FO101174V, Contract No: CN77296):

Tree Planting:

- Sitka Spruce / Additional Broadleaved Species Integrated Mix (34.11 ha)
- Alder / Silver Birch Integrated Mix (1.67 ha)
- Alder (1.32 ha).

Additional Details:

- Drainage
- Ground preparation: Mounding
- Planting Method: Angle Notch



-
- Access: Existing Track
 - Fertilizer [Zero Phosphate]
 - Herbicide Control (years 0 – 2)
 - Manual Control (years 3 - 4)
 - Upgrade existing fence to deer & sheep-proof specification.

The technical approval document (included in Appendix 1) states that all applications must be developed in accordance with detailed procedures & standards as described in the current Forestry Schemes Manual, and also requires Adherence to Forestry & Water Quality Guidelines (included in Appendix 2).



3. RELEVANT POLICIES AND GUIDELINES

3.1 Relevant National Policy

3.1.1 Forests, Products and People: Ireland's Forest Policy – A Renewed Vision (2014)

This document was published by the Department of Agriculture, Food and Marine in 2014. It contains strategic goals and recommendations of the Forest Policy Review Group.

The Strategic goal is stated as:

“Develop an internationally competitive and sustainable forest sector that provides a full range of economic, environmental and social benefits to society and which accords with the Forest Europe definition of sustainable development.”

It highlights the important role that forestry is playing in terms of the economy, environment and society. Forests now account for 10.5% of the land area of Ireland with strong forest growth rates compared to other European countries.

The importance of forests' contribution to climate change mitigation is also described in this report. Irish Kyoto-eligible forests will sequester about 4.8 million tonnes of carbon dioxide (CO₂) in 2020, representing between 40% and 60% of the target.

The afforestation policy outlined in the policy document aims to support transition to a low carbon economy and reach the demanding greenhouse gas emission reduction targets as well as reduce dependence on fossil fuels.

Some of the recommended policies and actions are:

- Expansion of the Forest Resource: To increase the forest area, in accordance with sustainable forest management (SFM) principles, in order to support a long term sustainable roundwood supply of 7 to 8 million cubic metres per annum. This policy aims to increase afforestation to 15,000 hectares annually.
- Management of the Resource: To ensure the sustainable management of the forest resource in accordance with best practice thereby ensuring its capacity to provide the full range of timber and other benefits.
- Environment and Public Goods: To ensure that afforestation, management of existing forests and development of the forest sector are undertaken in a manner that enhances their contribution to the environment and the capacity to provide public goods and services.

3.1.2 Forestry Programme 2014-2020

This programme was finalised in January 2015 by the Forest Service, Department of Agriculture, Food and the Marine in accordance with European Union Guidelines on State aid for agriculture and forestry and in rural areas 2014 to 2020. The measures proposed within this programme are consistent with the 'Forests, Products and People: Ireland's Forest Policy – A Renewed Vision' report and identifies needs and measures in relation to Ireland's forest sector.



Some objectives under Measure 1: Afforestation and Creation of Woodland are:

- Increase Ireland's forest cover from 10.7% to 18% by the 2046
- Establish up to 8,290 hectares of new forests and woodlands per annum (subject to the availability of funds)
- Foster carbon sequestration and climate change mitigation.
- Provide a resource which will contribute to long-term sustainable development in the rural economy.

This measure is the most relevant to increase, on a permanent basis, Ireland's forest cover to capture carbon, produce wood resources and help mitigate emissions from agriculture.

3.1.3 Climate Action Plan 2019

One of the targets of the Climate Action Plan is to achieve 26.8 MtCO₂eq abatement through LULUCF (Land Use, Land-Use Change and Forestry) actions over the period 2021 to 2030, comprising of an average of 8,000ha per annum of newly planted forest, and sustainable forest management of existing forests (providing 21MtCO₂eq cumulative abatement).

3.2 Relevant Regional Policy

3.2.1 Regional Planning Guidelines for the South West 2010 - 2022

The guidelines note that the forestry sector comprises mainly small and medium sized privately owned farm based enterprises that provide a potentially viable area for diversification. The National Forest Inventory quantifies the productive forest area for the South West region as covering 112,190ha, with Kerry having in excess of 40,000 ha of forestry plantations. The cycle of planting over the past 15 years indicates that many private forestry plantations will be at or approaching maturity during the next decade. The Regional Bio-energy Plan for the South West shows that enhanced management of this resource is required.

3.2.2 Regional Planning Guidelines for the Greater Dublin Area 2010 - 2022

The Greater Dublin Area Regional Planning Guidelines confirms that plantation forestry covers less than 5% of the area and effects only a small proportion of its water resources, which are mainly in Wicklow.

"In 2007, land under forestry in Co. Wicklow amounted to 36,270 Ha or 18% of the county. This was the highest percentage cover of any county in the state, almost double the national average of 10%. The amount of land under forestry cover was already ahead of the national target objective of 17% by 2030 contained in the Government's Strategic Plan (Growing for the Future). The existing and draft Wicklow County Development Plans seek to support existing resource based industries particularly agriculture and forestry while also promoting the diversification of the rural economy.



Objectives contained in the most recent draft County Development Plan seek to:

- *Promote the County as a Center of Excellence in Forestry Research and Management, and;*
- *Encourage the development of Forestry for Biomass.”*

These guidelines are applicable to the Ballard replant site.

3.3 Relevant County and Local Policies

3.3.1 Cork County Development Plan: 2014-2020

Cork County has a total forest area in excess of 79,188ha of forest and woodland area, or 10.5% land cover which is higher than the national average of 9%. The Cork County Development Plan 2014-2020 highlights that the sector will continue to be an important economic activity in rural areas, as well as an alternative enterprise for farmers. Sustainably managed forestry can also become an important tourism asset. The forestry industry will also play an important role in the future development of the Bioenergy sector.

The council states it will continue to support sustainable forestry development throughout the County, but acknowledges the importance of protecting sensitive areas, water supplies and fisheries and to ensure that the development is compatible with the protection of the environment and nature conservation areas.

3.3.2 Development Plan for the Greater Dublin Area 2010 – 2022

The strategic forestry objective is stated to “...promote state and private afforestation, to a scale and in a manner, which maximises its contribution to the County’s economic and social wellbeing on a sustainable basis and which is compatible with the protection of the environment.”

Additional objectives include; to promote County Wicklow as a centre of excellence in the forestry research and management field, to promote the use of native hardwood species using seed of native provenance where possible.

3.4 Relevant National Guidelines

The replanting at the proposed site will be carried out in accordance with the Forest Service Guidelines described below and any further requirements resulting from the technical approvals.



3.4.1 Forest Service Guidelines

Code of Best Forest Practice – Ireland²

The aim of the Code of Best Forest Practice is to complement on an operational level that of *Growing for the Future - A Strategic Plan for the Development of the "To develop forestry to a scale and in a manner which maximises its contribution to national economic and social well-being on a sustainable basis and which is compatible with the protection of the environment."*

In the context of sustainable forest management, it aims to ensure that the various environmental, economic and social forest values are recognised. Most forests in Ireland are managed on a commercial basis, therefore a careful balance between measures to protect the environment and measures to maintain forest productivity are deemed necessary in this code.

Environmental Requirements for Afforestation³

The aim of the guidelines is to ensure that the establishment of new woodlands and forests is carried out so that it compatible with the protection and enhancement of our environment. In assessing an application for afforestation, the Forest Service is required to consider potential impacts across a range of issues and sensitivities. This includes in-combination impacts regarding water, biodiversity, landscape, social issues, etc.

Forestry and Water Quality Guidelines⁴

Forestry activities have the potential to interact both positively and negatively with aquatic resources and the maintenance and enhancement of water quality is of utmost importance. These guidelines describe a range of measures intended to cover all situations relating to forestry and water quality.

Forestry and the Landscape Guidelines⁵

These guidelines describe a range of measures that forest owners can employ in relation to the landscape, it is recognised that some may be impractical for individual forests, due to land ownership pattern, location and other set factors. Where a degree of flexibility exists, forest owners are required to implement those landscape measures which can be applied effectively to their property.

All forest workers and machine operators involved in any forest operation should be made aware of and understand the guidelines, all relevant environmental issues relating to the site, and working practices which minimise environmental disturbance.

² Part 1

<https://www.agriculture.gov.ie/media/migration/forestry/publications/codeofbestforestpractice/Code%20of%20Best%20Forest%20Prac%20Part%201.pdf>

Part 2

<https://www.agriculture.gov.ie/media/migration/forestry/publications/codeofbestforestpractice/Code%20of%20Best%20Forest%20Prac%20Part%202.pdf>

³<https://www.agriculture.gov.ie/media/migration/forestry/grantandpremiumschemes/2016/EnvironmentalRequirementSAfforestationDecember121216.pdf>

⁴ https://www.agriculture.gov.ie/media/migration/forestry/publications/water_quality.pdf

⁵ <https://www.agriculture.gov.ie/media/migration/forestry/publications/landscape.pdf>



Forestry and Archaeology Guidelines⁶

Archaeological sites and monuments are part of the national heritage. These guidelines have been developed to ensure that forest development should not disturb sites of archaeological importance. They have been compiled to assist non-archaeologists involved in forest development to identify archaeological sites, and set out the procedures which should be followed to avoid site disturbance.

Forest Biodiversity Guidelines⁷

Forests are among the most diverse and complex ecosystems in the world, providing a habitat for a multitude of flora and fauna. Ireland's forests represent an important opportunity to conserve and enhance biodiversity at both a local and national level. These guidelines are biodiversity considerations to be incorporated into all forest development, harvesting, roading and maintenance plans to ensure biodiversity, habitat and nature conservation issues are considered.

Forest Harvesting and Environmental Guidelines⁸

These guidelines address issues relating to soil conservation; the protection of water quality, archaeological sites, biodiversity and the visual landscape; the maintenance of forest health and productivity in the context of timber harvesting and forest road construction and maintenance. It therefore provides guidelines for:

- *harvest planning;*
- *harvest operation;*
- *harvest site restoration;*
- *road planning;*
- *road construction;*
- *machine servicing.*

Forest Protection Guidelines⁹

These guidelines are set up to protect the forest, ensure a healthy and vigorous forest and to prevent and control damage in a correct, timely, effective and safe manner.

All of the above-mentioned guidelines set out sound and practical measures based on the principles of Sustainable Forest Management (SFM), and are based on the best available scientific information. All forest workers and machine operators involved in any forest operation should be made aware of and understand the guidelines, all relevant environmental issues relating to the site, and working practices which minimise environmental disturbance.

⁶ <https://www.agriculture.gov.ie/media/migration/forestry/publications/archaeology.pdf>

⁷ <https://www.agriculture.gov.ie/media/migration/forestry/publications/biodiversity.pdf>

⁸ <https://www.agriculture.gov.ie/media/migration/forestry/publications/harvesting.pdf>

⁹ <https://www.agriculture.gov.ie/media/migration/forestry/publications/fsFPG.pdf>



3.5 Existing Environment

3.5.1 Moneygorm, Co. Cork

3.5.1.1 *Desktop Study*

3.5.1.1.1 European Sites within 15km

Special Areas of Conservation (cSACs)

Special Areas of Conservation (SACs) are protected under the European Union (EU) ‘Habitats Directive’ (92/43/EEC). There is one SAC within 15km of the proposed replant lands. The full NPWS site synopses for designated areas are available on www.NPWS.ie.

Special Protection Areas (SPAs)

Special Protection Areas (SPAs) are protected under Directive 2009/147/EC (‘The Birds Directive’). There is one SPA within 15km of the study area.

- Blackwater River (Cork/Waterford) cSAC* (Site Code 002170) is located c. 380 m east
- Blackwater Callows SPA (Site Code 004094) is located c. 13.9 km northeast.

3.5.1.1.2 National Sites Within 10km

There are nine pNHAs, and no NHAs within 10km of the proposed replant lands.

Table 3-1: National Sites Within 10km

Site Name	Distance from Replant Lands (km)	Hydrological Connection
Bride/Bunaglanna Valley pNHA	0.36 km	Yes
Blackwater Valley (Kilcummer) pNHA	6.63 km	No
Blackwater Valley (Ballincurrig Wood) pNHA	6.72 km	No
Convamore, Ballyhooly (Near Fermoy) pNHA	6.78 km	No
Blackwater Valley (Killathy Wood) pNHA	7.61 km	No
Blackwater Valley (Killavullen) pNHA	7.94 km	No
Awbeg Valley (Castletownroche) pNHA	8.03 km	No
Blackwater Valley (Cregg) pNHA	8.93 km	No
Cregg Castle pNHA	9.24 km	No



3.5.1.1.3 Rare or Protected Flora

The Study Area lies within Ordnance Survey National Grid 10km Squares W69, and W79. The 10km grid squares were searched for records of plant species via the National Biodiversity Data Centre (NBDC). This list was then compared to the lists of species protected under the Flora (Protection) Order of 2015; the Ireland Red List No. 10: Vascular Plants (Wyse *et al.* 2016). Table 3-2 presents details of the rare and protected plant species found within the 10km squares N51 and N52. Information on habitats was completed using; Webb's '*An Irish Flora*', 8th edition, 2012., F. Rose '*The Wild Flower Key*', Revised edition, 1981., and The British Bryological society's '*Mosses and Liverworts of Britain and Ireland a field guide*', first edition, 2010.



Table 3-2: Rare or Protected Flora (NBDC)

Common Name	Scientific Name	Grid Square	Year of Last Record	Conservation Status	Habitat	Result of surveys for Moneygorm
Bordered Screw-moss	<i>Tortula marginata</i>	W69	16/03/2006	Threatened Species: Near threatened	Grows on moist, often shaded or sheltered rocks and walls (especially of limestone and base-rich sandstone) in woodland, and also on the mortar of buildings	Not recorded
Flexuous Bog-moss	<i>Sphagnum flexuosum</i>	W69	27/06/2009	Threatened Species: Vulnerable	Grows in slightly mineral-rich sites, for example poor fens and wet woodland. Slightly more base-demanding than <i>S. fallax</i> , though often growing with that species. Scarce in the most acidic habitats. This is probably an under-recorded species.	Not recorded



Common Name	Scientific Name	Grid Square	Year of Last Record	Conservation Status	Habitat	Result of surveys for Moneygorm
Fountain Feather-moss	<i>Amblystegium tenax</i>	W69	27/06/2009	Threatened Species: Near threatened	It occurs on stones and tree roots, but also on concrete, bricks, weirs and other man-made substrates. It may also occur on rocks and stones where water trickles	Not recorded
Spruce's Bristle-moss	<i>Orthotrichum sprucei</i>	W69	27/06/2009	Protected Species: Flora Protection Order Protected Species: Flora Protection Order >> Flora Protection Order 2015 Schedule B (Mosses) Threatened Species: Vulnerable	Grows on trees by very silty zones of large lowland rivers.	Not recorded



Common Name	Scientific Name	Grid Square	Year of Last Record	Conservation Status	Habitat	Result of surveys for Moneygorm
Toothed Streak-moss	<i>Rhabdoweisia crispata</i>	W69	27/06/2009	Threatened Species: Near threatened	Generally found in acidic habitats but may be slightly more tolerant of base-rich rocks.	Not recorded
River Bristle-moss	<i>Orthotrichum rivulare</i>	W79	27/06/2009	Threatened Species: Near threatened	Grows on trees by silty rivers; and is also sometimes found on riverside rocks or masonry.	Not recorded



3.5.1.1.4 Mammals

The protected mammal species listed in Table 3-3 have been recorded within the 10 km grid squares (W69, W79) in which the proposed replant land is located.

Nine species have been recorded within 10km of the proposed study area namely badger (*Meles meles*), red squirrel (*Sciurus vulgaris*), otter (*Lutra lutra*), pygmy shrew (*Sorex minutus*), hedgehog (*Erinaceus europaeus*), fallow deer (*Dama dama*), Irish hare (*Lepus timidus*), Irish stoat (*Mustela erminea Hibernica*) and pine marten (*Martes martes*). Two of the records are within the last three years. The most recent Irish stoat record dates from 2010.



Table 3-3: Rare or Protected Mammals recorded within 10km grid squares (W69, W79)

Grid Square	Common Name	Scientific Name	Year of Last Record	Survey	Conservation Status	Records within the study area
W69	Daubenton's Bat	<i>Myotis daubentonii</i>	08/08/2013	National Bat Database of Ireland	Wildlife Act, 1976, as amended. EU Habitats Directive Annex IV	Not recorded on site as survey was conducted by day. Potential for hedgerows/treelines to offer commuting/foraging habitat
W69	Eurasian Badger	<i>Meles meles</i>	31/12/2016	Badger Setts of Ireland Database	Wildlife Act, 1976, as amended.	Not recorded on site
W69	Eurasian Pygmy Shrew	<i>Sorex minutus</i>	24/07/2015	Atlas of Mammals in Ireland 2010-2015	Wildlife Act, 1976, as amended.	Not recorded on site, but likely to be present
W69	Eurasian Red Squirrel	<i>Sciurus vulgaris</i>	03/10/2018	Mammals of Ireland 2016-2025	Wildlife Act, 1976, as amended.	Not recorded on site
W69	European Otter	<i>Lutra lutra</i>	31/07/2018	Mammals of Ireland 2016-2025	EU Habitats Directive Annex II & Annex IV Wildlife Acts	Not recorded on site
W79	Lesser Noctule	<i>Nyctalus leisleri</i>	09/08/2008	National Bat Database of Ireland	Wildlife Act, 1976, as amended. EU Habitats Directive Annex IV	Not recorded on site as survey was conducted by day. Potential for hedgerows/treelines to offer commuting/foraging habitat
W69	Natterer's Bat	<i>Myotis nattereri</i>	28/01/2001	National Bat Database of Ireland	Wildlife Act, 1976, as amended. EU Habitats Directive Annex IV	Not recorded on site as survey was conducted by day. Potential for hedgerows/treelines to offer commuting/foraging habitat



Grid Square	Common Name	Scientific Name	Year of Last Record	Survey	Conservation Status	Records within the study area
W79	Pipistrelle	<i>Pipistrellus pipistrellus sensu lato</i>	09/08/2008	National Bat Database of Ireland	Wildlife Act, 1976, as amended. EU Habitats Directive Annex IV	Not recorded on site as survey was conducted by day. Potential for hedgerows/treelines to offer commuting/foraging habitat
W79	Soprano Pipistrelle	<i>Pipistrellus pygmaeus</i>	13/05/2016	Mammals of Ireland 2016-2025	Wildlife Act, 1976, as amended. EU Habitats Directive Annex IV	Not recorded on site as survey was conducted by day. Potential for hedgerows/treelines to offer commuting/foraging habitat
W69	West European Hedgehog	<i>Erinaceus europaeus</i>	24/07/2015	Atlas of Mammals in Ireland 2010-2015	Wildlife Acts	Not recorded on site, but likely to be present



3.5.1.1.5 Birds

The Study Area lies within Ordnance Survey National Grid 10km Squares W69, and W79. The 10km grid squares were searched for records of rare and protected birds. Table 3-4 details this below:

Table 3-4: Records of rare and protected birds within 10km grid squares W79 and W69

Grid Square	Common Name	Scientific Name	Year of Last Record	Conservation Status	Records within the study area
W79, W69	Barn Owl	<i>Tyto alba</i>	31/12/2011	Red listed	Not recorded within the study area
W79, W69	Barn Swallow	<i>Hirundo rustica</i>	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Black-headed Gull	<i>Larus ridibundus</i>	31/07/1991	Red listed	Not recorded within the study area
W69	Black-headed Godwit	<i>Limosa limosa</i>	31/12/2001	Amber listed	Not recorded within the study area
W79, W69	Common Coot	<i>Fulica atra</i>	31/12/2011	Amber listed	Not recorded within the study area
W69	Common Goldeneye	<i>Bucephala clangula</i>	31/12/2001	Amber listed	Not recorded within the study area
W79, W69	Common Grasshopper Warbler	<i>Locustella naevia</i>	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Common Kestrel	<i>Falco tinnunculus</i>	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Common Kingfisher	<i>Alcedo atthis</i>	31/12/2011	Annex I EU Birds Directive, Amber List	Not recorded within the study area
W79, W69	Common Linnet	<i>Carduelis cannabina</i>	31/12/2011	Amber listed	Not recorded within the study area
W69	Common Pochard	<i>Aythya ferina</i>	31/12/2001	Amber listed	Not recorded within the study area
W69	Common Redshank	<i>Tringa totanus</i>	31/12/2001	Red listed	Not recorded within the study area
W69	Common Sandpiper	<i>Actitis hypoleucos</i>	31/12/2001	Amber listed	Not recorded within the study area
W79, W69	Common Snipe	<i>Gallinago gallinago</i>	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Common Starling	<i>Sturnus vulgaris</i>	31/12/2011	Amber listed	Not recorded within the study area



Grid Square	Common Name	Scientific Name	Year of Last Record	Conservation Status	Records within the study area
W69	Common Shelduck	<i>Tadorna tadorna</i>	31/12/2001	Amber listed	Not recorded within the study area
W79, W69	Common Swift	<i>Apus apus</i>	31/12/2011	Amber listed	Not recorded within the study area
W69	Dunlin	<i>Calidris alpina</i>	31/12/2001	Amber listed	Not recorded within the study area
W79, W69	Eurasian Curlew	<i>Numenius arquata</i>	31/07/1991	Red listed	Not recorded within the study area
W79, W69	Eurasian Teal	<i>Anas crecca</i>	31/12/2011	Amber listed	Not recorded within the study area
W69	Eurasian Wigeon	<i>Anas penelope</i>	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Eurasian Woodcock	<i>Scolopax rusticola</i>	31/12/2011	Red listed	Not recorded within the study area
W79, W69	European Golden Plover	<i>Pluvialis apricaria</i>	31/12/2011	Annex I EU Birds Directive, Red listed	Not recorded within the study area
W69	European Nightjar	<i>Caprimulgus europaeus</i>	31/07/1972	Annex I EU Birds Directive, Red listed	Not recorded within the study area
W69	Great Black-backed Gull	<i>Larus marinus</i>	29/02/1984	Amber listed	Not recorded within the study area
W79, W69	Great Cormorant	<i>Phalacrocorax carbo</i>	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Hen Harrier	<i>Circus cyaneus</i>	10/04/2016	Annex I EU Birds Directive, Amber listed	Not recorded within the study area during 2019 survey. Nests previously recorded during the 2016-2017, and 2017 survey periods. These are located within 500m of the proposed replant lands.
W79, W69	Herring Gull	<i>Larus argentatus</i>	29/02/1984	Red listed	Not recorded within the study area
W79, W69	House Martin	<i>Delichon urbicum</i>	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	House Sparrow	<i>Passer domesticus</i>	31/12/2011	Amber listed	Not recorded within the study area



Grid Square	Common Name	Scientific Name	Year of Last Record	Conservation Status	Records within the study area
W69	Lesser Black-backed Gull	<i>Larus fuscus</i>	31/12/2001	Amber listed	Not recorded within the study area
W79	Jack Snipe	<i>Lymnocyptes minimus</i>	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Little Egret	<i>Egretta garzetta</i>	31/12/2011	Annex I EU Birds Directive, Green listed	Not recorded within the study area
W69	Little Grebe	<i>Tachybaptus ruficollis</i>	31/12/2001	Amber listed	Not recorded within the study area
W79	Merlin	<i>Falco columbarius</i>	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Mew Gull	<i>Larus canus</i>	29/02/1984	Amber listed	Not recorded within the study area
W79, W69	Mute Swan	<i>Cygnus olor</i>	31/12/2011	Amber listed	Not recorded within the study area
W69	Northern Goshawk	<i>Accipiter gentilis</i>	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Northern Lapwing	<i>Vanellus vanellus</i>	29/02/1984	Red listed	Not recorded within the study area
W69	Northern Shoveler	<i>Anas clypeata</i>	31/12/2001	Red listed	Not recorded within the study area
W79, W69	Peregrine Falcon	<i>Falco peregrinus</i>	31/12/2011	Annex I EU Birds Directive	Not recorded within the study area
W69	Red Grouse	<i>Lagopus lagopus</i>	31/07/1972	Red listed	Not recorded within the study area
W79, W69	Sand Martin	<i>Riparia riparia</i>	21/05/2016	Amber listed	Not recorded within the study area
W79, W69	Sky Lark	<i>Alauda arvensis</i>	31/12/2011	Amber listed	Not recorded within the study area
W69	Snowy Owl	<i>Bubo scandiaca</i>	01/01/2015	Annex I EU Birds Directive, Amber listed	Not recorded within the study area
W79, W69	Spotted Flycatcher	<i>Muscicapa striata</i>	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Stock Pigeon	<i>Columba oenas</i>	31/12/2011	Amber listed	Not recorded within the study area
W79, W69	Tufted Duck	<i>Aythya fuligula</i>	31/12/2011	Amber listed	Not recorded within the study area



Grid Square	Common Name	Scientific Name	Year of Last Record	Conservation Status	Records within the study area
W69	Whooper Swan	<i>Cygnus cygnus</i>	31/12/2001	Annex I EU Birds Directive, Amber listed	Not recorded within the study area
W79	Yellowhammer	<i>Emberiza citrinella</i>	31/12/2011	Red listed	Not recorded within the study area

3.5.1.1.6 Other Species

The Study Area lies within Ordnance Survey National Grid 10km Squares W69, and W79. The 10km grid squares were searched for records of rare and protected birds. Table 3-5 details this below:

Table 3-5: Records of rare and protected other species within 10km grid squares W79 and W69

Grid Square	Common Name	Scientific Name	Year of Last Record	Conservation Status	Records within the study area
W69, W79	Common Frog	<i>Rana temporaria</i>	25/02/2018	EU Habitats Directive Annex V, Wildlife Acts	Not recorded within the study area
W69, W79	Marsh Fritillary	<i>Euphydryas aurinia</i>	10/04/2019	EU Habitats Directive Annex II	Not recorded within the study area
W79	Smooth Newt	<i>Lissotriton vulgaris</i>	12/04/2018	Wildlife Act	Not recorded within the study area
W79	Freshwater White-clawed Crayfish	<i>Austropotamobius pallipes</i>	16/07/2015	EU Habitats Directive Annex V and II, Wildlife Act	Not recorded within the study area
W79	Freshwater Pearl Mussel	<i>Margaritifera margaritifera</i>	25/07/2006	EU Habitats Directive Annex II and Annex V, Wildlife Act	Not recorded within the study area

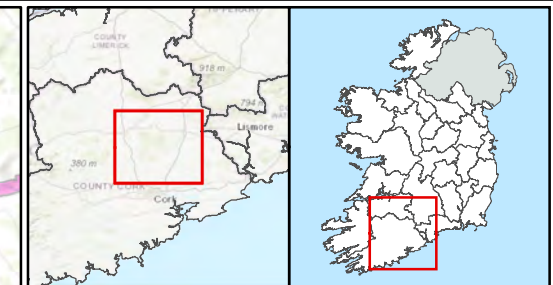
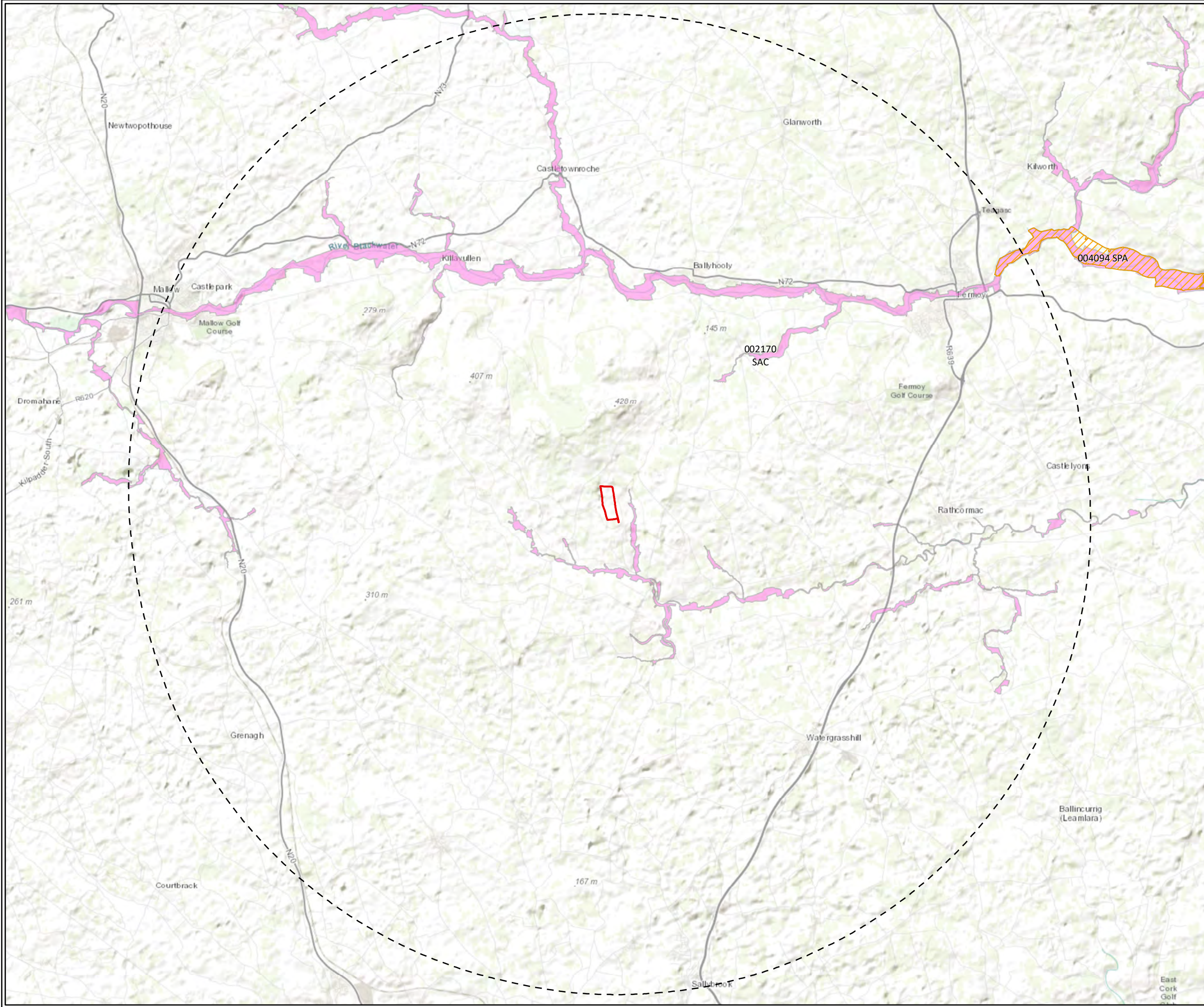
3.5.1.1.7 Invasive Species

The Study Area lies within Ordnance Survey National Grid 10km Squares W69, and W79. The 10km grid squares were searched for records of invasive species. Table 3-6 details the invasive species recorded during this desktop study.



Table 3-6: Invasive Species records within 10km (NBDC)

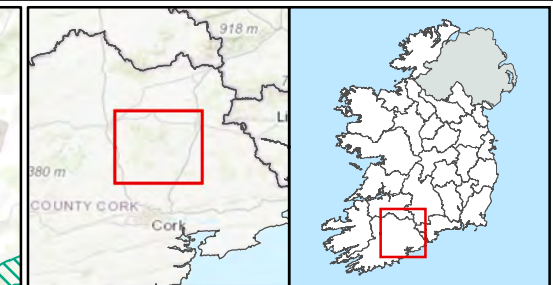
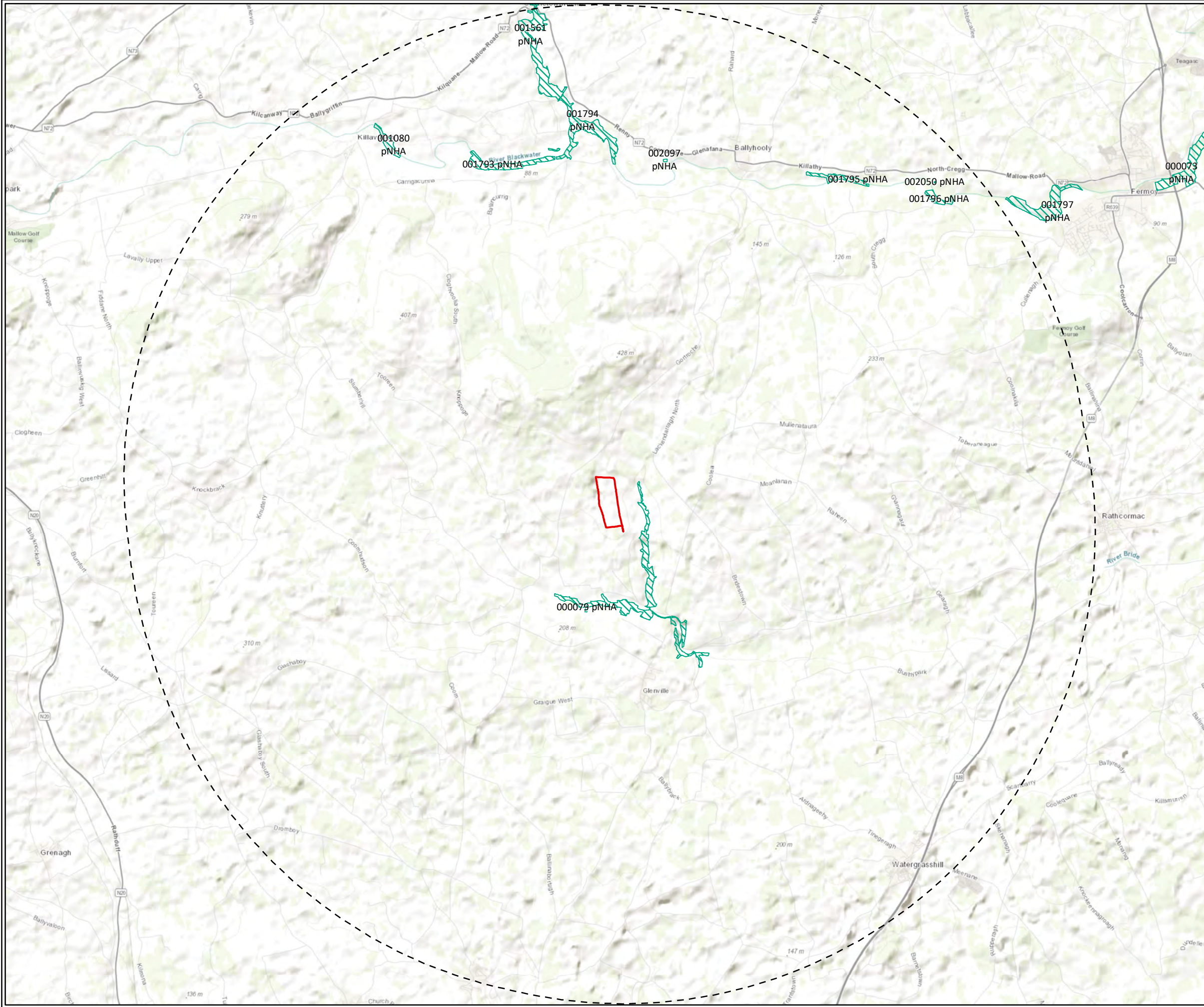
Common Name	Scientific Name	10km	Invasive Impact
Douglas Fir	<i>Pseudotsuga menziesii</i>	x	High Effect
American Skunk-cabbage	<i>Lysichiton americanus</i>	x	Medium Effect
Black Currant	<i>Ribes nigrum</i>	x	Medium Effect
Cherry Laurel	<i>Prunus laurocerasus</i>	x	High Effect
Indian Balsam	<i>Impatiens glandulifera</i>	x	High Effect
Japanese Knotweed	<i>Fallopia japonica</i>	x	High Effect
Rhododendron ponticum	<i>Rhododendron ponticum</i>	x	High Effect
Sycamore	<i>Acer pseudoplatanus</i>	x	Medium Effect
Budapest Slug	<i>Tandonia budapestensis</i>	x	Medium Effect
Common Garden Snail	<i>Cornu aspersum</i>	x	Medium Effect
Keeled Slug	<i>Tandonia sowerbyi</i>	x	Medium Effect
Wrinkled Snail	<i>Candidula intersepta</i>	x	Medium Effect
American Mink	<i>Mustela vison</i>	x	High Effect
Brown Rat	<i>Rattus norvegicus</i>	x	High Effect
European Rabbit	<i>Oryctolagus cuniculus</i>	x	Medium Effect
Fallow Deer	<i>Dama dama</i>	x	High Effect
Greater White-toothed Shrew	<i>Crocidura russula</i>	x	Medium Effect
Sika Deer	<i>Cervus nippon</i>	x	High Effect
Himalayan knotweed	<i>Persicaria wallichii</i>	X	Medium Effect



- Site Boundary
- 15km Distance from Site Boundary
- Special Protection Area (SPA)
- Site Code, Site Name, Distance(km)
004094, Blackwater Callows SPA, 13.9
- Special Area of Conservation (SAC)
- Site Code, Site Name, Distance(km)
002170, Blackwater River SAC, 0.4

TITLE: European Sites within 15km of Replant Lands at Moneygorm, Co. Cork	
PROJECT: Coom Green Energy Park, Co. Cork	
FIGURE NO:	3.1
CLIENT:	Coom Green Energy Park Ltd.
SCALE: 1:120000	REVISION: 0
DATE: 25/09/2020	PAGE SIZE: A3





	Site Boundary
	10km Distance from Site Boundary
	Proposed Natural Heritage Area (pNHA)
	Site Code, Site Name, Distance (km)
	000079, Bride/Bunaglanna Valley, 0.4
	001080, Blackwater Valley (Killavullen), 7.9
	001561, Awbeg Valley (Castletownroche), 8
	001793, Blackwater Valley (Ballincurrig Wood), 6.7
	001794, Blackwater Valley (Kilcummer), 6.6
	001795, Blackwater Valley (Killathy Wood), 7.6
	001796, Blackwater Valley (Cregg), 8.9
	002050, Cregg Castle, 9.2
	002097, Convamore Ballyhooly (Near Fermoy), 6.8

TITLE:	National Sites within 10km of Replant Lands at Moneygorm, Co. Cork		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.2		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:80000	REVISION:	0
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3.5.1.2 Description of existing habitats

3.5.1.2.1 Habitats / Flora

Improved Agricultural Grassland GA1

Improved Agricultural Grassland covers the majority of the site. Grasses include Yorkshire fog *Holcus lanatus*, perennial rye-grass *Lolium perenne* and annual meadow-grass *Poa annua*, with a range of herbaceous plants including common mouse-ear *Cerastium fontanum*, creeping buttercup *Ranunculus repens*, daisy *Bellis perennis*, dandelion *Taraxicum officinale* Agg., broad-leaved dock *Rumex obtusifolius* white clover *Trifolium repens*, greater plantain *Plantago major*, creeping thistle *Cirsium arvense* cuckooflower *Cardamine pratensis* and field forget-me-not *Myosotis arvensis* also present.

Improved Agricultural Grassland (GA1) is an artificial and intensively managed habitat type, with limited biodiversity value and is classified as being of Local Importance (lower value).

Dry Meadows and Grassy Verges GS2

The semi-natural habitat Dry Meadows and Grassy Verges in narrow strips bordering the replant lands fields. Species recorded in this habitat included Yorkshire fog *Holcus lanatus*, annual meadow-grass *Poa annua* cocksfoot *Dactylis glomerata*, soft rush *Juncus effusus*, creeping buttercup *Ranunculus repens*, birds foot trefoil *Lotus corniculatus*, hogweed *Heracleum sphondylium*, spear thistle *Cirsium vulgare*, common sorrel *Rumex acetosa*, cleavers *Galium aparine*, bilberry *Vaccinium myrtillus*, creeping cinquefoil *Potentilla reptans* and herb Robert *Geranium robertianum*.

Dry Meadows and Grassy Verges (GS2) is classified as being of Local Importance (lower value).

Scrub WS1

Scrub was also present in strips associated mainly with the outer margins of the replant lands; one narrow strip also extends into the Improved Agricultural Grassland GA1 which dominates the site.

Species recorded included goat willow *Salix caprea*, bramble *Rubus fruticosus* Agg., Bracken *Pteridium aquilinum*, willowherb *Epilobium* sp. gorse *Ulex* sp. foxglove *Digitalis purpurea*, soft shield fern *Polystichum setiferum*, rowan *Sorbus aucuparia*, holly *Ilex aquifolium*, oak *Quercus* sp. and a single Fuchsia *Fuchsia magellanica* bush.

Fuchsia is a non-native naturalised species. Its invasiveness effect has not been assessed.

Scrub (WS1) is classified as being of Local Importance (higher value).

Drainage Ditches FW4

The drainage channels within and bordering the replant lands site are shallow (1-3 cm wet depth), narrow (0.2 -0.3 m wet width) carrying flowing water over a rocky substrate. Aquatic vegetation is absent, with grasses such as Yorkshire fog and soft rush *Juncus effusus* present fringing the channels. The amount of water in these channels is likely to fluctuate markedly between wet and dry periods.

Drainage Ditches (FW4) is classified as being of Local Importance (higher value).



3.5.1.2.2 Rare and protected Flora

No rare or protected flora were identified on site during surveys.

3.5.1.2.3 Mammals

Three fox cubs were observed within the site during the walkover survey. No setts, holts, or dreys were recorded during the survey.

3.5.1.2.4 Avifauna

No rare or protected bird species were observed during ecological surveys within the replant lands site. Other species observed were jackdaw *Coloeus monedula*, hooded crow *Corvus cornix*, and robin *Erithacus rubecula*.

During ornithological surveys undertaken for Coom Wind Energy Park, two hen harrier nests were recorded within 500m of the proposed replant lands; one during the 2015-2016 survey period, and one during the 2017 surveys. No nests were recorded within 500m of the proposed replant lands during the 2018 survey period. A confirmed hen harrier territory was recorded ca. 355m from the replanting site 2019.

3.5.1.2.5 Aquatic Species

3.5.1.2.5.1 Fish stock assessment (electro-fishing)

Site B14 – Bunnaglanna Stream, Moneygorm

No fish were recorded during electro-fishing at site B14. The shallow, upland nature of the small channel with heavily bedded substrata (heavy siltation) reduced its viability for salmonids albeit populations were present further downstream in higher order reaches. Lamprey habitat was absent. The stream may be utilised seasonally by migratory European eel during periods of higher flow (e.g. autumn, winter) although the site's overall fisheries value was considered low.

Site B15 – River Bride, Old Bridge

Atlantic salmon and brown trout were the only two species recorded from site B15 on the River Bride (Figure 3-3). Both species were recorded in similar numbers ($n=22$, $n=21$ respectively). A healthy range of juvenile and adult trout size classes were present along with two distinct Atlantic salmon size classes. With the exception of European eel, the same species assemblage was also recorded during a 2017 survey of this site (Triturus, 2017) although abundances of juvenile Atlantic salmon and brown trout were notably higher in 2020.

The site was evidently an excellent salmonid nursery (Table 3-7) and also exhibited good spawning habitat locally, as reflected by the stock demographic captured during the survey. The best nursery areas were in the faster riffle area near the bridge. Holding habitat was also good moving upstream where pool habitat existed below large instream boulders. However, the River Bride was of too high energy at site B15 to support lamprey species. Some suitability existed as an eel nursery in the boulder and cobble areas although none were recorded during the survey.

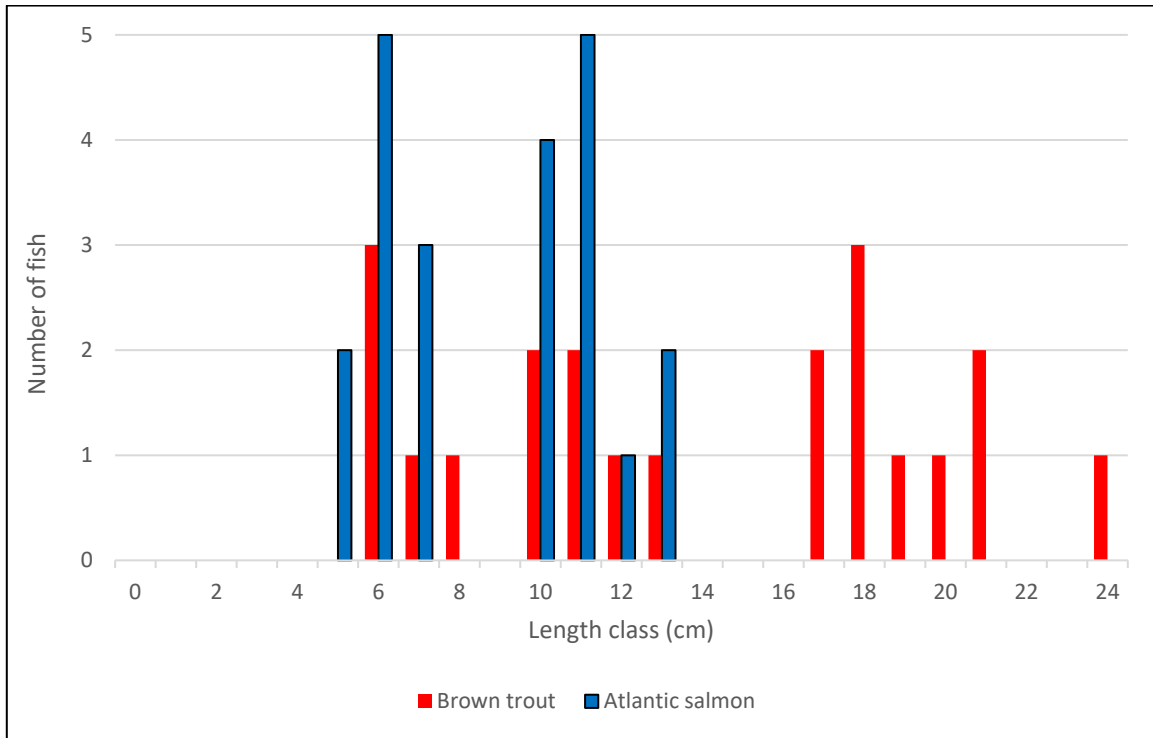


Figure 3-3: Fish stock length distribution recorded via electro-fishing at site B15 on the River Bride at Old Bridge, July 2020.



Plate 3-1: Adult brown trout and Atlantic salmon parr recorded from site B15 on the River Bride at Old Bridge, July 2020.



Table 3-7: Fish species densities per m² recorded at sites in the vicinity of Moneygorm replant lands via electro-fishing in July 2020. Lamprey numbers are presented per 1m² targeted quadrat unless otherwise stated

Site	CPUE	Approx. area fished (m ²)	Fish density (number fish per m ²)				
			Brown trout	Atlantic salmon	<i>Lampetra</i> sp.	European eel	Three-spined stickleback
B14	10-minute	65	0	0	0	0	0
B15	10-minute	240	0.088	0.092	0	0	0

3.5.1.2.6 Fisheries habitat

3.5.1.2.6.1 Salmonid habitat

Salmonid habitat ranged from poor to excellent value across the survey sites (Table 3-8). B15 (River Bride) offered excellent quality salmonid habitat according to life Cycle Unit scores. B14 offered little or no value for salmonids and scored as 'poor' in terms of salmonid habitat.

Table 3-8: Life Cycle Unit scores for sites surveyed in the vicinity of the proposed Moneygorm replant lands, July 2020

Site	Salmonid habitat value	Spawning	Nursery	Pool (holding)	Total score
B14	Poor	4	4	4	12
B15	Excellent	2	1	2	5

3.5.1.2.6.2 Lamprey habitat

Lamprey habitat was typically of poor to moderate quality across the majority of the survey area based on Lamprey Habitat Quality Index (LHQI) scores (Table 3-9). B14 offered poor lamprey habitat whilst B15 offered moderate quality lamprey habitat.

Table 3-9: Lamprey Habitat Quality Index (LHQI) scores for sites surveyed in the vicinity of the proposed Moneygorm replant lands, July 2020

Site	Lamprey habitat value	Spawning	Nursery	Total score
B14	Poor	4	4	8
B15	Moderate	3	4	7



3.5.1.2.6.3 European eel habitat

European eel was not recorded B14 Bunnaglanna river, and B15 River Bride.

3.5.1.2.6.4 Other Species

No other rare or protected species were observed during ecological surveys within the replant lands site.

3.5.1.2.6.5 Invasive Species

No invasive species were observed during ecological surveys within the replant lands site.

3.5.1.2.7 Habitats Evaluation

The basis of effect assessment should be a determination of which ecological resources within the zone of influence of the proposed replant lands are of sufficient value to be material in decision making and therefore, included in the assessment (NRA, 2009a and CIEEM, 2018). Table 3-10 below outlines the key receptors selected for assessment and the rationale for same; taken from NRA guidance (NRA, 2009a). Figure 3-4 details the habitats within the Moneygorm replant lands site.

Table 3-10: Evaluation of Habitats

Habitat type	Annex I status	NRA Evaluation	Rationale	Key Ecological Receptor
Improved Agricultural Grassland GA1	No	Local Importance (lower value)	Improved agricultural grassland is dominant within the footprint of the proposed replant lands at Moneygorm. This habitat type has a low level of ecological potential although can facilitate the feeding and provision of cover for species.	No
Dry Meadows and Grassy Verges GS2	No	Local Importance (lower value)	Dry meadows and grassy verges were found along the southern, eastern and northern boundaries of the footprint of the proposed replant lands. This habitat type has a low level of ecological potential although can facilitate the feeding and provision of cover for species.	No
Scrub WS1	No	Local Importance (higher value)	Scrub are identified along the southern and eastern border of the proposed replant lands site. This habitat type is of local importance (higher level) to biodiversity.	No
Drainage Ditches FW4	No	Local Importance (higher value)	Drainage ditches are located along the eastern aspect of the proposed replant lands at Moneygorm. This habitat type is of local importance (higher level) to biodiversity.	Yes



3.5.1.2.8 Species Evaluation

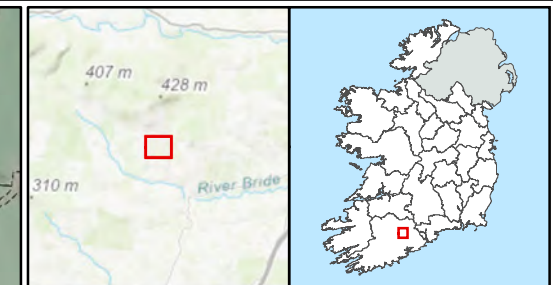
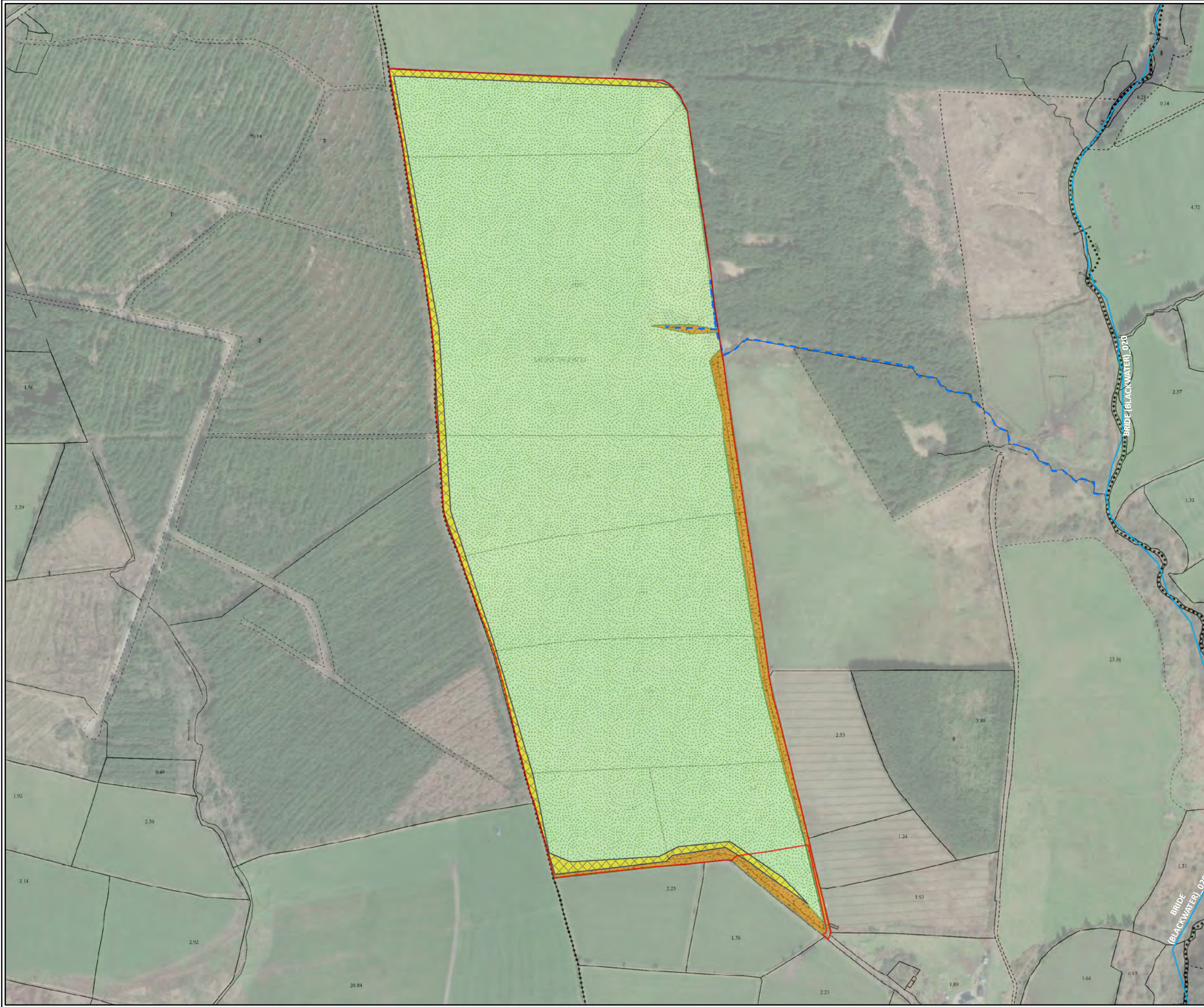
The basis of effect assessment should be a determination of which ecological resources within the zone of influence of the proposed replant lands are of sufficient value to be material in decision making and therefore, included in the assessment (NRA, 2009a and CIEEM, 2018). Table 3-11 below outlines the key receptors selected for assessment and the rationale for same; taken from NRA guidance (NRA, 2009a).

Table 3-11: Evaluation of Species

Common Name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
Otter	EU Habitats Directive Annex II; Protected Species: EU Habitats Directive Annex IV; Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site.	Yes
Bats	EU Habitats Directive Annex IV; Wildlife Act (Amendment) 2000	National Importance	Legal status and ecological sensitivity	Yes
Badger	Wildlife Act (Amendment) 2000	County Importance	Records in the greater area but not recorded within the site.	Yes
Pygmy Shrew	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area and potentially present within the site.	Yes
Red Squirrel	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site.	Yes
Fallow Deer	Wildlife Act (Amendment) 2000	Local Importance (Higher Value)	Records in the greater area but not recorded within the site.	Yes
Irish Hare	EU Habitats Directive Annex V, Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site.	Yes
Irish Stoat	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site.	Yes
Pine Marten	EU Habitats Directive Annex V, Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site.	Yes
Hedgehog	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site.	Yes
Grey Squirrel	Invasive non-native species	Not of ecological importance	Records in the greater area but not recorded within the site.	No



Common Name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
Wood Mouse	Wildlife Act (Amendment) 2000	Local Importance (Higher Value)	Records in the greater area but not recorded within the site.	No
Rabbit	Wildlife Act (Amendment) 2000	Local Importance (Higher Value)	Records in the greater area but not recorded within the site.	No
Fox	Wildlife Act (Amendment) 2000	Local Importance (Higher Value)	Recorded on site	No
American Mink	Invasive non-native species	Not of ecological importance	Records in the greater area but not recorded within the site.	No
Common Newt	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site.	Yes
Common Frog	EU Habitats Directive Annex V, Wildlife Acts	Local Importance (Higher Value)	Records in the greater area but not recorded within the site.	Yes
Marsh Fritillary	EU Habitats Directive Annex II	National Importance	Records in the greater area but not recorded within the site. Habitats not suitable.	No
Smooth Newt	Wildlife Act	National Importance	Records in the greater area but not recorded within the site.	No
Freshwater White-clawed Crayfish	EU Habitats Directive Annex V and II, Wildlife Act	National Importance	Records in the greater area but not recorded within the site.	No
Freshwater Pearl Mussel	EU Habitats Directive Annex II and Annex V, Wildlife Act	National Importance	Records in the greater area but not recorded within the site.	No



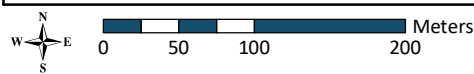
Site Boundary

WFD River Water Bodies

Habitat Classification

- FW4, Drainage Ditch
- GS2, Dry meadows and grassy verges
- WS1, Scrub
- GA1, Improved Agricultural Grassland

TITLE:	Habitat Map of Replant Lands at Moneygorm, Co. Cork		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.4		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:5000	REVISION:	0
DATE:	25/09/2020	PAGE SIZE:	A3





3.5.2 Ballard, Co. Wicklow

3.5.2.1 Desktop Study

3.5.2.1.1 European Sites within 15km

Special Areas of Conservation (cSACs)

Special Areas of Conservation (SACs) are protected under the European Union (EU) ‘Habitats Directive’ (92/43/EEC). There are five SACs within 15km of the proposed replant lands. The full NPWS site synopses for designated areas are available on www.NPWS.ie.

Special Protection Areas (SPAs)

Special Protection Areas (SPAs) are protected under Directive 2009/147/EC (‘The Birds Directive’). There is one SPA within 15km of the study area.

3.5.2.1.2 National Sites Within 10km

There are five pNHAs, and no NHAs within 10km of the proposed replant lands.

A sixth site located greater than 10km from the proposed replant lands namely Arklow Town Marsh pNHA (Site Code: 001931) is hydrologically connected to the replant lands site, 20.40km downstream along the Avoca River.

Table 3-12: National Sites Within 10km

Site Name	Distance from Replant Lands (km)	Hydrological Connection
Ballinacor Wood pNHA	2.7	No
Vale of Clara (Rathdrum Wood) pNHA	4.7	No
Glenealy Woods pNHA	8.8	No
Avoca River valley pNHA	4.9	Yes
Avondale pNHA	3.9	No

3.5.2.1.3 Rare or Protected Flora

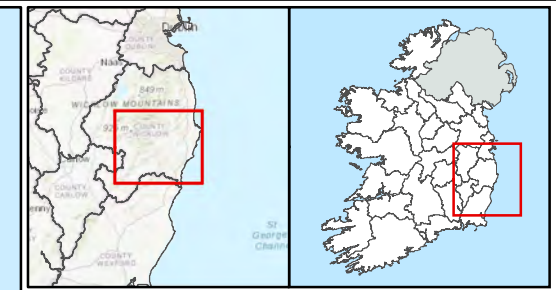
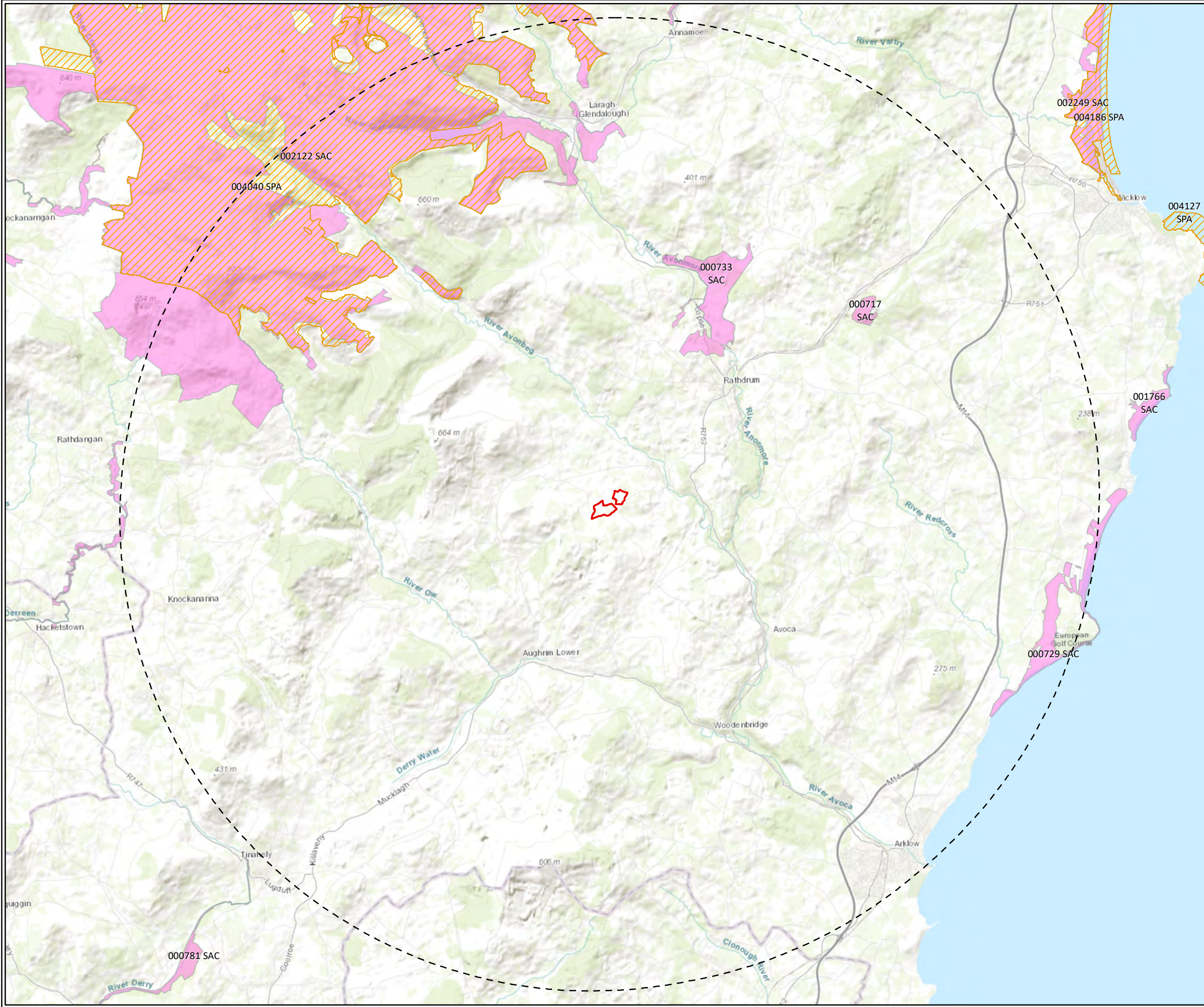
The Study Area lies within Ordnance Survey National Grid 10km Squares T18. The 10km grid squares were searched for recent (>1980) records of rare or protected plant, fern, bryophyte and lichen species, using records from the National Biodiversity Data Centre. This list was then compared to the lists of species protected under the Flora (Protection) Order of 2015; the Ireland Red List No. 10: Vascular Plants (Wyse *et al.* 2016). Table 3-13 presents details of the rare and protected plant species found within the 10km square T18.

Information on habitats was completed using; Webb’s ‘*An Irish Flora*’, 8th edition, 2012., F. Rose ‘*The Wild Flower Key*’, Revised edition, 1981., and The British Bryological society’s ‘*Mosses and Liverworts of Britain and Ireland a field guide*’, first edition, 2010.



Table 3-13: Rare or Protected Flora at T18 (NBDC)

Common Name	Scientific Name	Year of Last Record	Conservation Status	Habitat	Result of surveys
Greater Copperwort	<i>Cephaloziella nicholsonii</i>	24/04/2009	Protected Species on the Flora Protection Order 2015 Schedule C, Threatened Species: Vulnerable	Mineral rich soil	Not recorded

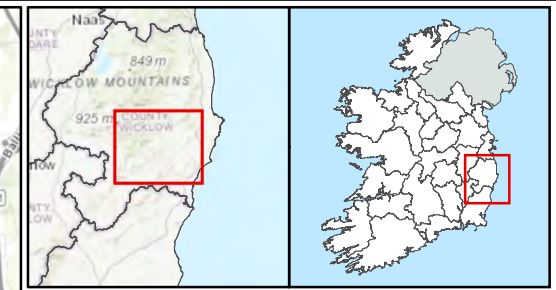
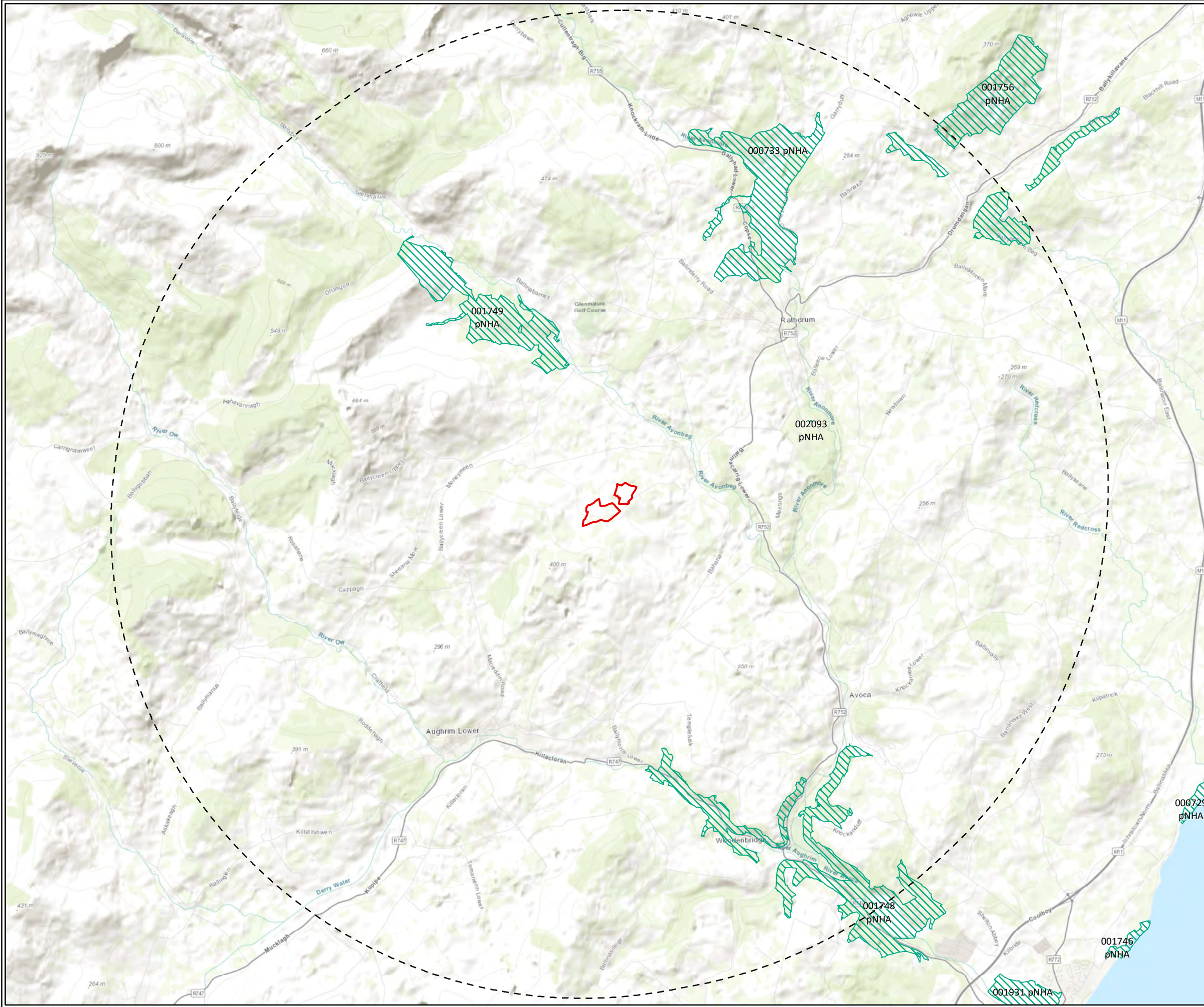


- Site Boundary
 - 15km Distance from Site Boundary
 - Special Protection Area (SPA)
 - Special Area of Conservation (SAC)
- Site Code, Site Name, Distance*
- 004040, Wicklow Mountains SPA, 7853m
 - 000717, Deputy's Pass Nature Reserve SAC, 9010m
 - 000729, Buckronev-Brittis Dunes And Fen SAC, 13406m
 - 000733, Vale of Clara Rathdrum Wood SAC, 4708m
 - 000781, Slaney River Valley SAC, 14744m
 - 002122, Wicklow Mountains SAC, 7852m

TITLE: European Sites within 15km of Replant Lands at Ballard, Co. Wicklow	
PROJECT: Coom Green Energy Park, Co. Cork	
FIGURE NO:	3.5
CLIENT:	Coom Green Energy Park Ltd.
SCALE: 1:120000	REVISION: 0
DATE: 25/09/2020	PAGE SIZE: A3

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- Site Boundary
 - 10km Distance from Site Boundary
 - Proposed Natural Heritage Area (pNHA)
- Site Code, Site Name, Distance*
- 000733, Vale Of Clara Rathdrum Wood, 4702m
 - 001748, Avoca River Valley, 4938m
 - 001749, Ballinacor Wood, 2696m
 - 001756, Glenealy Woods, 8848m
 - 002093, Avondale, 3942m

TITLE:	National Sites within 10km of Replant Lands at Ballard, Co. Wicklow		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.6		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:80000	REVISION:	0
DATE:	25/09/2020	PAGE SIZE:	A3





3.5.2.2 Description of existing environment

3.5.2.2.1 Habitats / Flora

Scrub WS1 and dry-humid acid grassland GS3 mosaic

This habitat mosaic was found to be dominant across the westerly portion of the replant lands site. Young saplings of downy birch (*Betula pubescens*) of between 2 and 3m in height were frequent, with lodgepole pine (*Pinus contorta*) also frequent to occasional. Bramble (*Rubus fruticosus* agg.) and gorse (*Ulex europaeus*) were found to be abundant, forming dense stands across the habitat, classified as areas of scrub (WS1). The abundance of other species including rosebay willowherb (*Chamaenerion angustifolium*) give the habitat elements of recently felled woodland (WS5). *Agrostis capillaris* and *Molinia caerulea* were found to be frequent in the field layer with *Centaurea nigra* noted as being rare within the study area. Stands of bracken (*Pteridium aquilinum*) and gorse (*Ulex* spp.) were found to be frequent.

Scrub (WS1) and dry-humid acid grassland (GS3) mosaic, with elements of recently felled woodland (WS5) is the result of the re-vegetation of an area following the cessation of conifer plantation management practices. This habitat type is of biodiversity value, although it does not conform to any protected (Annex I) habitat types under the EU habitats directive.

Dense bracken HD1

This habitat type is found across both the westerly and easterly portions of the replant lands site. The habitat is dominated by bracken (*Pteridium aquilinum*), with bryophytes such as *Rhytidiadelphus triquetrus* being dominant at ground level.

Dense bracken (HD1) is of some limited biodiversity value, through the provision of food and shelter for wildlife, although is considered a nuisance species due to its ability to out compete other native plants.

Recolonising bare ground ED3

Recolonising bare ground was identified in both the westerly and easterly portions of the replant lands site. This habitat was largely found along the disused conifer plantation access tracks throughout the site. These habitats were largely composed of mats of vegetation (>50%) with areas of exposed stone chipping. Grass species such as *Poa annua* were occasional along with species such as rosebay willowherb (*Chamaenerion angustifolium*). The habitat is dominated by lichen and bryophyte species including; *Cladonia chlorophaea* agg., *Peltigera hymenina* and *Rhytidiadelphus triquetrus*.

Recolonising bare ground (ED3) is classified as being locally important (lower value).

Hedgerow WL1

Hedgerow habitats are found across both the westerly and easterly portions of the replant lands site. Species recorded within this habitat type included bramble (*Rubus fruticosus* agg.), bracken (*Pteridium aquilinum*), ash (*Fraxinus excelsior*), holly (*Ilex aquifolium*), hawthorn (*Crataegus monogyna*) and gorse (*Ulex* spp.). One invasive species was identified at a single location across the site, cherry laurel (*Prunus laurocerasus*) was identified at a hedgerow/ treeline edge at 52.898757, -6.283634 (WGS 84 Web Mercator).

Hedgerow (WL1) habitat is classified as being locally important (higher value).

Treeline WL2

Treelines within the proposed replant lands site are largely located along the boundary of the site, with one exception of a birch dominant treeline at the westerly portion, which appears to be an old field boundary.



This habitat is largely abundant in species such as holly (*Ilex aquifolium*) and hawthorn (*Crataegus monogyna*), with ash (*Fraxinus excelsior*) being dominant. Gorse (*Ulex* spp.), bramble (*Rubus fruticosus* agg.) and bracken (*Pteridium aquilinum*) were also found to be frequent to occasional across the field layer of this habitat.

Treelines (WL2) are classified as being locally important (higher value).

Species poor wet grassland GS4

replant lands. *Molinia caerulea* and *Juncus inflexus* are frequent within this habitat with *Juncus conglomeratus* frequent in dryer areas. Within wet pools between hammocks and stands of *Juncus* spp is noted. Species including lesser spearwort (*Ranunculus flammula*), broad buckler-fern (*Dryopteris dilatata*), gorse (*Ulex* spp.) is occasional. This wet habitat is fed by a small unnamed stream which flows through adjacent conifer plantations and disperses into pre-existing drains before flowing into the adjacent Ballyeustace Stream. Stands of scrub are encroaching upon this habitat.

Species poor wet grassland (GS4) is classified as being locally important (higher value).

Drainage ditches FW4

Drainage ditches are found across both sites in varying sizes. The larger drainage ditches are located within the western aspect of the proposed replant lands and have been identified as providing adequate spawning grounds for frogs. Vegetation within these ditches is largely composed of overhang of *Juncus* spp. and *Rubus fruticosus* agg.

Drainage ditches (FW4) is classified as being locally important (higher value).

Species poor wet bog woodland WN7

A small section of species poor bog woodland (840 m³) was identified north of westerly section of the proposed replant lands, within the site boundary. This habitat is waterlogged, containing a canopy layer dominant in downy birch (*Betula pubescens*) and rare in scots pine (*Pinus Sylvestris*). The field layer is dominant in hummocks of *Molinia caerulea*, abundant in *Juncus effuses*, occasional in lesser spearwort (*Ranunculus flammula*), *Polytrichum commune*, *Polypodium vulgare*, *Sphagnum palustre*, *Rhytideodelphus triquetius*, *Thuidium tamariscinum* and Great Woodrush (*Luzula sylvatica*) and rare in *Cirsium palustre*, *Sphagnum papillosum* and *Veronica beccabunga*.

This habitat was identified as being species poor and was identified as lacking the adequate species assemblage in order to be termed as the Annex I protected habitat of 91D0 bog woodland. Species poor bog woodland (WN7) is classified as being locally important (higher value).

Immature woodland WS2 and scrub WS1 mosaic

Mosaic habitats of immature woodland and scrub was identified across both sections of the proposed replant lands. The canopy layer of this habitat mosaic is dominant in downy birch (*Betula pubescens*). The field layer is dominant in bramble (*Rubus fruticosus* agg.).

Immature woodland (WS2) and scrub (WS1) are classified as being locally important (higher value).

Conifer plantation WD4

A small area (1,688 m²) of conifer plantation was identified to the west of the replant lands site. Sitka spruce (*Picea sitchensis*) dominates the canopy layer of this habitat type, bryophytes including *Rhytidiadelphus triquetrus* dominate the field layer.



This habitat type is man-made and composed of non-native conifers, of low biodiversity value and is classified as being locally important (lower value).

Eroding/ upland rivers FW1

The Ballyeustace Stream flows adjacent, in a northerly direction, to both blocks of the replant lands site. Drainage ditches from both sites feed into this stream. The stream contains low levels of instream vegetation and evidence of its management can be observed.

This habitat type is classified as being locally important (higher value) due to its connectivity.

Oak-ash-hazel woodland WN2

This habitat type is present along the northern edge of the eastern block site boundary. This habitat's canopy layer is dominant in ash (*Fraxinus excelsior*) and rare in *Quercus robur*. The ground layer is dominated by bare litter filled ground with ivy (*Hedera helix*) and holly (*Ilex aquifolium*) being frequent.

This habitat type is classified as being locally important (higher value).

Scrub WS1

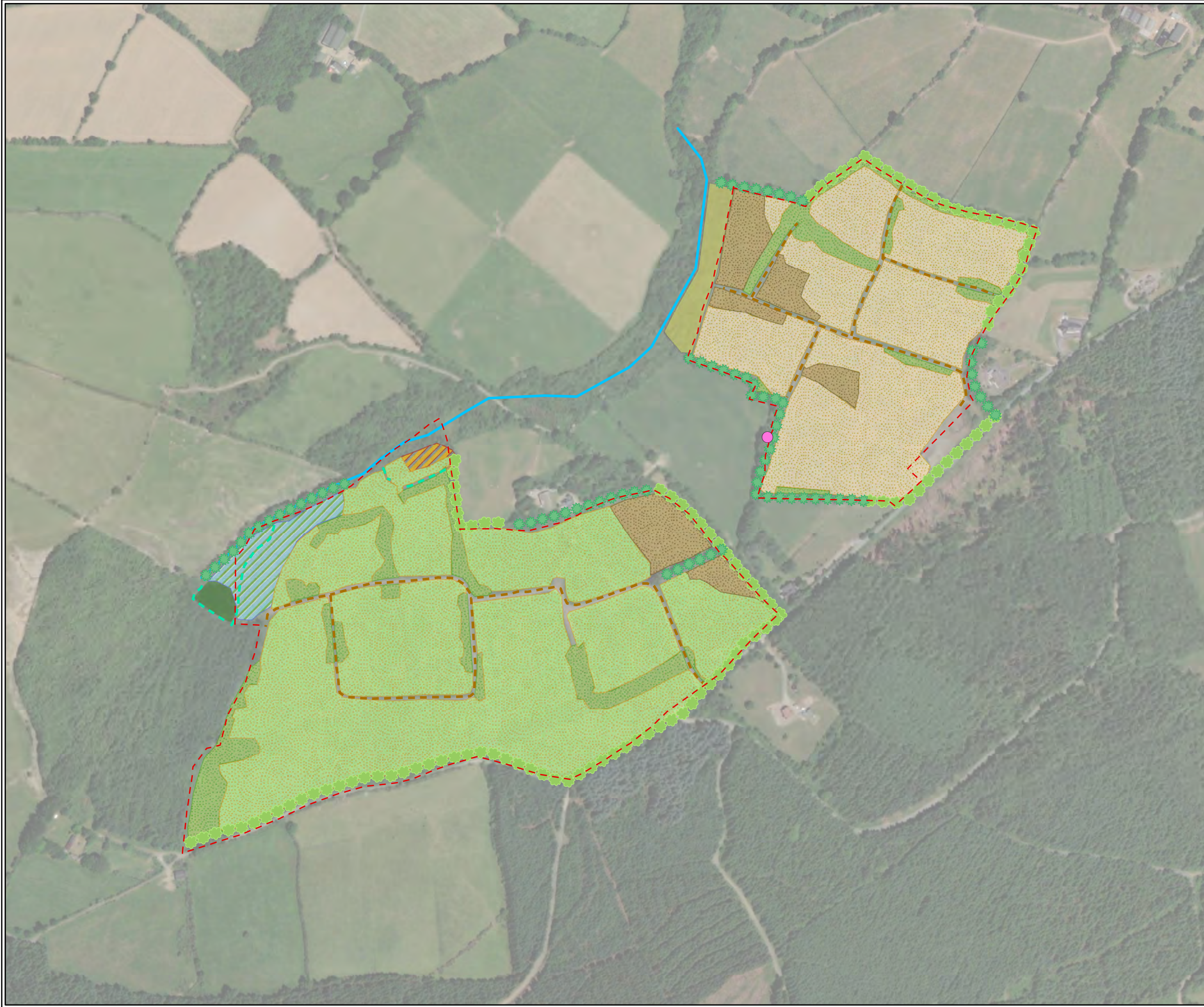
This habitat type is dominant within the easterly portion of the proposed replant lands site. It is largely dominated by species such as bramble (*Rubus fruticosus* agg.), gorse (*Ulex europaeus*) and rosebay willowherb (*Chamaenerion angustifolium*).

This habitat is of importance locally, although is typically of recently felled pre-immature woodland sites. This habitat type is classified as being locally important (higher value).

Conclusion

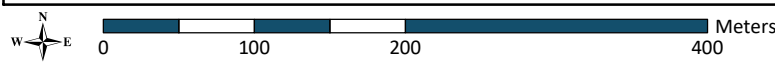
Scrub (WS1) and dry-humid acid grassland (GS3) mosaic, hedgerow (WL1), treeline (WL2), species poor wet grassland (GS4), drainage ditches (FW4), species poor wet bog woodland (WN7), immature woodland (WS2) and scrub (WS1) mosaic, eroding/ upland rivers (FW1), oak-ash-hazel woodland (WN2) and scrub (WS1) were all identified as being habitats of locally high quality.

Habitat types including eroding/ upland rivers (FW1), oak-ash-hazel woodland (WN2), species poor wet bog woodland (WN7), drainage ditches (FW4) and species poor wet grassland (GS4) have all been identified as having the potential to support rare or protected species within the local area. These habitats will be excluded from the development area and will not be considered as part of this assessment, as detailed in the mitigation measures section 3.7.1 and Figure 3-9.



- Cherry Laurel (Invasive Species)
- Site Boundary
- Habitat Classification**
- ED3, Recolonising bare ground
- FW1, Eroding/upland rivers
- FW4, Drainage ditches
- WL1, Hedgerows
- WL2, Treelines
- GS4, Wet grassland
- HD1, Dense bracken
- WD4, Conifer plantation
- WN2, Oak-ash-hazel woodland
- WN7, Bog woodland
- WS1, Scrub
- WS1/GS3, Scrub / Dry-humid acid grassland
- WS1/WS2, Scrub / Immature woodland

TITLE:	Habitats of Replant Lands at Ballard, Co. Wicklow		
PROJECT:	Coom Green Energy Park, Co. Cork		
FIGURE NO:	3.7		
CLIENT:	Coom Green Energy Park Ltd.		
SCALE:	1:5000	REVISION:	0
DATE:	25/09/2020	PAGE SIZE:	A3





3.5.2.2.2 Rare and protected Flora

No rare or protected flora were identified on site during surveys in 2018 or 2020.

3.5.2.2.3 Mammals

A badger sett (*Meles meles*) was identified at the westerly portion of the existing replant lands site during previous ecological surveys in 2019. No evidence of recent activity was noted around this sett during the 2020 survey. However, badger hair was identified throughout the site along with foraging evidence, indicating presence within the site. No additional badger setts were noted however during the survey in 2020. Fox (*Vulpes vulpes*) scat and feeding signs were identified throughout both portions of the proposed replant lands.

Three potential bat roosts were identified on site. These trees were identified as having moderate roosting potential due to the heavy ivy which has grown amongst their branches. These trees are largely ash with heavy densities of ivy (*Hedera helix*) and are identified within Table 3-14 below. As these potential bat roost trees are located along the site boundary outside the replanting area, the development of the conifer plantation will not result in the loss of these potential bat roosts within the area.

Table 3-14: Potential Bat Roost detail

Tree Number	Location (ITM)
1	684845.32, 715539.08
2	684856.96, 715485.90
3	684580.55, 715494.59

A dead pygmy shrew (*Sorex minutus*) was observed within the site during the walkover survey. No holts or dreys were recorded during the survey.

3.5.2.2.4 Birds

Species including buzzard, pheasant, woodpigeon and snipe were identified to be utilising habitats adjacent, to commute, hunt and roost.

Buzzard (Green-listed) was identified commuting and hunting in nearby habitats. Twelve pheasants (Green-listed) were observed utilising the sites habitats for feeding and roosting. Eight snipe (Amber-listed) were identified feeding within the development footprint of the site during surveys.

Woodpigeon and pheasant were identified within and surrounding the proposed replant lands during site survey. These species are both green listed in Ireland and are widespread within the surrounding environment.

3.5.2.2.5 Other Species

A number of frogs were observed to be breeding and spawning on site. Drainage ditches and pools on site were observed as holding large quantities of frog spawn.



3.5.2.2.6 Invasive species

One invasive species was identified at a single location outside of the replant lands footprint, cherry laurel (*Prunus laurocerasus*) was identified within a hedgerow/ treeline edge (684479.37, 715475.94 ITM).

3.5.2.3 Habitat Evaluation

The basis of effect assessment should be a determination of which ecological resources within the zone of influence of the proposed replant lands are of sufficient value to be material in decision making and therefore, included in the assessment (NRA, 2009a and CIEEM, 2018). Table 3-15 over outlines the key receptors selected for assessment and the rationale for same; taken from NRA guidance (NRA, 2009a). Table 3-15 details the habitats within the Ballard replant lands site.

Table 3-15: Evaluation of habitats

Habitat type	Annex I Status	NRA Evaluation	Rationale	Key Ecological Receptor
Scrub WS1 and dry-humid acid grassland GS3 mosaic	No	Local Importance (higher value)	This mosaic habitat type exists within the proposed footprint and provides cover, feeding opportunities and prey for wildlife within the area, including pheasant and snipe.	Yes
Dense bracken HD1	No	Local Importance (lower value)	This habitat type exists within the proposed footprint, although is widespread within the local area.	No
Recolonising bare ground ED3	No	Local Importance (lower value)	This habitat type exists within the proposed footprint.	No
Hedgerow WL1	No	Local Importance (higher value)	This linear habitat type borders the replant lands footprint. Hedgerows provide valuable roosting, foraging, commuting and feeding areas many species.	Yes
Treeline WL2	No	Local Importance (higher value)	This linear habitat type exists both along the border and within the replant lands footprint. An estimated 100m of treeline is located within the footprint.	Yes
Species poor wet grassland GS4	No	Local Importance (higher value)	This habitat type exists within the exclusion area (areas not being planted), adjacent to the replant lands footprint Figure 3-9.	No



Habitat type	Annex I Status	NRA Evaluation	Rationale	Key Ecological Receptor
Drainage ditches FW4	No	Local Importance (higher value)	This habitat type exists within the exclusion area, adjacent to the replant lands footprint Figure 3-9.	Yes
Species poor wet bog woodland WN7	No	Local Importance (higher value)	This habitat type exists within the exclusion area, adjacent to the replant lands footprint Figure 3-9.	No
Immature woodland WS2 and scrub WS1 mosaic	No	Local Importance (higher value)	This habitat type exists within the replant lands footprint.	Yes
Conifer plantation WD4	No	Local Importance (lower value)	This habitat exists within the replant lands footprint.	No
Eroding/ upland rivers FW1	No	Local Importance (higher value)	This habitat does not exist within the replant lands footprint, although is hydrologically linked through onsite drainage.	Yes
Oak-ash-hazel woodland WN2	No	Local Importance (higher value)	This habitat does not exist within the replant lands footprint, although is located adjacent.	No
Scrub WS1	No	Local Importance (higher value)	This habitat type exists within the replant lands footprint.	Yes

3.5.2.4 Species Evaluation

The basis of effect assessment should be a determination of which ecological resources within the zone of influence of the proposed replant lands are of sufficient value to be material in decision making and therefore, included in the assessment (NRA, 2009a and CIEEM, 2018). Table 3-16 below outlines the key fauna / flora receptors selected for assessment and the rationale for same; taken from NRA guidance (NRA, 2009a).



Table 3-16: Evaluation of fauna, birds, flora and other species

Common name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
Greater Copperwort	Protected Species on the Flora Protection Order 2015 Schedule C, Threatened Species: Vulnerable	National Importance	Records in the greater area but not recorded within the site.	No
Otter	EU Habitats Directive Annex II; Protected Species: EU Habitats Directive Annex IV; Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site. Potential to occur downstream of the site	Yes
Bats	EU Habitats Directive Annex IV; Wildlife Act (Amendment) 2000	National Importance	Legal status and ecological sensitivity. Some potential bat roosting habitat outside the site and potential foraging habitat within the site.	Yes
Badger	Wildlife Act (Amendment) 2000	County Importance	Badger sett and activity within the site	Yes
Pygmy Shrew	Wildlife Act (Amendment) 2000	National Importance	Potential habitat within the site	Yes
Red Squirrel	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site. Potential habitat adjacent to the site.	Yes
Pine Marten	EU Habitats Directive Annex V, Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site. Potential habitat adjacent to the site.	Yes



Common name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
Fox	Wildlife Act (Amendment) 2000	Local Importance (lower Value)	Recorded on site. Low conservation value species	No
Hedgehog	Wildlife Act (Amendment) 2000	National Importance	Records in the greater area but not recorded within the site. Potential habitat within the site	Yes
Red Deer	Wildlife Act (Amendment) 2000	National Importance if native but likely to be introduced	Records in the greater area but not recorded during surveys	Yes
Common Pheasant	Green listed	Local Importance (lower Value)	Recorded on site. Low conservation value species	No
Common Snipe	Amber listed	National Importance	Recorded on site.	Yes
Common Wood Pigeon	Green listed	Local Importance (lower Value)	Recorded on site. Low conservation value species	No
Buzzard	Green listed	Local Importance (lower Value)	Recorded adjacent to site included as it is a raptor species	Yes
Common Frog	EU Habitats Directive Annex V, Wildlife Act	National Importance	Recorded on site	Yes



3.6 Potential Effects

3.6.1 Construction Phase

3.6.1.1 Effects on European sites

There are no European sites within the proposed replant lands therefore no direct effects are predicted during construction. European sites hydrologically linked to the replant lands site have the potential to be indirectly effected due to hydrological changes and effects such as increased siltation, nutrient release and/or contaminated run-off through drainage channels and watercourses.

A separate Natura Impact Statement (NIS) has been prepared for the proposed replant lands and has been submitted with the planning application. The NIS addresses potential effects on European Sites resulting from the proposed replant lands. Whilst it has been acknowledged that there is the potential for the project to have significant indirect effects on two European sites, with the implementation of the detailed mitigation measures identified in the NIS, it is concluded beyond reasonable scientific doubt that the replant lands shall not result in a significant effect to any European sites.

3.6.1.2 Effects on Natural Heritage Areas or Proposed Natural Heritage Areas (NHAs / pNHAs)

3.6.1.2.1 Direct Effects

Moneygorm

The proposed replant lands are not within the boundary of any designated nature conservation sites. All NHAs or pNHAs previously described are outside the footprint of the Moneygorm site and, therefore, no direct effects are predicted.

Ballard

The proposed replant lands are not within the boundary of any designated nature conservation sites. All NHAs or pNHAs previously described are outside the footprint of the Ballard site and, therefore, no direct effects are predicted. The nearest pNHA and NHA to the proposed replant lands is the Vale of Clara (Rathdrum Wood) pNHA, located 4.7km to the north east and upstream of the project.

3.6.1.3 Indirect

Moneygorm

The Moneygorm replant lands are hydrologically linked to Bride/Bunnaglanna Valley pNHA (000079) which intersects with the Blackwater River SAC (002170). Afforestation of conifers will likely result in increased acidity and siltation upstream of the pNHA, potentially resulting in a **short-term slight effect**.

Ballard

The downstream distance to the nearest hydrologically linked Natural Heritage Area or Proposed Natural Heritage Area to the proposed replant land site (Avoca River Valley pNHA, Site Code: 01748) is 12.08km downstream of the site and 4.9km (straight line distance) from the site. Arklow Town Marsh pNHA, Site Code: 001931 is also hydrologically linked to the site, 20.40km downstream. Both of these sites are located along the Avoca River. Afforestation of conifers will likely result in increased acidity and siltation upstream of the pNHA, potentially resulting in a **short-term slight effect**.



3.6.1.4 *Effects on Habitats / Flora*

3.6.1.4.1 Direct Effects

Moneygorm

There are no Annex I habitat types within the study area and no rare and / or protected species of flora. There are no high value habitats recorded on site.

The effect of afforestation on those habitats recorded on-site, notably improved agricultural grassland (GA1), would be a **long-term imperceptible effect** as these habitat types shall be lost but they are common in the greater area and are already subjected to of disturbance. The effect of afforestation on these habitats would be, prior to mitigation **long-term slight Effect** as these habitat types and flora.

Ballard

There are no Annex I habitat types within the study area and no rare and / or protected species of flora. Habitats, such as scrub (WS1) and dry-humid acid grassland (GS3) mosaic, hedgerow (WL1), treeline (WL2), species poor wet grassland (GS4), drainage ditches (FW4), species poor wet bog woodland (WN7), immature woodland (WS2) and scrub (WS1) mosaic and eroding/ upland rivers (FW1), all classified as Locally Important (higher value), were identified as being key ecological receptors in relation to the proposed replanting lands.

Habitats types including dense bracken (HD1), scrub (WS1), scrub (WS1) and dry-humid acid grassland (GS3) mosaic, scrub (WS1) and immature woodland (WS2), treeline (WL2), hedgerow (WL1) and recolonising bare ground (ED3) are located within the footprint of the proposed replant lands site at Ballard. The impact of the proposed replant lands **long-term slight effect**.

Habitat types including eroding/ upland rivers (FW1), oak-ash-hazel woodland (WN2), species poor wet bog woodland (WN7), drainage ditches (FW4) and species poor wet grassland (GS4) have all been identified as having the potential to support rare or protected species within the local area. These higher value habitats were identified during the current appraisal and have subsequently been avoided for replanting (Figure 3-9). There shall be no direct loss of these habitats as a result of the replanting.

3.6.1.4.2 Indirect

Moneygorm

Indirect effects on habitats and flora include the spread of invasive species which could be distributed during construction works. *Fuscia* was identified onsite, this invasive plant species is easily spread by human activities. Interaction of proposed works with these species will likely occur and there exists the possibility of it being spread within the site during replanting.

It is likely that invasive species could affect the existing environment and habitats within the site. It is considered that prior to mitigation a **long-term slight effect** could arise as a result of invasive species.

There is potential for the conveyance of silt or contaminants towards the Suir via drainage ditches. Silt and other contaminants also have the potential to effect riparian woodlands bordering the site. The high gradient and array of Drainage Ditches (FW4) throughout the site increases the likelihood of contaminants or pollutants reaching the watercourses downstream of the development. Prior to mitigation, a **short-term moderate effect** is predicted.



Ballard

Indirect effects on habitats and flora include the spread of invasive species which could be distributed during construction works. Cherry laurel was identified onsite. This invasive plant species is not easily spread by human activities. It is likely that this species will not impact biodiversity in the short-term after the proposed works.

It is likely that invasive species could affect the existing environment and habitats within the site. It is considered that prior to mitigation a **long-term imperceptible effect** could arise as a result of invasive species.

There is potential for the conveyance of silt or contaminants towards the Ballyeustace Stream via drainage ditches. Silt and other contaminants also have the potential to effect riparian habitats bordering the site and downstream. The high gradient and array of drainage ditches throughout the site increases the likelihood of contaminants or pollutants reaching the watercourses downstream of the development. Without mitigation, a **short-term moderate effect** is predicted.

3.6.1.5 Effects on Fauna

3.6.1.5.1 Direct

Moneygorm

The proposed replanting of trees at Moneygorm will result in habitat loss of land which is currently used for intensive agriculture. These habitats are widespread in the general area and this small-scale loss of habitat will not result in a significant negative effect on the distribution of local protected fauna including pine marten, pygmy shrew, Irish hare, hedgehog, bat species and wood mouse. It is considered that any unmitigated effects will be **short-term imperceptible**.

Birds

Jackdaw, Hooded Crow, and Robin were recorded during the site walkover. Jackdaw and hooded crow are green listed and are of low of conservation concern.

The habitats recorded on site offer some nesting-suitability for these species (i.e. immature trees, low-growing scrub and hedgerows). Therefore, the resultant habitat loss is considered to be a **temporary imperceptible effect**.

Robin was also recorded on site during the site walkover. The species is amber listed for breeding, and protected under the Wildlife Act, 1979 (as amended). The habitats on site offer suitable nesting habitat for robin and other passerine species. However, these habitats are widespread and common in the surrounding area. Furthermore, the planting of trees of which a percentage will be broadleaved trees will in time provide additional nesting habitat for robin and other bird species. Therefore, the resultant habitat loss is considered to be a **short-term slight effect**.

Hen Harrier

The habitats present on site, particularly improved agricultural grassland GA1 which is dominant within the site, offers low value habitat for nesting and foraging hen harrier. Therefore, the resultant habitat loss is considered to be a **long-term imperceptible effect**. The planting of conifer plantation would between years 2 and 10 (prior to the canopy becoming enclosed) offer potential nesting habitat for the species.



Bats

The closest confirmed bat roost is located ca. 1.9km from site. *Myotis nattereri*, *Plecotus auritus*, and *Pipistrellus* were recorded here. *Myotis nattereri* were recorded as using the roost during summer, autumn and winter of the 2017 survey period. *Plecotus auratus* was recorded using the roost in summer of the 2017 survey period. Common pipistrelle was recorded using the roost in 2016. It has been recorded as a maternity, mating and hibernation roost.

In terms of potential roosts, there are 20 features within 2km as recorded during the 2017 survey. The closest is ca. 500m from the site and is a “metal farm building”. There are no roosts identified within the replant lands site, and no potential roosting habitat identified. Improved agricultural grassland which is dominant within the site offers low value foraging habitat for bats. Therefore, the resultant habitat loss is a **long-term imperceptible effect**. Hedgerows, treelines and scrub present on site is immature are low-growing but may offer potential foraging and commuting habitat for bat species. Where this vegetation is removed, there will be a short-term, slight impact. Tree planting will in time allow continued connectivity through the site for bats. Therefore, the resultant habitat loss is a **long-term imperceptible effect**. The planting of a portion of broadleaved trees will provide additional foraging habitat for bat species within the site.

Ballard

The planting of trees at Ballard will result in the loss of habitats within the footprint of the replanting area. However, these habitats are widespread in the general area and this small-scale loss of habitat will not result in a significant negative effect on the distribution of mammals including pine marten, red deer, pygmy shrew, hedgehog and wood mouse. It is considered that any unmitigated effects will be **short-term imperceptible**.

Badger

One badger sett (within the site boundary) was identified during surveys. If afforestation were to be carried out in close proximity to an active sett particularly during the breeding season (December to June), it is considered a **long-term significant effect** would result (without mitigation).

Otter

No holts or otter evidence were recorded during surveys within the site. Therefore, **no direct effect** to otter is predicted during construction.

Red Squirrel

No dreys or squirrel evidence were recorded during surveys within the site. Habitats within and along the edge of the footprint of the replanting area are suitable to squirrel. Suitable habitats within the proposed footprint, include a ca. 100m section of treeline and areas of scrub/ immature woodland (2.4 ha). The area of scrub/ immature woodland, to be removed, is imperceptible in relation to the overall habitat availability for squirrels within the locality and higher value habitats within the study area that are not being lost as a result of replanting. These higher value habitats were identified during the current appraisal and have subsequently been avoided for replanting.

It is considered that the construction of the proposed replant lands site will result in an initial **short-term imperceptible effect**. The planting of woodland will in time provide suitable habitat for the species.

Bats

Three potential bat roosts were identified along the border of the replant lands. These trees are located outside of the replant lands footprint; therefore they will not be removed as a result of the proposed replanting.

As replanting will only occur during the daytime, and not at night when bats are most active, it is considered that the construction of the proposed replant lands site will result in a **temporary imperceptible effect**.



Common Snipe

Common snipe were identified throughout the proposed replant site at Ballard. The species were identified as utilising the habitats within the footprint of the proposed replanting area for roosting and feeding. If replanting were to be carried out at a sensitive period for snipe (i.e. the breeding season) this could cause the abandonment or loss of nests resulting in a **localised temporary significant effect**.

Buzzard

Buzzards were identified to be commuting over and utilising habitats adjacent to the replant lands site at Ballard. These habitats are common within the wider area. It is considered that the construction of the proposed replant lands at Ballard will result in a **long-term slight effect** to buzzard.

Common Frog

Common frog and frogspawn were identified within the wetland habitats towards the north of the proposed replant lands site at Ballard. These wetland areas are not within the footprint of the proposed replanting area and therefore it is considered that the construction of the proposed replant lands at Ballard will result in a **long-term imperceptible effect** to common frogs

3.6.1.5.2 Indirect

Moneygorm

The planting (construction phase of the development) may result in temporary disturbance to fauna, however as this will be temporary in duration, and given the habitats present in the wider environment, affected mammals will be able to move to other locations in the wider area until the disturbance has ceased.

Prior to mitigation, there is potential for indirect effects to otter through the transport of pollutants and/or contaminants which could negatively affect the aquatic habitats and prey on which otter depend. These effects could occur as the result of afforestation activities and considering the high gradient and flow rate of the streams draining the study the magnitude of any such effect would be high. As such, any effects on otter prior to mitigation are predicted to be **short term slight**.

Birds

The amber listed species robin was recorded on site during the site walkover. The habitats on site offer suitable nesting habitat for robin and other passerine species. Thus, there is the potential for disturbance during the nesting season which would result in a **short-term significant effect**.

Hen Harrier

Hen harrier nests have been recorded within 2km of the replanting site in both the 2015-2016, and 2017 survey periods. A nest was confirmed ca. 380m from the replanting site during the 2015-2016 survey period. A nest was also recorded ca. 1.57km from the replanting site in 2017. There are no records of historic nests within 2km prior to this period. Similarly, there were no nests recorded within 2km in 2018. A confirmed hen harrier territory was recorded ca. 355m from the replanting site 2019.

Given the location of a potential nesting site within 500m of the replanting area there is the potential for disturbance to the species, particularly during sensitive periods i.e. the breeding season.

Therefore, based on the precautionary principal the resultant disturbance of planting works during the breeding season if the nest is occupied could lead to a **short-term significant effect**.



However, it is worth noting that the location of these nesting sites within conifer plantation and the existing conifer plantation between the nesting site and the Moneygorm site do offer a degree of screening / buffering to the replanting site. The nature of the works are also consistent with the ongoing forestry management within the area.

Bats

Given the proximity of the closest known roost (1.9km) and the closest potential roosting site (500m), the resultant impact due to disturbance is considered to be **temporary imperceptible effect**.

Ballard

The proposed replanting may result in temporary disturbance to fauna, however as this will be temporary in duration, and given the habitats present in the wider environment, affected fauna will be able to move to other locations in the wider area until the disturbance has ceased.

Prior to mitigation, there is potential for indirect effects to otter through the transport of pollutants and/or contaminants which could negatively affect the aquatic habitats and prey on which otter, snipe and common frog depend.

The effects could occur as the result of afforestation activities and considering the high gradient and flow rate draining the study the magnitude of any such effect would be high. As such, any effects on otter and badger prior to mitigation could result in a **temporary/short-term significant effect** (without mitigation).

The development of the proposed project could impact local mammals including pygmy shrew, pine marten, squirrel, red deer and hedgehog. The development of forestry has the potential to displace these species from the local area. Although, these species will be able to move to other locations in the wider area until the disturbance has ceased. It is envisaged that the replant lands will result in a **temporary imperceptible effect** upon these species.

Snipe also have the potential to be impacted as a result of disturbance if replanting were to be carried out at a sensitive period for snipe (i.e. the breeding season) this could cause the abandonment or loss of nests resulting in a **localised temporary significant effect** (without mitigation).

The development of the proposed replant lands is likely to result in a low level of localised disturbance to buzzards within the area. However, the habitat within the replanting area offer some foraging habitat only with no potential roosting habitat. The availability of similar habitat throughout the area it is envisaged that buzzards will result in a **temporary imperceptible effect**.

The local development of forestry is likely to reduce the level of bat prey within the immediate local area. This could be as a result of homogenised habitats typically within conifer plantations. Bats typically require linear features in order to hunt (Russ and Montgomery, 2002).

The development of conifer plantation has the potential to provide a concentration of such features benefiting bats and will not effect the connectivity through the site for bats. It is envisaged that the development of the replant lands at Ballard could result in a **long-term slight effect**, without mitigation.

The development of the proposed replant lands at Ballard is likely to indirectly effect frogs within the area. The development of forestry, including the afforestation of land, has the potential to result in negatively affected aquatic habitats and prey species populations. However, it is noted that most valuable habitats within the site for frog (the wetland habitats towards the north) is not within the footprint of the replant lands.



The development of the replant lands at Ballard could result in a **long-term slight effect** on frogs, without mitigation.

3.6.2 Operational Phase

3.6.2.1 Effects on European sites

There are no European sites within the replant lands area therefore no direct effects are predicted during operation. European sites hydrologically linked to the replant lands site have the potential to be indirectly effected due to hydrological changes and effects such as increased siltation, nutrient release and/or contaminated run-off through drainage channels and watercourses.

A Natura Impact Statement (NIS) has been prepared for the proposed replant lands and has been submitted with the planning application. The NIS addresses potential effects on European Sites resulting from the proposed replant lands. Whilst it has been acknowledged that there is the potential for the project to have significant indirect effects on two European sites, with the implementation of the detailed mitigation measures identified in the NIS, it is concluded beyond reasonable scientific doubt that the replant lands shall not result in a significant effect to any European sites.

3.6.2.2 Effects on Natural Heritage Areas or Proposed Natural Heritage Areas (NHAs / pNHAs)

3.6.2.2.1 Direct Effects

Moneygorm

No direct effects are envisaged as a result of the construction phase of the Moneygorm replant lands as no pNHAs or NHAs are located within the site.

Ballard

The nearest hydrologically linked Natural Heritage Area or Proposed Natural Heritage Area to the proposed replant land site Avoca River Valley pNHA (Site Code: 01748), is 12.08km downstream of the site. Arklow Town Marsh pNHA (Site Code: 001931), is 20.40km downstream along the Avoca River.

No direct effects are envisaged as a result of the construction phase of the Ballard replant lands as no pNHAs or NHAs are located within the site.

3.6.2.2.2 Indirect

Moneygorm

The Moneygorm replant lands are hydrologically linked to the Bride/ Bunaglanna Valley pNHA (Site Code: 000079). According to the site synopsis for the pNHA, "*is situated in county Cork, some 13km. south-west of the town of Fermoy. Both valleys are created by rivers that originate in the Nagles Mountain range*". The major features of interest in the site are "*firstly, the diverse range of comparatively intact habitat type present and, secondly, the microfungi community, some of which have not been recorded elsewhere*" (NPWS, 1995).



Other features noted as being present within the pNHA are “*semi-natural deciduous woodland of Willow (Salix sp.), Oak (Quercus sp.) and Rowan (Sorbus aucuparia) occurs with abundant Great Woodrush (Luzula sylvatica) in the ground flora along with a little Hairy Wood-rich (Luzula pilosa), Marsh Hawk’s-beard (Crepis paludosa), Water Avens (Geum rivale), Common Cow-wheat (Melampyrum pratense) and Golden-saxifrage (Chrysosplenium oppositifolium)*” (NPWS, 1995). No such habitat, or species were recorded on site.

Afforestation of conifers will likely result in increased acidity and siltation upstream of the pNHA, potentially resulting in a **long-term slight effect**.

Ballard

The nearest hydrologically linked Natural Heritage Area or Proposed Natural Heritage Area to the proposed replant land site Avoca River Valley pNHA (Site Code: 01748), is 12.08km downstream of the site. Arklow Town Marsh pNHA, (Site Code: 001931) is also hydrologically connected to the replant lands site (20.40km downstream). Both pNHAs are located along the Avoca River. Afforestation of conifers will likely result in increased acidity and siltation upstream of the pNHA, potentially resulting in a **long-term imperceptible effect** due to the significant instream distance to these designated sites.

3.6.2.3 Effects on Habitats / Flora

3.6.2.3.1 Direct Effects

Moneygorm

No direct effects to habitats and flora are envisaged as a result of operation of the proposed replant lands at Moneygorm. No Flora Protection Order species were identified at this intensively managed agricultural grassland site. Following planting as the forestry matures the understory shall be shaded out and changed. As such, any effects, prior to mitigation, are predicted to be **long term slight effect**.

Ballard

No direct effects to habitats and flora are envisaged as a result of operation of the proposed replant lands at Ballard. No Flora Protection Order species were identified on site during either survey in 2018 or 2020. Following planting as the forestry matures the understory shall be shaded out and changed. As such, any effects, prior to mitigation, are predicted to be **long term slight effect**.

3.6.2.3.2 Indirect

Moneygorm

Water quality as a result of growth of the conifer crop is likely to result in acidification and siltation of surrounding habitats, effecting flora. An indirect effect on habitats both on and off site is envisaged as a result of the high level of drainage from the site. The addition of silt, herbicides and other contaminants to the site is likely to result in a **long-term slight effect** to water quality, and species using this habitat if unmitigated.

Ballard

Water quality as a result of growth of the conifer crop is likely to result in acidification and siltation of surrounding habitats, effecting flora. An indirect effect on habitats both on and off site is envisaged as a result of the increased drainage from the site. The addition of silt, herbicides and other contaminants to the site is likely to result in a **long-term slight effect** to water quality locally, and species using this habitat if unmitigated.



3.6.2.4 Effects on Fauna

3.6.2.4.1 Direct

Moneygorm

No protected fauna species were identified on site. It is envisaged that the operation of the conifer plantation will have a **long-term imperceptible effect**.

Birds

It is envisaged that the operational phase of the replanting will have a **long-term imperceptible effect**. The planting of conifer plantation would between years 2 and 10 (prior to the canopy becoming enclosed) offer potential nesting habitat for hen harrier. The planting of trees of which a percentage will be broadleaved trees will in time provided additional nesting habitat for robin and other passerine bird species.

Bats

It is envisaged that the operational phase of the replanting will have a **long-term imperceptible effect**. The planting of a portion of broadleaved trees will provide additional foraging habitat for bat species within the site.

Ballard

Two bird species have been identified as key receptors. One amber-listed bird species, snipe, and one green-listed species, buzzard, were identified using, or adjacent to, the site. Snipe were observed throughout the site. Buzzard were observed flying over and perched alongside the site. Both species are likely to utilise habitats within the site, either for roosting, feeding or cover. The site's habitats are widely common within the area, particularly after the felling of plantation forestry. The operation phase of this replant lands will likely result in a **long-term slight effect** on these species, without mitigation.

Frogs are likely to be impacted as a result of conifer plantation operational management such as the thinning of trees and fertilisation. Without implementation of mitigation measures the direct effect of the operation phase is likely to result in a **long-term slight effect**.

Terrestrial mammals within the site, including pygmy shrew, hedgehog, red deer, red squirrel badger and otter, are likely to be impacted as a result of the operation phase of the replant lands. The disturbance of species during operation is likely to effect populations, although due to the high level of similar habitat located within the area, this effect is envisaged to result in a **long-term slight effect**, without mitigation.

The operation phase of the replant lands is not likely to impact bats within the area.

3.6.2.4.2 Indirect

Moneygorm

Afforestation of the site may result in an increase in nutrient, silt and herbicide runoff from the site. This is likely to have a reduction in oxygen levels in spawning beds caused by siltation; reduced oxygen levels at night-time caused by over-production of plant material. Knock-on effects include potential alteration in macrofaunal assemblage resulting in reduction of fish prey, and reduction in fish numbers (caused by effects to prey and/or spawning grounds) affecting otter which rely on fish stocks. It is envisaged that the operation of the conifer plantation will have a **long-term slight effect**.



Ballard

Afforestation of the site may result in an increase in nutrient, silt and herbicide runoff from the site. This has the potential (unmitigated) to result in a reduction in oxygen levels in spawning beds caused by siltation and reduced oxygen levels at night-time caused by over-production of plant material. Knock-on effects include potential alteration in macrofaunal assemblage resulting in reduction of fish prey, and reduction in fish numbers (caused by effects to prey and/or spawning grounds) affecting otter which rely on fish stocks. It is envisaged that the operation of the conifer plantation will have a **long-term slight effect** locally.

Afforestation of the site is likely to result in the increased siltation and flow rate of waterbodies within the site. Drainage practices completed for the development of plantation forestry are likely to result in increased flowrates of stagnant water on site (which frogs prefer to breed within). It is envisaged that the operation of the conifer plantation will have a **long-term slight effect**.

3.6.3 Cumulative Effects

3.6.3.1 Moneygorm, Co. Cork

The proposed Coom Green Energy Park (for which this replanting is being carried out) is located at a distance of 1.07km east from the proposed replanting area at Moneygorm and will not result in cumulative effects.

There is coniferous forestry located to the west and east of the wind farm site, and the cumulative effect arising from the proposed replanting in conjunction with the existing forestry plantations and future development is assessed as a short-term, negative effect in the absence of mitigation measures.

In considering whether the proposed replanting, by itself or in combination with other plans and projects, has the potential to affect the conservation objectives of the designated sites within 15km of the proposed replant lands, the following were considered:

- Permitted and existing projects in the vicinity of the replant lands
- Proposed projects in the vicinity of the replant lands
- Land use in the vicinity of the replant lands
- Cork County Development Plan 2014.

A planning search limited to applications submitted within the townlands overlapping and surrounding the replant lands during the previous 5 years was conducted on 23rd September 2020. The relevant townlands are:

- Moneygorm
- Toorgarrif
- Bunaglanna
- Ardarou
- Lackendarragh North
- Knockdoorty.



A number of permitted one-off domestic and agricultural developments including new houses and agricultural sheds and infrastructure are permitted in the townlands overlapping and abutting the replant lands.

In addition, the retention of an existing 24m tall communications mast in the townland of Lackendarragh North is permitted.

The large volume of coniferous forestry of various ages in the landscape surrounding the replant lands must be considered to have the potential to result in cumulative impacts due to the negative environmental impacts (silt, nutrient and acid inputs to watercourses) associated with commercial forestry operations (particularly in upland areas). While potential for such inputs exists, adherence to up-to-date environmental practices will ensure these are not excessive. It is envisaged that the proposed replanting could result in a **long-term slight cumulative effect**.

3.6.3.2 Ballard, Co. Wicklow

The proposed Coom Green Energy Park for which this replanting will be carried out, is located at a distance of 170km south-east from the proposed replanting area and will not result in cumulative effects on each other.

The surrounding industry is largely composed of intensive grazing agriculture and conifer plantations. Both practices have the potential to act cumulatively with other plans and projects within the area. The addition of silt, nutrients, fertilizers, herbicides and pesticides into adjoining habitats and river systems is likely to result in increased stress upon local ecological features. Coniferous forestry located to the west and east of the wind farm site, and the cumulative effect arising from the proposed replanting in conjunction with the existing forestry plantations and future development is assessed as a short-term, negative effect in the absence of mitigation measures. It is envisaged that the proposed replanting could result in a **long-term slight cumulative effect**.

In considering whether the proposed replanting, by itself or in combination with other plans and projects, has the potential to affect the conservation objectives of the designated sites within 15km of the proposed replant lands, the following were considered:

- Permitted and existing projects in the vicinity of the replant lands
- Proposed projects in the vicinity of the replant lands
- Land use in the vicinity of the replant lands
- Wicklow County Development Plan.

A planning search limited to applications submitted within the townlands overlapping and surrounding the replant lands during the previous 5 years was conducted on 23rd September 2020. The relevant townlands are:

- Ballard
- Ballyshane
- Ballymoney
- Ballinatone Lower
- Ballycarrigeen



- Ballinaclash
- Ballyknockan lower
- Bahana (King).

Over the previous five years, twenty-six applications were finalised within the townland of Ballard. Of these twenty-six applications, three were refused, four are awaiting decision and nineteen were granted on condition. Of those applications which were granted permission on condition, eleven were composed of the development of dwellings with waste-water treatment facilities and ancillary works such as garage development.

A water supply well along with ancillary works, entrance and treatment plant development within the townland was noted in 2016. This development is composed of the construction of a balcony and other ancillary works (161355). Agricultural works were also noted during this time within Ballard, including the development of a covered silage pit, milking parlour, cattle handling facility, calf shed, construction dirty water tank, silage effluent tank, rainwater harvesting tank and demolition of calf shed (171367) and the development of slatted sheds, cattle crush and additional ancillary works (17145).

No permitted developments were identified within the townland of Ballyshane within the last five years.

In the townland of Ballymoney four developments were granted on condition in the last five years. Of these developments two were associated with the construction (181007) or demolition (191256) of dwelling extensions within the townland.

The development of a 19ha solar farm consisting of photovoltaic panels on ground mounted steel frames, a site substation, 3 no inverter / transformer stations, underground cables and ducts was granted permission under condition in 2019 (19627).

No permitted developments were identified within the townland of Ballinatone Lower within the last five years.

No permitted developments were identified within the townland of Ballycarrigeen within the last five years.

Developments within the townland of Ballinaclash largely consist of the construction of dwellings (161241, 17848, 191025 and 19137), dwelling extensions (17511), dwelling garage development (171491) or works within dwellings (16337, 18430, 16322 and 181096). Two additional developments, of agriculture in nature, were granted permission under condition, these include the demolition of existing outhouses and storage sheds for the construction of a new shed, replacement of existing septic tank (18973) and the replacement of these sheds (19501).

No permitted developments were identified within the townland of Ballyknockan lower within the last five years.

Developments within the townland of Bahana over the previous five years, include the construction of a dwelling extension (15593) and the change of use of a dwelling and to allow for alterations (191052).

It is envisaged that the proposed replanting could result in a *long-term slight cumulative effect with other developments*.



3.7 Mitigation Measures

















3.7.1 Mitigation by Design at Ballard

A number of locally important wetland habitats have been identified on site, accounting for 2.3 Ha of the total 37.1 Ha of the proposed site. Habitat types including eroding/ upland rivers (FW1), oak-ash-hazel woodland (WN2), species poor wet bog woodland (WN7), drainage ditches (FW4) and species poor wet grassland (GS4) have all been identified as habitats of locally high quality or having the potential to support rare or protected species.

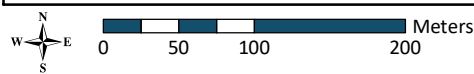
An exclusion buffer of 15m will be applied to these habitats in order to preserve their integrity and reduce the rate of siltation as a result of the proposed forestry replanting.

See Figure 3-8 for more details.



-  Exclusion Zone
-  Planting Area
-  Site Boundary
- Habitat Classification**
-  ED3, Recolonising bare ground
-  FW1, Eroding/upland rivers
-  FW4, Drainage ditches
-  WL1, Hedgerows
-  WL2, Treelines
-  GS4, Wet grassland
-  HD1, Dense bracken
-  WD4, Conifer plantation
-  WN2, Oak-ash-hazel woodland
-  WN7, Bog woodland
-  WS1, Scrub
-  WS1/GS3, Scrub / Dry-humid acid grassland
-  WS1/WS2, Scrub / Immature woodland

TITLE:	
Buffer Zones of Features of Interest at Ballard, Co. Wicklow	
PROJECT:	
Coom Green Energy Park, Co. Cork	
FIGURE NO:	3.8
CLIENT:	Coom Green Energy Park Ltd.
SCALE: 1:5000	REVISION: 0
DATE: 25/09/2020	PAGE SIZE: A3





3.7.2 General Mitigation Measures – Both Sites

The following mitigation measures are proposed for both Moneygorm and Ballard replant lands.

Mitigation measures which will reduce the risk of enrichment of suspended solids and nutrient release in surface watercourses comprise best practice methods which will be applied at the replanting site. These include:

Careful mapping of existing site drainage and vulnerabilities (wet ground, preferential flow paths) prior to planting will be carried out and the appropriate drainage design and management will be employed. This includes the provision of collector drains which will disperse drainage water with low velocity through wide (20m) vegetated buffer zones increasing the efficacy of sediment and nutrient retention across the area. Silt fencing will be erected along the drainage ditch at the location of the proposed replanting to provide additional protection to the watercourses in this area.

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage.

Site preparation for replanting will be carefully managed to prevent any loss of silt and sediment conveyed in surface water run-off to receiving waters.

This reduces potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site resulting in an imperceptible effect.

3.7.3 Mitigation Measures – Site Specific

The following site specific mitigation measures are proposed:

3.7.3.1 *Moneygorm*

The layout of the replant lands takes cognisance of the drainage regime on the site.

- A buffer of 10m either side of the drainage ditch will be maintained, as per the Forestry and Water Quality Guidelines (Department of Agriculture, 2000) (for areas of moderate slope of 0-15%). This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone.
- The drainage ditch will be protected by fencing, including the proposed stilling ponds.
- Additional protection will be provided in the form of silt fencing downslope during planting, to further ensure that there is no effect from the development to streams and rivers downslope of the site.
- This reduces potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site resulting in an imperceptible effect.

A preconstruction verification hen harrier survey to reconfirm findings of the bird surveys for the EIAR for the wind farm will be undertaken.

Planting and vegetation clearance will be undertaken outside the nesting season (1st March to 31st August).



3.7.3.2 Ballard

The following mitigation measures are proposed for Ballard replant lands:

- The drainage ditch will be protected by fencing, including the proposed stilling ponds.
- Additional protection will be provided in the form of silt fencing downslope during planting, to further ensure that there is no effect from the replanting to streams and rivers downslope of the site.
- This reduces potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site resulting in an imperceptible effect.
- For waterbodies and wetland habitats (including valuable drainage ditches) within the site, a buffer of 15m either side of the drainage ditch will be maintained, as per the Forestry and Water Quality Guidelines (Forestry Service, 2000b). This 15m buffer is specifically used on steep ground at between 15-30%. See Figure 3-9 for more details in relation to the buffer zones required.
- Additional protection will be provided in the form of silt fencing downslope during planting, to further ensure that there is no effect from the development to streams and rivers downslope of the site.
- This reduces potential sources of sediment and reduces the risk of sediment and sediment bound nutrient run-off from the site resulting in an imperceptible effect.
- A preconstruction mammal survey to reconfirm the finding of this survey particularly for badger and to inform a future derogation license for badgers will be undertaken prior to replanting. A buffer of 100m is required around the noted badger sett if derogation is not granted.
- The removal of scrub, trees or saplings will be completed outside of the bird nesting season only. As scrub makes up a large portion of the proposed site, this mitigation measure will be adhered to during the nesting season (1st March to the 31st August) (Section 40 of the Wildlife Act 1976).
- Pre-construction frog surveys will be completed, to reconfirm the findings of this report, within the replant lands site prior to construction, in the event that frogspawn is identified, translocation will be carried out in accordance with the NRA guidelines (NRA, 2009).
- Potential bat roost locations were not identified within the direct development footprint of the proposed replant lands. Potential bat roosts are located within the adjacent treeline habitats of the replant lands site, as treelines or hedgerows will not be impacted as a result of this replant lands, mitigation measures are not required.
- As the identified invasive species, cherry laurel, was not located within the replant lands site, no mitigation will occur. A single cherry laurel plant is located within the adjoining treeline habitat, adjacent to the development site, as this habitat will not be impacted during the construction or operation of the replant lands, no mitigation is needed in relation to the invasive species. A pre-construction invasive species survey will be undertaken to reconfirm the findings of this report.

A pre-construction mammal survey will be undertaken, to reconfirm the findings of this report, within the footprint of the replant lands and the findings of the mammal surveys cognisant of the NRA *Guidelines for the Treatment of Badgers Prior To the Construction of National Road Schemes* (NRA, 2008c). The following measures taken from this document shall be adhered to.



Disused and inactive setts

In the instance of disused setts or setts verified as inactive, and to prevent their reoccupation, the entrances shall be lightly blocked with vegetation and a light application of soil (soft blocking). The purpose of soft-blocking is to confirm that an apparently inactive sett is not occupied by badgers.

If a sett is deemed active after soft blocking a motion detection camera will be installed to confirm species and the number of individuals present.

If all entrances remain undisturbed for a minimum of five days, they will be hard-blocked immediately using stone and wire mesh, under the supervision of an experienced and suitably qualified ecologist.

Hard-blocking is best achieved using buried fencing materials and compacted soil with further fencing materials laid across and firmly fixed to blocked entrances and surrounds. If all entrances remain undisturbed for a minimum of five days, setts will be immediately destroyed due to the close proximity to the replant lands.

A report detailing evacuation procedures, sett excavation and destruction, and any other relevant issues will be submitted to the NPWS, in fulfilment of the wildlife licence conditions.

Active setts

Where field signs or monitoring reveal any suggestion of current or recent badger activity at any of the sett entrances, the sett will require thorough evacuation procedures.

Inactive entrances will be soft and then hard-blocked or destroyed as described for inactive setts, but any active entrances will have one-way gates installed (plus proofing around sides of gates) to allow badgers to exit but not to return. The gates will be tied open for three days prior to being set to exclude. Sticks will be placed at arm's length within the gated tunnels to establish if badgers remain within the sett.

Gates will be left installed, with regular inspections, over a minimum period of 21 days (including period with gates tied open) before the sett is deemed inactive. Any activity at all will require the procedures to be repeated or additional measures taken. The sett will be monitored regularly for signs of occupancy. Once all badgers have been excluded from active setts, they will be immediately hard-blocked (using a stone and wire) and will be destroyed, under the supervision of an experienced and suitably qualified ecologist. Hard-blocking is best achieved using buried fencing materials and compacted soil with further fencing materials laid across and firmly fixed to blocked entrances and surrounds.

A toolbox talk shall be provided to all construction workers accessing the site to raise the awareness of the species. If badgers do attempt to reoccupy the site all works shall cease within 30m of this area and the project ecologist/ECOW shall consult with NPWS. The area shall be treated as an active sett and the procedure outlined above shall apply in full.

A report detailing evacuation procedures, sett excavation and destruction, and any other relevant issues will be submitted to the NPWS, in fulfilment of the wildlife licence conditions.

Vegetation clearance

There is the potential for further setts to be discovered during vegetation clearance works.



Care will need to be taken during this early stage of the development and a competent ecologist will be required on-site for these works. If further setts are discovered all works within 30m of the sett shall be ceased including vegetation clearance. NPWS shall be contacted and an amendment to the derogation licence shall be sought with the inclusion of the new sett. An activity survey shall be carried out to assess the potential for the sett to be used by badgers. And the steps followed above under the titles 'Disused and Inactive Setts' and/or 'Active Setts' will be followed.

Measures to prevent the injury of badgers during proposed mitigation measures

In the event that a badger is found injured during the implementation of proposed mitigation measures, it is important to realise that injured badgers will be frightened and can be very dangerous. They are strong animals and are not used to being handled, so no attempt will be made to touch an injured badger, as this could result in workers being bitten. NPWS shall be contacted along with ISPCA and potentially a vet specified by NPWS capable of treating the species.

3.8 Residual effect

3.8.1 Residual Effect (Moneygorm)

With the implementation of the aforementioned mitigation measures, no significant residual effects are envisaged as a result of the proposed replanting. The overall residual effects to biodiversity will be a **localised reversible imperceptible to slight effect**.

3.8.2 Residual Effect (Ballard)

With the implementation of the aforementioned mitigation measures, no significant residual effects are envisaged as a result of the proposed replanting. The overall residual effects to biodiversity will be a **localised reversible imperceptible to slight effect**.



3.9 CONCLUSION

3.9.1 Assessment Conclusions

Moneygorm, Co. Cork

The proposed site is located in an area of agricultural pasture, with adjacent conifer plantation. The afforestation methodology is not intensive and all works and subsequent maintenance will be carried out in accordance with the various Guidelines described in Section 3.4 and the Technical Approvals issued by the Forest Service.

With the implementation of Forestry and Water Quality Guidelines, and the aforementioned mitigation measures (particularly in managing site drainage to ensure ground disturbance is kept to a minimum), there is a low risk of significant nutrient and sediment run-off to watercourses in the area. Thus, the residual effect will be **localised reversible long-term imperceptible to slight effect**.

Ballard, County Wicklow

The proposed site is located in an area dominated in both agricultural pasture and conifer plantation. The surrounding landscape is both mountainous and rural in character with semi-natural woodland to the north.

The afforestation methodology is not intensive and all works and subsequent maintenance will be carried out in accordance with the various Guidelines described in Section 3.4 and the Technical Approvals issued by the Forest Service.

With the implementation of Forestry and Water Quality Guidelines, and the aforementioned mitigation measures (particularly in managing site drainage to ensure ground disturbance is kept to a minimum and the sensitive habitats are excluded from planting), there is a low to slight risk of significant nutrient and sediment run-off to watercourses in the area. Thus, the residual effect will be **localised reversible long-term imperceptible to slight effect**.



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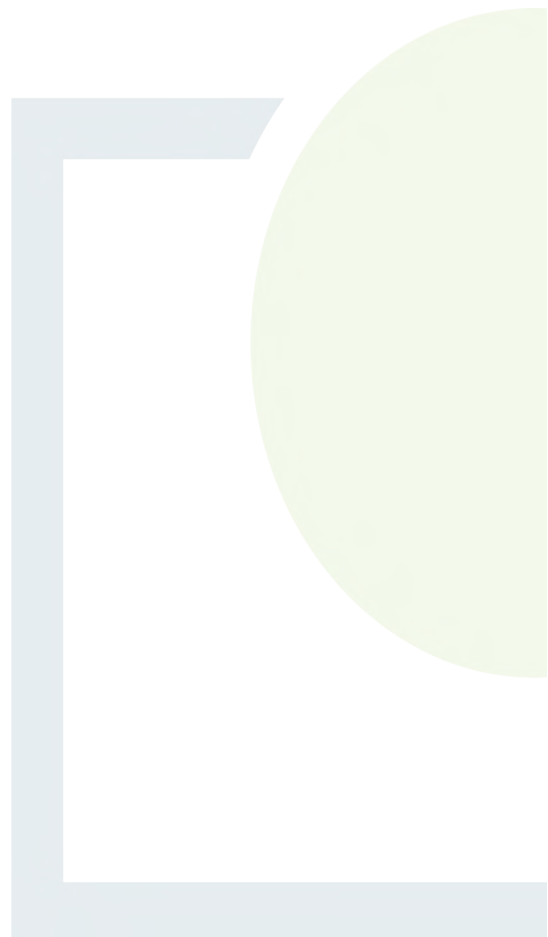
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CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE &
PLANNING

APPENDIX 1

Technical Approval for
Afforestation





MR DONAL KELLEHER
BALLYPHILIP
GLANMIRE
CO CORK

02/11/2018

Application for Technical Approval for an Afforestation Licence

Forest Owner	FO135956U
Contract Number	CN82229
Townland	Moneygorm
County	Cork
Approved Area (ha)	40.02
Fencing Length (lm)	1,960.00

This is technical approval for an afforestation licence only and is not grant approval. You should note that the project will not be eligible for grant aid unless prior financial approval has been given in writing in advance of commencement of planting. Also, to qualify for Afforestation grant and premiums applicants must own, lease or be in joint management of the lands proposed for planting. You should consult with your registered forester about applying for financial approval under the Scheme.

I refer to your application for an afforestation licence as described above and shown on the enclosed map. Your application has been assessed and a licence is hereby issued on the basis that the works will be undertaken in accordance with the prescription set out in Appendix A, attached herewith. You are now required to remove your site notice immediately.

This scheme is financed by the State and payment of the grant, if financial approval is given, is subject to the following conditions:

1. Availability of funds in each financial year.
2. Submission of a fully completed and signed Form 2 (Application for Payment) and the following documents to support this application.

Proof of Ownership (including removal of any constraints on ownership)
Valid Mandate
Current Tax Clearance Certificate(s)
C2 Certificate
Provenance Certificates
Fencing Map
Biodiversity Map
Certified Species Map

3. Satisfactory completion of the work not later than 30/10/2021.
4. Compliance with Operational Proposals and Specifications enclosed.
5. Compliance with Departmental guidelines and requirements for Landscape, Water Quality, Harvesting, Biodiversity and Archaeology.



6. Compliance with Ecological Survey and Management Plan as submitted (if applicable).
7. The work is carried out by the registered company or forester specified on the original application. If it is intended to have a different company or forester undertake the work, it will be necessary to submit a new application (Form 1) to the Forest Service.
8. All applications are subject to the provisions of the penalty schedules as set out in the Afforestation Grant and Premium Scheme document.
9. All applications are subject to Cross Compliance checks with other grant schemes.
10. Grant payment may be subject to the netting policy of the Department of Agriculture, Food and the Marine.
11. This licence is issued subject to the terms and conditions of the Forestry Standards and Procedures Manual.
12. Your acceptance that the responsibility for the ultimate success of the plantation rests with you, the applicant. Plantations which fail to establish successfully will result in grant and premium recoupment.
13. Additional Environmental & Silvicultural Conditions
 - Adhere to forestry & water quality guidelines,
 - All guidelines to apply,
 - Adhere to forestry & water quality guidelines

You are required to notify the Department of Agriculture, Food and the Marine in writing if any of the details of your application have changed. Changes to your application may invalidate this licence.

In order to allow for the possibility of appeals, you must not commence any works until 28 days from the date of this letter have elapsed. If an appeal is lodged, this licence will be suspended and no work may commence until the appeal process has concluded.

If you wish to appeal any condition attached to this licence, where applicable, you should do so in writing within 28 days of the date of this letter to the Forestry Appeals Committee. You must set out the grounds of your appeal and include a statement of the facts and contentions upon which you intend to rely along with any documentary evidence you wish to submit in support of your appeal. The appeal must be sent to the Forestry Appeals Committee, Kilminchey Court, Portlaoise, Co. Laois, Lo-Call 076 1064418 or 057 8631900.

Yours sincerely

LISA CHIGARA
Approval Section
Forestry Division



Operational Proposals for Technical Approval for an Afforestation Licence

Forest Owner Number	FO135956U
Contract Number	CN82229
Townland	Moneygorm
County	Cork
Area Approved	40.02(ha)
Fencing Length (LM)	1,960.00

All applications must be developed in accordance with detailed standards and procedures as described in the current Forestry Schemes Manual. Certain specific operational proposals particular to this application are described below. No change is permitted to these proposals and species approved unless approved in advance by the Department. The Department may insist that proposed changes constitutes a new application.

Operational Proposal Details

Agro Forestry (GPC 11)		
1.	Tree Shelters	Not Entered
2.	Plant Size and Stocking	Not Entered
Drainage		
1.	Drainage	Required
2.	Drainage Comment	500
Fertiliser		
1.	Zero	Yes
2.	350 Kg Granulated Rock Phosphate	Not Entered
3.	250 Kg Granulated Rock Phosphate	Not Entered
4.	Split Application	Not Entered
5.	Other Details	50
Firebreaks/Res.		
1.	Firebreaks/Res	Not Required
Forestry for Fibre (GPCs: 12a and 12b)		
1.	Is Land Free Drainage arable or pasture soils	Not Entered
2.	Are there surface water gleys without a peat layer	Not Entered
3.	Do you intend to use improved genetic material	Not Entered
4.	Details	500
Ground Prep.		
1.	Woody Weed Removal	Not Entered
2.	Ripping	Not Entered
3.	Pit Plant	Not Entered
4.	Mole Drainage	Not Entered
5.	Mounding	Yes
6.	Ploughing	Not Entered
9.	Other Details	50
Planting Method		
1.	Angle Notch	Yes
2.	Pit	Not Entered
3.	Machine	Not Entered



4.	Slit	Not Entered		
5.	Other Details	50		
Road Access				
1.	Road Access	Provided		
Standard Stocking				
1.	Standard Stocking	Yes		
2.	Details	50		
Weed Control				
1.	Herbicide Control yr0	Yes		
2.	Herbicide Control yr1	Yes		
3.	Herbicide Control yr2	Yes		
3.	Herbicide Control yr4	Not Entered		
4.	Manual	Yes		
4.	Herbicide Control yr3	Not Entered		
Fencing Details				
(metres)	Stock	0	Stock-Sheep	960
	Stock-Rabbit	0	Upgrade to Deer	0
	Deer-Rabbit	0	Deer	1000
	Upgrade Existing Fence(s)	Y	Tree Shelter (Hectares)	0
	Upgrade Details: Deer fence 15% broadleaf section in SW section of site			

Species Approved

The species approved in this proposal relate to the digitised certified species map attached.

Species Approved for Afforestation

Plot	Area	GPC	Land Type	Species	Species Area	Yield Class	Mixture Type	Exclusion	Exclusion Type
1	40.02	GPC 3	CHF	SS	34.02	20	Groups		
				ADB	6	8			

Additional Silvicultural and Environmental Conditions

In addition to the Department's environmental and silvicultural guidelines the following specific conditions apply to this proposal:

Silvicultural and Environmental Conditions

Adhere to forestry & water quality guidelines,
All guidelines to apply,
Adhere to forestry & water quality guidelines

Certified Species Information

Contract Number CN82229
Townland Moneygorm

County Cork City
6" OS No: CK43

Plot No	GPC	Parcel No	GPC Area(H)	Land Use Type	Species Area	Species	Mixture Type	Excl Area(h)	Excl Type
1	3	47654323	40.02	CHF	40.02	ADB,SS	Groups	0	
TOTALS			40.02		40.02			0	

Remarks:

Area Surveyed By:

Date:

Species Certified By:

Date:

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Contract: **CN82229**

Scale 1: 5000





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Contract: **CN82229**

Scale 1: 5000

COILLTE TEORANTA
ACCOUNTS PAYABLE
COILLTE TEORANTA, CEDAR HSE.,
MONEEN RD., CASTLEBAR
CO MAYO

08/08/2018

Licence for Non Grant Aided Forest Road

Forest Owner	FO101174V
Contract Number	CN77296
Townland	Ballard
County	Wicklow.
Approved Area (Ha)	37.1
Fencing Length (LM)	3,977.00

This is a preliminary technical approval only and is not a grant approval. If you wish to proceed with this project you must notify the undersigned in writing within four weeks of the proposed planting date in order to receive full approval to plant and to obtain financial grant approval if applicable. You should note that the project will not be eligible for grant aid unless prior financial approval has been given in writing in advance of commencement of planting.

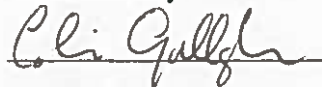
I refer to your licence application requesting approval of Afforestation

You are required to notify the Department of Agriculture, Food and the Marine in writing if any of the details of your application have changed.

In order to allow for the possibility of appeals, you must not commence any works until 28 days from the date of this letter have elapsed. If an appeal is lodged, this licence will be suspended and no work may commence until the appeal process has concluded.

If you wish to appeal any condition attached to this licence, where applicable, you should do so in writing within 28 days of the date of this letter to the Forestry Appeals Committee. You must set out the grounds of your appeal and include a statement of the facts and contentions upon which you intend to rely along with any documentary evidence you wish to submit in support of your appeal. The appeal must be sent to the Forestry Appeals Committee, Kilminchy Court, Portlaoise, Co. Laois, Lo-Call 076 1064418 or 057 8631900.

Yours sincerely



COLIN GALLAGHER
Approval Section
Forestry Division



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Contract: **CN77296** Scale 1: 5000

Certified Species Information

Contract Number	CN77296
Townland	Ballard
County	Wicklow
6" OS No:	WW34

Plot No	GPC	Parcel No	GPC Area(H)	Land Use Type	Species Area	Species	Mixture Type	Excl Area(h)	Excl Type
1	3	42568105	22.89	CHF	22.89	ADB,SS	Integrated Mix	0	
2	8	42567868	1.67	BHF	1.67	ALD,SBI	Integrated Mix	0	
3	8	42589585	1.32	BHF	1.32	ALD	Pure	0	
4	3	42570542	11.22	CHF	11.22	ADB,SS	Integrated Mix	0	
TOTALS			37.1		37.1			0	

Remarks:

Area Surveyed By:

Date:

Species Certified By:

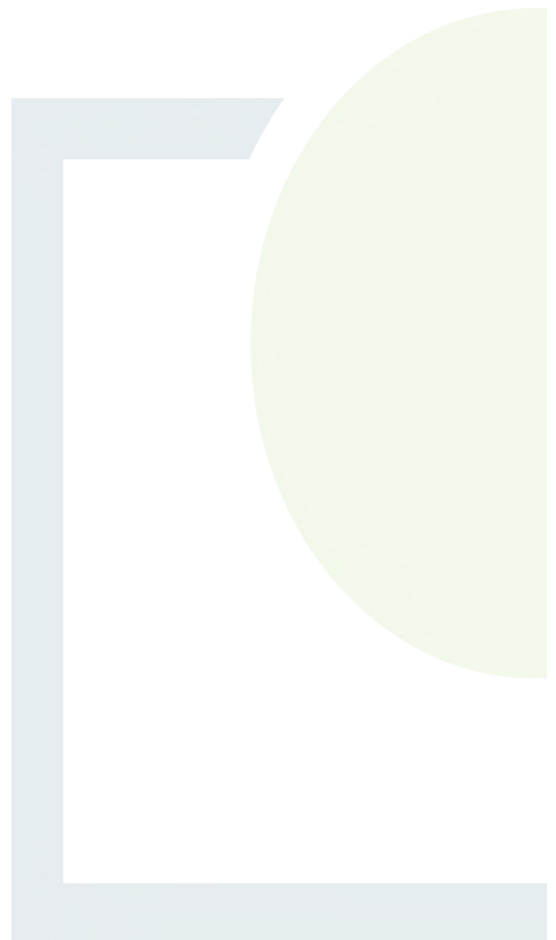
Date:



CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE &
PLANNING

APPENDIX 2

Forestry & Water Quality
Guidelines



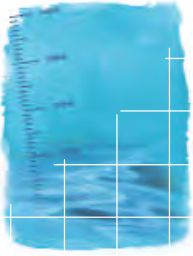
Front Cover



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INTRODUCTION

The maintenance and enhancement of water quality is of utmost importance. Forestry activities have the potential to interact both positively and negatively with aquatic resources. Careful planning and management will mitigate against potential negative impacts while maximising the positive aspects of forestry, such as aquatic biodiversity enhancement and the creation of appropriate riparian

An aquatic zone is defined as a permanent or seasonal river, stream or lake shown on an Ordnance Survey 6 inch map.

ecosystems.

Each river or lake has a unique drainage basin or catchment area. Some catchments are more vulnerable than others to changes in water quality, due to their particular soils and underlying geology. The type of landuses and associated operations within the overall catchment area can also have a major bearing on the volume and quality of water flowing into that particular river or lake. All land

The FORESTRY AND WATER QUALITY GUIDELINES have been developed through extensive consultation with a wide range of relevant parties. They set out sound and practical measures based on the principles of Sustainable Forest Management (SFM), and are firmly rooted in the best available scientific information. The guidelines will be kept under review to facilitate amendment in the light of new research findings.

To ensure the successful implementation of SFM in Ireland, it is important that forest owners adhere to the guidelines and undertake all work in a way which is compatible with the protection of the environment.

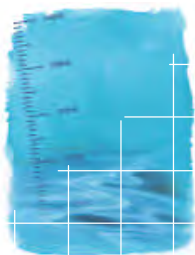
The guidelines describe a range of measures intended to cover all situations relating to forestry and water quality. Not all of the measures outlined will be applicable to every site. However, it is the responsibility of forest owners to identify and apply those measures which are appropriate to their particular forest.

The FORESTRY AND WATER QUALITY GUIDELINES apply to all grant-aided projects and to all activities associated with a Felling Licence. Any breach may result in the forfeit of grant aid and premium payment or the withdrawal of a Felling Licence.

It is essential that all forest workers and machine operators involved in any forest operation are made aware of and understand the guidelines, all relevant environmental issues relating to the site, and working practices which minimise environmental disturbance. All operators should have contact telephone numbers onsite for all relevant agencies (Local Authorities, Regional Fisheries Boards, Dúchas The Heritage Service, National Museum of Ireland, Garda Síochána, etc.) in case of accidental damage to aquatic zones, archaeological sites, important wildlife habitats and other environmental features.

owners, including forest owners, have a responsibility to play their role in conserving and enhancing overall catchment quality.





Left: Research and consultation are key elements in protecting water quality.

SENSITIVE AREAS

SPECIAL AREAS OF CONSERVATION, SPECIAL PROTECTION AREAS AND PROPOSED NATURAL HERITAGE AREAS

Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are protected by European Union and national legislation. Proposed Natural Heritage Areas (pNHAs) have been identified by National Parks and Wildlife of Dúchas as areas of value in the national effort to conserve biodiversity.

- Planting is not permitted in SACs and SPAs.
- Approval for planting in pNHAs is dependent on formal consultation between the Forest Service and Dúchas The Heritage Service.

AREAS SENSITIVE TO ACIDIFICATION

The Forest Service recognises the importance of water acidification arising from atmospheric pollution. It will continue its ongoing policy of consultation with Regional Fisheries Boards and Local Authorities on whether or not to proceed with forestry applications in areas where there is a perceived risk of acidification. These sensitive areas are designated on the basis of the following criteria:

- the aquatic zone is part of a recognised salmonid fishery and is a spawning, nursery or angling area, **and**
- the geology is base-poor, **and**
- in water samples taken regularly between 1st February and 31st May, **either**
 - pH readings are equal to or less than 5.5, **or**
 - water hardness, in mg calcium carbonate/litre, is less than 12, **or**
 - water alkalinity, in mg calcium carbonate/litre, is equal to or less than 10.

The Forest Service will also take account of new research findings as they become available.

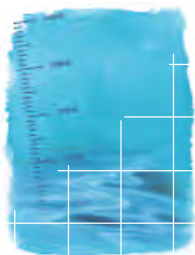
AREAS SENSITIVE TO EROSION

Where certain soil types (e.g. peat, sandstone-derived soils) and steep slopes occur together, there is a greater risk of soil erosion and subsequent sedimentation. It should also be noted that subsoils may be more prone to erosion than the associated topsoil. In such areas, due care should be taken when



Right: Forest owners, as with all landowners, have a responsibility to play their role in conserving and enhancing overall catchment quality.





planning all forest operations. Correct buffer zone management will help reduce the risk of sedimentation. Sensitivity to acidification or erosion can be local or confined to a sub-catchment. These sub-catchments may be identified by their particular geology, soil and terrain.

BUFFER ZONE GUIDELINES

The buffer zone is an area adjacent to an aquatic zone and managed for the protection of water quality and aquatic ecosystems. A buffer zone includes the riparian zone, i.e. that area directly adjacent to an aquatic zone, representing the intermediate between the aquatic and terrestrial environments and having its own distinctive hydrological and ecological characteristics. The buffer zone may also occupy adjacent areas beyond the riparian zone. Within the buffer zone, natural ground vegetation is allowed to develop, with additional planting of suitable riparian tree species.

Within the buffer zone, ground preparation and other forest operations are curtailed in order to protect water quality. Furthermore, drainage channels leading from the site must taper out before entering the buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. Buffer zones further enhance and protect water quality by:

- physically stabilising banks;
- acting as a source of leaf litter input into aquatic zones, which represents an important food source for a number of aquatic animals;
- providing cover and dappled shade.

Buffer zones should be in place throughout the rotation, and have particular

Table 1. Buffer zone widths.

Average slope leading to aquatic zone	Buffer zone width on each side of the aquatic zone	Buffer zone width for highly erodible soils
Moderate (even to 1 in 7 / 0-15%)	10 m	15 m
Steep (1 in 7 to 1 in 3 / 15-30%)	15 m	20 m
Very steep (1 in 3 / >30%)	20 m	25 m

relevance to establishment, road construction and harvesting.

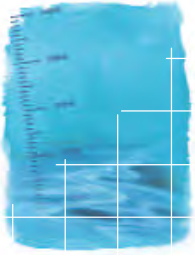
Buffer zone width is based on the following factors:

- the average slope of the area adjacent to the aquatic zone (buffer zone widths should be greater where slopes are steep);
- the sensitivity to erosion of the soil adjoining the aquatic zone.

- The width of the buffer zone may vary in certain situations, for example, to avoid straight edges for landscaping purposes. However, the minimum width, as set out above, must be maintained in all cases.

- Buffer zones should be actively managed to encourage sustainable vegetative growth and cover for the protection and enhancement of water quality. Well-vegetated banks are more resistant to undercutting and collapse. Vegetation shields the soil surface from rainfall impacts, slows run-off velocity and increases infiltration. Open and partially wooded conditions should be planned, so that bank vegetation thrives. Approximately half the length of a stream should be left open and the remainder kept under partial shade from trees and shrubs. Ground vegetation in buffer zones can be augmented by the planting of native tree species such as birch, willow and sally, with occasional alder, oak and ash. These species help to stabilise the riparian zone and protect it in times of flood. Such planting is permitted in the buffer zone and within 5 m of the aquatic zone, if this would, in the view of the Regional Fisheries Board, have a beneficial effect on that particular aquatic zone. On good fertile sites, natural regeneration of desirable species from local seed sources is likely to occur.

The development of natural riparian vegetation, including suitable tree species, will benefit water quality and aquatic life.



- All tree planting within the buffer zone should be carried out using pit planting only, except in wet areas where inverted mounding is allowed.
- Pruning and/or removal of undesirable trees should be carried out where required, in order to maintain the riparian vegetation and aquatic conditions.

Afforestation plans should be made for all sites, regardless of size. Such plans should include the location and treatment of aquatic zones located on or adjacent to the site.

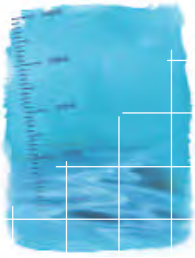
GROUND PREPARATION AND DRAINAGE

An essential element of protecting water quality is to ensure that sediment contained in water draining from the site does not enter the aquatic zone. Incorrect ground preparation and drainage can result in soil disturbance and subsequent sedimentation of nearby aquatic zones, particularly if ground preparation is followed by prolonged and heavy rainfall. For these reasons, ground preparation must be well-planned and drain layout/sediment traps correctly designed and installed. Mounding, moling, ripping and subsoiling will result in less soil disturbance than ploughing.

- Do not carry out ground preparation within the buffer zone. Where trees are being planted to restore or create riparian woodland, pit planting must be used, except in wet areas where inverted mounding is allowed. In general, trees should not be planted within 5 m of an aquatic zone.
- Where possible, ground preparation should be carried out when there is less of a risk of heavy rainfall.
- Where possible, do not disturb existing drains.
- Drains and sediment traps should be installed during ground preparation.
- Collector drains should be excavated at an acute angle to the contour (0.3%-3% gradient), to minimise flow velocities.
- Main drains to take the discharge from collector drains must be provided with waterdrops and rock armour where there are steep gradients, and should avoid being placed at right angles to the contour.
- Make sure that all drainage channels taper out before entering the buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, install sediment traps at the end of the drainage channels to the outside of the buffer zone.



Buffer zones play a major role in underpinning water quality.



- Drains and sediment traps must be maintained throughout the rotation, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are controlled.
- Sediment traps should be sited outside the buffer zone and have no direct outflow into the aquatic zone. Their capacity can extend over the life of the forest or have limited storage. In the latter case, machine access is required to enable the accumulated sediment to be excavated. Sediment should be carefully disposed of away from all aquatic zones. Sediment traps must be clearly marked and securely fenced for safety. Where possible, sediment traps should be constructed on even ground and not on sloping ground.
- In areas particularly sensitive to erosion, it may be necessary to install double or triple sediment traps.

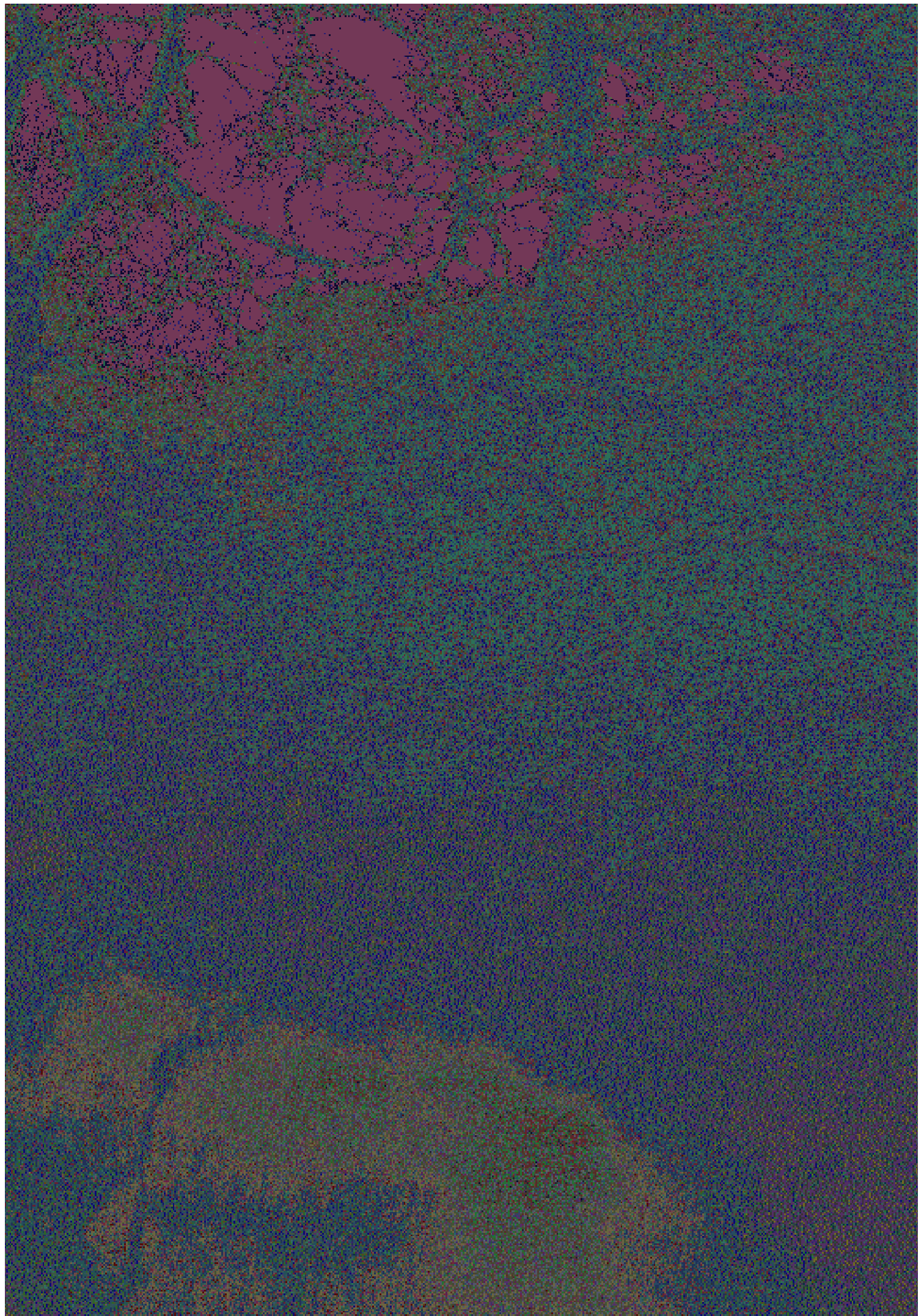
FERTILISER APPLICATION AND STORAGE

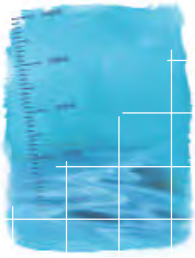
Complete all planting before fertiliser application takes place. Species selection together with site type and conditions determine fertiliser type and application rates. Phosphorus (P) is the main nutrient fertiliser applied, with nitrogen (N) and potassium (K) occasionally applied as remedial fertilisation. The following practices should be followed to minimise the risk of fertiliser run-off and transport to aquatic zones.

- Proposed fertiliser types and application rates should be included in the afforestation application.
- Fertiliser should not be applied within the buffer zone or within 20 m of an aquatic zone, whichever is greatest.
- Fertilisers should be prepared and securely stored under shelter on a dry, elevated site at least 50 m from the nearest aquatic zone.
- Granular fertiliser formulations should be used, with the exception of muriate of potash which is not available in granular form.



Care in the storage and application of fertilisers and chemicals will avoid risk to water quality and aquatic life.





- Phosphate application rates on peat soils should be kept to a minimum in any single application.
- Apply fertiliser manually or by ground-based machine, wherever possible. Fertiliser must be applied by hand in the 20-50 m area adjacent to the aquatic zone.
- Do not, under any circumstances, discharge fertilisers into an aquatic zone, drain or sediment trap.
- Where later fertilisation is required to counteract nutrient deficiencies, aerial application using helicopter can be considered where branch growth and onsite vegetation prevent manual application. However, a 50 m wide corridor adjacent to aquatic zones must be left unfertilised. Never undertake aerial fertilisation during high winds.
- Do not apply fertiliser during or following prolonged rainfall or if heavy rain is forecast.
- Fertiliser should only be applied during the months of April to August, inclusive.
- Remove all empty fertiliser bags and other rubbish from the site during and after the operation, for environmentally-acceptable off-site disposal.

CHEMICALS, FUEL AND MACHINE OILS

The on-site use of chemicals (herbicides, pesticides and urea), fuel and machine oils (hydraulic, engine, gearbox, lubricant or cutting oils) should be kept to a minimum. Accidental spillage or leakage can be detrimental to aquatic flora and fauna and can impair water quality. Training and safety are of primary importance to avoid hazards and to ensure the correct use of herbicides and pesticides.

- Do not apply chemicals if heavy rainfall is forecast or during high winds.
- Do not apply chemicals within the buffer zone.
- Refer to *Guidelines for the Use of Herbicides in Forestry*¹.
- Prepare and securely store all chemicals, fuel and machine oils under shelter on a dry, elevated site at least 50 m from the nearest aquatic zone.
- Cleaning of equipment should not take place within 50 m of an aquatic zone. All wash waters must be disposed of carefully.
- Unused diluted herbicides must not be spread within the buffer zone.
- Remove all containers from the site and dispose of carefully.
- All maintenance and refuelling operations and machine repairs (if required and practical) should be carried out at least 50 m from the nearest aquatic zone on a dry, elevated site.
- Spent oil must be collected and retained for correct off-site disposal.
- Where possible, biodegradable oil should be used as a substitute for mineral oil.
- Do not, under any circumstances, discharge chemicals, fuel or machine oils into an aquatic zone.
- The relevant Local Authority must be informed promptly of any accidental chemical, fuel or machine oil spillage which threatens an aquatic zone.

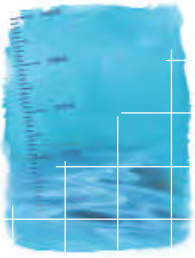
ROADS

Each stage of forest road construction has implications for water quality. Before road construction begins, the road network within the forest must be planned and outlined in the plan required by the FOREST HARVESTING AND THE ENVIRONMENT GUIDELINES. Key actions required for this plan include:

- inspection of the area and the preparation of a map containing a broad terrain classification and details of all aquatic zones;
- determination of the appropriate density and spacing of the road network, based on the size and shape of the area, machinery employed and the nature of the terrain;
- delineation of aquatic zones and associated buffer zones.

- The FOREST HARVESTING AND THE ENVIRONMENT GUIDELINES require a road and track network scheme as part of the harvesting plan. This plan should include a terrain classification which indicates all aquatic zones and buffer zones together with sources of public and private water supplies, access points, landings and, if

¹Ward, D. (ed.) 1998. Guidelines for the Use of Herbicides in Forestry. 2nd Edition. Coillte, Forest Protection, Newtownmountkennedy, Co. Wicklow.



necessary, proposed stream crossings. The map will identify the site location and provide directions and distances to the nearest national road.

- Roads should be located at least 50 m from an aquatic zone, where possible. Road layout should aim to direct off-road traffic away from streams. If there is no other option but to cross an aquatic zone, construct an appropriate bridge or culvert.
- Where possible, roads should follow the natural contours of the terrain.
- All ancillary drainage associated with road construction should be designed to divert water away from buffer zones and should not be allowed to discharge directly into aquatic zones. Sediment traps will be necessary. Roadside drains should not directly intercept run-off from higher ground. Cut-off drains should be constructed to a flat gradient at least 5 m back from the upper edge of the road formation, to avoid erosion.
- Carry out construction during dry weather, ideally from April to October.
- Cement must not be discharged into the aquatic zone.
- Do not remove gravel from an aquatic zone. Gravel may be removed from a buffer zone only after consultation with the Regional Fisheries Board and fishery owner. The opening of a new quarry requires planning permission.
- The maintenance of roadside drains and sediment traps is essential. Inspect periodically to ensure that they are free of debris and sediment, undertaking remedial action if necessary.

BRIDGES, CULVERTS AND FORDS

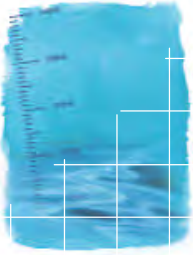
Aquatic zones may need to be crossed during forest operations. The construction of bridges and culverts, whether temporary or permanent, can cause soil and site disturbance, with subsequent soil erosion and the movement of sediment into the aquatic zone. The careful planning of these crossings is essential.

Where fish passage is important, e.g. spawning beds in the upper reaches of aquatic zones, bridge and culvert design should reflect this requirement. Fords are generally not appropriate, as their use can often result in the generation of considerable sediment and the restriction of fish passage.

Bridges are the most desirable structure as they allow unimpeded fish movement. Bridges also ensure that machines parts (and associated fuel and oils) are kept out of the aquatic zone.

Culverts can be open topped or embedded. In fish spawning aquatic zones, embedded culverts are favoured as they provide unrestricted passage for all fish sizes and retain the natural streambed and sediment. Embedded culverts are usually large diameter (greater than 1 m) culverts which aim to maintain the natural channel width, gradient and conditions.

- All water crossings should be marked and indicated in the road network plan.
- Minimise the number of crossings over a given aquatic zone. All crossings should be at right angles to the flow.
- Consult with the Regional Fisheries Board at the design stage of any crossing in a fish-bearing or potentially fish-bearing aquatic zone.
- Bridges should be constructed with minimum disturbance to the bank, channel or adjacent buffer zone.
- Do not build culverts or bridges over an aquatic zone in a way that would hinder fish passage.
- Use local stone for bridge kerbs and end treatments for culverts.
- Do not discharge cement into the aquatic zone. Uncured concrete can kill fish by altering water pH. When cast-in-place concrete is required, all work must be done in dry weather conditions and isolated from any water which may enter the aquatic zone, for a period sufficient to cure the concrete.
- Culvert ends should be tapered to match the embankment slope.
- Specifications for culvert design and size should reflect:
 - whether or not the aquatic zone is a spawning or fisheries watercourse;
 - the type of terrain;
 - the necessity to carry the 'normal' flow and to accommodate flash floods;
 - the requirement to embed culverts.



- Embedded culverts should be buried to a depth of 0.3 m or 20% of their height (whichever is greatest) below the streambed. The original bed material as well as boulder sized stones should then be placed in the culvert.
- Culverts should be maintained, removing debris which can cause clogging and eventual culvert failure.

HARVESTING

Harvesting (thinning and final harvesting) and associated activities such as extraction have the potential to adversely impact on water quality, through increased erosion rates, sedimentation and nutrient losses. These impacts can be mitigated through good planning and the implementation of the FORESTRY AND WATER QUALITY GUIDELINES. The factors that affect water quality at harvesting can be summarised as follows:

- soil type, sensitivity and slope;
 - number and type of machine passes.
-
- All harvesting and extraction operations must be carried out in accordance with the FOREST HARVESTING AND THE ENVIRONMENT GUIDELINES. Consult with the Regional Fisheries Board and Dúchas before commencing harvesting operations in areas of importance to fisheries and wildlife.
 - Prepare a forest harvesting plan as detailed in the FOREST HARVESTING AND THE ENVIRONMENT GUIDELINES, which will include:
 - a broad terrain classification detailing: the location of areas of potentially high erosion risk; the location of all aquatic zones and buffer zones; the identification of



A brush mat which has been used several times and now in need of renewal.

- public/private water supplies; and existing and planned road network, landings, turntables, bridges and extraction routes;
- the identification of appropriate machines to minimise adverse impacts;
 - the location of machine maintenance areas and storage areas for chemicals (herbicides, pesticides, urea), fuel and machine oils.
- Construct sediment traps prior to harvesting and maintain these traps throughout operations.
 - Plan felling operations with the shortest possible extraction routes, designed to be compatible with the avoidance of sedimentation.
 - Always fell trees away from the aquatic zone.
 - Avoid machine extraction within the buffer zone.
 - On sites where risk of erosion is high, brash mats must always be used to avoid soil damage, erosion and sedimentation. Brash mat renewal should take place when they become heavily used and worn. Provision should be made for brash mats along all off-road routes, to protect the soil from compaction and rutting.
 - Where there is risk of severe erosion occurring, extraction should be suspended during periods of high rainfall. Cable extraction may be an alternative in these situations.
 - Do not refuel or maintain machinery within 50 m of an aquatic zone.

	<i>Classification</i>	<i>Chlorophyll (mg/m³) Annual max.</i>	<i>Total P (µg P/litre) Annual mean</i>	<i>Phosphate (MRP) (µg P/litre) Annual median</i>
Lakes	Oligotrophic	≤2.5 and <8	>5 and •10	
	Mesotrophic	≥8 and <25	>10 and •20	
Rivers	Q5			15
	Q4-5 Q4			20
				30

S.I. 258 of 1998

- Do not pile logs within the buffer zone or on very low lying ground prone to water-logging. Select a dry area away from the aquatic zone.
- Do not allow branches, logs or debris to build up in aquatic zones. All such material should be removed when harvesting operations have been completed, but avoid removing natural debris deflectors.

APPENDIX EXAMPLES OF WATER QUALITY INDICATORS

Catchment waters may be used for some or all of the following purposes: salmonid water; drinking water; or bathing water. Statutory Instruments are in place which set standards for each of these categories. The following water quality parameters may be measured by the Local Authority, depending on the intended use and the respective Statutory Instruments. The relevant Statutory Instrument for each indicator is quoted in brackets. Indicators marked with (*), although not mentioned in Statutory Instruments, denote the lowest standard *which current knowledge suggests* will not indicate damage to water quality.

The objective at all times is to ensure that forest operations do not cause a deterioration in water quality.

Eutrophication

Biological parameters

- *Phytoplankton/Cyanobacteria (lakes)*: Critical limit: Composition and abundance consistent with those in unpolluted lakes(*)
- *Macrophytes (lakes and rivers)*: Critical limit: Composition and abundance consistent with those in unpolluted lakes(*)
- *Macroinvertebrates (rivers)*: Maintenance of existing EPA Quality (Q) rating, where it is ≥ Q4 (Statutory Instrument 258 of 1998).
- *Fish*: Critical limit: Presence of 0+ salmonids(*)

Physico-chemical parameters

"The existing trophic status for any part of a lake shall be maintained" (S.I. 258 of 1998).

- *Nitrate (NO₃)*: Critical limit: 11.3 mg N/litre (S.I. 81 of 1988).
- *Un-ionised ammonia*: Critical limit: <0.02 mg NH₃/litre (S.I. 293 of 1988).
- *Dissolved oxygen*: Critical limit: 80-120% saturation(*)

Acidification

Biological parameters

The Forest Service gratefully acknowledges the contribution of Dr Miriam G. Ryan, COFORD, National Council for Forest Research and Development, to the development of the FORESTRY AND WATER QUALITY GUIDELINES, made through the preparation of a commissioned report. Copies of this report can be obtained from the Forest Service, Department of the Marine and Natural Resources, Leeson Lane, Dublin 2.

Photos: All photos Forest Service, except COFORD, National Council for Forest Research and Development (pages 2 and 6) and T. Cummins, Forest Ecosystem Research Group, UCD (page 11).

- *Macrophytes (lakes)*: Critical limit: Presence of *Lobelia* and *Isoetes* spp.(*)
- *Macroinvertebrates*: Critical limit: Presence of several specimens of any or all of the following: *Baetis rhodani*, *Gammarus* spp., *Caenis* spp., *Centroptilum luteolum* and *Cloeon* spp. (Raddum,1999).
- *Fish*: Critical limit: Presence of 0+ salmonids(*)

Physico-chemical parameters

- *Total aluminium*: Critical limit: 0.2 mg Al/litre (S.I. 81 of 1988).
- *Labile monomeric aluminium*: Critical limit: 0.04 mg Al/litre (S.I. 293 of 1988).
- *pH*: pH \geq 6 and \leq 9 (S.I. 293 of 1988). pH between 5.5 and 8.5 (S.I. 294 of 1989).

Sedimentation

Parameter

- *Suspended solids*: Critical limit: <25 mg/litre (S.I. 293 of 1988).

Hydrology

Hydrological parameter

- *Flow*: Critical limit: Maintenance of base flow level throughout the catchment(*)

S.I. 81 of 1988 European Community (Quality of Water Intended for Human Consumption) Regulations 1988.

S.I. 293 of 1988 European Communities (Quality of Salmonid Waters) Regulations 1988 (Note: List of relevant water bodies is included).

S.I. 294 of 1989 European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations 1989.

S.I. 258 of 1998 Local Government (Water Pollution) Act 1977 (Water Quality Standard for Phosphorus) Regulations 1998.

Raddum, G.G. 1999. Large scale monitoring of invertebrates: Aims, possibilities and acidification indexes. *In* Proceedings of Workshop on Biological Assessment and Monitoring, Evaluation and Models. Raddum, G.G., Rosseland, B.O. and Bowman, J. (eds.) Zakopane, Poland. ICPWaters Report 50/99, NIVA, Oslo.



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Coom Green Energy Park:
Hen Harrier Collision Risk Modelling

Produced for:

Inis

Inis Environmental Consultants Ltd.

Prepared by:

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October 2020

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1. INTRODUCTION

1.1 Background

Copland Ecology has been commissioned by Inis Environmental Consultants Ltd. (INIS) to undertake an assessment of collision risk for Hen Harriers at the proposed Coom Green Energy Park (CGEP) Wind Farm in Co. Cork using standardised Collision Risk Modelling (CRM) methods.

1.2 Statement of authority

Dr. Alex Copland BSc PhD is a qualified ecologist with over 25 of professional experience working in both statutory and private companies, in third-level research institutions and with environmental NGOs. He is proficient in experimental design and data analysis and has managed several large-scale, multi-disciplinary ecological projects. These have included research and targeted management work for species of conservation concern, the design and delivery of practical conservation actions with a range of stakeholders and end-users, education and interpretation on the interface between people and the environment and the development of co-ordinated, strategic plans for birds and biodiversity. This work has been delivered in Ireland, where he has worked with NGOs and industry as well as public officials, and the EU, where he has worked with EU-level NGOs as well as EU institutions (EU Commission and EU Parliament).

He has written numerous scientific papers, developed and contributed to evidence-based position papers, visions and strategies on birds and habitats in Ireland. He has supervised the successful completion of research theses for several post-graduate students, including doctoral candidates. He lectures to both undergraduate and post-graduate students at UCD, as well as being a collaborative researcher with both UCD and UCC. He also sits on the Editorial Panel of the scientific journal, *Irish Birds*, which publishes original ornithological research relevant to Ireland's avifauna.

1.3 Constraints and Limitations

There are a number of constraints and limitation associated with pre-planning ecological assessments of potential development sites, as well as constraints and limitations inherent to the collection and analysis of field-based ecological data.

The data evaluated here were received from INIS (dated 30/09/2020 & 02/10/2020). These comprise:

- Hen Harrier flight data from timed Vantage Point watches. Data were clipped to the wind farm development footprint with a 1km buffer (clipping done by INIS) and consisted only of flights within the rotor-swept heights (20-200m). Flight duration (in seconds) for all Hen Harriers observations along with data relevant to each flight record (date, timing, weather conditions, VP location (number), etc.) were provided;
- Vantage Point survey effort data (recorded as hours of observations) on a monthly basis during the breeding season (March to August for 2016, 2017 and 2018 and April to September for 2019) for all VP survey work undertaken;
- Area viewed from each vantage point collectively (in hectares);
- Area of the wind farm footprint (plus 1km buffer) as indicated above; and
- Description and metrics for the wind farm as a whole as well as for individual turbine characteristics.

This collision risk model relates specifically to the supplied vantage point survey data which has not been independently validated by the author. In particular, any variation in the flight data, coverage of the vantage points surveyed during fieldwork, layout of the wind farm or individual turbine specifications, including upper and lower rotor swept heights, would require the outputs from this model to be amended.

Arising from initial monitoring work, areas that showed high use by Hen Harriers at the early stages of monitoring were dropped from consideration for turbine placement by the developer. This iterative approach is recommended as Best Practice in the design of wind farms (IWEA, 2012), but means in the project area changing over time to reflect changes to the proposed turbine layout. In order to maximise coverage of the revised layout areas, VPs changed to reflect Best Practice guidance (SNH, 2017) in the selection of VP locations. This is an essential and positive factor in the iterative approach adopted, but it makes the interpretation of VP data more complicated, especially around viewshed analysis of VP coverage. This has been somewhat ameliorated through the presentation of two models, reflecting the changes to the VPs used and the proposed turbine layout. Furthermore, by substantially expanding the flight risk area (using a 1km buffer) beyond the minimum indicated by Best Practice guidelines (800m buffer), the CRM results presented here indicate a substantially more conservative (i.e. higher) estimate of collision risk than is likely to be the case by incorporating additional Hen Harrier flight lines within this extended buffer.

For field-based surveys, the availability of suitable weather conditions for completing surveys, with good visibility and little wind or rain of paramount importance, must be considered. The Hen Harrier flight data presented here were all collected in optimal weather conditions, as determined by Best Practice guidance. In some circumstances, this required re-arrangement of monthly schedules, with some VPs being surveyed twice in one month to compensate for months when no survey work took place. These are clearly indicated within the data. It should be noted that such scheduling falls well within the tolerances of Best Practice guidelines for such survey work which seeks minimum coverage or two years of data which, with 36 hours per season required, means 72 hours of data are needed.

The data evaluated here covers four full Hen Harrier breeding seasons of fieldwork (2016, 2017, 2018 and 2019). In 2019, the required 36 hours of vantage point watches were obtained during the six-month period of April to September (rather than the six-month period of March to August that had been collected in 2016, 2017, and 2018). This alternation in survey periods adds value in relation to identifying the possible dispersal of young fledglings at the latter stages of the breeding season. In all cases, Best Practice guidance on selection and surveying at VPs has been adhered to throughout the work being reported.

When recording birds in flight, exact determination of ground location and flight height, both of which are essential to calculating collision risk, can be subject to variation between observers. It is therefore required to allow some margin of error for determining the exact location of flying birds, and this has been included within the CRM presented here by the inclusion of all recorded Hen Harrier flight lines in an expanded 1km buffer zone, and also including data from all flight lines that intersect with this extended buffer, i.e. if a flight line originated within the buffer zone, but flew beyond the 1km boundary, the flight was continuously recorded, and the time flying outside the buffer also included within the CRM calculations. Similarly for flight height, with a lowest swept area of 31m proposed for CGEP and a maximum swept height of 170m, all bird records consisting of flight heights between 20m and 200m are included in the model. Collectively, the inclusion of these data offer additional precaution in determining collision risk, supporting more robust outputs and therefore interpretation of results that would otherwise be the case.

1.4 Site and Development Description

The proposed CGEP wind farm development is located near Bottlehill, Co. Cork. The receiving environment for proposed wind turbine locations is representative of upland habitats and includes lands under active management for agriculture and forestry.

There have been multiple layouts proposed for the site, but the design iteration (DI-2) on which the CRM is based consists of 22 turbines, located in two discrete groups at the site. Turbine specifications were provided as shown in Table 1.4.1.

Table 1.4.1 Turbine specifications for Coom Green Energy Park

Technical information	Data used
Indicated wind turbine model	Enercon E-138 EP3
Number of turbines	22
Number of blades per turbine	3
Rotor diameter	138.25m
Rotor radius	69.125m
Rotor blade maximum chord	3.956m
Pitch angle of the blade during normal operation ¹	30°
Rotation speed	10.8rpm
Rotation period	5.56s
Lowest swept area of blade	31m
Turbine operation time ²	85%

¹ The pitch angle of the blade is determined by wind speed which is variable depending upon geographical location, landscape, local topographic factors, etc. To maintain a constant operating speed for a turbine altering the pitch angle of the blade is used. This is usually determined by wind speed, with higher wind speeds requiring greater pitch angle to “feather” the wind and thereby control the rotation speed. The figure of 30° used here is derived from Band (2012) which gives an average pitch along the blade length of between 25 – 30 degrees (30° results in greater likelihood of effects and is used within this model which has adopted a precautionary approach to the determination of risk).

² European Wind Energy Association (2016) gives the average operation time of a turbine of between 70% and 85% of the time; 85% is used in this model as this adopts the precautionary approach.

1.5 Background to Hen Harriers

Hen Harriers are medium-large raptors that are resident in Ireland, although they can make substantial post-breeding and post-fledging movements. They are Amber listed in Ireland (Colhoun & Cummins, 2013) as a species of European Conservation Concern, and are on Annex I of the EU Birds Directive. Recent surveys indicate that there are an estimated 108-157 breeding pairs in Ireland (Ruddock *et al.*, 2016).

Hen Harriers are ground nesting birds that breed in moorland, young conifer plantations and other upland habitats (Wilson *et al.*, 2009; Wilson *et al.*, 2010), and forage over a range of habitats including forestry, heath, bog and agricultural land, where they often hunt along linear features such as hedgerows.

Hen Harriers may be impacted at wind farms by displacement from nesting and foraging areas if habitats are lost, disturbance during construction or during the operational phase and through risks associated with colliding with operational turbines.

As recommended by Best Practice Guidance (SNH, 2014), basic biometric measurements (length and wingspan) of Hen Harriers (Robinson, 2005) and their average flight speed (Alerstam *et al.*, 2007) are used as part of the CRM. The data used are shown in Table 1.5.1.

Table 1.5.1 Hen Harrier biometrics

Biometric parameter	Data used
Length (bill to tail)	0.48m
Wingspan	1.1m
Flight speed	9.1 ms ⁻¹

2. METHODOLOGICAL APPROACH

Collision Risk Modelling (CRM) adopts a mathematical approach to determining the likelihood of a bird species colliding with wind turbine rotors at a pre-defined site and is fully described by Band *et al.* (2007) and Scottish Natural Heritage (SNH, 2000), with supporting information provided by Scottish Natural Heritage (SNH, 2018). This determination is based upon field data collected at the proposed wind farm site. The output from the model indicates the number of birds likely to collide with rotors of all turbines within the wind farm per year of operation of the wind farm as a whole. The inverse of this (i.e. the number of years over which a single fatality would be likely) is also often indicated.

Data on the site (such as the number, size, dimensions and likely functioning of the turbines proposed for the site; see Table 1.3.1) forms part of the model, along with biometric data on the Hen Harrier itself (see Table 1.4.1). These are reconciled against standardised field data collected using systematic and prescribed Best Practice methods on birds flying through the proposed site. Collectively, these data are then used to determine the number of bird flights through the rotors of all turbines within the area on an annual basis (CRM Stage 1) as well as the probability that a bird flying through the turbine will collide with the rotors (CRM Stage 2). The product of the numerical output from these two stages of assessment then indicate the number of birds likely to collide with the rotors if no avoiding action is being taken by the bird species in question. This value is then corrected using published avoidance rates (CRM Stage 3), to give a final indication of collision risk (number of bird colliding with the rotors per annum).

2.1 Collection of field data

The collision risk model (CRM) is based upon data collected from Vantage Points (VPs) at CGEP during the Hen Harrier breeding season (March to August inclusive) for four years (2016, 2017, 2018 and 2019). These data are collected following strict adherence to Best Practice methods (SNH, 2017).

Over these four years of data collection, the VPs changed to reflect modifications to the location of turbines on the site. This iterative approach to wind farm design was partly based upon locating turbines to avoid intensive areas of Hen Harrier activity. The identification of VPs was similarly designed to maximise coverage of the turbine layout, with all VPs subject to viewshed analysis. Due to the multiple changes to VP locations, the whole suite of VPs was fully revised in July 2017 with all VPs re-named, e.g. the “new” (post-July 2017) VP1 was in the same location as the “old” (pre-July 2017) VP3. This review also introduced additional and new VPs to maximise coverage of the viewshed (e.g. “new” VPs 11 to 15). This iterative design approach continued until April 2018, with 12 VPs surveyed on a monthly basis thereafter. Monthly VP coverage (hours surveyed) is shown in Appendix I.

Due to the variation in VP coverage, two collision risk models are presented for the pre-July 2017 (old) data and the post-July 2017 (new) data. Note that for both models, the same probability exists in relation to a collision with a turbine as the same species and same turbines are involved. However, the number of Hen Harrier flight paths passing through the rotor swept area changes due to differences in the areas surveyed and the flight lines recorded.

2.2 Determination of bird flights through the rotor swept area

Stage 1 of the CRM determines the number of transits through the rotors for a given period. For the calculation below, this is expressed as the number of birds flying through the rotors per breeding season (March to August). Two calculations of bird flights through the rotor swept area are provided, for the old VPs and the new VPs. For both calculations, the data requirements remain the same. The data used and calculations performed are shown in Table 2.4.1.

Table 2.4.1 Parameters used in the collision risk model (CRM) for Hen Harrier activity at CGEP

Model parameter		Data used	
		Pre-July 2017	Post-July 2017
Survey Area Visible from Vantage Points	Acc	6,841ha	3,373ha
Flight Risk Area	A_{FR}	2,734ha	
Total Survey Time	T	3,722,400s	3,796,200
Length of Hen Harrier Breeding Season	T_{SS}	184 days	
Daily Duration of Hen Harrier Activity	T_{DD}	15hrs	
Duration of Hen Harrier Activity at Rotor Height	T_{TH}	7,545s	4,065s
Proportion of Hen Harrier Activity at Rotor Height: (T_{TH}/T)	t	0.0020	0.0011
Flight Activity in Visible Area (per hectare): (t/A_{FR})	F	2.96×10^{-7}	3.17×10^{-7}
Hen Harrier Flight Time within Flight Risk Area: ($A_{FR} * F$)	t_{FR}	0.0008	0.0009
Hen Harrier Occupancy of the Flight Risk Area (hrs/breeding season): ($T_{SS} * T_{DD} * t_{FR}$)	n	2.236	2.396
Flight Risk Volume (m^3)	Vw	3,713,395,000	
Combined Rotor Volume (m^3)	Vr	1,464,989	
Hen Harrier Occupancy of Rotor Volume (bird-secs): ($(Vr/Vw) * n$)	b	3.18	3.40
Hen Harrier Transit Time through Rotors	v	0.49	
Number of Hen Harrier Transits through Rotors (per season): (b/t)	b_{FR}	6.48	6.94

A full description of all the parameters used, and the derivation for calculations in the model indicated in Table 2.4.1 is presented in Appendix II.

2.3 Probability of collision of birds passing through the rotor swept area

The probability of a Hen Harrier flying through the rotors and colliding with the blades is determined in Stage 2 of the CRM. The probability of a collision depends upon the Hen Harrier's size (both length and wingspan) and flight speed. In order to simplify the calculations, the Hen Harrier is assumed to be of simple cruciform shape, with the wings half-way down the length of the bird. Characteristics of the turbine and rotor blades are also required, including the width and pitch of the rotor blades and the rotation speed of the turbine. The turbine blade is assumed to have no thickness for Stage 2 of the CRM, although rotor blade depth is considered in Stage 1 of the model.

The risk of a bird colliding with the rotor blades changes depending upon whether it passes through the rotor swept area next to the hub (where the blades have a wider chord width, occupy a large volume of the airspace and are travelling quite slowly) or towards the blade tips (where the blades are only present for a small proportion of the time, have a short chord width and are travelling faster). Closer to the hub, the wingspan of the bird compared to the physical distance between the blades is the controlling factor. Towards the blade tips, it is the length of the bird that offers a greater contribution to the determination of collision risk.

The bird is assumed to enter the rotor swept area at random anywhere on the disc. The calculations determine the collision risk at 20 locations along the length of the rotor blade (in intervals of $0.05R$, where R is the radius of the rotor swept area) using numerical integration of various elements in relation to the rotors (notably chord width and angular velocity of the blade) and the Hen Harrier (such as the point at which the bird enters the rotor along the radius and the flight speed of the bird). These are calculated for both up-wind and down-wind flights and averaged to give a probability of collision per season, assuming no avoiding action is taken.

These calculations are performed in the SNH collision risk model¹, where the relevant data on the turbines and Hen Harriers are entered, and the model estimates the probability of a collision when a bird flies through the rotor area. This calculation is based solely upon the behaviour and structure of the Hen Harrier and the specifications of the turbines. Only a single calculation is therefore required for all the VP data collected. For CGEP, the average probability of a Hen Harrier passing through the wind farm and colliding with the rotors if it takes no avoiding action is 9.7%.

¹ <https://www.nature.scot/wind-farm-impacts-birds-calculating-probability-collision>

3. RESULTS

The overall collision risk model output from the first two stages is the number of bird collisions per annum. This is the product of the number of Hen Harrier transits through the rotors per season and the probability of a bird passing through the rotor swept area colliding with the blade.

The pre-July 2017 data therefore indicates that, if Hen Harriers take no avoiding action, there will be 0.53 collisions per breeding season. For the post-July 2017 data, the model indicates that 0.57 Hen Harriers will collide with the turbines per season.

However, it has been well documented that Hen Harriers demonstrated avoidance of wind turbines. This includes macro-avoidance, where Hen Harriers avoid the whole wind farm area, as well as micro-avoidance, where birds fly within the wind farm but avoid the turbines and blades. The documented level of avoidance for Hen Harriers is 99% (SNH, 2018). When the avoidance rate is applied to the CGEP data in the third stage of the CRM, the total number of Hen Harrier collisions at CGEP is 0.0053 birds/annum for the pre-July 2017 data and 0.0057 birds/annum for the post-July 2017 data.

Calculating the overall contribution that the two sets of data (i.e. both the pre- and post-July 2017 data) make to the model in terms of days of total survey time, indicates an overall risk of Hen Harriers colliding with the rotors of 0.0055 birds/season. This equates to approximately one Hen Harrier collision every 180 years.

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APPENDIX I-A: CGEP VANTAGE POINT SURVEY EFFORT (HOURS) FOR SUMMER 2016

Old VP	Summer 2016						Total Hours
	Mar	Apr	May	Jun	Jul	Aug	
3	6	6	6	0	7	5	30
7	6	6	6	6	6	6	36
9	6	6	6	6	12	6	42
12	6	6	6	6	6	6	36
14	0	0	0	0	6	6	12
14a	6	0	6	6	0	6	24
23	6	6	6	6	6	6	36
27a	0	0	0	0	4	6	10
30	6	6	6	6	6	6	36
31	6	6	6	6	6	6	36
(2)	6	6	6	6	0	0	24
(5)	6	6	6	6	0	0	24
(8)	6	6	6	6	0	0	24
(11)	6	6	6	6	0	0	24
(15)	6	6	6	6	0	0	24
(17)	6	6	6	6	0	0	24
(18)	6	6	6	6	0	0	24
(21)	6	6	6	6	0	0	24
(27)	6	8	6	6	0	0	26
(32)	6	6	6	6	0	0	24
(34)	6	6	6	6	0	0	24
(35)	0	0	6	6	0	0	12
Total	114	110	120	114	59	59	576

APPENDIX I-B: CGEP VANTAGE POINT SURVEY EFFORT (HOURS) FOR SUMMER 2017

Old VP	Summer 2017				New VP	Summer 2017		Total Hours
	Mar	Apr	May	Jun		Jul	Aug	
3	6	6	6	0	1	7	5	30
7	6	6	6	6	2	6	6	36
9	6	6	6	6	3	12	6	42
12	6	6	6	6	4	6	6	36
14	0	0	0	0	5	6	6	12
14a	6	0	6	6	6	0	6	24
23	6	6	6	6	7	6	6	36
27a	0	0	0	0	8	4	6	10
30	6	6	6	6	9	6	6	36
31	6	6	6	6	10	6	6	36
					11	6	6	12
					12	6	6	12
					13	6	6	12
					14	6	6	12
					15	6	0	6
(2)	6	6	6	6	-	0	0	18
(5)	6	6	6	6	-	0	0	18
(8)	6	6	6	6	-	0	0	18
(11)	6	6	6	6	-	0	0	18
(15)	6	6	6	6	-	0	0	18
(17)	6	6	6	6	-	0	0	18
(18)	6	6	6	6	-	0	0	18
(21)	6	6	6	6	-	0	0	18
(27)	6	8	6	6	-	0	0	20
(32)	6	6	6	6	-	0	0	18
(34)	6	6	6	6	-	0	0	18
(35)	0	0	6	6	-	0	0	12
Total	114	110	120	114		89	83	630

APPENDIX I-C: CGEP VANTAGE POINT SURVEY EFFORT (HOURS) FOR SUMMER 2018

VP	Summer 2018						Total Hours
	Mar	Apr	May	Jun	Jul	Aug	
1	6	6	6	6	6	6	36
2	6	6	6	6	6	6	36
3	8	6	6	6	6	6	38
4	6	6	6	6	6	6	36
5	6	6	6	6	6	6	36
7	6	6	6	6	6	6	36
8	9	0	6	6	6	6	33
9	6	6	6	6	6	6	36
10	6	6	6	6	6	6	36
11	6	6	0	12	6	6	36
12	6	6	12	6	6	6	42
13	6	12	6	6	6	6	42
14	6	0	0	0	0	0	6
Total	83	72	72	78	72	72	449

APPENDIX I-D: CGEP VANTAGE POINT SURVEY EFFORT (HOURS) FOR SUMMER 2019

VP	Summer 2019						Total Hours
	Apr	May	June	July	Aug	Sept	
1	6	4	6	7	8	6	37
2	6	3	6	6	9	6	36
3	6	6	6	6	6	6	36
4	6	6	6	6	6	6	36
5	6	12	0	6	6	6	36
7	6	3.5	6	6	9	6	36.5
8	6	0	12	6	6	6	33
9	6	6	6	6	6	6	36
10	6	6	6	6	6	6	36
11	6	6	6	6	6	6	36
12	6	2	6	6	10	6	36
13	6	6	6	6	6	6	36
Total	78	64.5	72	73	84	72	433.5

APPENDIX II – PARAMETERS AND CALCULATION STEPS FOR CRM STAGE 1

Survey Area visible from Vantage Points (Acc)

In order to determine the level of flight activity in an area, the total area over which observations are being made needs to be assessed. The area viewed from each VP is not necessarily mutually exclusive from the area viewed from another VP; indeed there needs to be some overlap to maximise coverage of the survey area. As a result, the total survey area visible from each VP is calculated, and these are summed for each VP to give the accumulated total area surveyed. The accumulated survey area from VPs will therefore be greater than the total survey area. This total is calculated in hectares.

Flight Risk Area (A_{FR})

The area where there may be a flight risk must be established and surveyed. Determination of this will largely have taken place in advance of undertaking survey work, but an iterative design approach may result in changes to the area that is required for survey. For CRM, the area should cover the whole wind farm, defined as a polygon encompassing the outer turbines plus the rotor radius. With the layout at CGEP (which incorporates two discrete areas of turbines) the wind turbine area plus a 500m buffer around all wind turbines can be used. However, as the exact locations of flight-lines may be subject to error, an increased buffer is recommended, with 800m often applied. For CGEP, a more conservative buffer of 1km was applied to all turbines to adequately cover the whole of the flight risk area and ensure the robustness of the CRM.

Total Survey time (T)

To assess flight activity in an area as the total survey time undertaken from the Vantage Point (VP) watches is needed. This is expressed as seconds.

Length of Hen Harrier Breeding Season (T_{SS})

The period when Hen Harriers are likely to be active in the area during the nesting season. This is indicated as 1 March to 31 August in each year. Expressed as days).

Daily Duration of Hen Harrier Activity (T_{DD})

The number of hours that Hen Harriers are potentially active during the day for the breeding season forms part of the model. This is quantified as 15 hours per day for the period 1 March to 31 August. This is likely to be an over-estimate of activity, which would be difficult to quantify in simple terms otherwise. Nevertheless, the provision of an over-estimation of activity time increases the likelihood of a collision as birds are considered to be more active (i.e. taking more flights) than if activity hours are reduced. This approach therefore offers a more robust estimation of collision risk within the CRM.

Duration of Hen Harrier Activity at Turbine Height (T_{TH})

This metric is based on the observation of flight-lines from the VP surveys. Turbine height is determined by the hub height +/- the length of the blade. This swept area may be subject to change depending upon final design iterations. For a turbine with a hub-height of 100m and a blade length of 70m, the swept area (Turbine Height) will be 30-170m.

However, it may be difficult to be certain about individual observations of flight heights, and a precautionary approach needs to be taken about which data to include. A tolerance of +/- 5m at lower flight heights should be considered and these tolerances may need to be greater at higher flight elevations (e.g. +/- 20m at 200m height). In the example above, all birds flying in the 20m-30m band would be included, in addition to all birds flying between 30m and up to 200m. For CGEP, with a lowest swept area of 31m and turbine diameter of 138.25m, all records between 20m and 200m were retained for analysis within the model.

Flight-lines recorded within the determined flight height bands are therefore selected, and the total numbers of seconds for birds observed within the Survey Area are summed. To ensure a precautionary approach is applied, any flight-lines at the relevant height bands recorded wholly or partially within the survey area are retained for analysis within the CRM.

Proportion of time at turbine height (t)

This metric is obtained by dividing the duration of activity (T_{TH}) by total survey time (T).

Flight Activity in Visible Area (F)

The level of flight activity within the survey area is determined by dividing the proportion of time Hen Harriers were recorded at turbine height (t) by the Visible Survey Area (Acc).

Hen Harrier Flight Time within Flight Risk Area (t_{FR})

The amount of time a Hen Harrier is likely to be within the flight risk area is the product of the Flight Risk Area (A_{FR}) and the Flight Activity in the Visible Area (F).

Hen Harrier Occupancy of the Flight Risk Area (n)

The time that a Hen Harrier is likely to be within the Flight Risk Area is a product of the Length of the Hen Harrier Breeding Season (T_{SS}), the Daily Duration of Hen Harrier Activity (T_{DD}) and the Hen Harrier Flight Time within the Flight Risk Area (t_{FR}). The output of this provides the number of hours that a Hen Harrier is within the Flight Risk Area per breeding season.

Flight Risk Volume (Vw)

This is the volume of airspace within the rotor height over the whole wind farm survey area. It is calculated by multiplying the Flight Risk Area (A_{FR}) with the diameter of the rotor (138.25m for the turbine specifications provided for CGEP).

Combined Rotor Volume (Vr)

This is the actual volume of airspace occupied by the rotors within the wind farm. Although the volume of airspace occupied by a single rotor is its depth (d : 3.956m for the turbine specified for CGEP) multiplied by its circumference (πr^2 , where r is the radius of the rotor: $138.25/2 = 69.125$ m for the turbine specified for CGEP), the CRM also takes into account the length of the Hen Harrier (l : 0.48m) into the rotor depth calculation, as the rotor could collide with the Hen Harrier anywhere along its length if flying through the swept area. Hence the volume for a single rotor is expressed as $(d+l)*\pi r^2$. For CGEP, this equates to 66,590.4 m³ per turbine. The combined rotor volume is this individual rotor volume multiplied by the number of turbines ($n=22$ for CGEP).

Hen Harrier Occupancy of the Rotor Volume (b)

This is an estimation of the time that Hen Harriers will occur within the rotors. It is calculated by dividing the Combined Rotor Volume (Vr) by the Flight Risk Volume (Vw), which gives the proportion of the Flight Risk Volume that is occupied by the rotors. This is then multiplied by the Hen Harrier Occupancy of the Flight Risk Area (n).

Hen Harrier Transit Time through Rotors (v)

This is calculated by adding length of a Hen Harrier (0.48m) to the depth of the rotor swept area (3.956m), and then dividing by the flight speed of a Hen Harrier (9.1ms^{-1}).

Number of Hen Harrier Transits through Rotors (b_{FR})

The number of times a Hen Harrier will pass through the rotors in a season is calculated by dividing Hen Harrier Occupancy of the Rotor Volume (b) by the Hen Harrier Transit Time through Rotors (v).

This final metric concludes the calculations for Stage 1 of the CRM.

Appendix 8-K: Conservation and Habitat Management Plan

Brookfield Renewable Energy
Ireland Ltd.

Coom Green Energy Park

Conservation and Habitat Management Plan

December 2020

This report considers the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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The logo for Inis Environmental Consultants Ltd. features the word "Inis" in a dark blue, serif font. A small, stylized leaf icon is positioned above the letter 'i'.

Quality Assurance

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The findings outlined within this report and the data we have provided are to our knowledge true, and express our bona fide professional opinions. This report has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) Code of Professional Conduct. Where pertinent CIEEM Guidelines used in the preparation of this report include the *Guidelines for Ecological Report Writing* (CIEEM, 2017a), *Guidelines for Preliminary Ecological Appraisals* (CIEEM, 2017b) and *Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine* (CIEEM, 2018). CIEEM Guidelines include model formats for Preliminary Ecological Appraisal and Ecological Impact Assessment. Also, where pertinent, evaluations presented herein take cognisance of recommended Guidance from the EPA such as *Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2017), and in respect of European Sites, *Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC* (European Commission, 2018).

Due cognisance has been given at all times to the provisions of the *Wildlife Act, 1976*, the *Wildlife (Amendment) Act, 2000*, the *European Union (Natural Habitats) (Amendment) Regulations. SI 378/2005*, the *European Communities (Birds and Natural Habitats) Regulations 2011*, EU Regulation 1143/2014 on Invasive Alien Species, the EU Birds Directive 2009/147/EC and *Habitats Directive 92/43/EEC*.

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Title		Coom Green Energy Park, Conservation and Habitat Management Plan		

Notice

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Appendix A - Habitat Maps for 250m Buffer of Turbine Locations

Appendix B - Habitat Calculations

Appendix C - Site Conditions and Description of Management Areas

Appendix D - NPWS Farm Plan Scheme, Terms and Conditions Document

1 Introduction

Coom Green Energy Park Ltd (CGEP) are applying for a 22-turbine wind farm and associated infrastructure at Bottlehill, County Cork. The proposed Coom Green Energy Park site includes lands contained within the following townlands: Glashaboy North, Coom (Hudson), Tooreen South, Killeagh, Coom (Fitzgerald), Slievedotia, Mullenaboree, Knoppoge, Carrig, Knuttery, Lackendarragh North, Knockacullata, Knockdoorty, and Glannasack. This Conservation and Habitat Management Plan (CHMP), proposed for the lifetime of the project, has been prepared by INIS Environmental Consultants Ltd on behalf of Coom Green Energy Park Ltd. The plan is compiled in the context of the existing Hen Harrier population and their ecological requirements in the wider context of the proposed windfarm development and wider landscape. The document draws largely on the National Parks and Wildlife Service Farm Plan Scheme, Terms and Conditions documents (Anon, 2010, 2017, 2020) but also applies successful management prescriptions that were more recently applied at Hen Harrier breeding areas by Inis Environmental Consultants for similar developments.

2 Site Description

The proposed CGEP is located in north County Cork. The receiving environment for the proposed wind turbine locations is situated on the southern aspect of the Nagle Mountains range. In addition, there is a previously consented municipal landfill in close proximity within the townland of Bottlehill. The landfill was constructed but is not currently in operation.

Terrestrial Habitats within the Coom Green Energy Park study area are dominated by mature commercial coniferous forestry plantations. There are also areas of improved agricultural grassland, with smaller areas of broadleaved woodland, heathlands, hedgerows, wet grassland, private roads and public roads.

The greater part of the study area consists of commercial forestry plantation, particularly in the vicinity of the proposed windfarm. The grid connection will be located primarily within the public road which passes through lands characterised by a predominance of agricultural grassland and coniferous forestry plantation, as well as other habitat types associated with the public road, e.g. roadside hedgerows, treelines, earth banks, dwellings, farm buildings and associated gardens, amenity grassland, hedges and lawns. The site is located within the Munster Blackwater and River Bride catchments.

The proposed CGEP site includes lands contained within the following townlands: Glashaboy North, Coom (Hudson), Tooreen South, Killeagh, Coom (Fitzgerald), Slievedotia, Mullenaboree, Knoppoge, Carrig, Knuttery, Lackendarragh North, Knockacullata, Knockdoorty, and Glannasack.

3 Plan scope and objectives

3.1 Scope of Plan

This Conservation and Habitat Enhancement Plan has been prepared by Inis Environmental Consultants Ltd for the benefit of wildlife, but specifically Hen Harrier. Inis Environmental Consultants has previously been involved in the preparation of such Conservation and Habitat Enhancement Plans for sites in counties Clare, Cork, Leitrim, Monaghan, Tipperary, Kerry and Limerick. The rationale of the plan is based on available publications (Anon, 2010, 2017, 2020) which have been developed through research on Hen Harrier in Ireland, and recording what designed and managed habitats for Hen Harrier have been seen to be readily accepted/used by Hen Harrier at various locations throughout Ireland. The Hen Harrier is afforded protection under Annex I of the EU Birds Directive and is known to occupy the environs of the CGEP site. The other species which will benefit from this CHMP will include Sparrowhawk, Kestrel, Barn Owl, Irish Hare and a range of other small mammal and bird species which form prey items for Hen Harrier. Forestry plans and the future forestry management regime developed by Coillte for the area have also been considered closely when formulating the scope of this plan.

3.2 Hen Harrier

The Hen Harrier is an Annex 1 species on the EU Birds Directive and is currently Amber listed in Ireland (Colhoun & Cummins, 2013). It is a bird of open country that utilizes almost any open terrain that contains enough small mammals or birds for hunting purposes (Watson, 1977).

Thompson (1849) describes the Hen Harrier as being ‘pretty generally distributed over the island’ and although no specific mention is made of North Cork, he does quote other sources which say it is ‘occasionally met with’ in East Cork and ‘common’ in Kerry. By 1893, Usher (1893) describes the Hen Harrier as being ‘resident and common’ fifty years earlier but decreasing to the point where ‘it seems now to have almost disappeared’. Ussher & Warren (1900) state that it is ‘frequently seen on the mountains south of the Mallow and Killarney line’, but ‘a straggler to other parts of the county’. By the 1950’s the hen harrier was considered to be ‘nowadays a rare straggler’ to Ireland (Kennedy et al., 1954) and sufficiently rare to merit publications of individual sightings. Subsequent to this, it became known that the Hen Harrier had continued to breed in the Slieve Bloom Mountains, in Co. Laois, and on the Waterford/Tipperary border (O’Flynn, 1983; Watson, 1977). In the early 1950’s a recovery is believed to have begun (O’Flynn, 1983) and Sharrock (1976) suggested that the population had risen to 200-300 pairs by 1972.

However, by the late 1970’s early 1980’s the population is again believed to have declined and O’Flynn (1983) says that ‘since 1978’ in many areas, including the Nagles, he has been ‘unable to find any evidence of breeding’. From 1980 onwards however, hen harriers were once again breeding in the Ballyhouras (C. Saich & P. Smiddy personal communication, cited in Nagle, 2006), although numbers as low as only 12-15 pairs were estimated in Cork in the mid-1980’s (Hutchinson, 1989).

In recent years a number of national hen harrier surveys have taken place. The first National Survey took place in 1998-2000 and identified 102-129 breeding pairs nationally (Norriss et al., 2002). The second National Survey took place in 2005 and identified 132-153 breeding pairs (Barton et al., 2006). The third National Survey, only just published, was undertaken in 2010 and estimated 128-172

breeding pairs, although this survey had more than double the survey effort from 2005 (Ruddock et al., 2012).

Considerable Hen Harrier survey work has been carried out both at the site (2016 - 2020) of the proposed CGEP development and in the surrounding area. This includes work done during the national surveys of 1998-2000, 2005, 2010, 2015 (Barton et al., 2006; Norriss et al., 2002; Ruddock et al., 2012, 2016), work done by the 2007-2012 Plan for bio Hen Harrier project and specific surveys carried out at the proposed wind farm study area (2016 – present). **Table 3.1** below summarizes the results for the Nagles in the most recent National Hen Harrier Surveys.

Table 3.1: Summary of Results of Recent Hen Harrier Surveys in the Nagles Mountains.

Year of Survey	Number of Possible Breeding pairs	Number of Confirmed breeding pairs	Total Estimated Pairs
1998-2000	3-5	Not available	Not available
2005	0	9	9
2010	4	7	7-11
2015	5	Not available	Not available

3.3 Main Objectives

The main objective of this Conservation and Habitat Management Plan is to provide a net gain of habitat value for Hen Harrier for the lifetime of the proposed CGEP. This will be achieved by maintaining and improving the habitats, within viable foraging distances, on 5 no. managed areas in a way that maintains these areas as being optimal for foraging Hen Harrier. This will be achieved by the action of maintaining and improving the value of lands as foraging habitat for the species while also protecting historical nesting sites.

This Management Plan makes provision for habitat enhancement through management. It is recognised that anything that benefits potential prey species is of benefit to the Hen Harrier. Habitat enhancement will be achieved by diversifying the range and extent of habitats on 5 no. managed areas with a particular focus on habitats (e.g. heath and bog, rushy wet grassland, hedgerows, forestry rides) that support prey species and thus facilitate foraging Hen Harriers.

3.4 Habitat Requirements

3.4.1 Hen Harrier Habitat Selection and Preference

Hen harriers are primarily birds of open countryside, with requirements for extensive areas of suitable land over which to forage. Requirements for nesting, however, are small-scale and can be met in a variety of habitats (e.g. bog/heath, pre-thicket plantations, scrub). As available evidence suggests that foraging habitat, rather than nesting habitat, limits the size of the population, this plan is focused on the continuous provision, for the lifetime of the Coom Green Energy Park, of foraging habitat for the local Hen Harrier population (though these resultant managed areas will generally not preclude nesting).

Until relatively recently there had been little study of Hen Harrier habitat preference in Ireland. Unplanted blanket bog and heath had been traditionally recognised as prime Harrier habitat. The value for foraging of young conifer plantations on bog became apparent after the extensive afforestation programmes during the 1960s and 1970s (Biosphere Environmental Services, 2010). As recently as the early 2000s, the value of restock for foraging was unclear though it was recognised as important habitat for nesting (Norriss et al., 2002). Madders' (2000) studying Hen Harrier foraging preferences and success rates in western Scotland found that Hen Harriers foraged preferentially over young coniferous forests, and selected heathland and grassland habitats ahead of closed canopy woodland.

In the 2012 National Survey (Ruddock et al., 2012), the most frequent habitat category recorded was heather moorland although afforested habitats were recorded more frequently (49.4%) than open habitats (44.8%). Hunting was recorded most frequently in heather moorland (34%) and foraging was observed less frequently in afforested (42.5%) than in open habitats (53.4%). The 2015 National Survey (Ruddock et al., 2016) showed similar preferences for foraging habitat selection, with heather moorland the most frequent category (30%) followed by second rotation forest (19.7%). On the basis of the 2012 and 2015 surveys, and Madder's (2000) work, the creation of areas of perpetually maintained heathland and grassland habitats will provide a suitable habitat enhancement component for the Coom Green Energy Park wind farm.

Habitat selection for foraging by harriers has been investigated in various studies funded by NPWS. Although the preference order of positively selected habitats varied in different study areas and years, five habitats (heath/bog HB, hill farmland RG, new plantation NF, and the later stages of 2nd rotation pre-thicket plantation 2nd F 3 & 4) were consistently preferred by both sexes, whilst three (intensive grassland G, mature plantation F, and recently cleared plantation 2nd F1 & 2) were consistently avoided (habitat abbreviations are given in **Table 3.2**). Individual females showed quite variable habitat usage, reflecting the often-restricted choices within small foraging ranges close to the nest. For males, the average rank order of habitat selected across sites and years, from most to least preferred, was NF>2ndF3>H/B>2ndF4, followed by F>2ndF1&2>G.

Table 3.2: Recommended classification of habitat types for hen harrier assessments.

Habitat Code		Description
NF	NF 2	New forestry plantation, trees 20-30 cm high
	NF 3	New forestry plantation, trees c.1 m in height
	NF 4	New forestry plantation, trees > 2m in height, patchy thickets
2 nd F	2 nd F 1 & 2	2 nd rotation forestry plantation, trees 20-30 cm high
	2 nd F 3	2 nd rotation forestry plantation, trees c. 1m in height
	2 nd F 4	2 nd rotation forestry plantation trees >2m high
F		Post thicket plantation
G		Grazing

Habitat Code	Description
RG	Rough Grazing & rushy pasture
H/B	Heath / Bog
DE	Deciduous woodland & scrub
GO	Gorse

In the 2015 National Survey the majority of confirmed nests/territories were located in afforested habitats (65.7%), primarily in second rotation crops (59.3%), compared to open moorland (heather) habitats (25.9%). Foraging activity, however, continued to indicate a preference for open moorland habitats on a national scale.

Within the Nagles Mountains, the proportion of second rotation forest has increased dramatically since the late 1990s and early 2000s. Suitable habitat generally exists from about 3 to 10 years after planting, out of a typical 30-40-year cycle. Observations within the Nagles Mountains (and the Ballyhouras to the north of this site) have shown that optimum habitat conditions occur where there is a mosaic of vegetation types. While the size of the units is important, each vegetation type should preferably be more than merely a few hectares. Linearity is also important in allocating land for enhancement measures. Hen Harrier will most benefit from linear routes not less than 30 metres wide and as long as possible. These factors have been taken strictly into consideration when choosing suitable areas for enhancement habitat for the proposed CGEP, i.e. finding linear plots or large extensive plots that will benefit Hen Harrier prey items and, therefore, Hen Harrier.

4 Enhancement Habitat Calculations

4.1 Hen Harrier estimated exclusion habitats

To calculate the exact extent of habitat from which Hen Harrier will theoretically be excluded from operational turbines, a radius of 250m has been mapped around each proposed turbine location (**Figure 4.1**). The rationale behind the selected distance relates to the recorded displacement of foraging and flight behaviour close to wind turbines as reported in the literature (100m for foraging and 250m for flight - Mike Madders & Whitfield, 2006; Pearce-Higgins et al., 2009; Whitfield & Madders, 2006).

A 250m radius around a turbine equates to an area of 19.6 ha. For the purposes of the following calculations, the extent of each suitable habitat type for Hen Harrier, within this 250m radius of each turbine, has been quantified using Geographic Information Systems (GIS) and then expressed as a percentage (%) of these 19.6 ha (**Table 4.1**). Habitats excluded from this percentage (i.e. considered unsuitable for Hen Harrier) are GA1 *Improved Agricultural Grassland* and BL3 *Buildings and artificial surfaces*. WD4 *Conifer plantation* habitats were considered suitable for Hen Harrier only during the pre-thicket phase, i.e. between year 2 and year 12 of each plantation, within the 250m radius of each turbine and during the 30-year operational lifespan of the proposed CGEP. A detailed habitat map for

the 250m radius around each turbine can be viewed in **Appendix A** and a detailed calculation per turbine can be found in **Appendix B**.

Other variables are then used, such as forestry age, habitat type, harvesting years, etc, to calculate the exact area of habitat that needs to be allocated for each turbine over its 30-year operational lifespan. All habitats are listed in the text using the Fossitt classification (Fossitt, 2000). Any overlap occurring for the 250m radius Hen Harrier exclusion areas has been ignored within the calculations, allowing for the allocation of more habitats within the CHMP, which represents an added conservationist benefit.

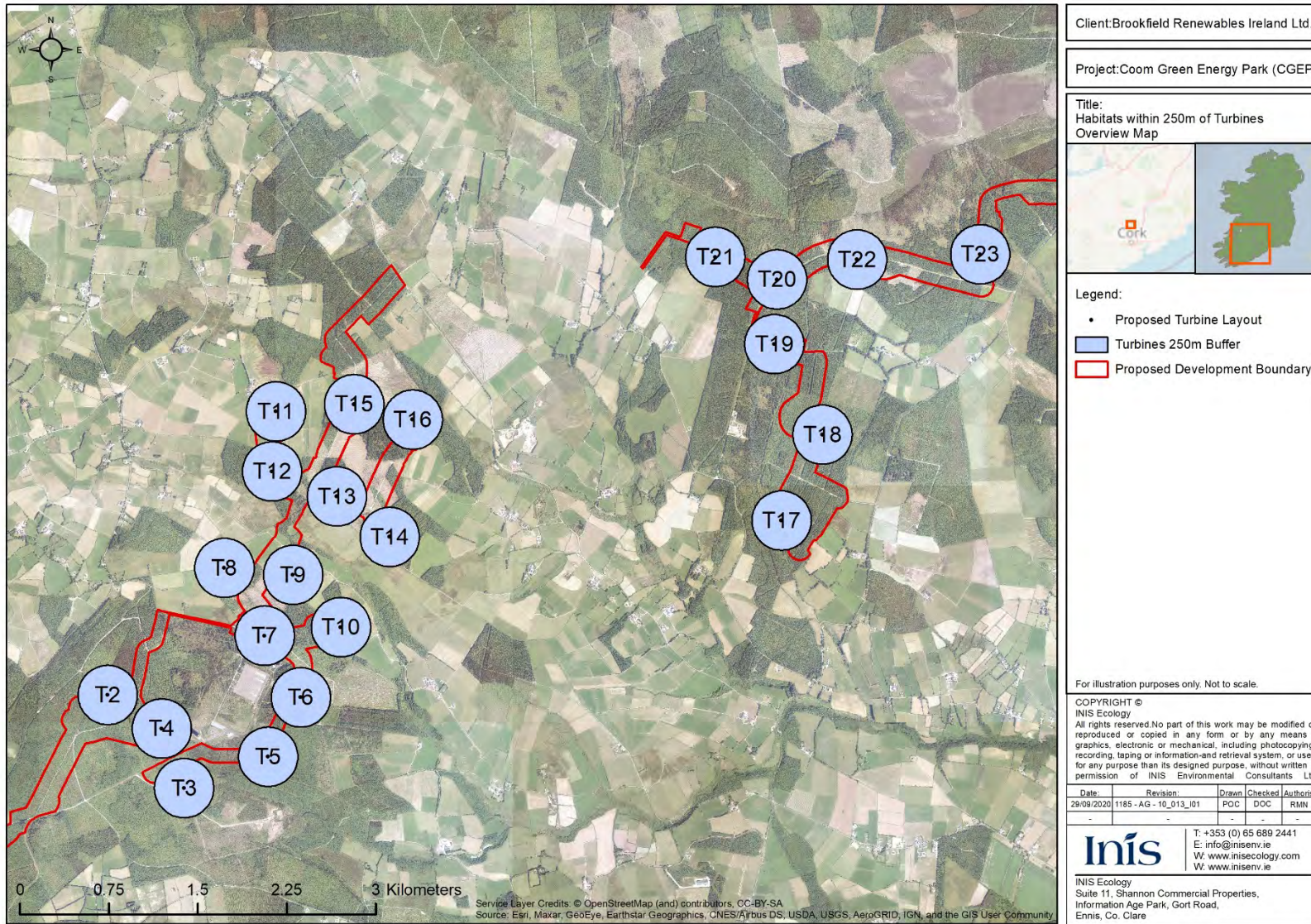


Figure 4.1: Overview map of the Turbines location and the 250m exclusion areas.

Table 4.1: Direct habitat loss required for all turbines within CGEP.

Turbine ID	Direct habitat loss (ha/annum) requiring habitat enhancement measures	Percentage of 250m radius buffer requiring habitat enhancement measures (%)
T2	5.8	29.7%
T3	7.2	36.9%
T4	4.3	22.1%
T5	9.1	46.6%
T6	5.5	27.9%
T7	12.1	61.7%
T8	3.1	15.6%
T9	11.1	56.6%
T10	0.8	4.3%
T11	2.9	14.6%
T12	4.8	24.5%
T13	16.4	83.5%
T14	6.6	33.6%
T15	8.7	44.4%
T16	7.8	39.9%
T17	9.4	47.8%
T18	2.4	12.1%
T19	1.4	7.0%
T20	5.7	29.1%
T21	3.6	18.5%
T22	17.8	90.8%
T23	2.3	12.0%
Total	148.8 ha	

4.2 Proposed Areas to be Managed under CHMP

As described in **Section 4.1**, it is estimated that the construction and operation of the proposed CGEP would represent a total of 148.8ha of potential suitable habitats displacement for Hen Harrier. To achieve an ecological net gain (CIEEM, 2016), this CHMP proposes the management of 5 areas, in the vicinity of the proposed CGEP where landowner consent has been achieved, which would amount to a total area of 170.82ha (**Figure 4.2**). Of this total area, 99.62% (170.16ha) are habitats favoured by Hen Harrier, which would represent a total net gain of 22.02ha (**Table 4.2** and **Appendix C**).

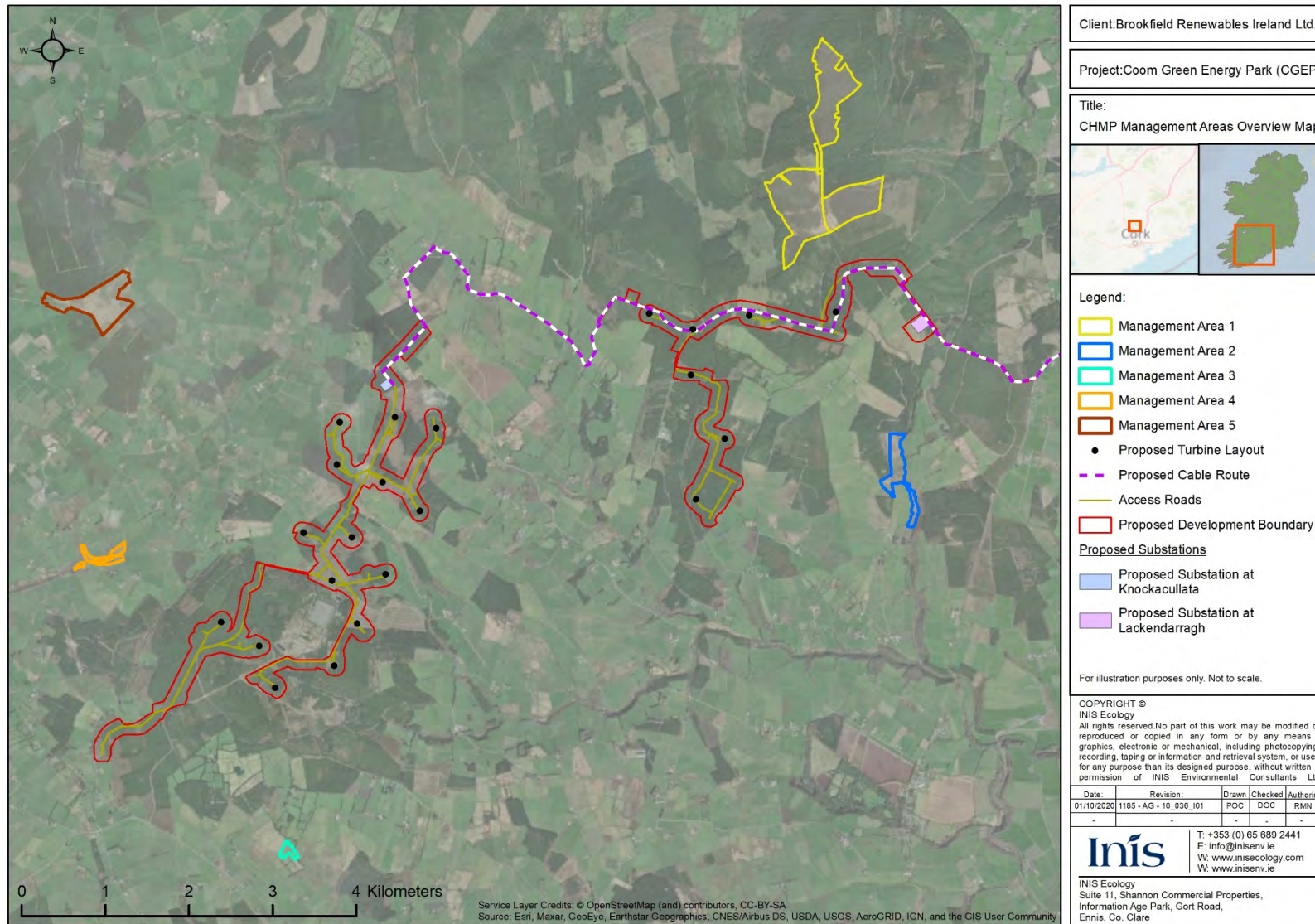


Figure 4.2: Overview of the five Management Areas.

The development of the proposed CGEP would then provide significant net gain of managed foraging areas for Hen Harrier for the lifetime of the proposed wind farm, i.e. approximately 22ha of additional lands on the 5 management areas. Four of the five management areas have been specially chosen to provide viable foraging opportunity proximal to historical and recent Hen Harrier nesting areas as this has been proven to be of benefit to breeding Hen Harrier.

Table 4.2: Details for the five proposed management areas.

Management Area	Habitat (Fossitt, 2000)	Area (ha)		Maximum Distance from CGEP Wind Farm (km)
Management Area 1	HH/PB Heath and Bog	116.82	117.96	1.4
	WD4 Conifer Plantation	1.14		
Management Area 2	GS/WS1 Grassland Scrub Mosaic	2.11	14.38	1.9
	GS4 Wet Grassland	6.26		
	HH/GS4 Heath/Wet Grassland	3.49		
	WS1 Scrub	2.52		
Management Area 3	GA1 Agricultural Grassland	0.66	2.27	1.9
	GS4 Wet Grassland	1.62		
Management Area 4	GS4 Wet Grassland	4.11	5.71	1.5
	WS1 Scrub	1.60		
Management Area 5	GS4 Wet Grassland	29.98	30.49	3.0
	WS1 Scrub	0.51		
Total		170.82		

5 Irish Conservation Management Best Practice

5.1 NPWS Management area prescriptions

The National Parks and Wildlife Service (NPWS) has operated a management area prescription scheme for pro-active habitat management for Hen Harriers within the Special Protection Areas (SPAs) designated specifically for Hen Harrier (Anon, 2010, 2020). The scheme's objectives are as follows:

- To protect key species and habitats through the delivery of site-specific conservation objectives at farm level;
- To engage with the farming community in the development of farming techniques which benefit key habitats and species;

- To provide a mechanism that allows the NPWS to assist farmers with the enhancement and protection of key wildlife habitats and species.

Although the proposed CGEP development is not within a SPA, the same management prescriptions applied by the NPWS for Hen Harrier Management in SPAs will be adhered to at five no. specified management areas through this CHMP. The management measures required for Hen Harrier will vary according to the habitats present, but the prescribed measures, in accordance with the NPWS scheme (Anon, 2010, 2020), are described in the following Sections. All measures will be monitored by a Hen Harrier ecologist.

5.1.1 Grazing

Management of areas of rough grassland with extensive or mixed grazing by cattle should continue. Light grazing, rather than cutting or topping, is to be introduced to areas with no stock. The guideline stocking level on rough grazing is 0.6 LU/ha, whereas a low stocking intensity should be maintained on bog and heath.

5.1.2 Scrub and Hedgerow

Existing areas of scrub and hedgerow should be retained. Small areas of established scrub and other hedge-banks can be trimmed but must not be removed, burnt or killed. In open areas, or areas where the extent of scrub/hedgerow is limited, habitat should either be created, or some scrub expansion should be allowed. Hedges should be planted where possible, e.g. along open banks or inside existing wire fences. If a hedgerow requires cutting it should be cut to an "A" shape, i.e. wider at the base than at the top. Cutting in this case should not come closer than 1m from the base of the hedge, and a buffer zone of 1.5m on each side of the hedge must be left uncut, within which fertilisers should not be applied. In addition, herbicides and pesticides should not be used within 5m of an existing hedgerow, with the exception being the spot treatment of difficult invasive weeds (e.g. Japanese Knotweed *Fallopia japonica*). Hedge cuttings should be piled into heaps and left to decay naturally. In all cases, cutting of hedgerows must not be carried out during the breeding season (i.e. March 1st to August 31st). Large continuous blocks (greater than one hectare) of established Bramble, Gorse or other scrub should be opened up (outside the March-August bird breeding season). At least 50% of such areas covered by scrub should be retained in lines or scattered patches, rather than in a single block.

5.1.3 Rushes

Rough wet grassland will be maintained in the optimal condition for Hen Harrier. Existing rush fields will be managed by rotational cutting. The frequency of cutting of rushes will vary, as the soil type, drainage, slope, grazing regime, machinery used, etc, will all affect the speed of re-colonisation. However, in most cases, upland rough grassland is likely to revert to rush relatively quickly. It is critical that the rush is not topped/cut too frequently. Annual cutting of the rushes would be conducted to ensure they do not become too excessive. Rushes should generally occupy no less than 30% of the field and no more than 70%. The distribution of rush will depend on the local drainage patterns. It is important that the rush is allowed to form tussocks, as this provides a habitat for Hen Harrier prey. In most situations, a regime of cutting every second year will be required. Reseeding of rough grassland fields will be allowed, or may be required, where this is shown to be necessary and part of an existing

management regime. The broadcast spraying of rushes will not be permitted but spot treatments or wipe-on treatments will be allowed where the rushes become too dominant.

5.1.4 Conifers

Within managed areas, all self-seeded conifers that are growing outside of forestry plantations will be removed in order to avoid the spread of conifers over open Hen Harrier foraging habitat. This is especially important at Management Area 1 (**Figure 4.2** and **Appendix C**) to the north of the proposed CGEP.

5.1.5 Other

Spraying or broadcast application of herbicide will not be permitted. Spot application and wipe-on treatments will be allowed to eradicate docks, thistles, ragwort and similar noxious weeds. Rhododendron and conifers may be removed by cutting and spot application. Bracken control may be by rolling, cutting and/or by controlled cattle trampling in early summer. In exceptional circumstances, control of bracken by herbicides may be permitted. The principal aim of the plan is to provide areas of optimum foraging habitat for hen harriers during the lifetime of the project, providing enhanced prey item production in managed foraging areas and in doing so provide a net gain to the local Hen Harrier population.

The rationale of this CHMP is based on results from operational Hen Harrier management plans that have proven to be successful for breeding Hen Harrier, from available research on Hen Harrier in Ireland and also on the results of Hen Harrier surveys carried out on the site of the proposed CGEP and its environs. The management area prescriptions have been chosen proximal to historical nest sites (within 3km) to reflect the results of successful Hen Harrier management plans.

6 Habitat management prescriptions

6.1 Introduction

The provision of the proposed prescriptions for effective habitat management for Hen Harrier is must be integral to every Hen Harrier Management Plan. In addition, the provision of prescriptions proximal to Hen Harrier nests is of extreme importance as parent birds staying close to the nest will be able to achieve increased surveillance of the nest and this could lead to a decrease in predation, which is now becoming a recognized significant risk to eggs and fledglings. Hen Harrier individuals using wind farm areas and adjoining lands have to forage over a larger area than most harriers to provide to their broods which, as it has been reported, leads to a constrained Hen Harrier Lifetime Reproductive Success (LRS) from the availability of prey (Irwin et al., 2012). This management plan provides managed foraging habitats proximal (i.e. within 3km) to known nest sites, allowing harriers the ability to increase their foraging success close to their nest sites, thus increasing the chance of breeding success rates.

The conservation habitat management prescriptions for Hen Harrier within this document are based on the prescriptions that are specified in the NPWS management area prescription scheme for Hen Harrier SPAs (Anon, 2010, 2017, 2020), even though the site of the proposed development is not part of, or adjacent to a SPA.

The prescriptions are concerned mainly with maintaining low-level extensive grazing in bog and heath areas, the maintenance of rough wet upland grassland in a condition that is neither too overgrown, nor too heavily grazed (preferably by means of low-intensity grazing) and the retention and creation of scrub areas and edge habitats (i.e. bushy hedgerows). The intention is to ensure that extensive grazing continues, and that appropriate management of grassland, scrub and bog creates a favorable habitat mosaic for Hen Harrier. The proposed prescriptions for effective habitat management for Hen Harrier are also planned to benefit a wide range of other species including Merlin.

Managing the land for Hen Harrier fits the concept of focal species modelling. In managing habitats to benefit Hen Harrier, a range of other beneficial outcomes can be achieved. Successful management for Hen Harrier should also benefit other species, as small passerines (prey species of Hen Harrier), other raptors, Irish Hare and a range of small mammal species. The development of habitats such as blanket bog, upland heath, rivers and streams, hedgerows and trees will also benefit.

The ability of the management prescriptions to deliver the enhancement, as designed within management plans, is imperative, especially in cases such as the CGEP site (i.e. outside SPAs), where Hen Harrier pairs need the protection and stable environments afforded to pairs within SPAs to remain successful. This proposed Conservation and Habitat Management Plan is formulated in the context of the available information on foraging behavior and Hen Harrier preference. The ecologist, who will supervise the implementation of the Conservation and Habitat Management Plan will have experience of Hen Harrier ecology and habitat management and will work in close association with landowners and the local Coillte forest manager.

The prescriptions for specific habitat types are outlined in Section 6.2, followed by generic prescriptions for all habitat types in Section 6.4.

6.2 Management Prescriptions for Specific Habitats

The habitats that are the subject of specific management prescriptions are outlined below:

- Hedgerows, Earth Banks and Scrub;
- Heath and Bog;
- Wet Grassland;
- Improved Agricultural Grassland; and
- Forestry.

The habitats that are the subject of specific management prescriptions are shown in **Appendix C**.

6.2.1 Hedgerows, Earth Banks and Scrub

Some blocks of scrub, large enough to map on a macro-scale, were recorded at some of the proposed management areas, although there were also small clumps of scrubby growth within other habitats at some of the management areas (on the micro-scale). Woody Scrub (e.g. Gorse, Willow, Alder, Birch, etc.) is one of the most beneficial habitats for Hen Harrier, as it provides prey (e.g. passerines, small mammals) and hunting habitat for the harrier. Scrub and hedgerow clearance are amongst the reported factors for the loss of viable Hen Harrier habitat in Ireland (e.g. O'Flynn, 1983; Ruddock et al., 2016; Wilson et al., 2009). In general, existing areas of scrub and hedgerow should be retained. Small areas of established gorse or willow scrub can be trimmed to prevent further encroachment onto grassland or access paths, but they must not be removed, burnt or killed. The overarching

principle in the management of scrub and hedgerow will be to increase the surface area as increased surface area equates to increased prey item supporting habitats, which leads to increased foraging ability for Hen Harrier.

6.2.1.1 Habitat management prescriptions for scrub and hedgerows

- Existing areas of scrub and hedgerows will be retained;
- Where there is evidence of scrub or hedgerow removal, these habitats will be reinstated as part of individual management area prescriptions; and
- In open areas or where the extent of scrub and hedgerows is limited, create new areas of habitat.

6.2.1.2 Habitats for Specific Management

- In open areas or where the extent of scrub and hedgerows is limited, the expansion of native hardwood scrub will be allowed;
- The only means of preventing further encroachment of established areas of gorse or willow scrub onto grassland or access paths and tracks will be trimming. This action can be repeated annually if necessary;
- Any removal, burning or herbicide use on areas of established scrub will be prevented;
- If it is deemed necessary for road safety reasons, roadside hedgerows will be cut outside of the bird nesting season (i.e. the period from March 1st to the 31st of August);
- If deemed necessary for the protection of overhead electricity lines, cut hedgerows outside of the bird nesting season (March 1st – August 31st), if possible;
- Hedgerow maintenance will be permitted to prevent hedge overgrowth. In such cases, hedgerow trees should be left uncut and the remainder of the hedgerow cut into an “A” shape, i.e. wider at the base than at the top;
- Encroachment of scrub onto grassland can be controlled by cutting on annual basis if required. Cutting in this case should not come closer than 1.5 metres to the base of the hedge;
- Herbicides and pesticides will not be used, except where spot treatment is required to treat invasive species (e.g. Rhododendron); and
- Hedge cuttings will be piled into heaps and left to decay naturally.

Habitats on the site should be reassessed prior to commencement of the proposed development and, should any blocks of scrub greater than one ha in area be present, these should be broken up by cutting rides through or cutting smaller blocks out of the large block of scrub. Sufficient rides should be cut into the large block to ensure that the remaining blocks of scrub do not exceed one hectare in area. Work on cutting out rides must commence in Year One; at least 80% of the required works must be completed before the end of Year Three; and 100% before the end of Year Four.

Since bushy hedgerows are good potential foraging sites for Hen Harrier, hedge cutting will be restricted to the minimum necessary and bushy hedges with tall shrubs will be encouraged (as opposed to heavily managed hedge lines). Any hedge cutting that does take place will be limited to the period from September to February, inclusive, except where cutting is required for Health and Safety requirements (e.g. where vegetation is a risk of coming into contact with electricity cables). Prescriptions for scrub management at the management areas is concerned mainly with prevention

of scrub encroachment onto wet heath and wet grassland since (as described above) there are no large areas of scrub within the site at present.

6.2.2 Heath and Bog

Heath and bog habitats occupy 116.82 hectares of the proposed management areas, with an additional 3.49 hectares of heath/wet grassland mosaic (**Table 4.2**). In total these habitats comprise 70.43% of the 170.82ha of the proposed management areas.

The principle method for managing heath as a suitable habitat for Hen Harrier is the use of low intensity grazing and regular inspection to ensure no self-seeding conifers will become established. Grazing intensity will be kept at a low level and will follow Anon (2010) guidelines: 0.25 LU/hectare for heath; 0.10 LU/hectare on blanket bog. Relevant annual livestock units (LU) are presented in **Table 6.1** but livestock should only be grazing these habitats outside the breeding period, i.e. during the months of May to October, inclusive. Consequently, livestock levels can be as much as double the guideline annual stocking levels for the six months of grazing.

Table 6.1: Definition of livestock units according to animal age and type.

Animal	Livestock Unit
1 Cow	1
1 Bovine over 2 years old	1
1 Bovine over 1 year old but under 2 years old or under	0.6
1 Bovine under 1 year old	0.4
1 Equine over 6 months old	1
1 Equine under 6 months old	0.6
1 Ewe/ Goat	0.15
1 Deer (red)	0.38
1 Deer (Fallow or Sika)	0.15
1 Ewe + lamb	0.15
1 Hogget	0.15
1 Goat	0.15

6.2.2.1 Habitat management prescriptions for heath are outlined below:

- If stocking is proposed in the future, maintain NPWS guideline stocking levels of up to 0.25 LU/ha on heath (Anon, 2010);
- No new forestry planting on the heath areas within the study area will be permitted;
- Self-seeded conifers invading open areas of heath will be removed. Heath habitats will be surveyed at least once every two years to ensure that new seedlings are removed.

Consideration will be given to the creation of a shallow pool, or pools, 30-50 cm deep to provide spawning sites for amphibians. Appropriate measures will be adopted to maintain these habitats (e.g. periodic vegetation clearance and silt removal) and it will be ensured that a corridor of suitable vegetation between any such pond and the nearest hedgerow, stream or drain will also be maintained (i.e. a corridor with a vegetation height of at least 10 centimeters, so that the pond is not isolated in short-grazed grass).

The vegetated earth banks (and their vegetation cover) within the site will all be retained.

6.2.3 Grassland

6.2.3.1 Wet Grassland

Wet grassland occupies 41.96 hectares of the proposed management areas, or 24.57% of the total proposed management areas.

The objective of the habitat management prescriptions for wet or rough grassland is to maintain the habitat, wherever it is found, in as rank a condition as possible while not overgrown with dead grasses or rushes. To achieve this, management prescriptions will focus on three principal points: grazing management; rush management and nutrient management.

6.2.3.1.1 Grazing Management

Grazing of areas of wet or rough grassland by cattle or horses/ponies or by mixed grazing is preferred. For similar plans in other areas, grazing by sheep is often allowed to continue where this has been the traditional practice.

All areas of wet grassland and wet heath at the site are currently grazed and this will remain the practice during the lifetime of the proposed development. Guideline target stocking levels for rough grazing are specified below, but there is no formal upper limit to planned stocking density. In cases where the land is wet, consideration should be given to concentrating grazing pressure in the summer months.

Habitat management prescriptions for managing grazing on wet grassland are:

- Introduce light grazing, rather than cutting or topping, to areas with no stock;
- The guideline target stocking level on rough grazing is a minimum of 0.6 LU/ hectare;
- In cases where the land is wet, concentrate grazing during the summer months;
- Stocking levels will be specified in the individual management area prescriptions to be prepared for each contributing landowner.

6.2.3.1.2 Rush Management

The objective in managing rushes is to maintain rough grassland in the optimal condition for Hen Harrier. Optimal condition constitutes as dense a covering of rushes as feasible, but not to the point where rushes are falling over, or matting the ground. Rush cover in the 30–70% range is ideal. While appropriate grazing pressure is preferred, in most cases managing rush cover will require active management. In the majority of cases, rush management will be achieved by cutting every second year. However, there will be considerable variation from site to site and alternative cutting regimes may be more appropriate in certain cases (**Table 6.2**).

Table 6.2: Rush Management Regimes (adapted from Anon, 2010).

Code	Habitat Condition	Management Regimes
I	Habitats where rush cover of 30-70% is considered unlikely to be achievable, irrespective of management and perhaps in some cases undesirable, e.g. Shallow Limestone soils.	No cutting required.
II	Swards where reversion of Improved Grassland is planned or where Rush cover is less than 10%.	Allow further rush development in the early years of the management area prescription. One or two cycles of cutting commencing in year three may be appropriate to allow further rush development in the early years of the plan.
III	Swards where rush cover is 10-30% or where rushes have been topped in the past year.	One or two cycles of cutting commencing in year three may be appropriate.
IV	Swards where the rush cover is already in the 30-70% range.	In these cases, cutting/topping in years one, three and five of the management area prescription could maintain the sward in the desired state.
V	Swards where rush cover is dominant (>70%) and where weed-licking with a suitable herbicide in year one, followed by cutting/topping in years three and five could be considered.	Weed licking with a suitable herbicide may provide the opportunity for the creation of a suitable sward within two or three years. However, the use of herbicides must always be subject to consideration of possible effects on watercourses. No herbicide use is permitted within 5 metres of a watercourse or existing hedgerow without the consent of the NPWS.

Habitat management prescriptions for managing rushes on wet grassland are:

- In general, rushes should be cut on a two-year cycle unless there are specific reasons for a longer cycle (e.g. weak rush growth);
- In most cases, active rush management should commence in year one of the plan and should only be delayed until year two or three where improved grassland is in reversion, where rush growth is very weak or where the rushes were cut or treated with herbicide in the year prior;
- The use of an herbicide applied using a weed lick is permitted but not encouraged. This should only be considered in cases where rush growth is very dense and cutting is impractical;
- No herbicide use is permitted within five metres of a watercourse or existing hedgerow;
- If access difficulties prevent the active management of rushes, alternatives such as grazing will be employed.

The planned rush management should be reviewed on an annual basis to determine if it is having the desired effect. If it is found during an annual inspection that rush recovery has been stronger or weaker than had been originally anticipated, the management area prescription should be changed to adjust the cutting sequence for future years.

6.2.3.1.3 Nutrient Management

The nutrient management of areas of wet grassland consists on the avoidance of the application of chemical or organic fertilizer on the managed lands.

6.2.3.2 Improved Agricultural Grassland

Improved Agricultural Grassland occupies 0.66 ha of the proposed 5 management areas, or 0.38% of the total area.

NPWS guidelines for management area prescriptions in Hen Harrier SPAs allow normal agricultural practice on improved agricultural grassland to continue (Anon, 2010, 2017, 2020). The NPWS management area prescriptions also permit wet grassland to be improved, provided it accounts for no more than 20% of the designated area on the farm. Although the proposed CGEP is not located within any SPA boundary, such improvement will not be encouraged on the proposed CGEP site under this Conservation and Habitat Management Plan.

Landowners will be required to allow improved grassland to revert to a more natural state. In such cases, a reversion program will be required, which will involve:

- Analysis of soil samples so that a baseline record of soil phosphorus and potassium exists;
- Cease applying chemical and organic fertilizers;
- No application of lime; and
- Habitat enhancement works.

The above-mentioned habitat enhancement work will be satisfied by additional hedgerow planting. If there is already 400 metres of hedgerow per hectare on or adjoining the land planned for reversion, then no further planting will be required. If the amount of Hedgerow is less than 400 metres per hectare, the landowner will be encouraged to plant sufficient hedgerow to bring the length of hedgerow up to 400 metres per hectare, subject to a maximum planting requirement of 50 metres per hectare. New hedgerow should be located on, or adjacent to, the plots planned for reversion.

6.2.3.3 Grassland fields >2 hectares or with <100 metres of hedgerow per hectare

In fields of this type, the individual management area prescriptions will require the establishment of scrub in field corners, or the planting of 25 metres of hedgerow per hectare. The planting of hedgerows will be in accordance with the specifications for hedgerow planting outlined by Anon (2010). Hedgerows will be planted in Year one of the management area prescriptions and established by the end of Year four.

Under the field corners option, livestock must be excluded from at least two field corners and a permanent fence, set back at least 15 metres from the corners, will be required for this purpose. At least 10 native trees must be planted in the field corner, which must be staked and protected with a tree guard. The field corner must be left ungrazed for the duration of the management area

prescription. Where required, fencing and tree planting will be completed before the end of Year one of the plans.

6.2.3.3.1 Field corner treatment

Within the fenced area in the field corners, briars and Blackthorn will be controlled on an annual basis, where spot treatments with a suitable herbicide or mechanical control (e.g. using a strimmer) are acceptable methods. The use of herbicides in site preparation is permitted provided:

- They are not used within three metres of the existing field boundaries (five metres in the case of watercourses and existing hedgerows).
- That care is taken to ensure that no drift occurs.

6.2.3.4 Grassland fields greater than four hectares in size

In grassland fields over 4 ha in area, the establishment of new hedges and/or exclosures is required. At least one exclosure, or 100 metres of new hedgerow, is required for each hectare, or part thereof over 4 hectares. For example, in a six-hectare grassland plot, two exclosures, or 200 metres of new hedgerow, are required. If the plot in question is improved agricultural grassland in reversion, then these requirements are in addition to any additional hedgerow planting required as part of the reversion process.

Exclosures will be 0.1-0.3 hectares in size. Livestock will be excluded from these exclosures by means of a permanent fence before the end of Year one of the management area prescription. The fence must be maintained in a stock proof condition. Where possible, exclosures should incorporate any existing patches of scrub and are to be planted with native tree/shrub species at a density of 1,000 plants per hectare (whips of 40-80 cm in size are the preferred planting material). Planting must be completed before the end of Year one of the plan. The planting density may be reduced if some scrub already exists on the site.

The planting of hedgerows will be in accordance with the specifications for hedgerow planting outlined by Anon (2010).

6.2.3.5 General Issues Relating to Grassland Management

Broadcast herbicide spraying of rushes is not permitted but spot treatments or wipe-on treatments are allowed. Herbicides applied using a weed lick can be applied where necessary, particularly in situations where rush growth is very dense or where cutting is impractical due to steep slopes. Applications should not be at a rate which will denude fields completely of rushes. Under normal circumstances, chemical treatment of rushes will only be permitted once in a five-year plan. Wipe on treatments will only be applied in either Year one or Year two of the management area prescriptions.

The following prescriptions will also apply to general grassland management:

- Maintain traditional grazing patterns;
- Control Bracken, if necessary, by weed licking, spot spraying, cutting, rolling or controlled trampling with stock. Mechanical control or trampling is most effective in May/early June. Mechanical control will need to be repeated several times during this period to have a beneficial impact;

- Cut species rich meadows after July 15th, preferably later;
- No plough, cultivation, drainage or otherwise reclaim of land will be undertaken;
- Conifers will not be planted;
- Trees will not be planted unless such action is provided for in the plan;
- Lime will not be applied;
- Fertilisers will not be applied above the stipulated levels;
- Slopes greater than 25 degrees will not be fertilized;
- The recommended stocking limits will not be exceeded;
- Supplementary feed stock will not be provided on the grassland except where this has been traditionally practiced; and
- There will be no dumping of waste material.

6.2.4 Forestry

The conifer forestry plantation occupies 1.14 ha of the proposed management areas for the proposed CGEP, or 0.67% of the total proposed management areas. These areas are under a 30-40-year forestry rotation plan and will be replanted after future felling.

Forest Service requirements for felling and replanting, imposed as conditions of felling licenses, will ensure that these areas will remain available, on a limited basis, for Hen Harrier habitat conservation. The Forest Service limits the area of forestry that can be felled yearly, so that the felling of the plantation on the site may be staggered. The cycle of planting, growth and felling will intermittently produce areas of pre-thicket plantation that are favourable for Hen Harrier nesting and foraging.

Habitat management prescriptions for forestry are :

- All felling operations are to be carried out in accordance with any felling license issued by the Forest Service;
- Any area of forestry felled as part of a regular forest rotation should be replanted with a similar species within one year of felling, unless otherwise stipulated by any condition of the felling license;
- All clear-felling forestry operations should be in accordance with current Forest Service guidelines.
- All forestry thinning operations should be in accordance with current Forest Service guidelines;
- All forestry fertilising operations should be in accordance with current Forest Service guidelines;
- Any measure employed to control disease in forestry areas should be in accordance with current Forest Service guidelines;
- Felling will not be carried during the Hen Harrier breeding season (i.e. March- August, inclusive).

As forestry plantations grow up, tracks or forestry rides provide edge habitat useful for Hen Harrier foraging. Tracks rides within forestry should be maintained to avoid scrub species overgrowth.

6.3 Management Prescriptions Common to All Habitats

6.3.1 Hen Harrier Nest Sites

If Hen Harrier nesting is suspected within the managed lands, the landowner should notify the NPWS at the earliest possible opportunity. Furthermore, landowners should refrain from publicising the exact location of any nest site. After contacting the NPWS, they should avoid approaching the nest during the period March 1st-July 31st and grazing will not be permitted within 50 metres of the nest site during the same period. Where it is discovered that Hen Harriers are nesting on the farm after a management area prescription has been prepared, the management area prescription will be amended as required.

Use of machinery (e.g. for firebreak cutting) and turbary practices will be avoided in the immediate vicinity of any Hen Harrier nesting sites from April to July, inclusive. Forestry planting and felling in these areas will also be avoided during this period.

6.3.2 Supplementary Feeding

Supplementary feeding of livestock will continue, provided excessive poaching is avoided. Sacrificial paddocks will not be permitted at any time. Supplementary feeding of round bales or from fixed feeding points is not permitted within 30 metres of a watercourse. On land sloping towards a watercourse, a greater distance will be required.

6.3.3 Burning

The burning of vegetation or other materials within the managed area of the CHMP is not permitted at any time.

6.3.4 Use of Herbicides

Spraying or broadcast application of herbicide is not permitted. Spot application and wipe-on treatments are permitted to eradicate docks, thistles, ragwort and similar noxious weeds. Rhododendron and conifers are to be removed by cutting and herbicide treatment (Round-up® applied to incision made into the cambium - just inside bark - works best). Bracken may be controlled by rolling, cutting and/ or by controlled cattle/equine trampling in early summer. In exceptional circumstances, control of bracken by herbicides may be permitted. The use of herbicides is not permitted within five metres of a watercourse or existing hedgerows; the only exception is spot treatment for the control of difficult invasive species such as Himalayan Knotweed and Rhododendron.

6.3.5 Use of Poisons or Stupefying Baits

The use of poisons or stupefying baits is not permitted. Hen Harriers and other birds of prey can fall victim to secondary and direct poisoning.

6.3.6 Fence Marking

Hen Harriers can fly into thin wires. 'Bird diverters'/'game guards' should be used to mark the guy wires of any anemometer towers or electricity transmission lines. The same measure should be considered for lengths of wire fencing. Any new fencing/boundary markers will make use of hedge planting instead of wire fencing alone.

6.3.7 Shooting

Shooting (except for the legal control of vermin) will not be allowed on the management areas.

7 Plan Implementation

7.1 Timing

This Conservation and Habitat Management Plan will be implemented to run concurrently with the commencement of construction of the proposed CGEP development. As per the additional bird surveying requirements outlined in **Section 8.1.2** below, which will commence in advance of the CGEP construction works commencing, preparation for the implementation of this conservation and habitat enhancement plan will also have to commence in advance of the physical works for the CGEP on the ground.

7.2 Consent

The proposed CGEP enhancement measures detailed will be implemented at the five land parcels, within 5 km of the proposed CGEP. The landowners of all these landholdings will retain ownership of their lands throughout the lifetime of the enhancement measures. As part of the proposed project, a lease agreement sets out the terms and conditions of the management of the landholdings and this will facilitate the implementation of the prescriptions set out in this Conservation and Habitat Management Plan.

7.3 Procedures

The prescriptions for each of the individual management areas will be chosen from the various recommended management options and practices outlined in **Section 5** of this report, and also from proven Hen Harrier habitat prescriptions that Inis ecologists have recorded over the past 10 years. These prescriptions will be based on a review of current land management and land management will be based on the most appropriate management options for each land use type so to maximise value for hen harrier.

7.4 Responsibility

Coom Green Energy Park Ltd (CGEP) and the planning permission applicant, will ultimately be responsible for the implementation of this Conservation and Habitat Management Plan. In the event of favorable consideration of the planning application, and should An Bord Pleanála deem it appropriate, it is expected that a condition requiring the implementation of this Conservation and Habitat Management Plan will be attached to the grant of planning permission. The responsibility for the implementation of the plan will lie solely with the developer and its agents. A Hen Harrier ecologist will be engaged by CGEP to oversee the implementation of this Conservation and Habitat Management Plan on the small scale (i.e. with respect to the application of measures in particular parts of the site, on a landholding by landholding or field by field basis). The implementation is also likely to require the input of agricultural advisors with regard to appropriate stocking levels.

Inis Environmental Consultants Ltd has extensive experience monitoring Hen Harrier in a wide range of habitat types in Ireland. This experience confers a high degree of confidence that the habitats produced with the implementation of the present Conservation and Habitat Management Plan will signify an important net gain/ enhancement in managed viable foraging habitats proximal to known Hen Harrier nesting territories.

8 Monitoring

A Conservation and Habitat Management Plan requires monitoring to determine if the objectives of the plan are being achieved and to determine whether any modifications to the plan are required to enable the achievement of the objectives. The principal objective of the present CGEP Conservation and Habitat Management Plan is to provide enhanced foraging habitat for Hen Harrier due to a calculated loss as a result of the CGEP project. Regular reporting on the results of management strategies will be required to show that the prescriptions are being managed properly and on a constant basis for the benefit of hen harriers.

8.1 Habitats

Areas of Hen Harrier foraging habitat (i.e. wet grassland, hedgerows, scrubby earth banks and wet heath) should be accurately mapped and should be monitored annually, for the lifetime of the proposed CGEP, to guarantee that the areas associated with the Conservation and Habitat Management Plan have not altered in size and that the grazing regime that is in place is maintaining the current state of these habitats (i.e. neither poaching nor overgrowth of open areas is occurring). As well as mapping, this monitoring should be recorded by means of fixed-point photography.

8.2 Additional Bird Surveying

Annual bird monitoring will take place throughout the construction period and operational phase of the proposed CGEP development to monitor nesting activity and confirm usage of the five enhancement areas by hen harrier, throughout the breeding season.

8.3 Auditing

Audits will be required to ensure the effectiveness of the Conservation and Habitat Management Plan. They are essential to ensure adequate plan quality, compliance and control. Audits will be based on a field inspection and the assessment of the management area prescriptions.

Ten percent of the management area prescriptions will be selected each year for auditing. The audit will assess:

- Objectives of the individual management area prescription;
- Implementation of the plan; and
- Adherence to requirements of the management area prescription.

8.4 Review

Individual management area prescriptions will be reviewed every five years, as is the case with NPWS Hen Harrier management area prescriptions.

9 Conclusion

The development of the proposed CGEP provides habitat enhancement measures at alternative lands due to loss of potential forage habitat within 250metres radius of each turbine, which totals an area of approximately 148.76ha.

The management prescriptions applied will benefit Hen Harrier in both the short and long term, and will ensure the supply of a substantial area of suitable foraging habitat for the local Hen Harrier population, over and above that potentially lost as a result of the proposed CGEP development.

The overall aim of the management plan is to provide a net gain of foraging habitat for Hen Harrier for the lifetime of the proposed CGEP. The management prescriptions proposed are likely to enhance the existing biodiversity of the site for prey items and wildlife in general, which is an extremely important component of a successful Conservation and Habitat Management Plan. The Plan will also promote a mosaic of vegetation types, which are optimal foraging habitat, and are likely to improve foraging success rates and, consequently, breeding success rates for the local Hen Harrier population, which is the ultimate target of the Conservation and Habitat Management Plan.

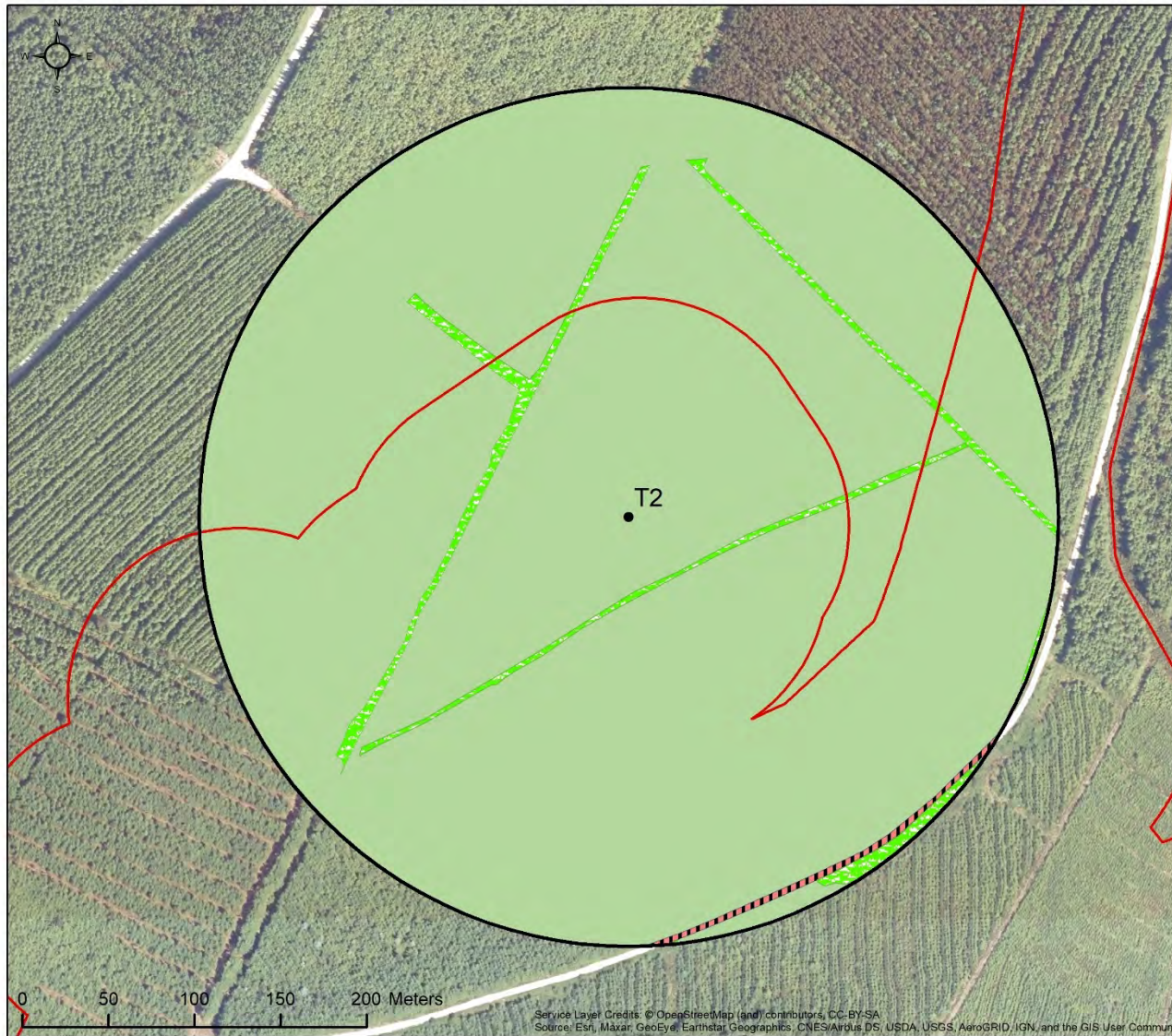
It is concluded that the proposed Conservation and Habitat Management Plan will provide full and effective additional habitat for Hen Harrier, as part of the proposed development of the CGEP.

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Appendix A - Habitat Maps for 250m Buffer of Turbine Locations



Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 2

Legend:

Habitats within 250m of Turbine 2

- ED2: Spoil and bare ground
- WD4: Conifer plantation
- WS1: Scrub
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

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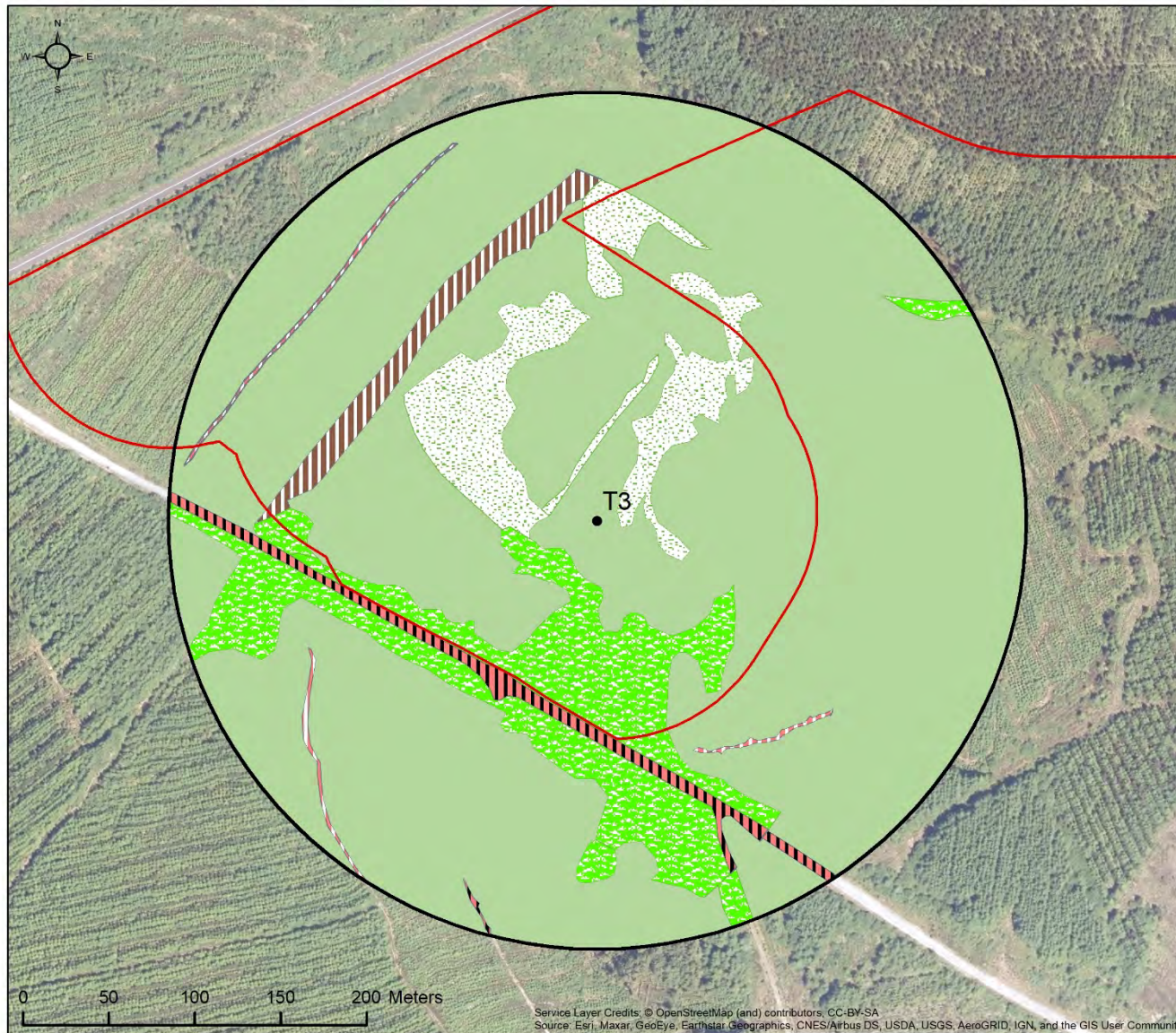
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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 3

Legend:

Habitats within 250m of Turbine 3

- ED2: Spoil and bare ground
- ED3: Recolonising bare ground
- HH3/WS1: Wet heath/Scrub mosaic
- WD4: Conifer plantation
- WS1: Scrub
- WS5: Recently-felled woodland
- Turbines 250m Buffer
- Proposed Turbine Layout
- Proposed Development Boundary

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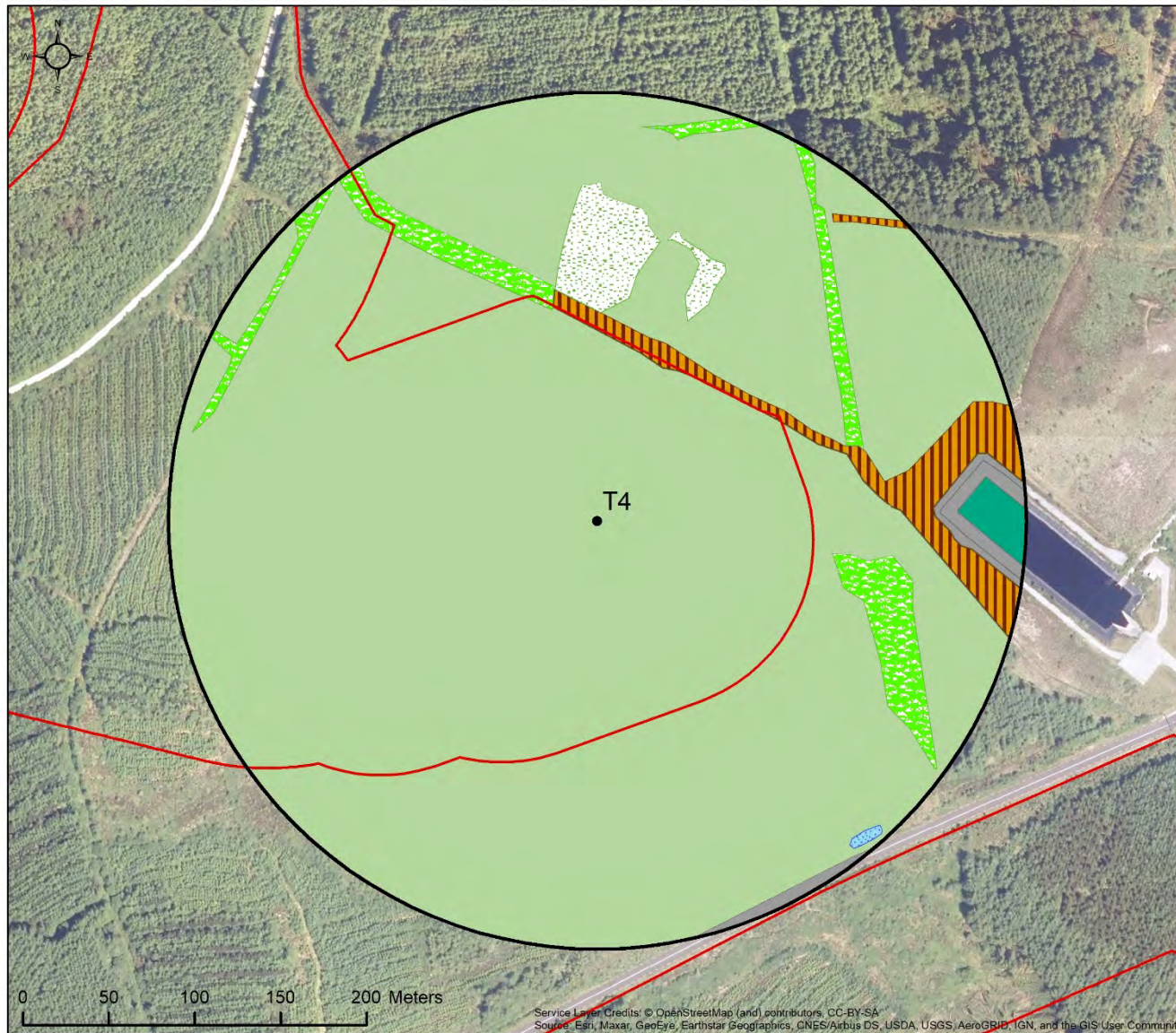
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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 4

Legend:

Habitats within 250m of Turbine 4

- BL3: Buildings and artificial surfaces
- FL8: Other artificial lakes and ponds
- FS1: Reed and large sedge swamps
- GS4/HH1: Wet grassland/Dry siliceous heath mosaic
- WD4: Conifer plantation
- WS1: Scrub
- WS5: Recently-felled woodland
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

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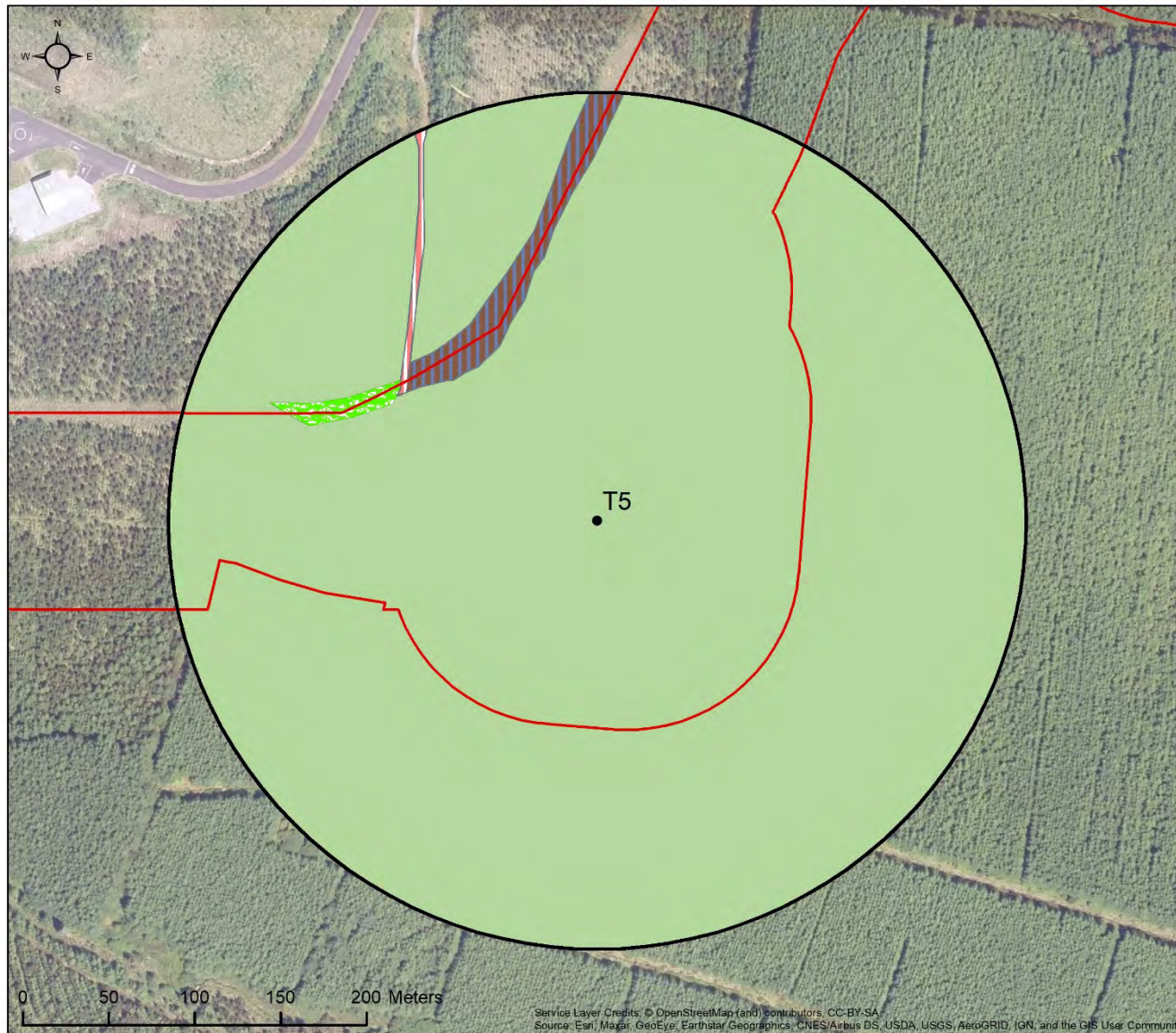
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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 5

Legend:

Habitats within 250m of Turbine 5

- ED3: Recolonising bare ground
- HH3: Wet heath
- WD4: Conifer plantation
- WS1: Scrub
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

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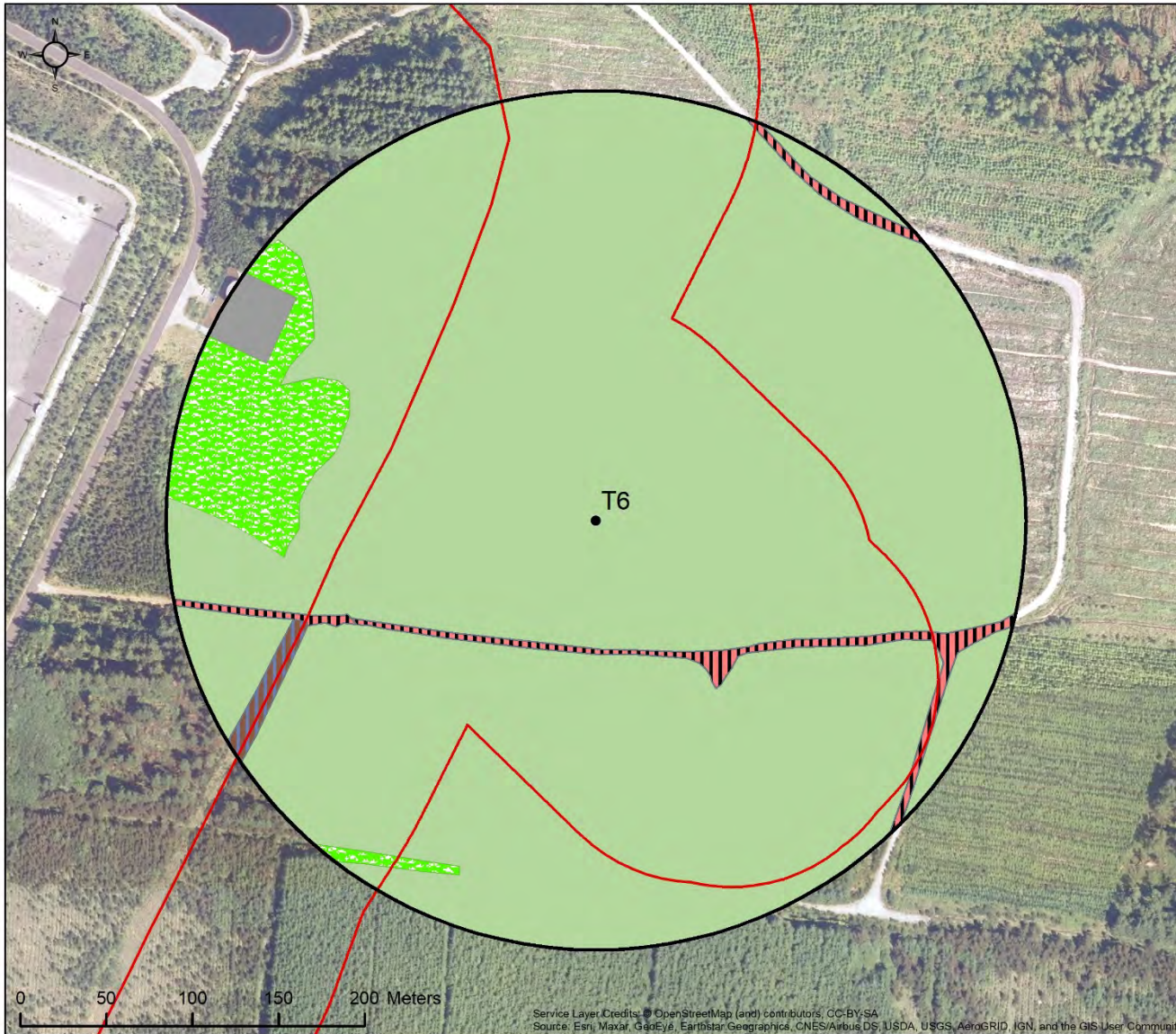
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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 6

Legend:
Habitats within 250m of Turbine 6

- BL3: Buildings and artificial surfaces
- ED2: Spoil and bare ground
- HH3: Wet heath
- WD4: Conifer plantation
- WS1: Scrub
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

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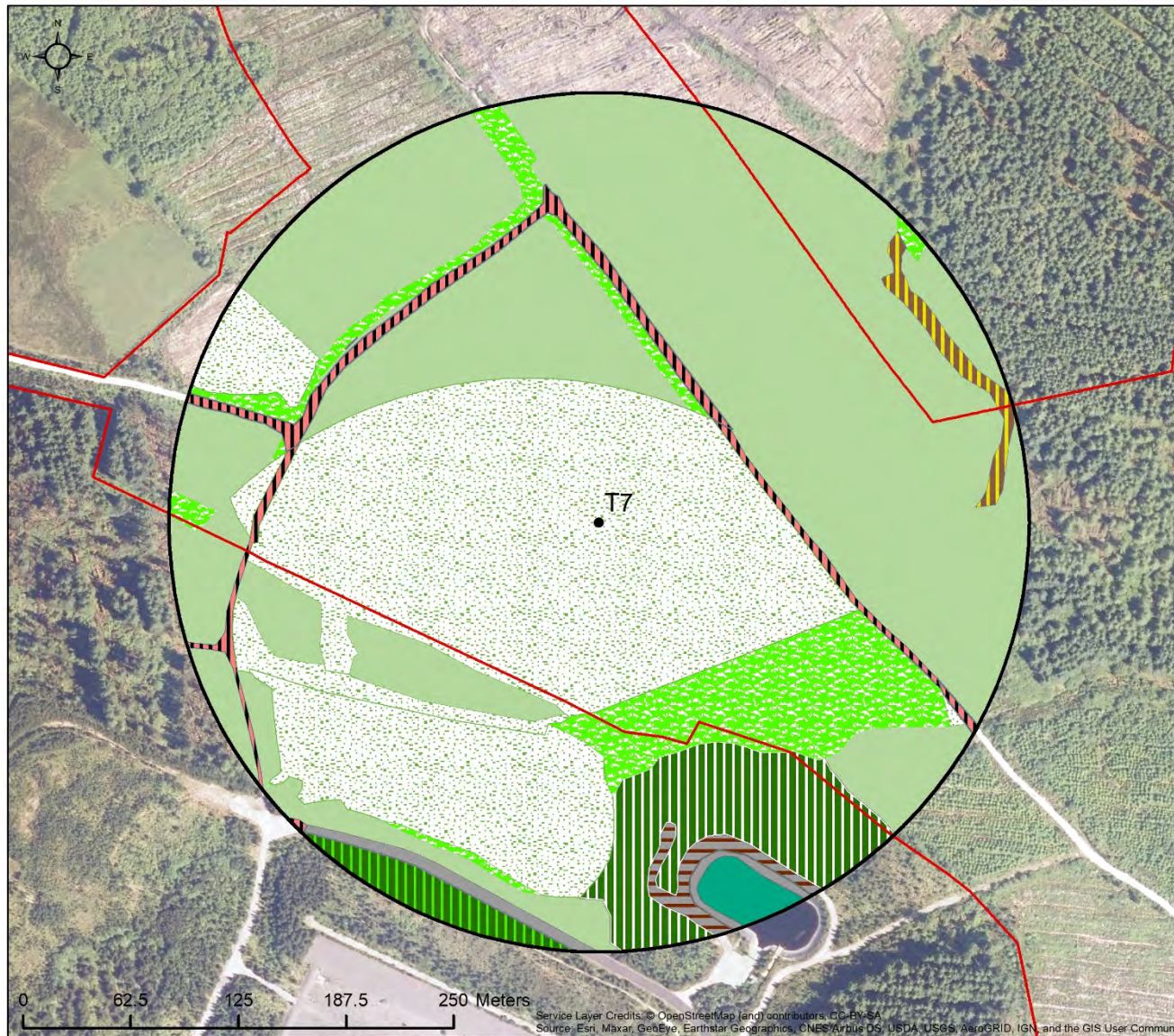
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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 7

Legend:
Habitats within 250m of Turbine 7

- BL2: Earth Banks
- BL3: Buildings and artificial surfaces
- ED2: Spoil and bare ground
- FL8: Other artificial lakes and ponds
- HD1: Dense Bracken
- WD4: Conifer plantation
- WD4/WS1: Conifer plantation/Scrub mosaic
- WS1: Scrub
- WS1/WD4: Scrub/Conifer
- WS5: Recently-felled woodland
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

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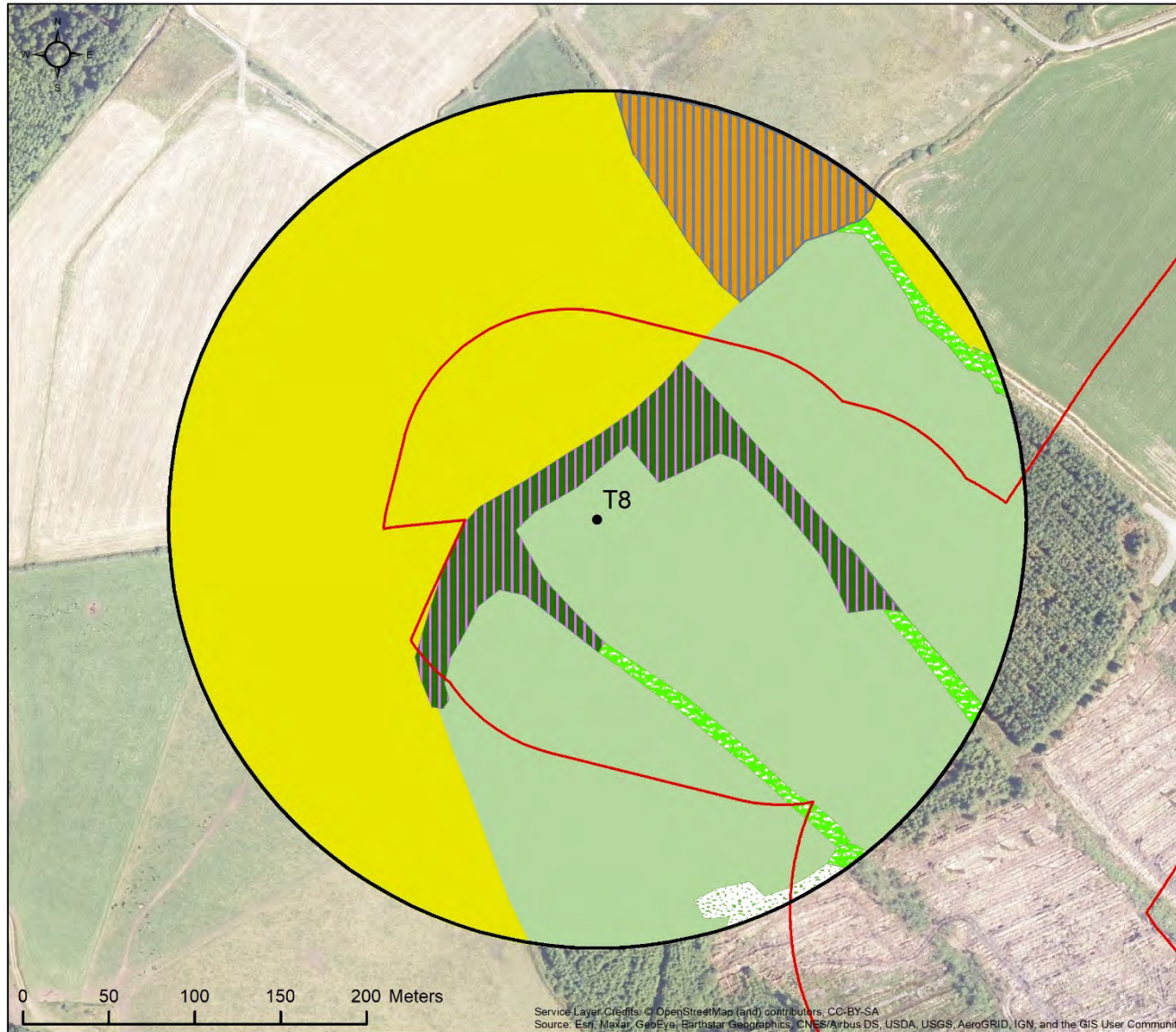
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Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 8

Legend:
Habitats within 250m of Turbine

- GA1: Improved agricultural grassland
- GS4: Wet grassland
- WD1: (Mixed) broadleaf woodland
- WD4: Conifer plantation
- WS1: Scrub
- WS5: Recently-felled woodland
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

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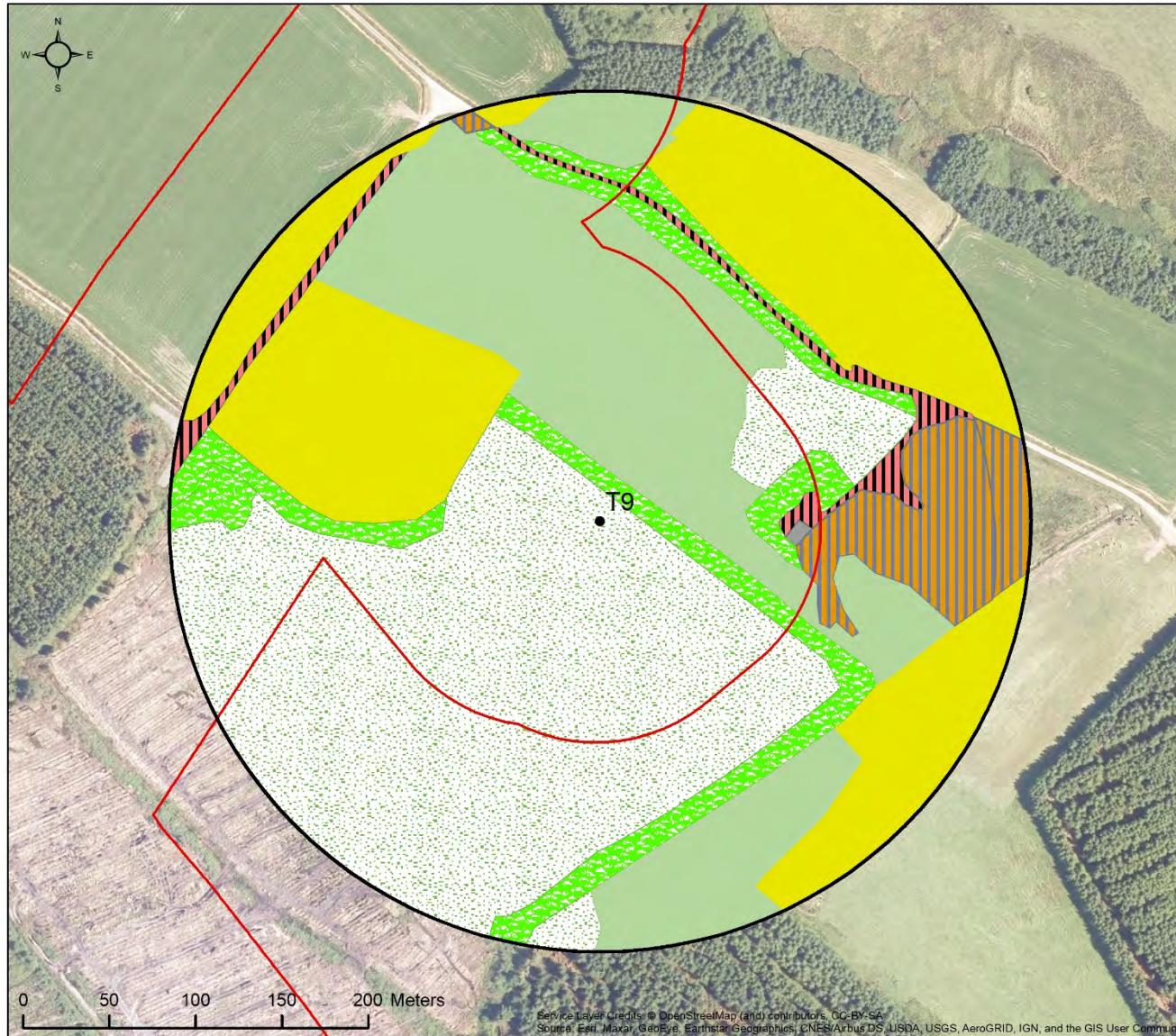
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Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 9

Legend:

Habitats within 250m of Turbine 9

- BL3: Buildings and artificial surfaces
- ED2: Spoil and bare ground
- GA1: Improved agricultural grassland
- GS4: Wet grassland
- WD4: Conifer plantation
- WS1: Scrub
- WS5: Recently-felled woodland
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

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Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 10

Legend:

Habitats within 250m of Turbine 10

- ED2: Spoil and bare ground
- GA1: Improved agricultural grassland
- WD4: Conifer plantation
- WS1: Scrub
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

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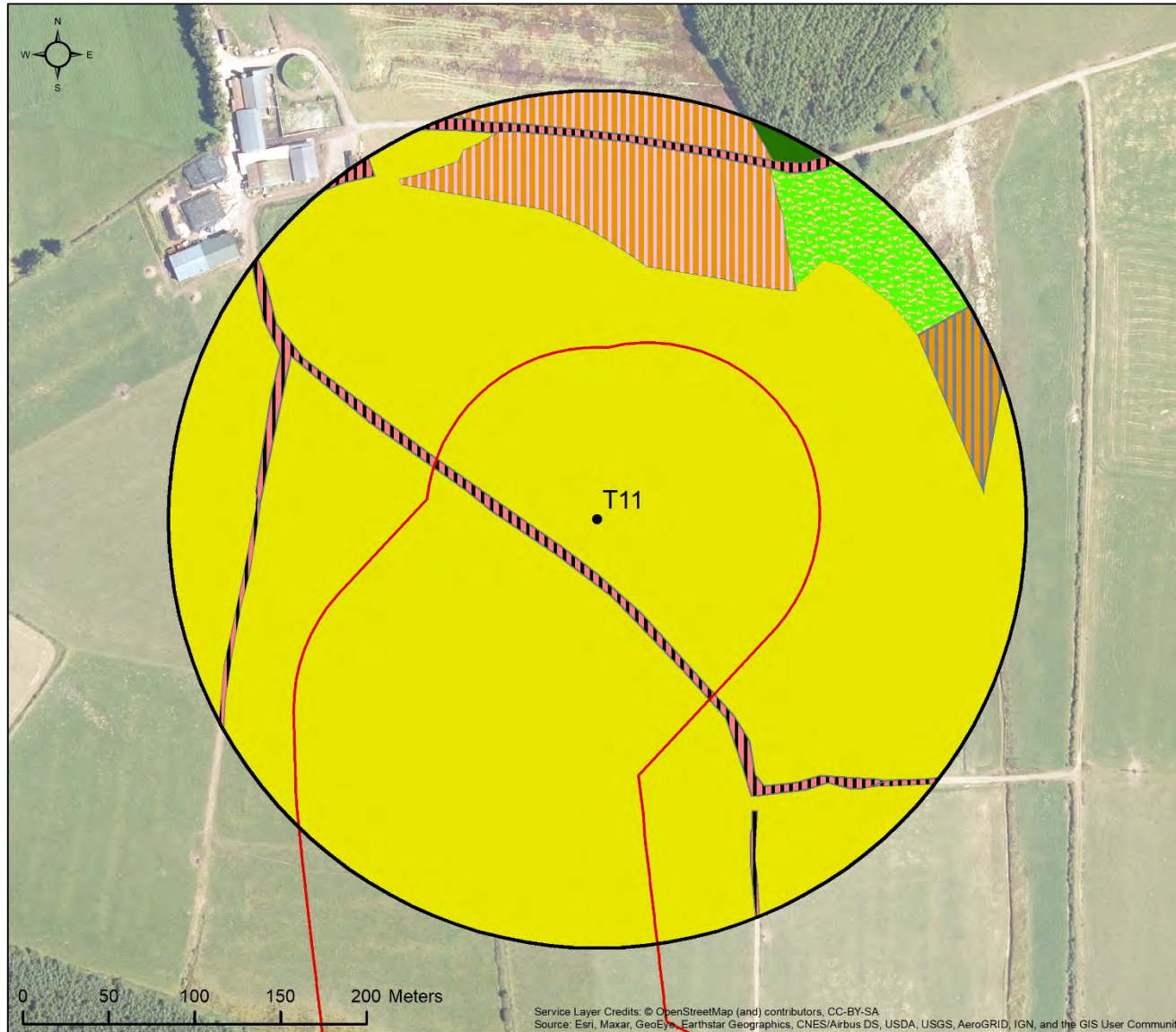
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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 11

Legend:

Habitats within 250m of Turbine 11

- ED2: Spoil and bare ground
- GA1: Improved agricultural grassland
- GS4: Wet grassland
- GS4/HH3 Wet Grassland/Wet Heath
- WD4: Conifer plantation
- WS1/HH3: Scrub/Wet Heath
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

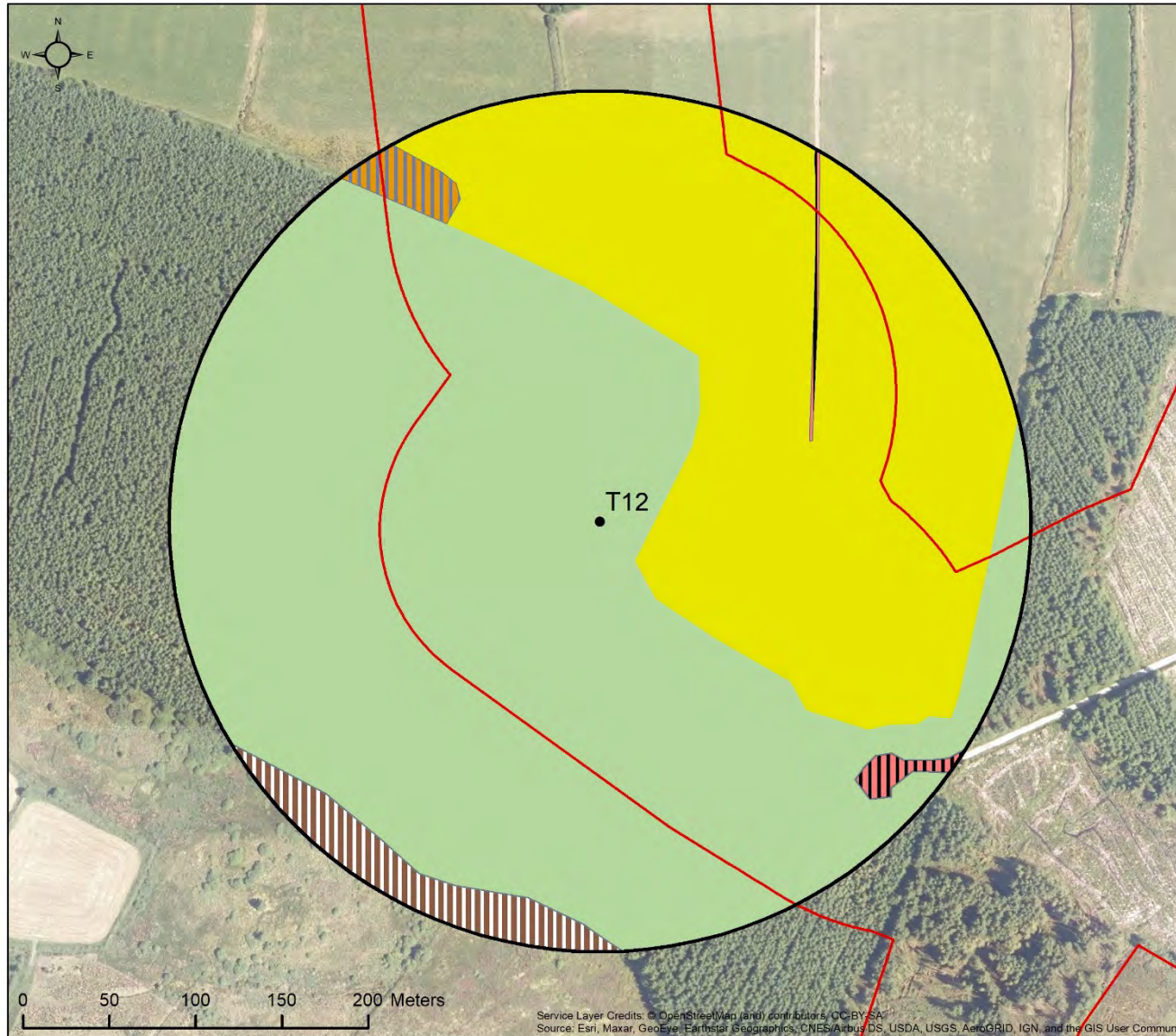
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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 12

Legend:
 Habitats within 250m of Turbine 12
 ED2: Spoil and bare ground
 GA1: Improved agricultural grassland
 GS4: Wet grassland
 HH3/WS1: Wet heath/Scrub mosaic
 WD4: Conifer plantation
 ● Proposed Turbine Layout
 ◻ Turbines 250m Buffer
 ◻ Proposed Development Boundary

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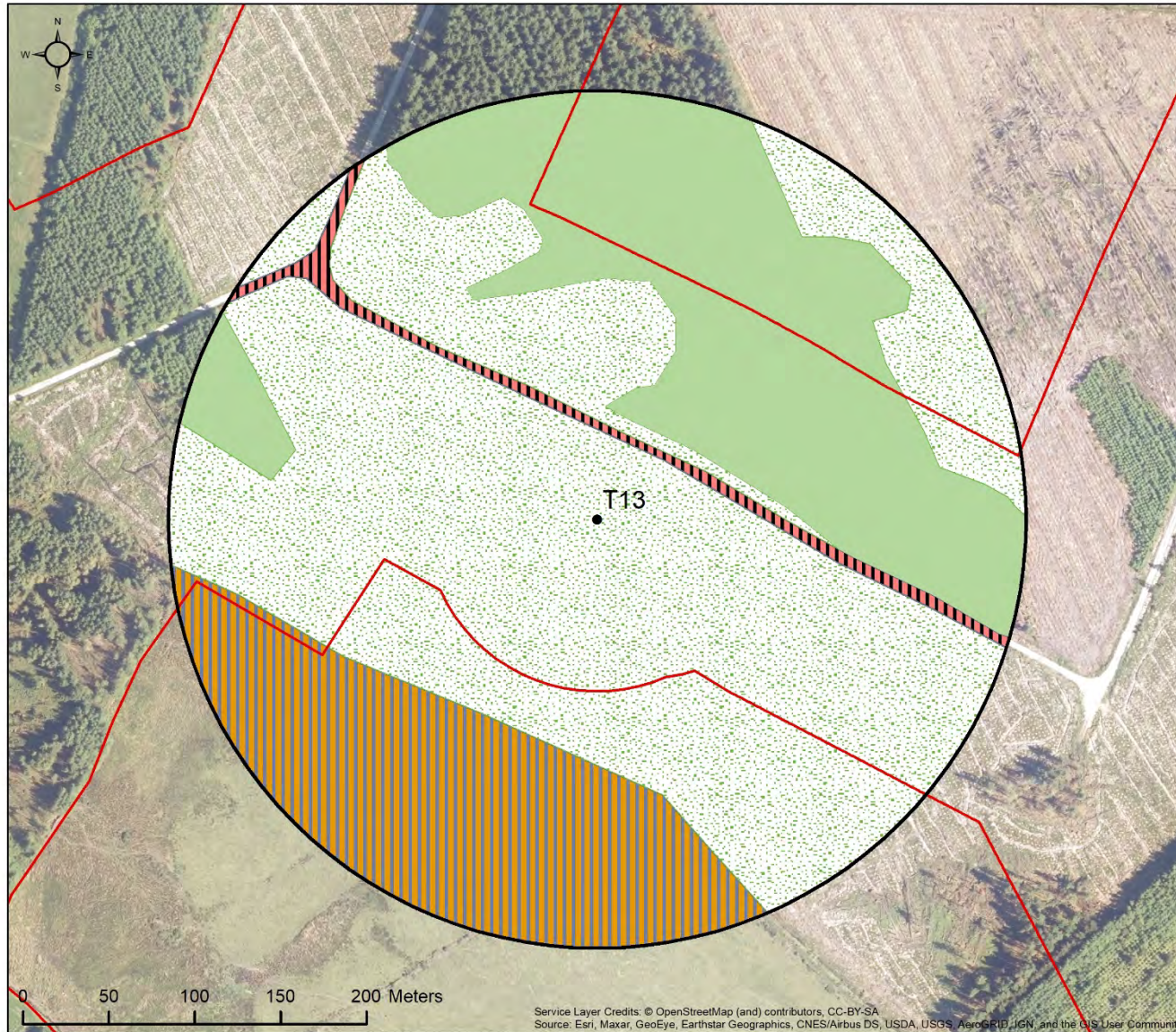
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

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 13



Legend:

Habitats within 250m of Turbine 13

-  ED2: Spoil and bare ground
-  GS4: Wet grassland
-  WD4: Conifer plantation
-  WS5: Recently-felled woodland
-  Proposed Turbine Layout
-  Turbines 250m Buffer
-  Proposed Development Boundary

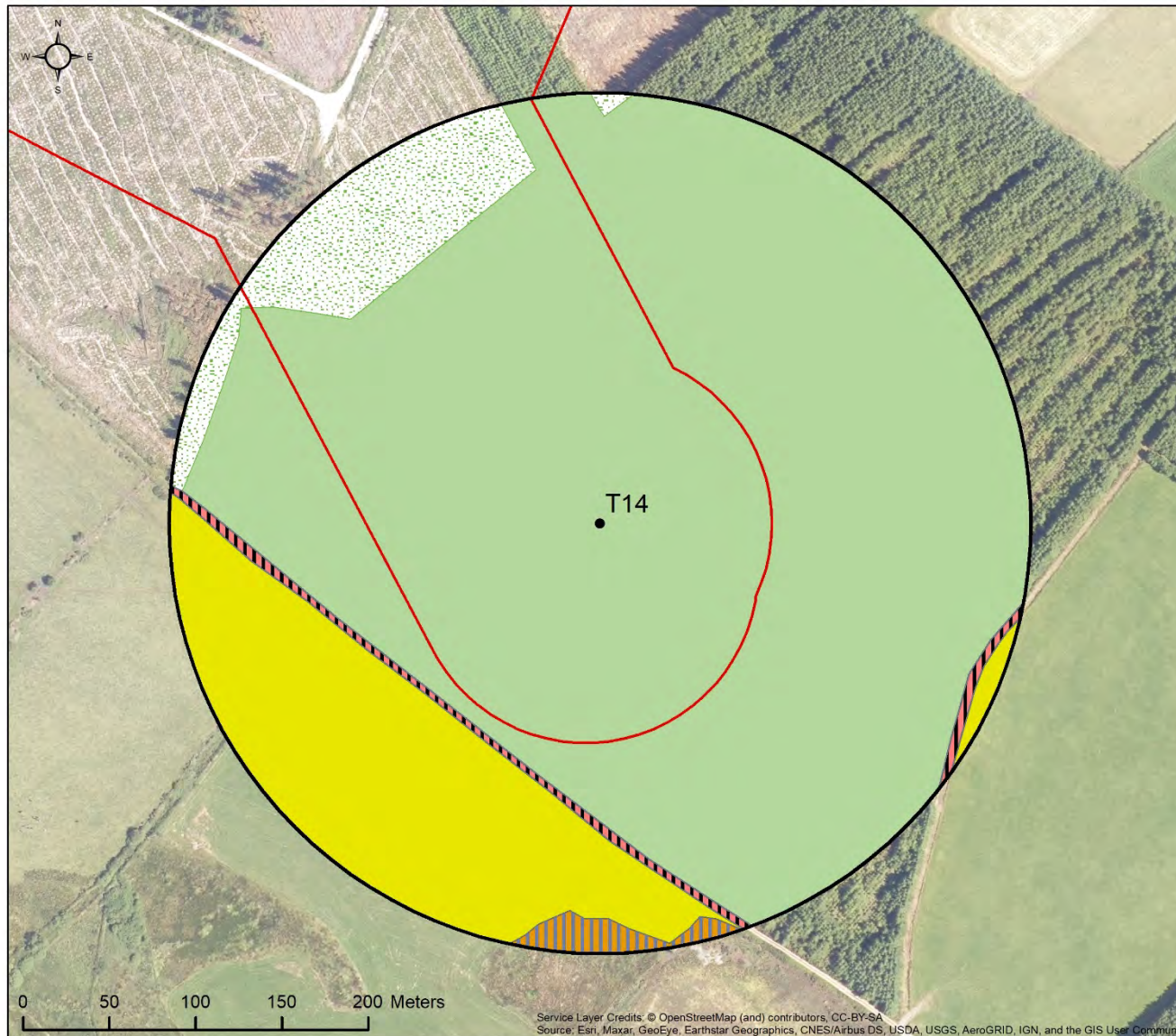
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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 14

Legend:

Habitats within 250m of Turbine 14

- ED2: Spoil and bare ground
- GA1: Improved agricultural grassland
- GS4: Wet grassland
- WD4: Conifer plantation
- WS5: Recently-felled woodland
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

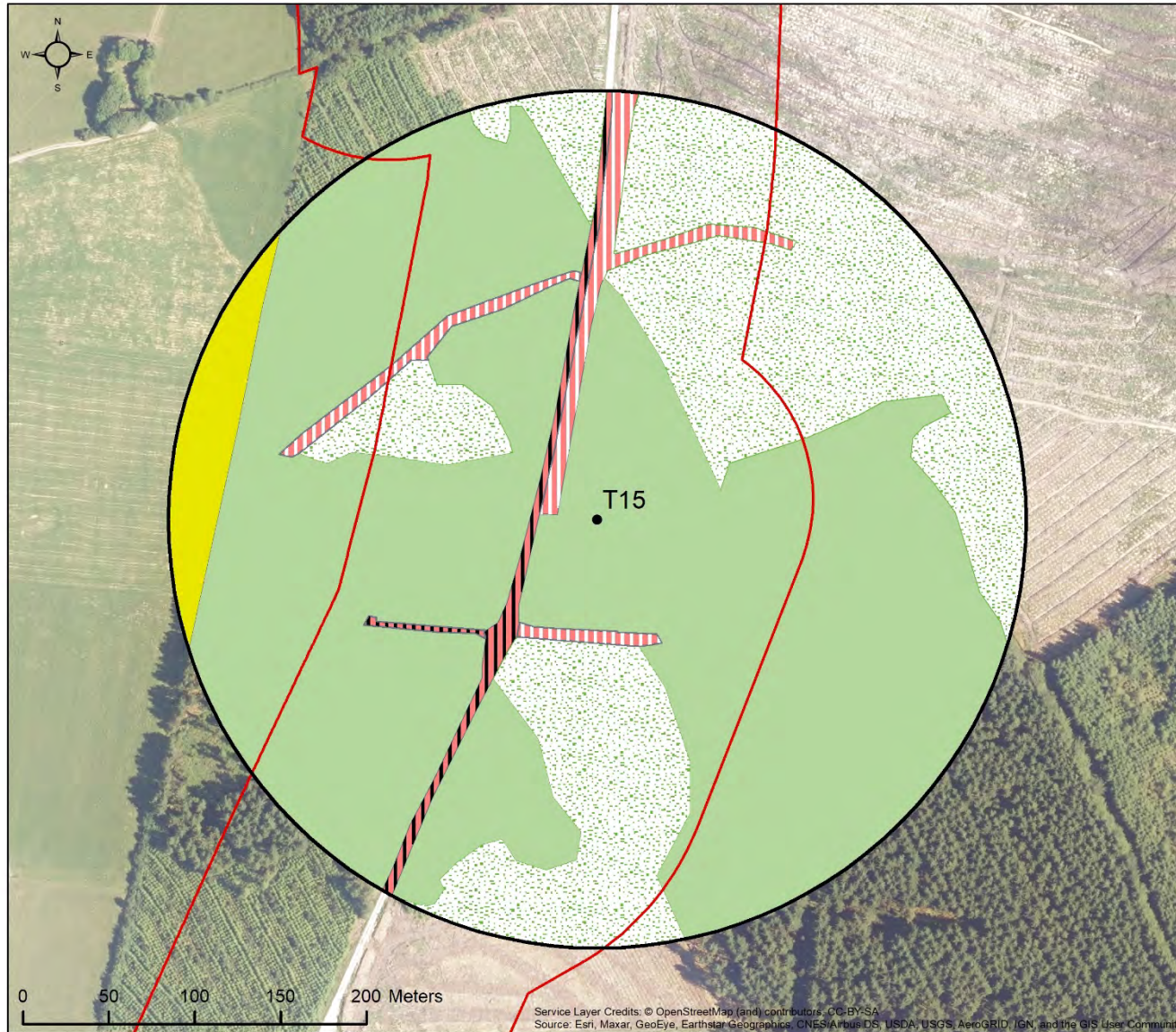
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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 15

Legend:

Habitats within 250m of Turbine 15

- ED2: Spoil and bare ground
- ED3: Recolonising bare ground
- GA1: Improved agricultural grassland
- WD4: Conifer plantation
- WS5: Recently-felled woodland
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

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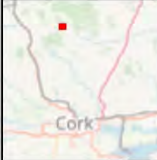
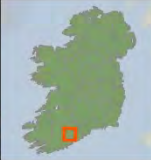







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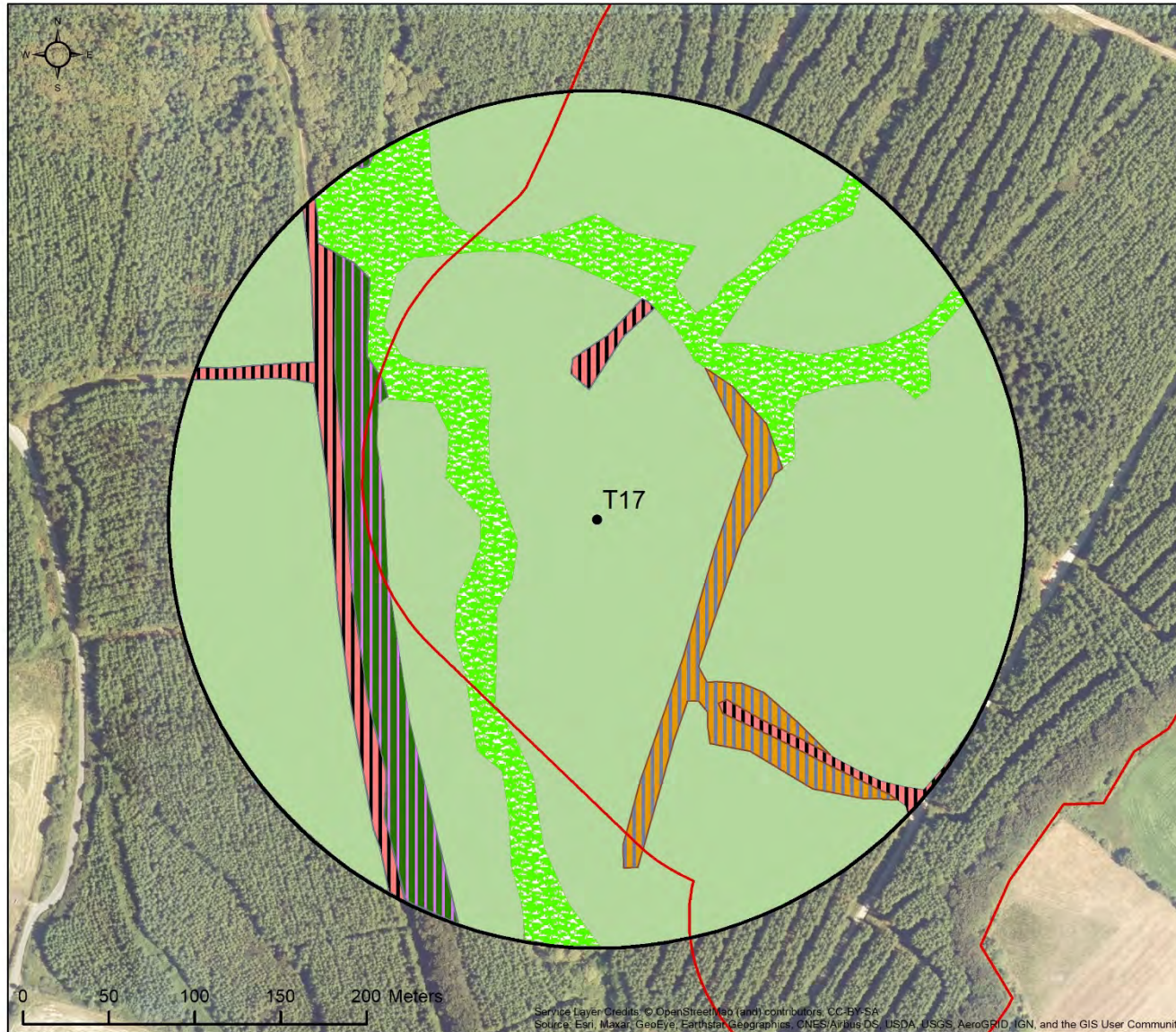
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Client: Brookfield Renewables Ireland Ltd.					
Project: Coom Green Energy Park (CGEP)					
Title: Habitats within 250m of Turbine 16					
					
Legend:					
Habitats within 250m of Turbine 16					
	GA1: Improved agricultural grassland				
	WD4: Conifer plantation				
	WS5: Recently-felled woodland				
	Proposed Turbine Layout				
	Turbines 250m Buffer				
	Proposed Development Boundary				
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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 17

Legend:

Habitats within 250m of Turbine 17

- ED2: Spoil and bare ground
- GS4/HH3: Wet grassland/wet heath mosaic
- WD1: (Mixed) broadleaf woodland
- WD4: Conifer plantation
- WS1: Scrub
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

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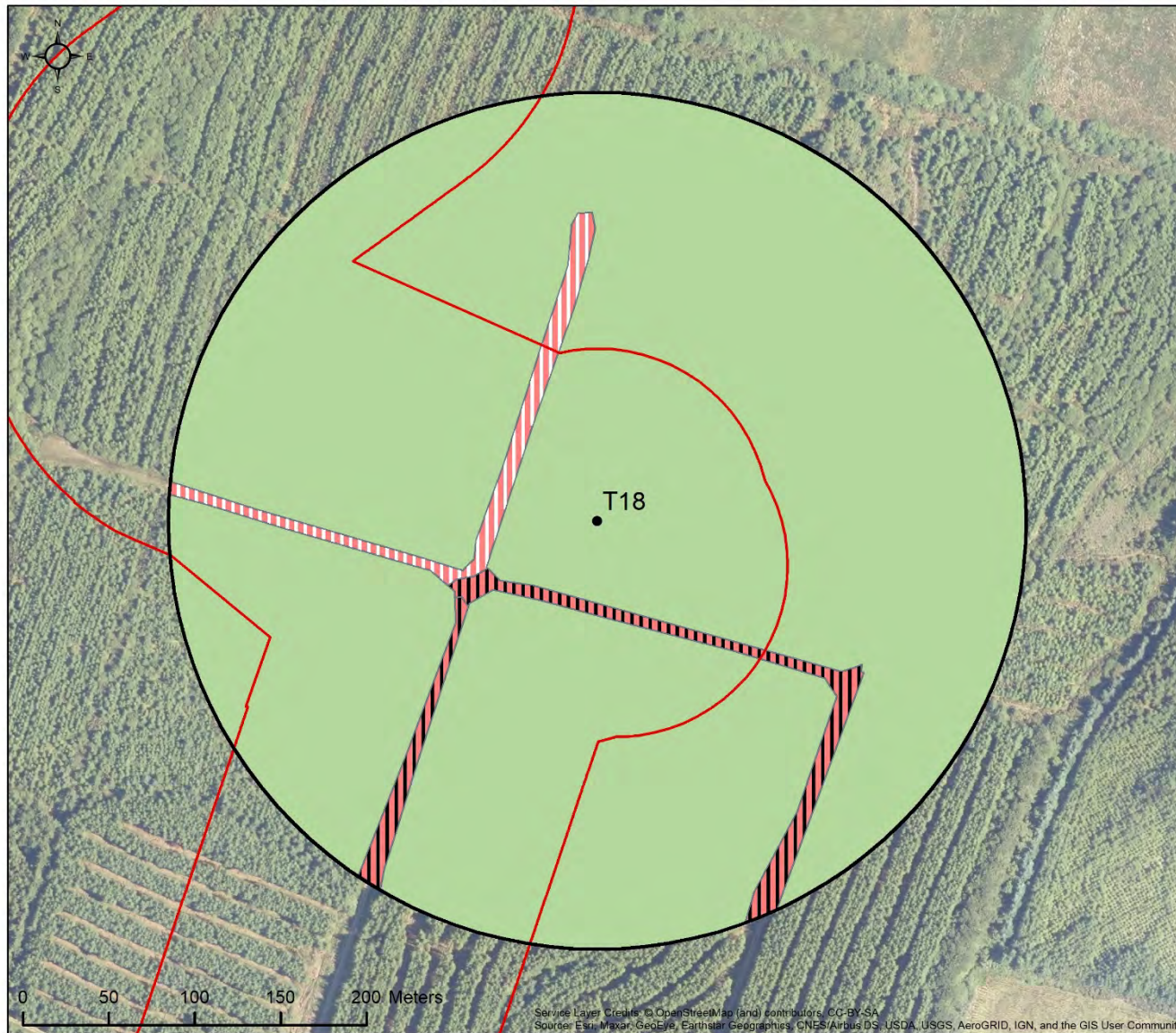
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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 18

Legend:

Habitats within 250m of Turbine

- ED2: Spoil and bare ground
- ED3: Recolonising bare ground
- WD4: Conifer plantation
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 19

Legend:

Habitats within 250m of Turbine 19

- ED2: Spoil and bare ground
- WD1: (Mixed) broadleaf woodland
- WD4: Conifer plantation
- WS1: Scrub
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

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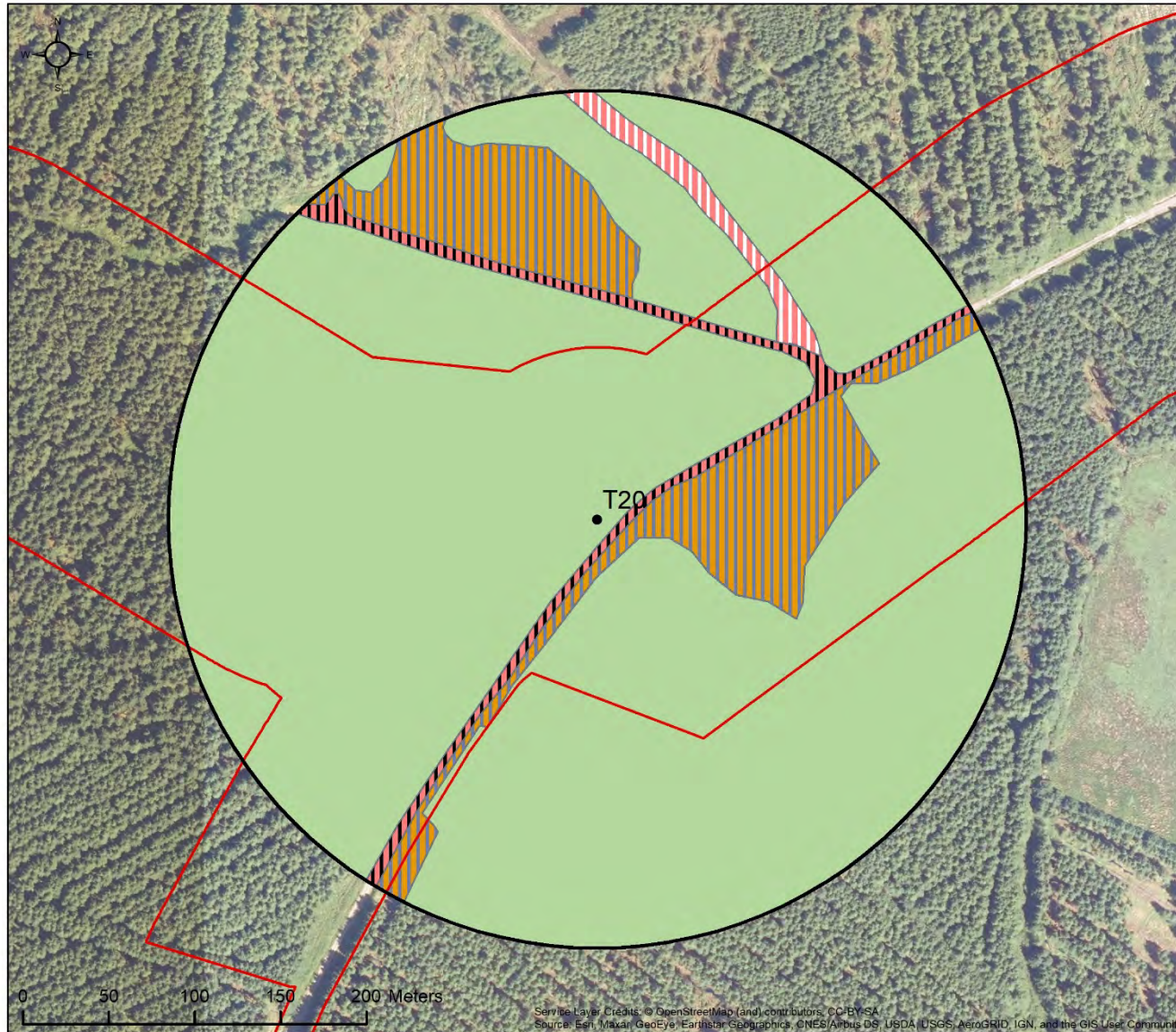
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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 20

Legend:

Habitats within 250m of Turbine 20

- ED2: Spoil and bare ground
- ED3: Recolonising bare ground
- GS4: Wet grassland
- WD4: Conifer plantation
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

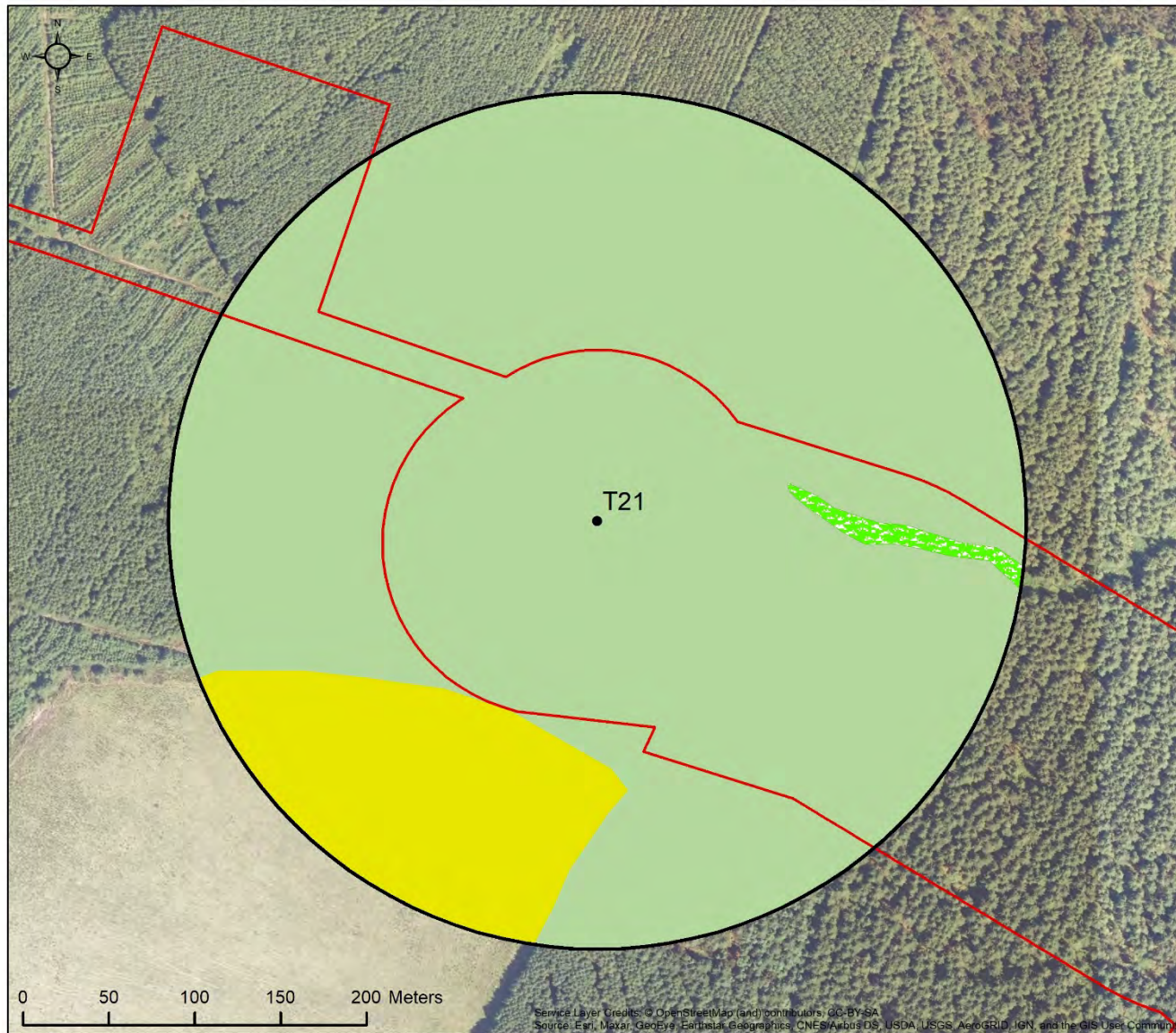
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Client: Brookfield Renewables Ireland Ltd.

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Title:
Habitats within 250m of Turbine 21

Legend:

Habitats within 250m of Turbine 21

- GA1: Improved agricultural grassland
- WD4: Conifer plantation
- WS1: Scrub
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

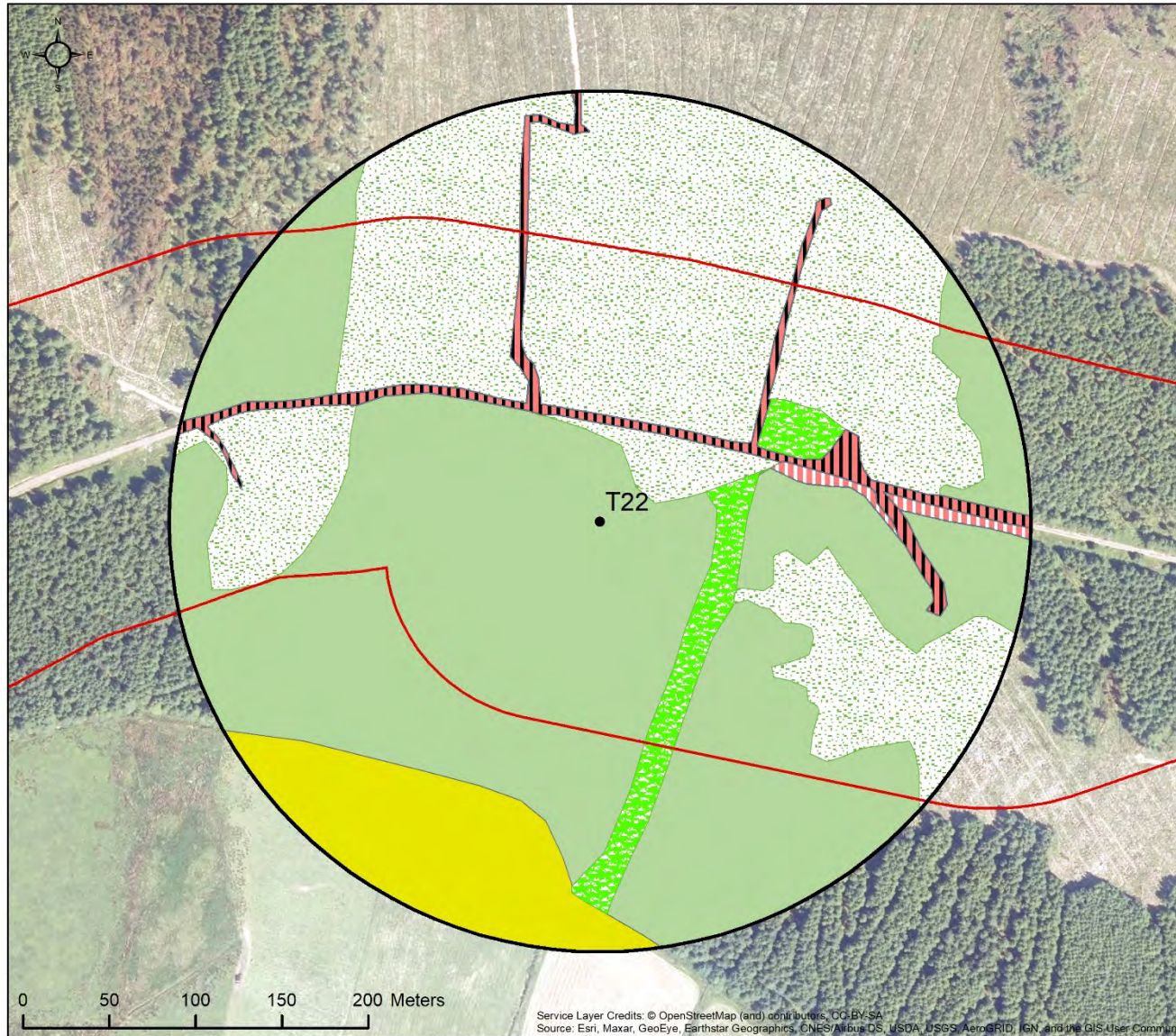
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Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 22

Legend:

Habitats within 250m of Turbine 22

- ED2: Spoil and bare ground
- ED3: Recolonising bare ground
- GA1: Improved agricultural grassland
- WD4: Conifer plantation
- WS1: Scrub
- WS5: Recently-felled woodland
- Proposed Turbine Layout
- Turbines 250m Buffer
- Proposed Development Boundary

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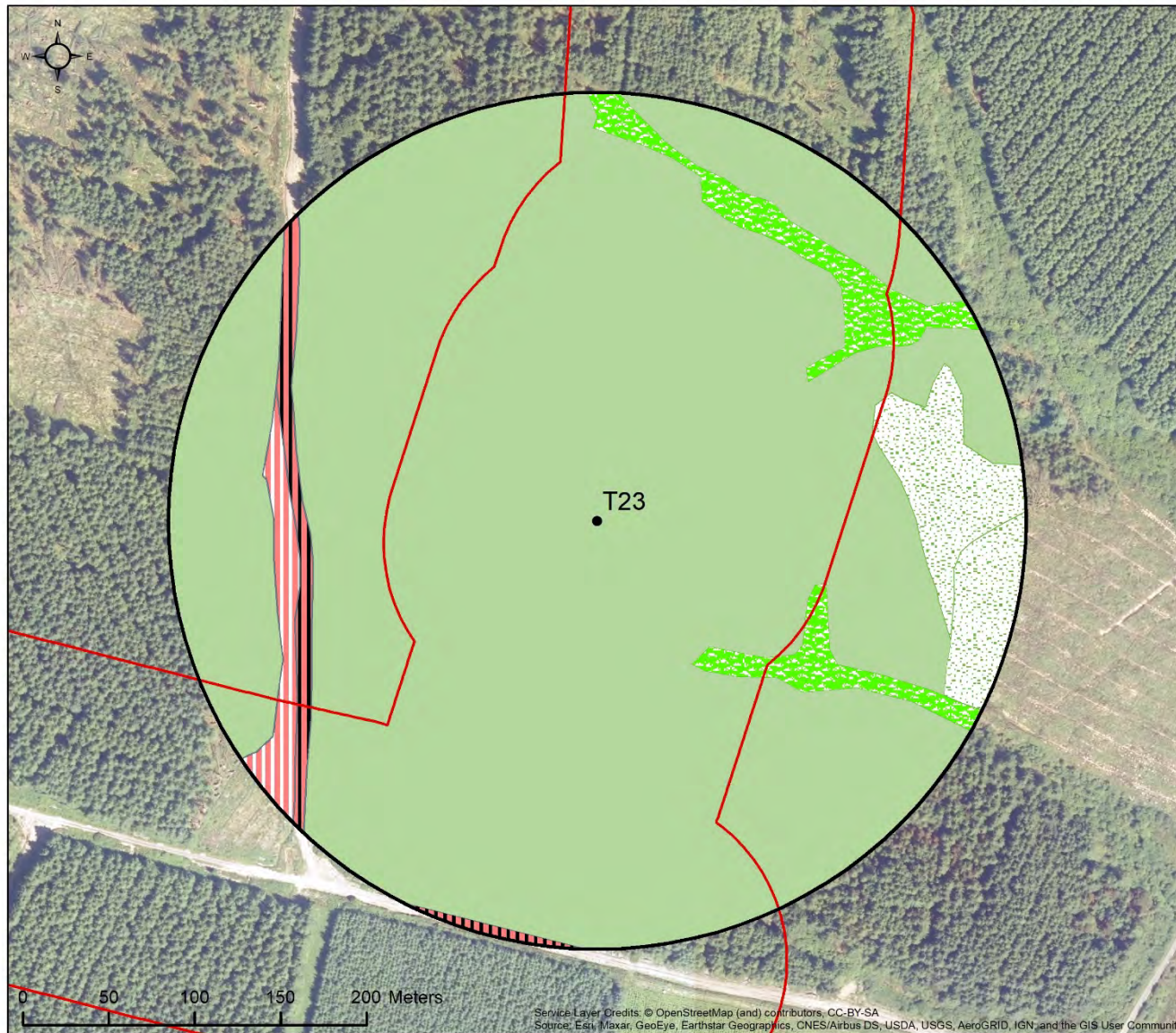
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Client: Brookfield Renewables Ireland Ltd.

Project: Coom Green Energy Park (CGEP)

Title:
Habitats within 250m of Turbine 23

Legend:

Habitats within 250m of Turbine

- ED2: Spoil and bare
- ED3: Recolonising bare
- WD4: Conifer plantation
- WS1: Scrub
- WS5: Recently-felled
- Proposed Turbine Layout
- Turbines 250m Buffer
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Appendix B – Forage habitat calculations for 250m buffer surrounding Turbines.

Turbine 2

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T2	WD4	17-18	2002	2045	1.05	5	0.18
T2	WD4	25-26	1994	2040	0.08	10	0.03
T2	WD4	25-26	1994	2027	0.00	10	0.00
T2	WD4	22-23	1997	2041	0.13	9	0.04
T2	WD4	21-22	1998	2046	1.63	4	0.22
T2	WD4	25-26	1994	2027	0.25	10	0.08
T2	WD4	25-26	1994	2040	0.00	10	0.00
T2	ED2	-			0.09		0.09
T2	WS1	-			0.12		0.12
T2	WD4	22-23	1997	2027	0.21	10	0.07
T2	WD4	22-23	1997	2041	0.87	9	0.26
T2	WD4	25-26	1994	2040	4.25	10	1.42
T2	WD4	25-26	1994	2040	2.48	10	0.83
T2	WD4	17-18	2002	2045	0.55	5	0.09
T2	WS1	-			0.24		0.24
T2	WD4	25-26	1994	2040	4.22	10	1.41
T2	WD4	12-13	2007	2025	0.06	10	0.02
T2	WS1	-			0.00		0.00
T2	WS1	-			0.08		0.08
T2	WS1	-			0.00		0.00
T2	WS1	-			0.12		0.12
T2	WD4	21-22	1998	2046	1.74	4	0.23
T2	WS1	-			0.01		0.01
T2	WS1	-			0.00		0.00
T2	WS1	-			0.00		0.00
T2	WD4	22-23	1997	2027	0.04	10	0.01
T2	WD4	21-22	1998	2046	0.20	4	0.03
T2	WD4	25-26	1994	2027	0.01	10	0.00
T2	WD4	25-26	1994	2040	0.04	10	0.01
T2	WD4	25-26	1994	2027	0.02	10	0.01
T2	WD4	17-18	2002	2046	0.14	4	0.02
T2	WD4	25-26	1994	2027	0.02	10	0.01
T2	WD4	22-23	1997	2060	0.00	0	0.00

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T2	WD4	22-23	1997	2045	0.06	5	0.01
T2	WD4	22-23	1997	2060	0.18	0	0.00
T2	WD4	22-23	1997	2027	0.44	10	0.15
T2	WD4	17-18	2002	2045	0.16	5	0.03
T2	WD4	25-26	1994	2045	0.11	5	0.02
T2	WD4	25-26	1994	2046	0.02	4	0.00
T2	WD4	25-26	1994	2045	0.00	5	0.00

Turbine 3

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T3	ED2	-			0.03		0.03
T3	WD4	-			0.13	0	0.00
T3	WD4	56-57	1963		0.08	0	0.00
T3	WS1	-			0.04		0.04
T3	WD4	56-57	1963		0.00	0	0.00
T3	WD4	56-57	1963		0.00	0	0.00
T3	WD4	7-8	2012	2023	1.68	12	0.67
T3	WD4	31-32	1988	2044	0.46	6	0.09
T3	WS1	-			0.04		0.04
T3	ED2	-			0.29		0.29
T3	WS1	-			0.99		0.99
T3	ED3	-			0.02		0.02
T3	WD4	7-8	2012	2023	1.27	12	0.51
T3	WD4	-			0.03	0	0.00
T3	WS1	-			0.96		0.96
T3	WS1	-			0.04		0.04
T3	WD4	56-57	1963		0.95	0	0.00
T3	ED2	-			0.01		0.01
T3	ED3	-			0.04		0.04
T3	WD4	7-8	2012	2023	1.50	12	0.60
T3	WS5	-			0.39		0.39
T3	WD4	15-16	2004	2047	0.18	3	0.02
T3	WD4	11-12	2008	2054	0.40	0	0.00
T3	WD4	9-10	2010	2045	0.01	5	0.00
T3	HH3/WS1	-			0.37		0.37
T3	WS1	-			0.06		0.06
T3	WS1	-			0.01		0.01
T3	WD4	7-8	2012	2023	1.05	12	0.42

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T3	WS5	-			0.60		0.60
T3	WD4	56-57	1963		2.17	0	0.00
T3	WD4	56-57	1963		0.64	0	0.00
T3	WS5	-			0.19		0.19
T3	WD4	9-10	2010	2045	2.21	5	0.37
T3	WS5	-			0.04		0.04
T3	ED3	-			0.04		0.04
T3	WD4	56-57	1963		0.00	0	0.00
T3	WD4	9-10	2010	2045	0.41	5	0.07
T3	WD4	56-57	1963		0.74	0	0.00
T3	WD4	7-8	2012	2047	1.25	5	0.21
T3	WD4	31-32	1988	2028	0.30	10	0.10

Turbine 4

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T4	BL3	-			0.06		0
T4	WD4	12-13	2007	2025	0.01	10	0.00
T4	WD4	9-10	2010	2045	10.11	5	1.68
T4	WD4	31-32	1988	2044	0.00	6	0.00
T4	WS1	-			0.21		0.21
T4	WD4	22-23	1997		0.97	0	0.00
T4	FS1	-			0.01		0.01
T4	WS1	-			0.00		0.00
T4	WD4	9-10	2010	2025	0.12	10	0.04
T4	WD4	12-13	2007	2025	0.12	10	0.04
T4	WD4	22-23	1997	2041	0.01	9	0.00
T4	WD4	12-13	2007	2025	0.08	10	0.03
T4	WS1	-			0.07		0.07
T4	WS1	-			0.02		0.02
T4	BL3	-			0.06		0
T4	FL8	-			0.11		0.11
T4	BL3	-			0.09		0
T4	WD4	31-32	1988	2044	0.48	6	0.10
T4	WD4	9-10	2010	2045	2.17	5	0.36
T4	WS1	-			0.29		0.29
T4	WD4	23-24	1996	2040	0.17	10	0.06
T4	WD4	23-24	1996	2040	0.60	10	0.20
T4	GS4/HH1	-			0.60		0.60

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T4	WD4	22-23	1997		0.10	0	0.00
T4	WD4	31-32	1988		0.95	0	0.00
T4	WD4	23-24	1996		1.04	0	0.00
T4	WS5	-			0.30		0.30
T4	WD4	22-23	1997		0.35	0	0.00
T4	WD4	22-23	1997		0.09	0	0.00
T4	WS5	-			0.06		0.06
T4	WD4	22-23	1997		0.23	0	0.00
T4	WS1	-			0.06		0.06
T4	WS1	-			0.11		0.11
T4	WD4	31-32	1988	2044	0.00	6	0.00
T4	WD4	22-23	1997		0.00	0	0.00
T4	WD4	22-23	1997		0.00	0	0.00

Turbine 5

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T5	WD4	26-27	1993		0.11	0	0.00
T5	WD4	32-33	1987	2031	5.17	10	1.72
T5	WD4	18-19	2001		4.04	0	0.00
T5	WD4	32-33	1987	2031	1.01	10	0.34
T5	WS1	-			0.08		0.08
T5	WD4	26-27	1993		1.23	0	0.00
T5	WD4	26-27	1993	2043	0.23	7	0.05
T5	WD4	26-27	1993		0.88	0	0.00
T5	WD4	26-27	1993	2043	1.67	7	0.39
T5	HH3	-			0.34		0.34
T5	ED3	-			0.06		0.06
T5	WD4	26-27	1993	2043	1.78	7	0.42
T5	WD4	26-27	1993	2043	1.19	7	0.28
T5	WD4	18-19	2001		0.01	0	0.00
T5	WD4	18-19	2001		0.06	0	0.00
T5	WD4	26-27	1993	2054	0.82	0	0.00
T5	WD4	26-27	1993	2054	0.96	0	0.00
T5	BL3	-			0.15		0
T5	WD4	9-10	2010	2045	0.21	5	0.04
T5	WD4	8-9	2011	2045	0.00	6	0.00
T5	WD4	8-9	2011	2045	0.10	6	0.02
T5	WD4	9-10	2010	2045	0.00	5	0.00

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T5	WD4	46-47	1973	2020	0.00	10	0.00
T5	WD4	46-47	1973	2020	3.78	10	1.26
T5	WD4	32-33	1987	2031	0.63	10	0.21
T5	WD4	46-47	1973	2045	0.00	5	0.00
T5	WD4	2-3	2017	2051	6.42	7	1.50
T5	WS1	-			0.98		0.98
T5	ED2	-			0.31		0.31
T5	WD4	32-33	1987	2031	0.13	10	0.04
T5	WD4	46-47	1973	2045	1.13	5	0.19
T5	WD4	46-47	1973		0.38	0	0.00
T5	WD4	46-47	1973		0.28	0	0.00
T5	HH3	-			0.09		0.09
T5	ED2	-			0.04		0.04
T5	WS1	-			0.00		0.00
T5	WD4	46-47	1973		0.02	0	0.00
T5	WS1	-			0.05		0.05
T5	WD4	46-47	1973	2020	0.00	10	0.00
T5	WD4	46-47	1973	2020	0.00	10	0.00
T5	WD4	46-47	1973		1.77	0	0.00
T5	WD4	2-3	2017	2051	3.14	7	0.73

Turbine 6

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T6	BL3	-			0.15		0
T6	WD4	9-10	2010	2045	0.21	5	0.04
T6	WD4	8-9	2011	2045	0.00	6	0.00
T6	WD4	8-9	2011	2045	0.10	6	0.02
T6	WD4	9-10	2010	2045	0.00	5	0.00
T6	WD4	46-47	1973	2020	0.00	10	0.00
T6	WD4	46-47	1973	2020	3.78	10	1.26
T6	WD4	32-33	1987	2031	0.63	10	0.21
T6	WD4	46-47	1973	2045	0.00	5	0.00
T6	WD4	2-3	2017	2051	6.42	7	1.50
T6	WS1	-			0.98		0.98
T6	ED2	-			0.31		0.31
T6	WD4	32-33	1987	2031	0.13	10	0.04
T6	WD4	46-47	1973	2045	1.13	5	0.19
T6	WD4	46-47	1973		0.38	0	0.00

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T6	WD4	46-47	1973		0.28	0	0.00
T6	HH3	-			0.09		0.09
T6	ED2	-			0.04		0.04
T6	WS1	-			0.00		0.00
T6	WD4	46-47	1973		0.02	0	0.00
T6	WS1	-			0.05		0.05
T6	WD4	46-47	1973	2020	0.00	10	0.00
T6	WD4	46-47	1973	2020	0.00	10	0.00
T6	WD4	46-47	1973		1.77	0	0.00
T6	WD4	2-3	2017	2051	3.14	7	0.73

Turbine 7

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T7	WS1	-			0.07		0.07
T7	WS5	-			0.29		0.29
T7	WS1	-			0.10		0.10
T7	WS1	-			0.02		0.02
T7	HD1	-			0.16		0.16
T7	WS1	-			0.09		0.09
T7	WS1	-			0.00		0.00
T7	WD4	45-46	1974	2008	0.00	10	0.00
T7	WD4	47-48	1972		0.02	0	0.00
T7	WD4	45-46	1974	2008	0.26	10	0.09
T7	WD4	45-46	1974		0.00	0	0.00
T7	WS1	-			0.09		0.09
T7	WS1	-			0.00		0.00
T7	WD4	45-46	1974	2008	0.00	10	0.00
T7	WD4	45-46	1974	2008	0.02	10	0.01
T7	WD4	45-46	1974	2008	0.69	10	0.23
T7	WD4	45-46	1974	2051	0.00	0	0.00
T7	WS1	-			0.00		0.00
T7	WS1	-			0.04		0.04
T7	WS1	-			0.01		0.01
T7	WS1	-			0.00		0.00
T7	WD4	2-3	2017	2051	1.13	7	0.26
T7	WD4	45-46	1974	2008	2.64	10	0.88
T7	WD4	21-22	1998		0.34	0	0.00
T7	WD4	18-19	2011	2049	0.00	2	0.00

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T7	WD4	18-19	2011	2049	0.38	2	0.03
T7	WS5	-			0.01		0.01
T7	WS1	-			0.00		0.00
T7	WD4	18-19	2011	2049	0.02	2	0.00
T7	WS1	-			0.00		0.00
T7	ED2	-			0.01		0.01
T7	ED2	-			0.25		0.25
T7	BL3	-			0.12		0
T7	ED2	-			0.09		0.09
T7	ED2	-			0.08		0.08
T7	WD4/WS1	-			0.26		0.26
T7	WD4	45-46	1974		0.12	0	0.00
T7	WD4	45-46	1974		0.38	0	0.00
T7	WD4	18-19	2011	2049	0.30	2	0.02
T7	FL8	-			0.15		0.15
T7	BL3	-			0.06		0
T7	BL2	-			0.15		0.15
T7	WS1/WD4	-			1.08		1.08
T7	WD4	18-19	2011	2049	0.06	2	0.00
T7	WS1	-			0.48		0.48
T7	WS1	-			0.49		0.49
T7	WS5	-			1.46		1.46
T7	WS1	-			0.12		0.12
T7	WS5	-			4.58		4.58
T7	WS5	-			0.23		0.23
T7	WD4	45-46	1974		0.31	0	0.00
T7	WD4	45-46	1974		0.18	0	0.00
T7	WD4	47-48	1972		0.23	0	0.00
T7	WS5	-			0.05		0.05
T7	WD4	2-3	2017	2052	0.24	7	0.06
T7	WS1	-			0.03		0.03
T7	WS5	-			0.00		0.00
T7	WS5	-			0.00		0.00
T7	ED2	-			0.00		0.00
T7	WD4	45-46	1974	2100	0.43	0	0.00
T7	WD4	2-3	2017	2052	0.30	7	0.07
T7	WD4	45-46	1974	2045	0.42	5	0.07
T7	WD4	45-46	1974	2052	0.59	0	0.00

Turbine 8

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T8	WD4	21-22	1998		1.23	0	0.00
T8	WD1	-			1.06		1.06
T8	WD4	21-22	1998		1.54	0	0.00
T8	WS1	-			0.10		0.10
T8	GA1	-			0.04		0
T8	WS5	-			0.12		0.12
T8	WS1	-			0.15		0.15
T8	WS1	-			0.02		0.02
T8	WD4	15-16	2004	2045	2.76	5	0.46
T8	WD4	44-45	1974	2045	1.45	5	0.24
T8	WS1	-			0.08		0.08
T8	WD4	44-45	1974	2100	0.49	0	0.00
T8	WD4	15-16	2004	2100	1.00	0	0.00
T8	GA1	-			2.84		0
T8	GA1	-			0.53		0
T8	GA1	-			0.73		0
T8	GA1	-			2.89		0
T8	GS4	-			0.82		0.82
T8	GA1	-			1.49		0
T8	WS1	-			0.02		0.02

Turbine 9

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T9	ED2	-			0.27		0.27
T9	BL3	-			0.01		0
T9	ED2	-			0.16		0.16
T9	GA1	-			0.49		0
T9	WD4	31-32	1988		0.16	0	0.00
T9	WS1	-			0.15		0.15
T9	GA1	-			0.22		0
T9	GA1	-			0.81		0
T9	GS4	-			0.80		0.80
T9	GA1	-			1.58		0
T9	WS1	-			0.74		0.74
T9	WS1	-			0.32		0.32
T9	WS1	-			0.15		0.15

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T9	WS5	-			7.40		7.40
T9	WS5	-			0.17		0.17
T9	WD4	31-32	1988		1.01	0	0.00
T9	WS1	-			0.28		0.28
T9	WS1	-			0.16		0.16
T9	WS5	-			0.48		0.48
T9	WD4	21-22	1998		3.45	0	0.00
T9	GA1	-			0.81		0
T9	GA1	-			0.00		0
T9	GA1	-			0.00		0
T9	WD4	31-32	1988		0.00	0	0.00
T9	GA1	-			0.00		0
T9	GA1	-			0.00		0
T9	GS4	-			0.00		0.00
T9	WD4	21-22	1998		0.00	0	0.00
T9	GS4	-			0.00		0.00
T9	GA1	-			0.00		0
T9	GA1	-			0.00		0

Turbine 10

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T10	WS1	-			0.66		0.66
T10	GA1	-			2.13		0
T10	WD4	31-32	1988		0.57	0	0.00
T10	WD4	23-24	1996		7.01	0	0.00
T10	GA1	-			0.07		0
T10	GA1	-			7.53		0
T10	GA1	-			1.29		0
T10	ED2	-			0.07		0.07
T10	GA1	-			0.03		0
T10	GA1	-			0.11		0
T10	GA1	-			0.06		0
T10	WS1	-			0.01		0.01
T10	WD4	23-24	1996		0.00	0	0.00
T10	WS1	-			0.10		0.10

Turbine 11

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T11	GS4/HH3	-			0.37		0.37
T11	GS4/HH3	-			1.13		1.13
T11	WS1/HH3	-			0.55		0.55
T11	GA1	-			0.25		0
T11	GS4	-			0.26		0.26
T11	GA1	-			0.00		0
T11	GA1	-			0.13		0
T11	GA1	-			0.17		0
T11	GA1	-			3.50		0
T11	GA1	-			8.42		0
T11	ED2	-			0.14		0.14
T11	WD4	23-24	1996	2040	0.05	10	0.02
T11	ED2	-			0.32		0.32
T11	ED2	-			0.04		0.04
T11	GA1	-			0.77		0
T11	GA1	-			3.07		0
T11	ED2	-			0.02		0.02
T11	GA1	-			0.03		0
T11	ED2	-			0.01		0.01
T11	GA1	-			0.40		0

Turbine 12

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T12	ED2	-			0.05		0.05
T12	GS4	-			0.16		0.16
T12	WD4	21-22	1997	2037	11.94	10	3.98
T12	GA1	-			6.87		0
T12	HH3/WS1	-			0.53		0.53
T12	ED2	-			0.08		0.08

Turbine 13

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T13	GS4	-			3.40		3.40

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T13	WD4	20-21	1999	2040	0.33	10	0.11
T13	WS5	-			8.27		8.27
T13	WS5	-			0.12		0.12
T13	ED2	-			0.36		0.36
T13	WS5	-			1.58		1.58
T13	WD4	46-47	1973	2023	4.56	10	1.52
T13	WS5	-			1.01		1.01

Turbine 14

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T14	WD4	25-26	1994	2040	14.77	10	4.92
T14	WD4	10-11	2009	2040	0.15	10	0.05
T14	WS5	-			0.02		0.02
T14	WS5	-			1.19		1.19
T14	GS4	-			0.17		0.17
T14	GA1	-			3.03		0
T14	GA1	-			0.08		0
T14	ED2	-			0.06		0.06
T14	ED2	-			0.17		0.17

Turbine 15

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T15	ED2	-			0.28		0.28
T15	WS5	-			1.66		1.66
T15	WD4	10-11	2009	2053	0.65	0	0.00
T15	ED3	-			0.32		0.32
T15	WD4	47-48	1972	2024	3.78	10	1.26
T15	WS5	-			3.54		3.54
T15	GA1	-			0.58		0
T15	WD4	10-11	2009	2053	2.20	0	0.00
T15	WS5	-			0.25		0.25
T15	WD4	10-11	2009	2053	0.69	0	0.00
T15	WD4	10-11	2009	2053	0.92	0	0.00
T15	WS5	-			0.43		0.43

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T15	WD4	10-11	2009	2023	2.21	10	0.74
T15	WD4	10-11	2009	2053	0.75	0	0.00
T15	ED3	-			0.14		0.14
T15	WD4	10-11	2009	2053	1.16	0	0.00
T15	ED3	-			0.06		0.06
T15	ED2	-			0.02		0.02

Turbine 16

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T16	WS5	-			1.98		1.98
T16	WD4	26-27	1993	2040	0.96	10	0.32
T16	WD4	26-27	1993	2040	0.08	10	0.03
T16	WD4	26-27	1993	2040	0.24	10	0.08
T16	GA1	-			0.11		0
T16	WD4	26-27	1993	2040	0.84	10	0.28
T16	WD4	47-48	1972	2024	1.20	10	0.40
T16	WD4	26-27	1993	2040	5.26	10	1.75
T16	WD4	26-27	1993	2040	8.70	10	2.90
T16	WD4	26-27	1993	2040	0.26	10	0.09

Turbine 17

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T17	WS1	-			2.36		2.36
T17	ED2	-			0.10		0.10
T17	WD4	22-23	1997	2027	5.29	10	1.76
T17	WD1	62-63	1957	2053	0.87		0.87
T17	WD1	62-63	1957	2053	0.00		0.00
T17	WD4	22-23	1997	2027	1.26	10	0.42
T17	WD4	22-23	1997	2027	1.80	10	0.60
T17	WD4	18-19	2000	2027	0.75	10	0.25
T17	WD4	22-23	1997	2027	3.37	10	1.12
T17	GS4/HH3	-			0.64		0.64
T17	WD4	22-23	1997	2039	2.10	10	0.70
T17	WD4	13-14	2006	2050	0.37	0	0.00

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T17	ED2	-			0.07		0.07
T17	ED2	-			0.48		0.48

Turbine 18

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T18	WD4	13-14	2006	2050	2.21	0	0.00
T18	WD4	16-17	2003	2050	11.90	0	0.00
T18	WD4	22-23	1997	2027	3.99	10	1.33
T18	WD4	22-23	1997	2027	0.71	10	0.24
T18	ED3	-			0.34		0.34
T18	ED2	-			0.14		0.14
T18	ED2	-			0.34		0.34

Turbine 19

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T19	ED2	-			0.31		0.31
T19	WD1	-			0.18		0.18
T19	WS1	-			0.07		0.07
T19	WS1	-			0.48		0.48
T19	WS1	-			0.04		0.04
T19	WS1	-			0.04		0.04
T19	WS1	-			0.05		0.05
T19	WS1	-			0.03		0.03
T19	WS1	-			0.02		0.02
T19	WS1	-			0.09		0.09
T19	WS1	-			0.03		0.03
T19	WS1	-			0.02		0.02
T19	WD4	24-25	1995		0.77	0	0.00
T19	WD4	26-27	1993		6.17	0	0.00
T19	WD4	24-25	1995		5.62	0	0.00
T19	WD4	28-29	1991		2.66	0	0.00
T19	WD4	24-25	1995		3.04	0	0.00

Turbine 20

Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T20	WD4	28-29	1991		6.83	0	0.00
T20	WD4	36-37	1983		1.33	0	0.00
T20	GS4	-			1.19		1.19
T20	WD4	35-36	1983		7.70	0	0.00
T20	WD4	35-36	1983		0.87	0	0.00
T20	WD4	35-36	1983		0.05	0	0.00
T20	GS4	-			0.96		0.96
T20	ED3	-			0.25		0.25
T20	ED2	-			0.46		0.46

Turbine 21

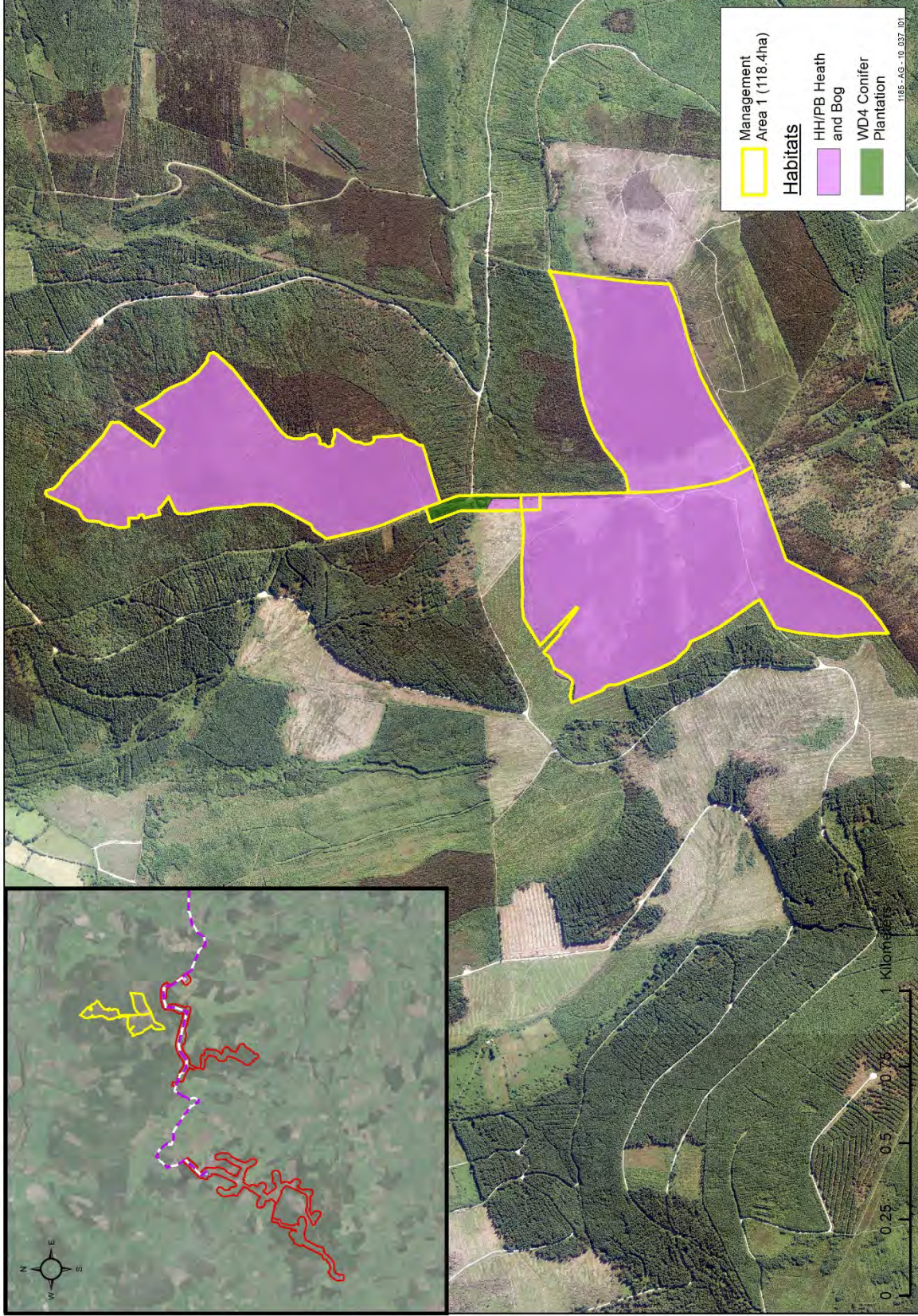
Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T21	GA1	-			2.37		0
T21	WS1	-			0.16		0.16
T21	WD4	11-12	2008	2055	1.35	0	0.00
T21	WD4	25-26	1994	2040	0.38	10	0.13
T21	WD4	25-26	1994	2045	9.15	5	1.53
T21	WD4	36-37	1983		6.21	0	0.00

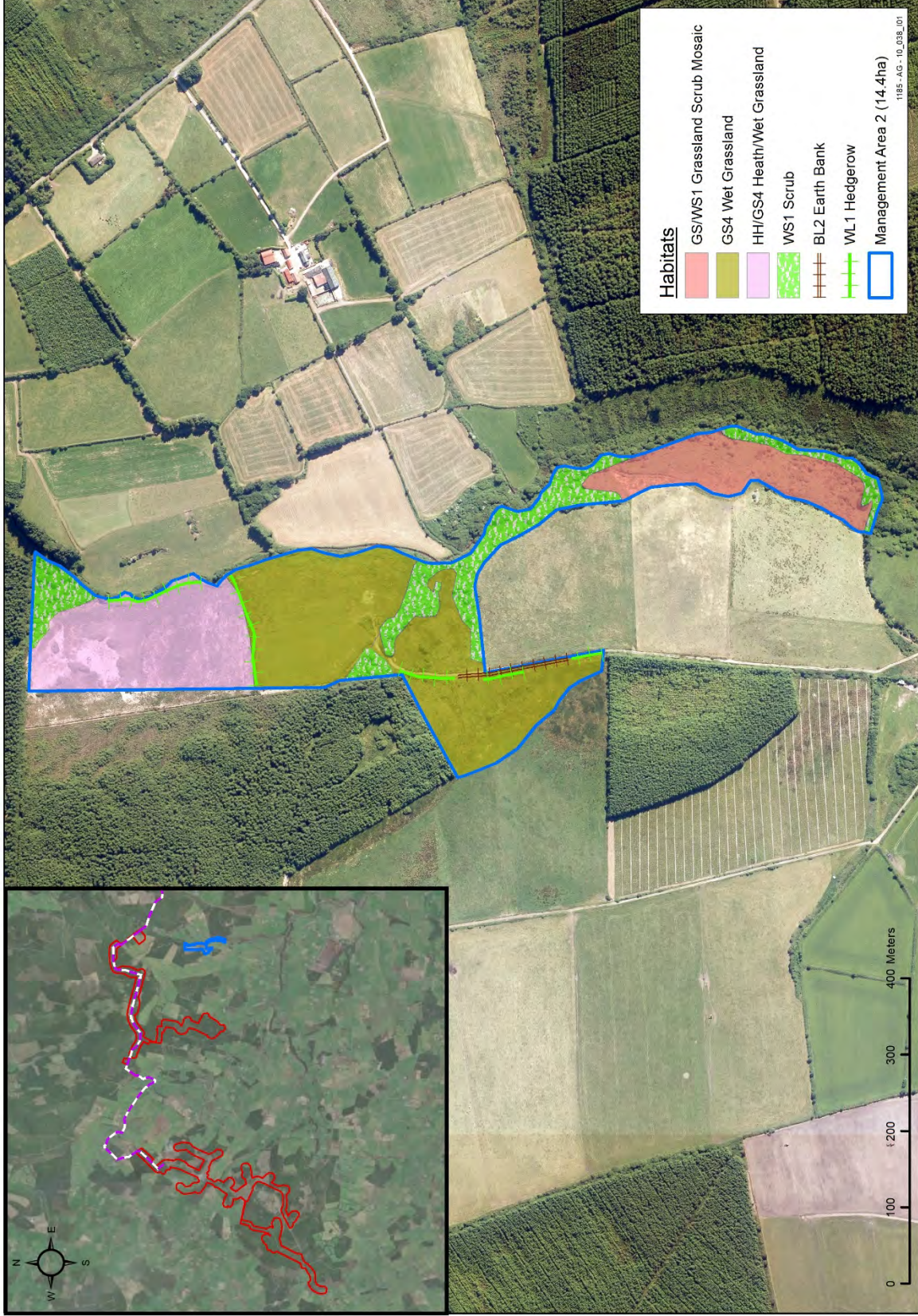
Turbine 22

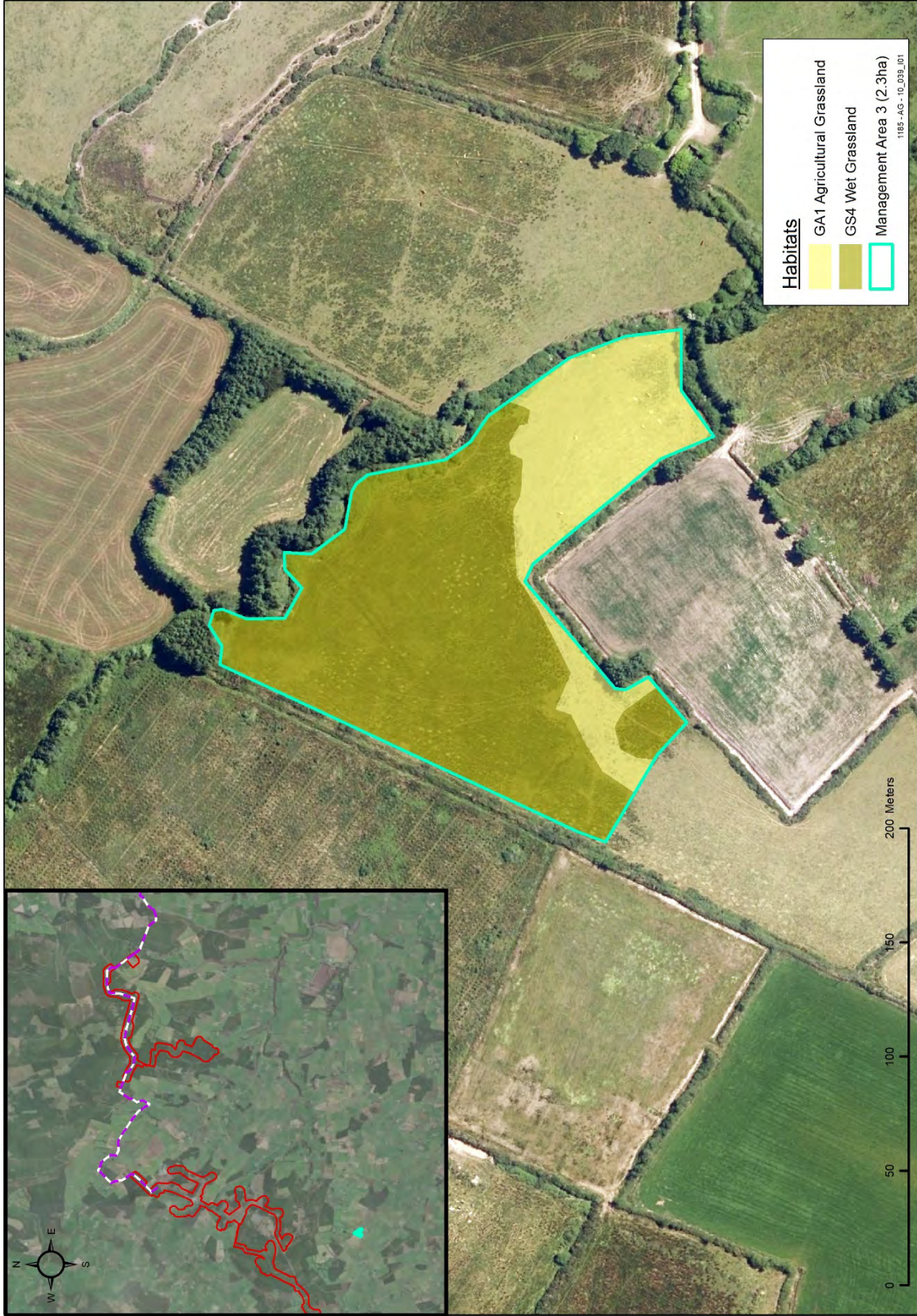
Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T22	WD4	28-29	1991		0.37	0	0.00
T22	WD4	28-29	1991		0.88	0	0.00
T22	WD4	28-29	1991		1.92	0	0.00
T22	WD4	28-29	1991		5.32	0	0.00
T22	WS5	-			1.03		1.03
T22	GA1	-			1.42		0
T22	WD4	35-36	1983		0.80	0	0.00
T22	WS5	-			1.55		1.55
T22	WS5	-			0.68		0.68
T22	WS1	-			0.12		0.12
T22	WS5	-			4.15		4.15
T22	WS1	-			0.47		0.47

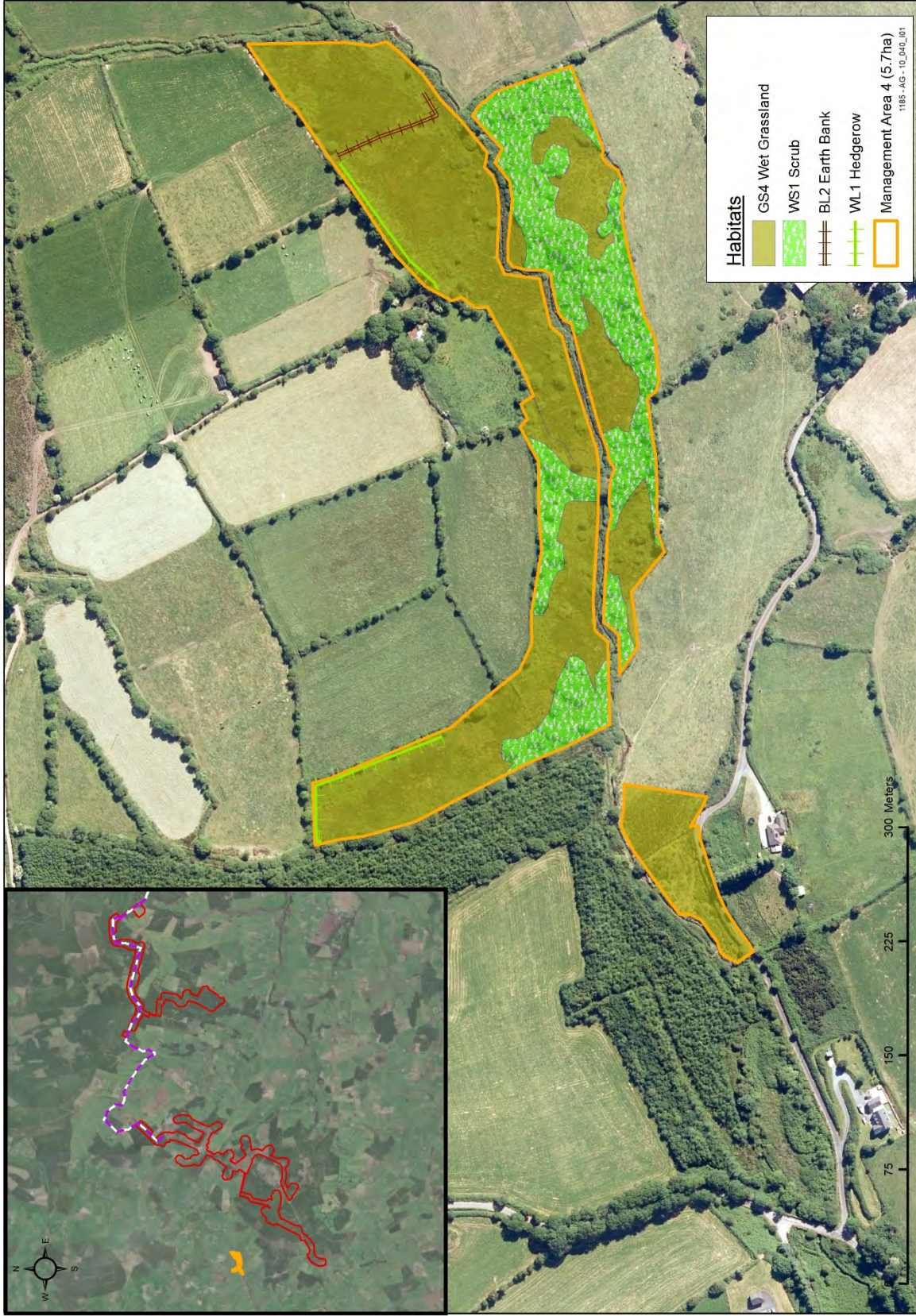
Turbine	Fossitt Code	Forestry age class (2020)	Plant year	Fell year	Area (ha)	Availability of Habitat (yrs)	Mitigation Habitat (ha/annum)
T22	ED3	-			0.05		0.05
T22	ED3	-			0.05		0.05
T22	WS5	-			0.25		0.25
T22	ED2	-			0.54		0.54

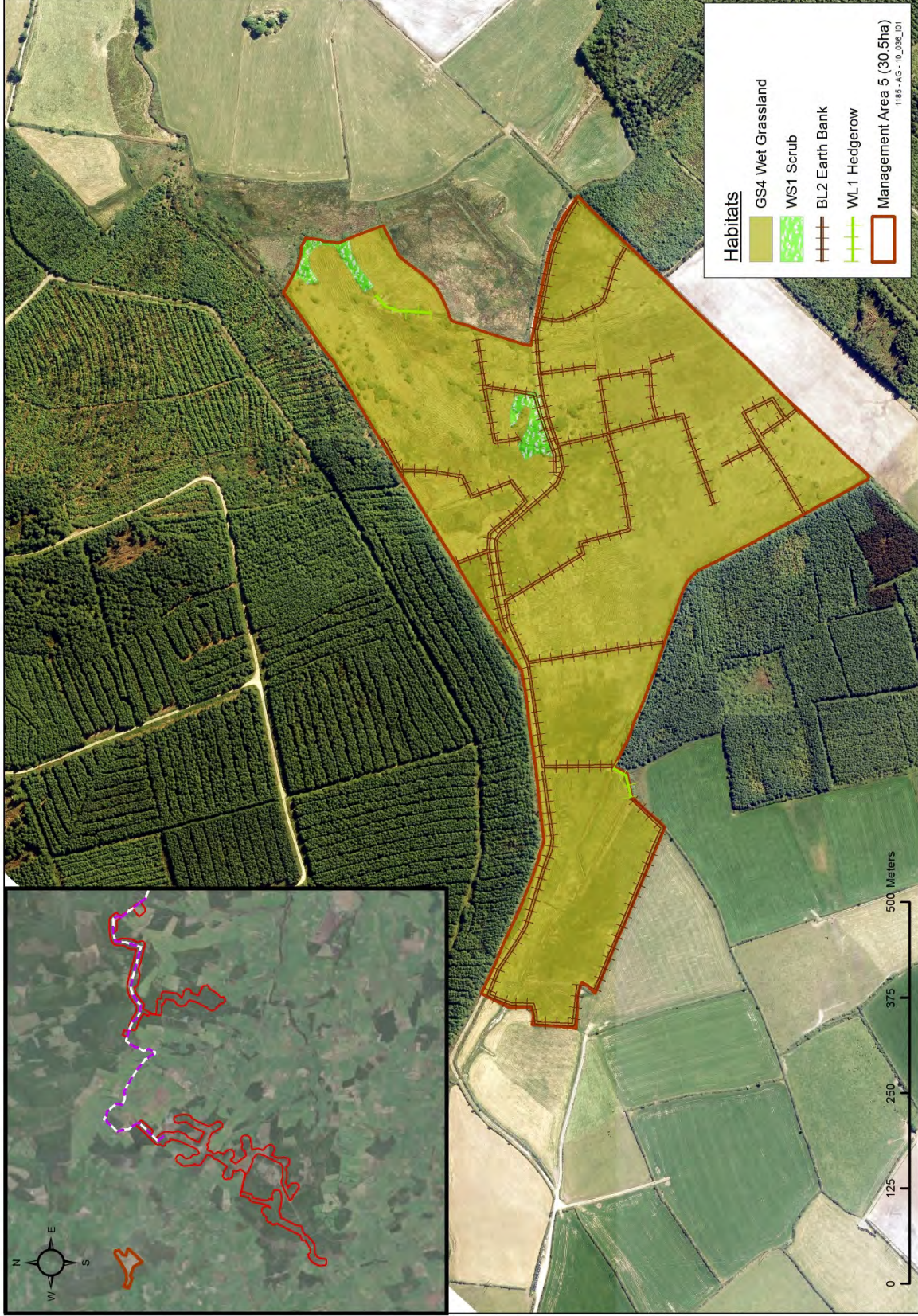
Appendix C – Site Conditions and Description of Management Areas.











Confidential Annex (Not For Publication)

Include Confidential Annex
Include Confidential Figures